

## GENERAL DESCRIPTION

The XRT86VL38 is an eight-channel 1.544 Mbit/s or 2.048 Mbit/s DS1/E1/J1 framer and LIU integrated solution featuring R<sup>3</sup> technology (Relayless, Reconfigurable, Redundancy). The physical interface is optimized with internal impedance, and with the patented pad structure, the XRT86VL38 provides protection from power failures and hot swapping.

The XRT86VL38 contains an integrated DS1/E1/J1 framer and LIU which provide DS1/E1/J1 framing and error accumulation in accordance with ANSI/ITU-T specifications. Each framer has its own framing synchronizer and transmit-receive slip buffers. The slip buffers can be independently enabled or disabled as required and can be configured to frame to the common DS1/E1/J1 signal formats.

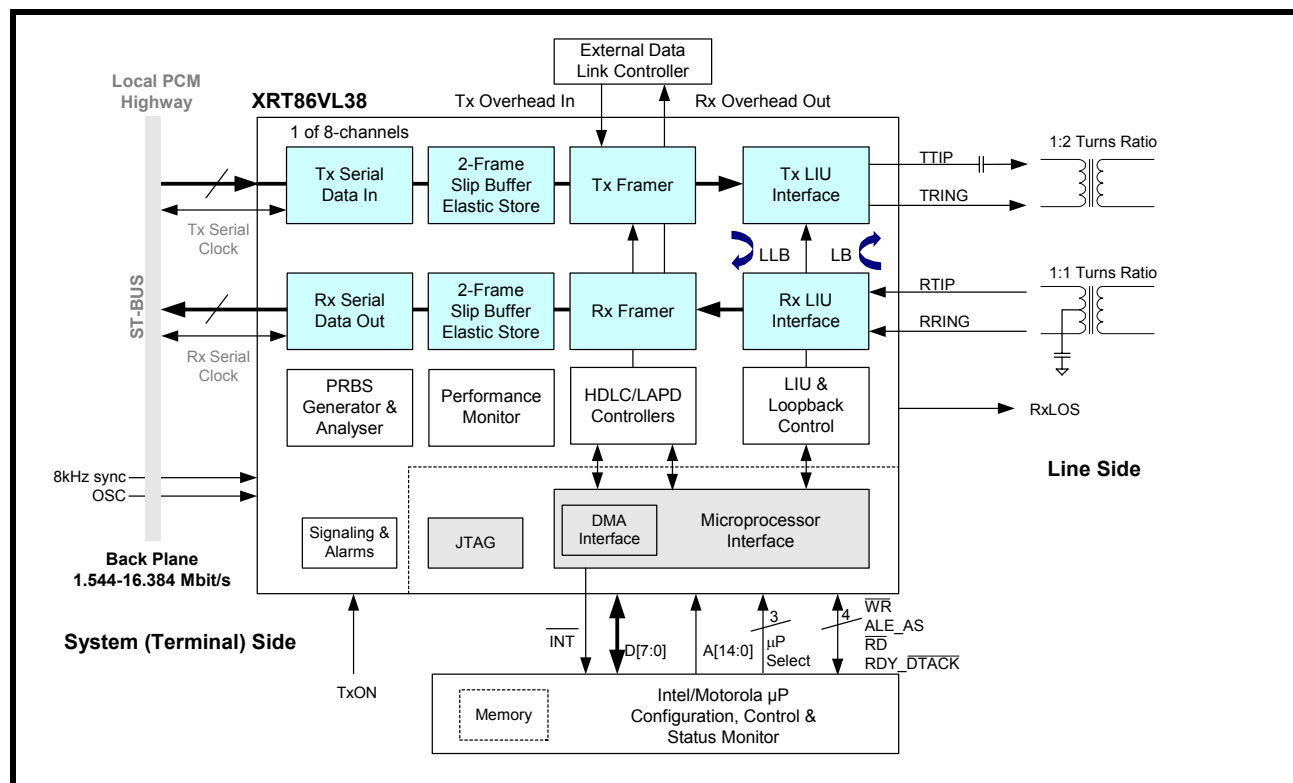
Each Framer block contains its own Transmit and Receive T1/E1/J1 Framing function. There are 3 Transmit HDLC controllers per channel which encapsulate contents of the Transmit HDLC buffers into LAPD Message frames. There are 3 Receive HDLC controllers per channel which extract the

payload content of Receive LAPD Message frames from the incoming T1/E1/J1 data stream and write the contents into the Receive HDLC buffers. Each framer also contains a Transmit and Overhead Data Input port, which permits Data Link Terminal Equipment direct access to the outbound T1/E1/J1 frames. Likewise, a Receive Overhead output data port permits Data Link Terminal Equipment direct access to the Data Link bits of the inbound T1/E1/J1 frames.

The XRT86VL38 fully meets all of the latest T1/E1/J1 specifications: ANSI T1/E1.107-1988, ANSI T1/E1.403-1995, ANSI T1/E1.231-1993, ANSI T1/E1.408-1990, AT&T TR 62411 (12-90) TR54016, and ITU G-703, G.704, G.706 and G.733, AT&T Pub. 43801, and ETS 300 011, 300 233, JT G.703, JT G.704, JT G.706, I.431. Extensive test and diagnostic functions include Loop-backs, Boundary scan, Pseudo Random bit sequence (PRBS) test pattern generation, Performance Monitor, Bit Error Rate (BER) meter, forced error insertion, and LAPD unchannelized data payload processing according to ITU-T standard Q.921.

**Applications and Features (next page)**

**FIGURE 1. XRT86VL38 8-CHANNEL DS1 (T1/E1/J1) FRAMER/LIU COMBO**



**OCTAL T1/E1/J1 FRAMER/LIU COMBO - HARDWARE DESCRIPTION**

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**APPLICATIONS**

- High-Density T1/E1/J1 interfaces for Multiplexers, Switches, LAN Routers and Digital Modems
- SONET/SDH terminal or Add/Drop multiplexers (ADMs)
- T1/E1/J1 add/drop multiplexers (MUX)
- Channel Service Units (CSUs): T1/E1/J1 and Fractional T1/E1/J1
- Digital Access Cross-connect System (DACs)
- Digital Cross-connect Systems (DCS)
- Frame Relay Switches and Access Devices (FRADS)
- ISDN Primary Rate Interfaces (PRA)
- PBXs and PCM channel bank
- T3 channelized access concentrators and M13 MUX
- Wireless base stations
- ATM equipment with integrated DS1 interfaces
- Multichannel DS1 Test Equipment
- T1/E1/J1 Performance Monitoring
- Voice over packet gateways
- Routers

**FEATURES**

- Eight independent, full duplex DS1 Tx and Rx Framer/LIUs
- Two 512-bit (two-frame) elastic store, PCM frame slip buffers (FIFO) on TX and Rx provide up to 8.192 MHz asynchronous back plane connections with jitter and wander attenuation
- Supports input PCM and signaling data at 1.544, 2.048, 4.096 and 8.192 Mbits. Also supports 4-channel multiplexed 12.352/16.384 (HMVIP/H.100) Mbit/s on the back plane bus
- Programmable output clocks for Fractional T1/E1/J1
- Supports Channel Associated Signaling (CAS)
- Supports Common Channel Signalling (CCS)
- Supports ISDN Primary Rate Interface (ISDN PRI) signaling
- Extracts and inserts robbed bit signaling (RBS)
- 3 Integrated HDLC controllers per channel for transmit and receive, each controller having two 96-byte buffers (buffer 0 / buffer 1)
- HDLC Controllers Support SS7
- Timeslot assignable HDLC
- V5.1 or V5.2 Interface
- Automatic Performance Report Generation (PMON Status) can be inserted into the transmit LAPD interface every 1 second or for a single transmission
- Alarm Indication Signal with Customer Installation signature (AIS-CI)
- Remote Alarm Indication with Customer Installation (RAI-CI)
- Gapped Clock interface mode for Transmit and Receive.

- Intel/Motorola and Power PC interfaces for configuration, control and status monitoring
- Parallel search algorithm for fast frame synchronization
- Wide choice of T1 framing structures: SF/D4, ESF, SLC@96, T1DM and N-Frame (non-signaling)
- Direct access to D and E channels for fast transmission of data link information
- PRBS, QRSS, and Network Loop Code generation and detection
- Programmable Interrupt output pin
- Supports programmed I/O and DMA modes of Read-Write access
- Each framer block encodes and decodes the T1/E1/J1 Frame serial data
- Detects and forces Red (SAI), Yellow (RAI) and Blue (AIS) Alarms
- Detects OOF, LOF, LOS errors and COFA conditions
- Loopbacks: Local (LLB) and Line remote (LB)
- Facilitates Inverse Multiplexing for ATM
- Performance monitor with one second polling
- Boundary scan (IEEE 1149.1) JTAG test port
- Accepts external 8kHz Sync reference
- 1.8V Inner Core Voltage
- 3.3V I/O operation with 5V tolerant inputs
- 420-pin PBGA package or 484-pin STBGA package with -40°C to +85°C operation

**ORDERING INFORMATION**

| PART NUMBER    | PACKAGE                         | OPERATING TEMPERATURE RANGE |
|----------------|---------------------------------|-----------------------------|
| XRT86VL38IB    | 420 Plastic Ball Grid Array     | -40°C to +85°C              |
| XRT86VL38IB484 | 484 Shrink Thin Ball Grid Array | -40°C to +85°C              |

**420 BALL - PLASTIC BALL GRID ARRAY (BOTTOM VIEW, SEE PIN LIST FOR DESCRIPTION)**

| 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----|
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | A  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | B  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | C  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | D  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | E  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | F  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | G  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | H  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | J  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | K  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | L  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | M  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | N  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | P  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | R  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | T  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | U  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | V  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | W  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | Y  |
| O  | O  | O  | O  | O  |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |   | O | O | O | O | O | AA |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | AB |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | AC |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | AD |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | AE |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | AF |

**484 BALL - SHRINK THIN BALL GRID ARRAY (BOTTOM VIEW - SEE PIN LIST FOR DESCRIPTION)**

| 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----|
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | A  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | B  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | C  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | D  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | E  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | F  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | G  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | H  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | J  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | K  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | L  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | M  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | N  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | P  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | R  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | T  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | U  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | V  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | W  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | Y  |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | AA |
| O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O  | O | O | O | O | O | O | O | O | O | AB |

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**1.0 PIN LISTS**
**TABLE 1: 420 BALL LIST  
BY BALL NUMBER**
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BY BALL NUMBER**
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BY BALL NUMBER**
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BY BALL NUMBER**

| PIN | PIN NAME  |
|-----|-----------|
| A1  | DVDD18    |
| A2  | DGND      |
| A3  | AGND      |
| A4  | MCLKIN    |
| A5  | TMS       |
| A6  | RXSERCLK0 |
| A7  | TCK       |
| A8  | RXCHCLK0  |
| A9  | TXSYNC0   |
| A10 | RXCHN0_4  |
| A11 | TXSERCLK0 |
| A12 | TXCHCLK0  |
| A13 | TXCHN0_2  |
| A14 | RXCHCLK1  |
| A15 | RXCHN1_2  |
| A16 | RXLOS1    |
| A17 | TXMSYNC1  |
| A18 | TXOH1     |
| A19 | TXOHCLK1  |
| A20 | TXCHN1_3  |
| A21 | TXCHN1_4  |
| A22 | RXCHN2_0  |
| A23 | RXCASYNC2 |
| A24 | RXCHCLK2  |
| A25 | VDD       |
| A26 | RXCHN2_4  |
| B1  | VDDPLL18  |
| B2  | GNDPLL    |
| B3  | NC        |
| B4  | AVDD18    |
| B5  | E1MCLKOUT |

| PIN | PIN NAME   |
|-----|------------|
| B6  | TDO        |
| B7  | TRST       |
| B8  | RXCRCSYNC0 |
| B9  | RXOHCLK0   |
| B10 | TXMSYNC0   |
| B11 | TEST       |
| B12 | TXCHN0_1   |
| B13 | RXSERCLK1  |
| B14 | RXSER1     |
| B15 | RXOH1      |
| B16 | RXCHN1_3   |
| B17 | VSS        |
| B18 | NC         |
| B19 | TXCHN1_2   |
| B20 | RXLOS2     |
| B21 | GPIO1_3    |
| B22 | RXCHN2_1   |
| B23 | NC         |
| B24 | TXSYNC2    |
| B25 | VSS        |
| B26 | TXCHCLK2   |
| C1  | VDDPLL18   |
| C2  | VDDPLL18   |
| C3  | GNDPLL     |
| C4  | NC         |
| C5  | ANALOG     |
| C6  | VSS        |
| C7  | RXSER0     |
| C8  | VDD        |
| C9  | RXCHN0_2   |
| C10 | RXCHN0_3   |
| C11 | RXOH0      |

| PIN | PIN NAME   |
|-----|------------|
| C12 | TXOH0      |
| C13 | VSS        |
| C14 | TXCHN0_4   |
| C15 | VDD        |
| C16 | TXSYNC1    |
| C17 | RXCHN1_4   |
| C18 | TXCHN1_0   |
| C19 | TXSERCLK1  |
| C20 | RXSERCLK2  |
| C21 | RXSER2     |
| C22 | RXCHN2_2   |
| C23 | RXCHN2_3   |
| C24 | TXMSYNC2   |
| C25 | VSS        |
| C26 | TXCHN2_2   |
| D1  | RTIP0      |
| D2  | RVDD0      |
| D3  | VDDPLL18   |
| D4  | JTAG_RING  |
| D5  | RxTSEL     |
| D6  | T1MCLKOUT  |
| D7  | TDI        |
| D8  | RXCHN0_0   |
| D9  | RXSYNC0    |
| D10 | VSS        |
| D11 | TXSER0     |
| D12 | TXCHN0_0   |
| D13 | RXCRCSYNC1 |
| D14 | RXCHN1_0   |
| D15 | RXSYNC1    |
| D16 | RXOHCLK1   |
| D17 | TXSER1     |

| PIN | PIN NAME   |
|-----|------------|
| D18 | TXCHN1_1   |
| D19 | RXSYNC2    |
| D20 | VSS        |
| D21 | RXOH2      |
| D22 | TXSERCLK2  |
| D23 | NC         |
| D24 | VDD18      |
| D25 | TXCHN2_1   |
| D26 | RXSER3     |
| E1  | RRING0     |
| E2  | RGND0      |
| E3  | GNDPLL     |
| E4  | GNDPLL     |
| E5  | NC         |
| E6  | SENSE      |
| E7  | aTEST      |
| E8  | RXLOS0     |
| E9  | RXCHN0_1   |
| E10 | RXCASYNC0  |
| E11 | TXOHCLK0   |
| E12 | VDD18      |
| E13 | TXCHN0_3   |
| E14 | RXCHN1_1   |
| E15 | RXCASYNC1  |
| E16 | NC         |
| E17 | TXCHCLK1   |
| E18 | VDD18      |
| E19 | NC         |
| E20 | RXCRCSYNC2 |
| E21 | RXOHCLK2   |
| E22 | NC         |
| E23 | TXSER2     |

## OCTAL T1/E1/J1 FRAMER/LIU COMBO - HARDWARE DESCRIPTION

TABLE 1: 420 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME   |
|-----|------------|
| E24 | TXOHCLK2   |
| E25 | TXCHN2_4   |
| E26 | TXOH2      |
| F1  | RTIP1      |
| F2  | RVDD1      |
| F3  | TTIP0      |
| F4  | TVDD0      |
| F5  | JTAG_TIP   |
| F22 | TXCHN2_0   |
| F23 | TXCHN2_3   |
| F24 | VDD        |
| F25 | RXCHCLK3   |
| F26 | RXOH3      |
| G1  | RRING1     |
| G2  | RGND1      |
| G3  | TTIP1      |
| G4  | TRING0     |
| G5  | NC         |
| G22 | GPIO1_2    |
| G23 | RXSYNC3    |
| G24 | RXOHCLK3   |
| G25 | RXCRCSYNC3 |
| G26 | RXCHN3_0   |
| H1  | RTIP2      |
| H2  | RVDD2      |
| H3  | TVDD1      |
| H4  | TRING1     |
| H5  | TGND0      |
| H22 | VSS        |
| H23 | RXCASYN3   |
| H24 | RXLOS3     |
| H25 | RXSERCLK3  |

TABLE 1: 420 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME  |
|-----|-----------|
| H26 | RXCHN3_1  |
| J1  | RRING2    |
| J2  | RGND2     |
| J3  | TTIP2     |
| J4  | TVDD2     |
| J5  | TGND1     |
| J22 | TXCHCLK3  |
| J23 | RXCHN3_2  |
| J24 | VDD18     |
| J25 | TXOH3     |
| J26 | RXCHN3_3  |
| K1  | RTIP3     |
| K2  | RVDD3     |
| K3  | TTIP3     |
| K4  | TRING2    |
| K5  | TGND2     |
| K22 | TXSYNC3   |
| K23 | TXOHCLK3  |
| K24 | TXSERCLK3 |
| K25 | RXCHN3_4  |
| K26 | TXSER3    |
| L1  | RRING3    |
| L2  | RGND3     |
| L3  | TVDD3     |
| L4  | TRING3    |
| L5  | TGND3     |
| L22 | TXCHN3_0  |
| L23 | VSS       |
| L24 | TXMSYN3   |
| L25 | TXCHN3_1  |
| L26 | CS        |
| M1  | RTIP4     |

TABLE 1: 420 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME |
|-----|----------|
| M2  | RVDD4    |
| M3  | TTIP4    |
| M4  | TRING4   |
| M5  | TGND4    |
| M22 | TXCHN3_2 |
| M23 | WR       |
| M24 | TXCHN3_3 |
| M25 | DATA7    |
| M26 | TXCHN3_4 |
| N1  | RRING4   |
| N2  | RGND4    |
| N3  | TVDD4    |
| N4  | NC       |
| N5  | TGND5    |
| N22 | ADDR14   |
| N23 | ADDR13   |
| N24 | DATA6    |
| N25 | DATA5    |
| N26 | VDD      |
| P1  | RTIP5    |
| P2  | RVDD5    |
| P3  | TTIP5    |
| P4  | TRING5   |
| P5  | NC       |
| P22 | ADDR11   |
| P23 | BLAST    |
| P24 | DATA4    |
| P25 | ADDR12   |
| P26 | VSS      |
| R1  | RRING5   |
| R2  | RGND5    |
| R3  | TVDD5    |

TABLE 1: 420 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME |
|-----|----------|
| R4  | TRING6   |
| R5  | TGND6    |
| R22 | ALE      |
| R23 | ADDR9    |
| R24 | ADDR10   |
| R25 | PTYPE2   |
| R26 | INT      |
| T1  | RTIP6    |
| T2  | RVDD6    |
| T3  | TTIP6    |
| T4  | TVDD6    |
| T5  | TGND7    |
| T22 | ADDR7    |
| T23 | VDD18    |
| T24 | ADDR8    |
| T25 | DATA2    |
| T26 | DATA3    |
| U1  | RRING6   |
| U2  | RGND6    |
| U3  | TTIP7    |
| U4  | TRING7   |
| U5  | NC       |
| U22 | ADDR2    |
| U23 | ADDR3    |
| U24 | ADDR4    |
| U25 | ADDR5    |
| U26 | ADDR6    |
| V1  | RTIP7    |
| V2  | RVDD7    |
| V3  | TVDD7    |
| V4  | NC       |
| V5  | NC       |

**TABLE 1: 420 BALL LIST  
BY BALL NUMBER**

| PIN  | PIN NAME |
|------|----------|
| V22  | VSS      |
| V23  | DBEN     |
| V24  | RDY      |
| V25  | ADDR0    |
| V26  | ADDR1    |
| W1   | RRING7   |
| W2   | RGND7    |
| W3   | NC       |
| W4   | NC       |
| W5   | NC       |
| W22  | iADDR    |
| W23  | PTYPE0   |
| W24  | DATA1    |
| W25  | RD       |
| W26  | PTYPE1   |
| Y1   | VSS      |
| Y2   | VDD      |
| Y3   | TXON     |
| Y4   | RESET    |
| Y5   | E1OSCCLK |
| Y22  | RXOHCLK4 |
| Y23  | ACK0     |
| Y24  | ACK1     |
| Y25  | PCLK     |
| Y26  | DATA0    |
| AA1  | VSS      |
| AA2  | 8KEXTOSC |
| AA3  | NC       |
| AA4  | NC       |
| AA5  | NC       |
| AA22 | RXOH4    |
| AA23 | VSS      |

**TABLE 1: 420 BALL LIST  
BY BALL NUMBER**

| PIN  | PIN NAME   |
|------|------------|
| AA24 | REQ1       |
| AA25 | VDD        |
| AA26 | fADDR      |
| AB1  | LOP        |
| AB2  | TXCHCLK7   |
| AB3  | 8KSYNC     |
| AB4  | TXCHN7_4   |
| AB5  | TXSERCLK7  |
| AB6  | RXSERCLK7  |
| AB7  | RXSER7     |
| AB8  | RXCHN7_0   |
| AB9  | TXSER6     |
| AB10 | TXCHN6_0   |
| AB11 | RXSYNC6    |
| AB12 | RXSERCLK6  |
| AB13 | RXCHN6_1   |
| AB14 | TXCHN5_3   |
| AB15 | TXSER5     |
| AB16 | TXOHCLK5   |
| AB17 | RXCHN5_2   |
| AB18 | GPIO0_2    |
| AB19 | VSS        |
| AB20 | VDD18      |
| AB21 | TXSER4     |
| AB22 | RXCHN4_4   |
| AB23 | VSS        |
| AB24 | RXCHCLK4   |
| AB25 | RXCRCSYNC4 |
| AB26 | REQ0       |
| AC1  | T1OSCCLK   |
| AC2  | TXOH7      |
| AC3  | TXCHN7_3   |

**TABLE 1: 420 BALL LIST  
BY BALL NUMBER**

| PIN  | PIN NAME   |
|------|------------|
| AC4  | VDD        |
| AC5  | TXCHN7_0   |
| AC6  | RXSYNC7    |
| AC7  | RXCHN7_1   |
| AC8  | TXMSYNC6   |
| AC9  | RXCASYN6   |
| AC10 | TXOHCLK6   |
| AC11 | VDD        |
| AC12 | RXLOS6     |
| AC13 | RXCHN6_0   |
| AC14 | TXCHN5_4   |
| AC15 | TXCHN5_0   |
| AC16 | VSS        |
| AC17 | RXCHN5_3   |
| AC18 | RXSER5     |
| AC19 | RXSERCLK5  |
| AC20 | TXCHN4_2   |
| AC21 | TXMSYNC4   |
| AC22 | VSS        |
| AC23 | RXCHN4_3   |
| AC24 | VDD18      |
| AC25 | RXSER4     |
| AC26 | RXLOS4     |
| AD1  | VDD18      |
| AD2  | TXCHN7_2   |
| AD3  | TXCHN7_1   |
| AD4  | RXLOS7     |
| AD5  | RXCRCSYNC7 |
| AD6  | VSS        |
| AD7  | VDD18      |
| AD8  | TXSYNC6    |
| AD9  | VSS        |

**TABLE 1: 420 BALL LIST  
BY BALL NUMBER**

| PIN  | PIN NAME   |
|------|------------|
| AD10 | TXCHCLK6   |
| AD11 | GPIO0_0    |
| AD12 | RXCHN6_3   |
| AD13 | GPIO0_1    |
| AD14 | TXOH5      |
| AD15 | TXCHN5_1   |
| AD16 | TXMSYNC5   |
| AD17 | RXCHN5_4   |
| AD18 | RXCHN5_0   |
| AD19 | TXCHN4_4   |
| AD20 | GPIO0_3    |
| AD21 | TXCHN4_0   |
| AD22 | TXCHCLK4   |
| AD23 | VDD        |
| AD24 | RXCASYN4   |
| AD25 | RXCHN4_0   |
| AD26 | RXSERCLK4  |
| AE1  | TXOHCLK7   |
| AE2  | VSS        |
| AE3  | TXSER7     |
| AE4  | TXSYNC7    |
| AE5  | RXCHN7_3   |
| AE6  | TXSERCLK6  |
| AE7  | RXOHCLK7   |
| AE8  | TXCHN6_4   |
| AE9  | TXCHN6_2   |
| AE10 | RXCRCSYNC6 |
| AE11 | RXCHCLK6   |
| AE12 | RXSER6     |
| AE13 | RXOHCLK6   |
| AE14 | RXOH6      |
| AE15 | TXCHN5_2   |

## OCTAL T1/E1/J1 FRAMER/LIU COMBO - HARDWARE DESCRIPTION

TABLE 1: 420 BALL LIST  
BY BALL NUMBER

| PIN  | PIN NAME   |
|------|------------|
| AE16 | TXCHCLK5   |
| AE17 | RXOH5      |
| AE18 | VDD        |
| AE19 | RXCASYNC5  |
| AE20 | TXCHN4_3   |
| AE21 | RXCHCLK5   |
| AE22 | GPIO1_0    |
| AE23 | TXSERCLK4  |
| AE24 | GPIO1_1    |
| AE25 | RXCHN4_1   |
| AE26 | RXSYNC4    |
| AF1  | NC         |
| AF2  | TXMSYNC7   |
| AF3  | RXCHN7_4   |
| AF4  | RXCHN7_2   |
| AF5  | RXCHCLK7   |
| AF6  | RXCASYNC7  |
| AF7  | RXOH7      |
| AF8  | TXCHN6_3   |
| AF9  | TXCHN6_1   |
| AF10 | TXOH6      |
| AF11 | RXCHN6_4   |
| AF12 | RXCHN6_2   |
| AF13 | VSS        |
| AF14 | VDD18      |
| AF15 | TXSERCLK5  |
| AF16 | TXSYNC5    |
| AF17 | RXOHCLK5   |
| AF18 | RXCHN5_1   |
| AF19 | RXSYNC5    |
| AF20 | RXLOS5     |
| AF21 | RXCRCSYNC5 |

TABLE 1: 420 BALL LIST  
BY BALL NUMBER

| PIN  | PIN NAME |
|------|----------|
| AF22 | TXCHN4_1 |
| AF23 | TXOHCLK4 |
| AF24 | TXSYNC4  |
| AF25 | TXOH4    |
| AF26 | RXCHN4_2 |

**TABLE 2: 484 BALL LIST  
BY BALL NUMBER**

| PIN | PIN NAME   |
|-----|------------|
| A2  | AVDD_LV    |
| A4  | E1MCLKOUT  |
| A5  | MCLKIN     |
| A6  | TRST       |
| A7  | RXCHN0_0   |
| A8  | RXSYNC0    |
| A9  | TXMSYNC0   |
| A10 | TXOHCLK0   |
| A11 | TXCHN0_1   |
| A12 | RXSERCLK1  |
| A13 | TXCHN0_4   |
| A14 | RXOH1      |
| A15 | RXCHN1_3   |
| A16 | TXCHCLK1   |
| A17 | TXOHCLK1   |
| A18 | RXSYNC2    |
| A19 | GPIO1_3    |
| A20 | RXCRCSYNC2 |
| A21 | RXOHCLK2   |
| B1  | VDDPLL18   |
| B3  | AGND       |
| B5  | DGND       |
| B6  | TMS        |
| B7  | RXSER0     |
| B8  | RXCRCSYNC0 |
| B9  | TXSYNC0    |
| B10 | RXCHN0_4   |
| B11 | TXCHN0_0   |
| B12 | RXCRCSYNC1 |
| B13 | RXCHN1_0   |
| B14 | RXCASYNC1  |

**TABLE 2: 484 BALL LIST  
BY BALL NUMBER**

| PIN | PIN NAME  |
|-----|-----------|
| B15 | TXMSYNC1  |
| B16 | TXOH1     |
| B17 | TXSERCLK1 |
| B18 | RXSERCLK2 |
| B19 | RXCHN2_0  |
| B20 | RXCHCLK2  |
| B21 | RXCHN2_4  |
| B22 | TXOHCLK2  |
| C1  | VDDPLL18  |
| C2  | JTAG_RING |
| C6  | RXTSEL    |
| C7  | ATEST     |
| C8  | RXLOS0    |
| C9  | RXCHN0_1  |
| C10 | RXCASYNC0 |
| C11 | TXSERCLK0 |
| C12 | TXCHCLK0  |
| C13 | RXCHN1_1  |
| C14 | RXLOS1    |
| C15 | TXSER1    |
| C16 | TXCHN1_0  |
| C17 | TXCHN1_3  |
| C18 | RXCASYNC2 |
| C19 | RXCHN2_1  |
| C20 | TXSYNC2   |
| C21 | TXCHN2_0  |
| C22 | TXCHN2_4  |
| D1  | GNDPLL18  |
| D2  | VDDPLL18  |
| D3  | GNDPLL18  |
| D4  | ANALOG    |
| D8  | TDO       |

**TABLE 2: 484 BALL LIST  
BY BALL NUMBER**

| PIN | PIN NAME  |
|-----|-----------|
| D9  | RXSERCLK0 |
| D10 | RXCHN0_2  |
| D11 | RXOH0     |
| D12 | TXCHN0_2  |
| D13 | RXCHN1_2  |
| D14 | RXOHCLK1  |
| D15 | TXCHN1_1  |
| D16 | RXLOS2    |
| D17 | RXSER2    |
| D18 | RXOH2     |
| D19 | RXCHN2_3  |
| D20 | TXSER2    |
| D21 | TXCHN2_3  |
| D22 | RXSYNC3   |
| E1  | RVDD0     |
| E2  | GNDPLL18  |
| E3  | VDDPLL18  |
| E4  | GNDPLL18  |
| E5  | JTAG_TIP  |
| E6  | SENSE     |
| E9  | TDI       |
| E10 | RXCHCLK0  |
| E11 | RXCHN0_3  |
| E12 | TEST      |
| E13 | TXOH0     |
| E14 | RXSER1    |
| E15 | RXCHCLK1  |
| E16 | RXSYNC1   |
| E17 | TXSERCLK2 |
| E18 | TXMSYNC2  |
| E19 | TXCHCLK2  |
| E20 | TXCHN2_1  |

**TABLE 2: 484 BALL LIST  
BY BALL NUMBER**

| PIN | PIN NAME   |
|-----|------------|
| E21 | TXOH2      |
| E22 | RXOHCLK3   |
| F1  | TRING0     |
| F2  | TVDD0      |
| F3  | TTIP_0     |
| F4  | RGND0      |
| F5  | DVDD18     |
| F9  | T1MCLKOUT  |
| F10 | TCK        |
| F11 | RXOHCLK0   |
| F12 | TXSER0     |
| F13 | TXCHN0_3   |
| F14 | TXSYNC1    |
| F15 | TXCHN1_2   |
| F16 | RXCHN1_4   |
| F17 | RXCHN2_2   |
| F19 | TXCHN2_2   |
| F20 | RXSER3     |
| F21 | RXCASYNC3  |
| F22 | RXLOS3     |
| G1  | TVDD1      |
| G2  | RTIP0      |
| G3  | RRING0     |
| G4  | TGND0      |
| G17 | TXCHN1_4   |
| G18 | GPIO1_2    |
| G19 | RXCHCLK3   |
| G20 | RXCRCSYNC3 |
| G21 | RXCHN3_1   |
| G22 | TXCHCLK3   |
| H1  | RRING1     |
| H2  | RTIP1      |

## OCTAL T1/E1/J1 FRAMER/LIU COMBO - HARDWARE DESCRIPTION

TABLE 2: 484 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME  |
|-----|-----------|
| H3  | RGND1     |
| H4  | TTIP1     |
| H5  | RVDD1     |
| H18 | RXOH3     |
| H19 | RXCHN3_0  |
| H20 | RXSERCLK3 |
| H21 | RXCHN3_3  |
| H22 | TXOHCLK3  |
| J1  | TRING2    |
| J2  | TVDD2     |
| J3  | TTIP2     |
| J4  | RGND2     |
| J5  | TRING1    |
| J6  | TGND1     |
| J18 | TXOH3     |
| J19 | RXCHN3_2  |
| J20 | TXSYNC3   |
| J21 | TXSERCLK3 |
| J22 | RXCHN3_4  |
| K1  | TTIP3     |
| K2  | RGND3     |
| K3  | RRING2    |
| K4  | RTIP2     |
| K5  | TGND2     |
| K6  | RVDD2     |
| K17 | TXCHN3_1  |
| K18 | TXSER3    |
| K19 | TXCHN3_0  |
| K20 | TXMSYNC3  |
| K21 | CS        |
| K22 | TXCHN3_2  |
| L1  | RRING3    |

TABLE 2: 484 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME |
|-----|----------|
| L2  | RTIP3    |
| L3  | TVDD3    |
| L4  | TRING3   |
| L5  | TGND3    |
| L6  | RVDD3    |
| L17 | TXCHN3_4 |
| L18 | ADDR13   |
| L19 | TXCHN3_3 |
| L20 | WR       |
| L21 | DATA7    |
| L22 | ADDR14   |
| M1  | RRING4   |
| M2  | RTIP4    |
| M3  | TRING4   |
| M4  | RGND4    |
| M5  | TTIP4    |
| M6  | TVDD4    |
| M7  | RVDD4    |
| M17 | BLAST    |
| M18 | ADDR11   |
| M19 | ADDR12   |
| M20 | DATA5    |
| M21 | DATA6    |
| M22 | DATA4    |
| N1  | TVDD5    |
| N2  | TTIP5    |
| N3  | RGND5    |
| N4  | RVDD5    |
| N5  | TGND4    |
| N17 | ADDR1    |
| N18 | DATA3    |
| N19 | ADDR9    |

TABLE 2: 484 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME |
|-----|----------|
| N20 | ADDR10   |
| N21 | PTYPE2   |
| N22 | INT      |
| P1  | RGND6    |
| P2  | RRING5   |
| P3  | RTIP5    |
| P4  | TGND5    |
| P5  | TRING5   |
| P18 | ADDR0    |
| P19 | ADDR7    |
| P20 | ADDR8    |
| P21 | DATA2    |
| P22 | ALE      |
| R1  | TGND6    |
| R2  | TRING6   |
| R3  | TVDD6    |
| R4  | TTIP6    |
| R5  | RVDD6    |
| R18 | iADDR    |
| R19 | RDY      |
| R20 | ADDR4    |
| R21 | ADDR5    |
| R22 | ADDR6    |
| T1  | TTIP7    |
| T2  | RTIP6    |
| T3  | RRING6   |
| T4  | RGND7    |
| T5  | RVDD7    |
| T18 | fADDR    |
| T19 | DATA0    |
| T20 | PTYPE1   |
| T21 | ADDR2    |

TABLE 2: 484 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME   |
|-----|------------|
| T22 | ADDR3      |
| U1  | TVDD7      |
| U2  | TRING7     |
| U3  | RRING7     |
| U4  | RTIP7      |
| U5  | 8KEXTOSC   |
| U7  | TXCHN7_4   |
| U8  | RXLOS7     |
| U9  | TXSERCLK6  |
| U10 | TXSER6     |
| U11 | TXOH6      |
| U12 | RXOH6      |
| U13 | TXOHCLK5   |
| U14 | RXCHN5_0   |
| U15 | TXCHN4_1   |
| U16 | GPIO0_3    |
| U17 | TXMSYNC4   |
| U18 | RXCHCLK4   |
| U19 | REQ0       |
| U20 | DATA1      |
| U21 | RD         |
| U22 | DBEN       |
| V1  | TGND7      |
| V2  | LOP        |
| V3  | T1OSCCLK   |
| V4  | E1OSCCLK   |
| V5  | TXCHCLK7   |
| V6  | TXOHCLK7   |
| V7  | TXSERCLK7  |
| V8  | TXCHN7_1   |
| V9  | RXCRCSYNC7 |
| V10 | RXOH7      |

**TABLE 2: 484 BALL LIST  
BY BALL NUMBER**

| PIN | PIN NAME  |
|-----|-----------|
| V11 | TXCHCLK6  |
| V12 | RXCHN6_1  |
| V13 | TXSYNC5   |
| V14 | RXCHN5_3  |
| V15 | GPIO0_2   |
| V16 | RXSERCLK5 |
| V17 | RXCASYN4  |
| V18 | RXOH4     |
| V19 | RXOHCLK4  |
| V20 | PTYPE0    |
| V21 | ACK1      |
| V22 | PCLK      |
| W1  | TXON      |
| W2  | 8KSYNC    |
| W3  | TXSER7    |
| W4  | TXCHN7_0  |
| W5  | TXMSYN7   |
| W6  | RXSERCLK7 |
| W7  | RXCHN7_4  |
| W8  | RXCHN7_1  |
| W9  | TXCHN6_4  |
| W10 | RXCASYN7  |
| W11 | TXCHN6_0  |
| W12 | RXSERCLK6 |
| W13 | TXCHN5_2  |
| W14 | RXCHN5_4  |
| W15 | RXLOS5    |
| W16 | TXCHN4_0  |
| W17 | TXOH4     |
| W18 | RXCHN4_2  |
| W19 | RXSER4    |
| W20 | RXSERCLK4 |

**TABLE 2: 484 BALL LIST  
BY BALL NUMBER**

| PIN | PIN NAME  |
|-----|-----------|
| W21 | RXLOS4    |
| W22 | ACK0      |
| Y1  | RESET     |
| Y2  | TXCHN7_3  |
| Y3  | RXSYNC7   |
| Y4  | RXCHN7_2  |
| Y5  | RXCHCLK7  |
| Y6  | RXOHCLK7  |
| Y7  | RXCHN7_0  |
| Y8  | RXCASYN6  |
| Y9  | RXCRCYN6  |
| Y10 | RXLOS6    |
| Y11 | GPIO0_1   |
| Y12 | TXCHN5_3  |
| Y13 | TXCHCLK5  |
| Y14 | RXOH5     |
| Y15 | RXSYNC5   |
| Y16 | TXCHN4_2  |
| Y17 | TXSYNC4   |
| Y18 | TXSERCLK4 |
| Y19 | RXCHN4_4  |
| Y20 | RXSYNC4   |
| Y21 | RXCRCYN4  |
| Y22 | REQ1      |
| AA1 | TXOH7     |
| AA2 | TXSYNC7   |
| AA3 | RXCHN7_3  |
| AA4 | TXSYNC6   |
| AA5 | TXCHN6_2  |
| AA6 | RXSYNC6   |
| AA7 | TXOHCLK6  |
| AA8 | RXCHCLK6  |

**TABLE 2: 484 BALL LIST  
BY BALL NUMBER**

| PIN  | PIN NAME  |
|------|-----------|
| AA9  | RXSER6    |
| AA10 | RXCHN6_0  |
| AA11 | TXOH5     |
| AA12 | TXSERCLK5 |
| AA13 | TXSER5    |
| AA14 | RXOHCLK5  |
| AA15 | RXSER5    |
| AA16 | TXCHN4_4  |
| AA17 | RXCRCYN5  |
| AA18 | GPIO1_0   |
| AA19 | TXCHCLK4  |
| AA20 | GPIO1_1   |
| AA21 | RXCHN4_1  |
| AA22 | RXCHN4_0  |
| AB1  | TXCHN7_2  |
| AB2  | RXSER7    |
| AB3  | TXMSYN6   |
| AB4  | TXCHN6_3  |
| AB5  | TXCHN6_1  |
| AB6  | GPIO0_0   |
| AB7  | RXCHN6_4  |
| AB8  | RXCHN6_3  |
| AB9  | RXCHN6_2  |
| AB10 | RXOHCLK6  |
| AB11 | TXCHN5_4  |
| AB12 | TXCHN5_1  |
| AB13 | TXCHN5_0  |
| AB14 | TXMSYN5   |
| AB15 | RXCHN5_2  |
| AB16 | RXCHN5_1  |
| AB17 | RXCASYN5  |
| AB18 | TXCHN4_3  |

**TABLE 2: 484 BALL LIST  
BY BALL NUMBER**

| PIN         | PIN NAME |
|-------------|----------|
| AB19        | RXCHCLK5 |
| AB20        | TXOHCLK4 |
| AB21        | TXSER4   |
| AB22        | RXCHN4_3 |
| POWER PINS  |          |
| Pin         | Pin Name |
| G11         | VDD18    |
| G14         | VDD18    |
| G16         | VDD18    |
| J17         | VDD18    |
| P17         | VDD18    |
| T8          | VDD18    |
| T10         | VDD18    |
| T12         | VDD18    |
| T14         | VDD18    |
| T17         | VDD18    |
| G10         | VDD      |
| G12         | VDD      |
| G15         | VDD      |
| H17         | VDD      |
| L16         | VDD      |
| R17         | VDD      |
| T7          | VDD      |
| T9          | VDD      |
| T11         | VDD      |
| T13         | VDD      |
| T15         | VDD      |
| GROUND PINS |          |
| Pin         | Pin Name |
| F6          | VSS      |
| G6          | VSS      |
| G7          | VSS      |

## OCTAL T1/E1/J1 FRAMER/LIU COMBO - HARDWARE DESCRIPTION

TABLE 2: 484 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME |
|-----|----------|
| G8  | VSS      |
| G9  | VSS      |
| G13 | VSS      |
| H6  | VSS      |
| H7  | VSS      |
| H16 | VSS      |
| J7  | VSS      |
| J16 | VSS      |
| K7  | VSS      |
| K16 | VSS      |
| L7  | VSS      |
| M16 | VSS      |
| N6  | VSS      |
| N7  | VSS      |
| N16 | VSS      |
| P6  | VSS      |
| P7  | VSS      |
| P16 | VSS      |
| R6  | VSS      |
| R7  | VSS      |
| R16 | VSS      |
| T6  | VSS      |
| T16 | VSS      |
| U6  | VSS      |
| H8  | VSS      |
| H9  | VSS      |
| H10 | VSS      |
| H11 | VSS      |
| H12 | VSS      |
| H13 | VSS      |
| H14 | VSS      |
| H15 | VSS      |

TABLE 2: 484 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME |
|-----|----------|
| J8  | VSS      |
| J9  | VSS      |
| J10 | VSS      |
| J11 | VSS      |
| J12 | VSS      |
| J13 | VSS      |
| J14 | VSS      |
| J15 | VSS      |
| K8  | VSS      |
| K9  | VSS      |
| K10 | VSS      |
| K11 | VSS      |
| K12 | VSS      |
| K13 | VSS      |
| K14 | VSS      |
| K15 | VSS      |
| L8  | VSS      |
| L9  | VSS      |
| L10 | VSS      |
| L11 | VSS      |
| L12 | VSS      |
| L13 | VSS      |
| L14 | VSS      |
| L15 | VSS      |
| M8  | VSS      |
| M9  | VSS      |
| M10 | VSS      |
| M11 | VSS      |
| M12 | VSS      |
| M13 | VSS      |
| M14 | VSS      |
| M15 | VSS      |

TABLE 2: 484 BALL LIST  
BY BALL NUMBER

| PIN             | PIN NAME |
|-----------------|----------|
| N8              | VSS      |
| N9              | VSS      |
| N10             | VSS      |
| N11             | VSS      |
| N12             | VSS      |
| N13             | VSS      |
| N14             | VSS      |
| N15             | VSS      |
| P8              | VSS      |
| P9              | VSS      |
| P10             | VSS      |
| P11             | VSS      |
| P12             | VSS      |
| P13             | VSS      |
| P14             | VSS      |
| P15             | VSS      |
| R8              | VSS      |
| R9              | VSS      |
| R10             | VSS      |
| R11             | VSS      |
| R12             | VSS      |
| R13             | VSS      |
| R14             | VSS      |
| R15             | VSS      |
| NO CONNECT PINS |          |
| A1              | NC       |
| A3              | NC       |
| A22             | NC       |
| B2              | NC       |
| C3              | NC       |
| C4              | NC       |
| C5              | NC       |

TABLE 2: 484 BALL LIST  
BY BALL NUMBER

| PIN | PIN NAME |
|-----|----------|
| D5  | NC       |
| D6  | NC       |
| D7  | NC       |
| E7  | NC       |
| E8  | NC       |
| F7  | NC       |
| F8  | NC       |
| G5  | NC       |
| B4  | NC       |
| F18 | NC       |



## 2.0 PIN DESCRIPTIONS

There are six types of pins defined throughout this pin description and the corresponding symbol is presented in table below. The per-channel pin is indicated by the channel number or the letter 'n' which is appended at the end of the signal name, for example, TxSERn, where "n" indicates channels 0 to 7. All output pins are "tri-stated" upon hardware RESET.

| SYMBOL | PIN TYPE      |
|--------|---------------|
| I      | Input         |
| O      | Output        |
| I/O    | Bidirectional |
| GND    | Ground        |
| PWR    | Power         |
| NC     | No Connect    |

The structure of the pin description is divided into fourteen groups, as presented in the table below

**TABLE 3: PIN DESCRIPTION STRUCTURE**

| SECTION                             | PAGE NUMBER |
|-------------------------------------|-------------|
| Transmit System Side Inter-<br>face | page 15     |
| Transmit Overhead Inter-<br>face    | page 23     |
| Receive Overhead Interface          | page 25     |
| Receive System Side Inter-<br>face  | page 26     |
| Receive Line Interface              | page 34     |
| Transmit Line Interface             | page 35     |
| Timing Interface                    | page 36     |
| GPIO Interface                      | page 38     |
| JTAG Interface                      | page 39     |
| Microprocessor Interface            | page 40     |
| Power Pins (3.3V)                   | page 49     |
| Power Pins (1.8V)                   | page 50     |
| Ground Pins                         | page 51     |
| No Connect Pins                     | page 53     |
|                                     |             |

## TRANSMIT SYSTEM SIDE INTERFACE

| SIGNAL NAME       | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|------------------|-------------------|------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxSER0/<br>TxPOS0 | D11              | F12               | I    | -                   | <p><b>Transmit Serial Data Input (TxSERn)/Transmit Positive Digital Input (TxPOSn):</b></p> <p>The exact function of these pins depends on the mode of operation selected, as described below.</p> <p><b>DS1/E1 Mode - TxSERn</b></p> <p>These pins function as the transmit serial data input on the system side interface, which are latched on the rising edge of the TxSERCLKn pin. Any payload data applied to this pin will be inserted into an outbound DS1/E1 frame and output to the line. In DS1 mode, the framing alignment bits, facility data link bits, CRC-6 bits, and signaling information can also be inserted from this input pin if configured appropriately. In E1 mode, all data intended to be transported via Time Slots 1 through 15 and Time slots 17 through 31 must be applied to this input pin. Data intended for Time Slots 0 and 16 can also be applied to this input pin if configured accordingly.</p> <p><b>DS1 or E1 High-Speed Multiplexed Mode* - TxSERn</b></p> <p>In this mode, these pins are used as the high-speed multiplexed data input pin on the system side. High-speed multiplexed data of channels 0-3 must be applied to TxSER0 and high-speed multiplexed data of channels 4-7 must be applied to TxSER4 in a byte or bit-interleaved way. The framer latches in the multiplexed data on TxSER0 and TxSER4 using TxM-SYNC/TxINCLK and demultiplexes this data into 4 serial streams. The LIU block will then output the data to the line interface using TxSERCLKn.</p> <p><b>DS1 or E1 Framer Bypass Mode - TxPOSn</b></p> <p>In this mode, TxSERn is used for the positive digital input pin (TxPOSn) to the LIU.</p> <p><b>NOTE:</b></p> <ol style="list-style-type: none"> <li><i>*High-speed multiplexed modes include (For T1/E1) 16.384MHz H.100, Bit-multiplexed modes, and (For T1 only) 12.352MHz Bit-multiplexed mode.</i></li> <li><i>In DS1 high-speed modes, the DS-0 data is mapped into an E1 frame by ignoring every fourth time slot (don't care).</i></li> <li><i>These 8 pins are internally pulled "High" for each channel.</i></li> </ol> |
| TxSER1/<br>TxPOS1 | D17              | C15               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| TxSER2/<br>TxPOS2 | E23              | D20               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| TxSER3/<br>TxPOS3 | K26              | K18               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| TxSER4/<br>TxPOS4 | AB21             | AB21              |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| TxSER5/<br>TxPOS5 | AB15             | AA13              |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| TxSER6/<br>TxPOS6 | AB9              | U10               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| TxSER7/<br>TxPOS7 | AE3              | W3                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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**TRANSMIT SYSTEM SIDE INTERFACE**

| SIGNAL NAME              | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|------------------|-------------------|------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxSERCLK0/<br>TxLINECLK0 | A11              | C11               | I/O  | 12                  | <p><b>Transmit Serial Clock (TxSERCLKn)/Transmit Line Clock (TxSERCLKn):</b></p> <p>The exact function of these pins depends on the mode of operation selected, as described below.</p> <p><b>In Base-Rate Mode (1.544MHz/2.048MHz) - TxSERCLKn:</b></p> <p>This clock signal is used by the transmit serial interface to latch the contents on the TxSERn pins into the T1/E1 framer on the rising edge of the TxSERCLKn. These pins can be configured as input or output as described below.</p> <p><b>When TxSERCLKn is configured as Input:</b></p> <p>These pins will be inputs if the TxSERCLK is chosen as the timing source for the transmit framer. Users must provide a 1.544MHz clock rate to this input pin for T1 mode of operation, and 2.048MHz clock rate in E1 mode.</p> <p><b>When TxSERCLKn is configured as Output:</b></p> <p>These pins will be outputs if either the recovered line clock or the MCLK PLL is chosen as the timing source for the T1/E1 transmit framer. The transmit framer will output a 1.544MHz clock rate in T1 mode of operation, and a 2.048MHz clock rate in E1 mode.</p> <p><b>DS1/E1 High-Speed Backplane Modes* - TxSERCLKn as INPUT ONLY</b></p> <p>In this mode, TxSERCLK is an optional clock signal input which is used as the timing source for the transmit line interface, and is only required if TxSERCLK is chosen as the timing source for the transmit framer. If TxSERCLK is chosen as the timing source, system equipment should provide 1.544MHz (For T1 mode) or 2.048MHz (For E1 mode) to the TxSERCLKn pins on each channel. TxSERCLK is not required if either the recovered clock or MCLK PLL is chosen as the timing source of the device.</p> <p>High speed or multiplexed data is latched into the device using the TxMSYNC/TxINCLK high-speed clock signal.</p> <p><b>DS1 or E1 Framer Bypass Mode - TxLINECLKn</b></p> <p>In this mode, TxSERCLKn is used as the transmit line clock (TxLINECLK) to the LIU.</p> <p><b>NOTE:</b> *High-speed backplane modes include (For T1/E1) 2.048MVIP, 4.096MHz, 8.192MHz, 16.384MHz HMVIP, H.100, Bit-multiplexed modes, and (For T1 only) 12.352MHz Bit-multiplexed mode.</p> <p><b>NOTE:</b> In DS1 high-speed modes, the DS-0 data is mapped into an E1 frame by ignoring every fourth time slot (don't care).</p> <p><b>NOTE:</b> These 8 pins are internally pulled "High" for each channel.</p> |
| TxSERCLK1/<br>TxLINECLK1 | C19              | B17               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| TxSERCLK2/<br>TxLINECLK2 | D22              | E17               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| TxSERCLK3/<br>TxLINECLK3 | K24              | J21               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| TxSERCLK4/<br>TxLINECLK4 | AE23             | Y18               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| TxSERCLK5/<br>TxLINECLK5 | AF15             | AA12              |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| TxSERCLK6/<br>TxLINECLK6 | AE6              | U9                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| TxSERCLK7/<br>TxLINECLK7 | AB5              | V7                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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## TRANSMIT SYSTEM SIDE INTERFACE

| SIGNAL NAME        | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|------------------|-------------------|------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxSYNC0/<br>TxNEG0 | A9               | B9                | I/O  | 12                  | <p><b>Transmit Single Frame Sync Pulse (TxSYNCn) / Transmit Negative Digital Input (TxNEGn):</b></p> <p>The exact function of these pins depends on the mode of operation selected, as described below.</p> <p><b>DS1/E1 Base Rate Mode (1.544MHz/2.048MHz) - TxSYNCn:</b></p> <p>These TxSYNCn pins are used to indicate the single frame boundary within an outbound T1/E1 frame. In both DS1 or E1 mode, the single frame boundary repeats every 125 microseconds (8kHz).</p> <p>In DS1/E1 base rate, TxSYNCn can be configured as either input or output as described below.</p> <p><b>When TxSYNCn is configured as an Input:</b></p> <p>Users must provide a signal which must pulse "High" for one period of TxSERCLK during the first bit of an outbound DS1/E1 frame. It is imperative that the TxSYNC input signal be synchronized with the TxSERCLK input signal.</p> <p><b>When TxSYNCn is configured as an Output:</b></p> <p>The transmit T1/E1 framer will output a signal which pulses "High" for one period of TxSERCLK during the first bit of an outbound DS1/E1 frame.</p> <p><b>DS1/E1 High-Speed Backplane Modes* - TxSYNCn as INPUT ONLY:</b></p> <p>In this mode, TxSYNCn must be an input regardless of the clock source that is chosen to be the timing source for the transmit framer. In 2.048MVIP/4.096/8.192MHz high-speed modes, TxSYNCn pins must be pulsed 'High' for one period of TxSERCLK during the first bit of the outbound T1/E1 frame. In HMOVIP mode, TxSYNC0 and TxSYNC4 must be pulsed 'High' for 4 clock cycles of the TxMSYNC/TxINCLK signal in the position of the first two and the last two bits of a multiplexed frame. In H.100 mode, TxSYNC0 and TxSYNC4 must be pulsed 'High' for 2 clock cycles of the TxMSYNC/TxINCLK signal in the position of the first and the last bit of a multiplexed frame.</p> <p><b>DS1 or E1 Framer Bypass Mode - TxNEGn</b></p> <p>In this mode, TxSYNCn is used as the negative digital input pin (TxNEG) to the LIU.</p> <p><b>NOTE:</b> *High-speed backplane modes include (For T1/E1) 2.048MVIP, 4.096MHz, 8.192MHz, 16.384MHz HMOVIP, H.100, Bit-multiplexed modes, and (For T1 only) 12.352MHz Bit-multiplexed mode.</p> <p><b>NOTE:</b> In DS1 high-speed modes, the DS-0 data is mapped into an E1 frame by ignoring every fourth time slot (don't care).</p> <p><b>NOTE:</b> These 8 pins are internally pulled "Low" for each channel.</p> |
| TxSYNC1/<br>TxNEG1 | C16              | F14               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| TxSYNC2/<br>TxNEG2 | B24              | C20               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| TxSYNC3/<br>TxNEG3 | K22              | J20               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| TxSYNC4/<br>TxNEG4 | AF24             | Y17               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| TxSYNC5/<br>TxNEG5 | AF16             | V13               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| TxSYNC6/<br>TxNEG6 | AD8              | AA4               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| TxSYNC7/<br>TxNEG7 | AE4              | AA2               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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**TRANSMIT SYSTEM SIDE INTERFACE**

| SIGNAL NAME                          | 420 PKG<br>BALL#          | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
|--------------------------------------|---------------------------|-------------------|------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------|---------------------------|-------|--------------------------|-------|--------------------------|-------|--------------------------------------|--------|---------------------------|--------|-------------------------------|--------|-------------------------------|--------|
| TxMSYNC0/<br>TxINCLK0                | B10                       | A9                | I/O  | 12                  | <p><b>Multiframe Sync Pulse (TxMSYNcN) / Transmit Input Clock (TxINCLKn)</b></p> <p>The exact function of these pins depends on the mode of operation selected, as described below.</p> <p><b>DS1/E1 Base Rate Mode (1.544MHz/2.048MHz) - TxM-SYNcN</b></p> <p>In this mode, these pins are used to indicate the multi-frame boundary within an outbound DS1/E1 frame.</p> <p>In DS1 ESF mode, TxMSYNcN repeats every 3ms.</p> <p>In DS1 SF mode, TxMSYNcN repeats every 1.5ms.</p> <p>In E1 mode, TxMSYNcN repeats every 2ms.</p> <p>If TxMSYNcN is configured as an input, TxMSYNcN must pulse "High" for one period of TxSERCLK during the first bit of an outbound DS1/E1 multi-frame. It is imperative that the TxMSYNc input signal be synchronized with the TxSERCLK input signal.</p> <p>If TxMSYNcN is configured as an output, the transmit section of the T1/E1 framer will output and pulse TxMSYNc "High" for one period of TxSERCLK during the first bit of an outbound DS1/E1 frame.</p> <p><b>DS1/E1 High-Speed Backplane Modes* - (TxINCLKn as INPUT ONLY)</b></p> <p>In this mode, this pin must be used as the high-speed input clock pin (TxINCLKn) for the backplane interface to latch in high-speed or multiplexed data on the TxSERn pin. The frequency of TxINCLK is presented in the table below.</p> <table><tr><th>OPERATION MODE</th><th>FREQUENCY OF TxINCLK(MHz)</th></tr><tr><td>2.048MVIP non-multiplexed</td><td>2.048</td></tr><tr><td>4.096MHz non-multiplexed</td><td>4.096</td></tr><tr><td>8.192MHz non-multiplexed</td><td>8.192</td></tr><tr><td>12.352MHz Bit-multiplexed (DS1 ONLY)</td><td>12.352</td></tr><tr><td>16.384MHz Bit-multiplexed</td><td>16.384</td></tr><tr><td>16.384 HMVIP Byte-multiplexed</td><td>16.384</td></tr><tr><td>16.384 H.100 Byte-multiplexed</td><td>16.384</td></tr></table> <p><b>NOTES:</b></p> <ol style="list-style-type: none"><li><i>*High-speed backplane modes include (For T1/E1) 2.048MVIP, 4.096MHz, 8.192MHz, 16.384MHz HMVIP, H.100, Bit-multiplexed modes, and (For T1 only) 12.352MHz Bit-multiplexed mode.</i></li><li><i>In DS1 high-speed modes, the DS-0 data is mapped into an E1 frame by ignoring every fourth time slot (don't care).</i></li><li><i>These 8 pins are internally pulled "Low" for each channel.</i></li></ol> | OPERATION MODE | FREQUENCY OF TxINCLK(MHz) | 2.048MVIP non-multiplexed | 2.048 | 4.096MHz non-multiplexed | 4.096 | 8.192MHz non-multiplexed | 8.192 | 12.352MHz Bit-multiplexed (DS1 ONLY) | 12.352 | 16.384MHz Bit-multiplexed | 16.384 | 16.384 HMVIP Byte-multiplexed | 16.384 | 16.384 H.100 Byte-multiplexed | 16.384 |
| OPERATION MODE                       | FREQUENCY OF TxINCLK(MHz) |                   |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 2.048MVIP non-multiplexed            | 2.048                     |                   |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 4.096MHz non-multiplexed             | 4.096                     |                   |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 8.192MHz non-multiplexed             | 8.192                     |                   |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 12.352MHz Bit-multiplexed (DS1 ONLY) | 12.352                    |                   |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 16.384MHz Bit-multiplexed            | 16.384                    |                   |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 16.384 HMVIP Byte-multiplexed        | 16.384                    |                   |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 16.384 H.100 Byte-multiplexed        | 16.384                    |                   |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| TxMSYNC1/<br>TxINCLK1                | A17                       | B15               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| TxMSYNC2/<br>TxINCLK2                | C24                       | E18               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| TxMSYNC3/<br>TxINCLK3                | L24                       | K20               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| TxMSYNC4/<br>TxINCLK4                | AC21                      | U17               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| TxMSYNC5/<br>TxINCLK5                | AD16                      | AB14              |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| TxMSYNC6/<br>TxINCLK6                | AC8                       | AB3               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| TxMSYNC7/<br>TxINCLK7                | AF2                       | W5                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                           |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |

## TRANSMIT SYSTEM SIDE INTERFACE

| SIGNAL NAME | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------|------------------|-------------------|------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxCHCLK0    | A12              | C12               | O    | 8                   | <p><b>Transmit Channel Clock Output Signal (TxCHCLKn):</b></p> <p>The exact function of this pin depends on whether or not the transmit framer enables the transmit fractional/signaling interface to input fractional data, as described below.</p> <p><b>If transmit fractional/signaling interface is disabled:</b></p> <p>This pin indicates the boundary of each time slot of an out-bound DS1/E1 frame. In T1 mode, each of these output pins is a 192kHz clock which pulses "High" during the LSB of each 24 time slots. In E1 mode, each of these output pins is a 256kHz clock which pulses "High" during the LSB of each 32 time slots. The Terminal Equipment can use this clock signal to sample the TxCHN0 through TxCHN4 time slot identifier pins to determine which time slot is being processed.</p> <p><b>If transmit fractional/signaling interface is enabled:</b></p> <p>TxCHCLKn is the fractional interface clock which either outputs a clock signal for the time slot that has been configured to input fractional data, or outputs an enable signal for the fractional time slot so that fractional data can be clocked into the device using the TxSERCLK pin.</p> <p><b>NOTE:</b> Transmit fractional interface can be enabled by programming to bit 4 - TxFr1544/TxFr2048 bit from register 0xn120 to '1'.</p> |
| TxCHCLK1    | E17              | A16               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxCHCLK2    | B26              | E19               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxCHCLK3    | J22              | G22               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxCHCLK4    | AD22             | AA19              |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxCHCLK5    | AE16             | Y13               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxCHCLK6    | AD10             | V11               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxCHCLK7    | AB2              | V5                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

**TRANSMIT SYSTEM SIDE INTERFACE**

| SIGNAL NAME         | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|------------------|-------------------|------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxCHN0_0/<br>TxSIG0 | D12              | B11               | I/O  | 8                   | <b>Transmit Time Slot Octet Identifier Output 0 (TxCHNn_0) / Transmit Serial Signaling Input (TxSIGn):</b><br>The exact function of these pins depends on whether or not the transmit framer enables the transmit fractional/signaling interface, as described below:<br><b>If transmit fractional/signaling interface is disabled - TxCHNn_0:</b><br>These output pins (TxCHNn_4 through TxCHNn_0) reflect the five-bit binary value of the current time slot being processed by the transmit serial interface. Terminal Equipment can use the TxCHCLK to sample the five output pins of each channel in order to identify the time slot being processed. This pin indicates the Least Significant Bit (LSB) of the time slot channel being processed.<br><b>If transmit fractional/signaling interface is enabled - TxSIGn:</b><br>These pins can be used to input robbed-bit signaling data to be inserted within an outbound DS1 frame or to input Channel Associated Signaling (CAS) data within an outbound E1 frame, as described below.<br><b>T1 Mode:</b> Signaling data (A,B,C,D) of each channel must be provided on bit 4,5,6,7 of each time slot on the TxSIG pin if 16-code signaling is used. If 4-code signaling is selected, signaling data (A,B) of each channel must be provided on bit 4, 5 of each time slot on the TxSIG pin. If 2-code signaling is selected, signaling data (A) of each channel must be provided on bit 4 of each time slot on the TxSIG pin.<br><b>E1 Mode:</b> Signaling data in E1 mode can be provided on the TxSIGn pins on a time-slot-basis as in T1 mode, or it can be provided on time slot 16 only via the TxSIGn input pins. In the latter case, signaling data (A,B,C,D) of channel 1 and channel 17 must be inserted on the TxSIGn pin during time slot 16 of frame 1, signaling data (A,B,C,D) of channel 2 and channel 18 must be inserted on the TxSIGn pin during time slot 16 of frame 2...etc. The CAS multiframe Alignments bits (0000 bits) and the extra bits/alarm bit (xyxx) must be inserted on the TxSIGn pin during time slot 16 of frame 0.<br><b>NOTE:</b> Transmit fractional interface can be enabled by programming to bit 4 - TxFr1544/TxFr2048 bit from register 0xn120 to '1'.<br><b>NOTE:</b> These 8 pins are internally pulled "Low" for each channel. |
| TxCHN1_0/<br>TxSIG1 | C18              | C16               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| TxCHN2_0/<br>TxSIG2 | F22              | C21               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| TxCHN3_0/<br>TxSIG3 | L22              | K19               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| TxCHN4_0/<br>TxSIG4 | AD21             | W16               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| TxCHN5_0/<br>TxSIG5 | AC15             | AB13              |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| TxCHN6_0/<br>TxSIG6 | AB10             | W11               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| TxCHN7_0/<br>TxSIG7 | AC5              | W4                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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## TRANSMIT SYSTEM SIDE INTERFACE

| SIGNAL NAME                                                                                                                                                                                          | 420 PKG<br>BALL#                                       | 484 PKG<br>BALL #                                    | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------|------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxCHN0_1/<br>TxFrTD0<br>TxCHN1_1/<br>TxFrTD1<br>TxCHN2_1/<br>TxFrTD2<br>TxCHN3_1/<br>TxFrTD3<br>TxCHN4_1/<br>TxFrTD4<br>TxCHN5_1/<br>TxFrTD5<br>TxCHN6_1/<br>TxFrTD6<br>TxCHN7_1/<br>TxFrTD7         | B12<br>D18<br>D25<br>L25<br>AF22<br>AD15<br>AF9<br>AD3 | A11<br>D15<br>E20<br>K17<br>U15<br>AB12<br>AB5<br>V8 | I/O  | 8                   | <p><b>Transmit Time Slot Octet Identifier Output 1 (TxCHNn_1) / Transmit Serial Fractional Input (TxFrTDn):</b></p> <p>The exact function of these pins depends on whether or not the transmit framer enables the transmit fractional/signaling interface, as described below:</p> <p><b>If transmit fractional/signaling interface is disabled - TxCHNn_1</b></p> <p>These output signals (TxCHNn_4 through TxCHNn_0) reflect the five-bit binary value of the current time slot being processed by the transmit serial interface. Terminal Equipment can use the TxCHCLK to sample the five output pins of each channel in order to identify the time slot being processed. This pin indicates Bit 1 of the time slot channel being processed.</p> <p><b>If transmit fractional/signaling interface is enabled - TxFrTDn</b></p> <p>These pins are used as the fractional data input pins to input fractional DS1/E1 payload data which will be inserted within an outbound DS1/E1 frame. In this mode, terminal equipment can use either TxCHCLK or TxSERCLK to clock in fractional DS1/E1 payload data depending on the framer configuration.</p> <p><b>NOTES:</b></p> <ol style="list-style-type: none"> <li>1. Transmit fractional/Signaling interface can be enabled by programming to bit 4 - TxFr1544/TxFr2048 bit from register 0xn120 to '1'.</li> <li>2. These 8 pins are internally pulled "Low" for each channel.</li> </ol> |
| TxCHN0_2/<br>Tx32MHz0<br>TxCHN1_2/<br>Tx32MHz1<br>TxCHN2_2/<br>Tx32MHz2<br>TxCHN3_2/<br>Tx32MHz3<br>TxCHN4_2/<br>Tx32MHz4<br>TxCHN5_2/<br>Tx32MHz5<br>TxCHN6_2/<br>Tx32MHz6<br>TxCHN7_2/<br>Tx32MHz7 | A13<br>B19<br>C26<br>M22<br>AC20<br>AE15<br>AE9<br>AD2 | D12<br>F15<br>F19<br>K22<br>Y16<br>W13<br>AA5<br>AB1 | O    | 8                   | <p><b>Transmit Time Slot Octet Identifier Output 2 (TxCHNn_2) / Transmit 32.678MHz Clock Output (Tx32MHz):</b></p> <p>The exact function of these pins depends on whether or not the transmit framer enables the transmit fractional/signaling interface, as described below:</p> <p><b>If transmit fractional/signaling interface is disabled - TxCHNn_2</b></p> <p>These output signals (TxCHNn_4 through TxCHNn_0) reflect the five-bit binary value of the current time slot being processed by the transmit serial interface. Terminal Equipment can use the TxCHCLK to sample the five output pins of each channel in order to identify the time slot being processed. This pin indicates Bit 2 of the time slot channel being processed.</p> <p><b>If transmit fractional/signaling interface is enabled - Tx32MHz</b></p> <p>These pins are used to output a 32.678MHz clock reference which is derived from the MCLKIN input pin.</p> <p><b>NOTE:</b> Transmit fractional interface can be enabled by programming to bit 4 - TxFr1544/TxFr2048 bit from register 0xn120 to '1'.</p>                                                                                                                                                                                                                                                                                                                                               |



## TRANSMIT SYSTEM SIDE INTERFACE

| SIGNAL NAME            | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------|------------------|-------------------|------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxCHN0_3/<br>TxOHSYNC0 | E13              | F13               | O    | 8                   | <b>Transmit Time Slot Octet Identifier Output 3 (TxCHNn_3) / Transmit Overhead Synchronization Pulse (TxOHSYNCn):</b><br>The exact function of these pins depends on whether or not the transmit framer enables the transmit fractional/signaling interface, as described below:<br><b>If transmit fractional/signaling interface is disabled - TxCHNn_3</b><br>These output signals (TxCHNn_4 through TxCHNn_0) reflect the five-bit binary value of the current time slot being processed by the transmit serial interface. Terminal Equipment can use the TxCHCLK to sample the five output pins of each channel in order to identify the time slot being processed. This pin indicates Bit 3 of the time slot channel being processed.<br><b>If transmit fractional/signaling interface is enabled - TxOHSYNCn</b><br>These pins are used to output an Overhead Synchronization Pulse which indicates the first bit of each multi-frame.<br><i><b>NOTE:</b> Transmit fractional interface can be enabled by programming to bit 4 - TxFr1544/TxFr2048 bit from register 0xn120 to '1'.</i> |
| TxCHN1_3/<br>TxOHSYNC1 | A20              | C17               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN2_3/<br>TxOHSYNC2 | F23              | D21               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN3_3/<br>TxOHSYNC3 | M24              | L19               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN4_3/<br>TxOHSYNC4 | AE20             | AB18              | O    |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN5_3/<br>TxOHSYNC5 | AB14             | Y12               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN6_3/<br>TxOHSYNC6 | AF8              | AB4               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN7_3/<br>TxOHSYNC7 | AC3              | Y2                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN0_4               | C14              | A13               | O    | 8                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN1_4               | A21              | G17               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN2_4               | E25              | C22               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN3_4               | M26              | L17               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN4_4               | AD19             | AA16              |      |                     | <b>Transmit Time Slot Octet Identifier Output-Bit 4 (TxCHNn_4):</b><br>These output signals (TxCHNn_4 through TxCHNn_0) reflect the five-bit binary value of the current time slot being processed by the transmit serial interface. Terminal Equipment can use the TxCHCLK to sample the five output pins of each channel in order to identify the time slot being processed. This pin indicates the Most Significant Bit (MSB) of the time slot channel being processed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| TxCHN5_4               | AC14             | AB11              |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN6_4               | AE8              | W9                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxCHN7_4               | AB4              | U7                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## TRANSMIT OVERHEAD INTERFACE

| SIGNAL NAME | 420 PKG<br>BALL # | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------|-------------------|-------------------|------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxOH0       | C12               | E13               | I    | -                   | <p><b>Transmit Overhead Input (TxOHn):</b></p> <p>The exact function of these pins depends on the mode of operation selected, as described below.</p> <p><b>DS1 Mode</b></p> <p>These pins operate as the source of Datalink bits which will be inserted into the Datalink bits within an outbound DS1 frame if the framer is configured accordingly. Datalink Equipment can provide data to this input pin using the TxOHCLKn clock at either 2kHz or 4kHz depending on the transmit datalink bandwidth selected.</p> <p><b>NOTE:</b> <i>This input pin will be disabled if the framer is using the Transmit HDLC Controller, or the TxSER input as the source for the Data Link Bits.</i></p> <p><b>E1 Mode</b></p> <p>These pins operate as the source of Datalink bits or Signaling bits depending on the framer configuration, as described below.</p> <p><b>Sourcing Datalink bits from TxOHn:</b></p> <p>The E1 transmit framer will output a clock edge on TxOHCLKn for each Sa bit that has been configured to carry datalink information. Terminal equipment can then use TxOHCLKn to provide datalink bits on TxOHn to be inserted into the Sa bits within an outbound E1 frame.</p> <p><b>Sourcing Signaling bits from TxOHn:</b></p> <p>Users must provide signaling data on TxOHn pins on time slot 16 only. Signaling data (A,B,C,D) of channel 1 and channel 17 must be inserted on the TxOHn pin during time slot 16 of frame 1, signaling data (A,B,C,D) of channel 2 and channel 18 must be inserted on the TxOHn pin during time slot 16 of frame 2...etc. The CAS multiframe Alignments bits (0000 bits) and the extra bits/alarm bit (xyxx) must be inserted on the TxOHn pin during time slot 16 of frame 0.</p> <p><b>NOTE:</b> <i>These 8 pins are internally pulled "Low" for each channel.</i></p> |
| TxOH1       | A18               | B16               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxOH2       | E26               | E21               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxOH3       | J25               | J18               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxOH4       | AF25              | W17               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxOH5       | AD14              | AA11              |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxOH6       | AF10              | U11               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TxOH7       | AC2               | AA1               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**TRANSMIT OVERHEAD INTERFACE**

| SIGNAL NAME | 420 PKG<br>BALL # | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------|-------------------|-------------------|------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxOHCLK0    | E11               | A10               | O    | 8                   | <b>Transmit OH Serial Clock Output Signal(TxOHCLKn)</b><br>This pin functions as an overhead output clock signal for the transmit overhead interface, and its function is explained below.<br><b>DS1 Mode</b><br>If the TxOH pins have been configured to be the source for Datalink bits, the DS1 transmit framer will provide a clock edge for each Data Link Bit. In DS1 ESF mode, the TxOHCLK can either be a 2kHz or 4kHz output signal depending on the selection of Data Link Bandwidth (Register 0xn10A).<br>Data Link Equipment can provide data to the TxOHn pin on the rising edge of TxOHCLK. The framer latches the data on the falling edge of this clock signal.<br><b>E1 Mode</b><br>If the TxOH pins have been configured to be the source for Data Link bits, the E1 transmit framer will provide a clock edge for each National Bit (Sa bits) that has been configured to carry data link information. (Register 0xn10A) |
| TxOHCLK1    | A19               | A17               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxOHCLK2    | E24               | B22               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxOHCLK3    | K23               | H22               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxOHCLK4    | AF23              | AB20              |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxOHCLK5    | AB16              | U13               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxOHCLK6    | AC10              | AA7               |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| TxOHCLK7    | AE1               | V6                |      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## RECEIVE OVERHEAD INTERFACE

| SIGNAL NAME                                                                                  | 420 PKG<br>BALL #                                       | 484 PKG<br>BALL #                                     | TYPE | OUTPUT<br>DRIVE(MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------|------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RxOH0<br>RxOH1<br>RxOH2<br>RxOH3<br>RxOH4<br>RxOH5<br>RxOH6<br>RxOH7                         | C11<br>B15<br>D21<br>F26<br>AA22<br>AE17<br>AE14<br>AF7 | D11<br>A14<br>D18<br>H18<br>V18<br>Y14<br>U12<br>V10  | O    | 8                   | <p><b>Receive Overhead Output (RxOHn):</b></p> <p>These pins function as the Receive Overhead output, or Receive Signaling Output depending on the receive framer configuration, as described below.</p> <p><b>DS1 Mode</b></p> <p>If the RxOH pins have been configured as the destination for the Data Link bits within an inbound DS1 frame, datalink bits will be output to the RxOHn pins at either 2kHz or 4kHz depending on the Receive datalink bandwidth selected. (Register 0xn10C).</p> <p>If configured appropriately, signaling information in the receive signaling array registers (Registers 0xn500-0xn51F) can also be output to the RxOHn output pins.</p> <p><b>E1 Mode</b></p> <p>These output pins will always output the contents of the National Bits (Sa4 through Sa8) if these Sa bits have been configured to carry Data Link information (Register 0xn10C). The Receive Overhead Output Interface will provide a clock edge on RxOHCLKn for each Sa bit carrying Data Link information.</p> <p>If configured appropriately, signaling information in the receive signaling array registers (Registers 0xn500-0xn51F) can also be output to the RxOHn output pins.</p> |
| RxOHCLK0<br>RxOHCLK1<br>RxOHCLK2<br>RxOHCLK3<br>RxOHCLK4<br>RxOHCLK5<br>RxOHCLK6<br>RxOHCLK7 | B9<br>D16<br>E21<br>G24<br>Y22<br>AF17<br>AE13<br>AE7   | F11<br>D14<br>A21<br>E22<br>V19<br>AA14<br>AB10<br>Y6 | O    | 8                   | <p><b>Receive Overhead Clock Output (RxOHCLKn):</b></p> <p>This pin functions as an overhead output clock signal for the receive overhead interface, and its function is explained below.</p> <p><b>DS1 Mode</b></p> <p>If the RxOH pins have been configured to be the destination for Datalink bits, the DS1 transmit framer will output a clock edge for each Data Link Bit. In DS1 ESF mode, the RxOHCLK can either be a 2kHz or 4kHz output signal depending on the selection of Data Link Bandwidth (Register 0xn10C).</p> <p>Data Link Equipment can clock out datalink bits on the RxOHn pin using this clock signal.</p> <p><b>E1 Mode</b></p> <p>The E1 receive framer provides a clock edge for each National Bit (Sa bits) that is configured to carry data link information.</p> <p>Data Link Equipment can clock out datalink bits on the RxOHn pin using this clock signal.</p>                                                                                                                                                                                                                                                                                                   |

**RECEIVE SYSTEM SIDE INTERFACE**

| SIGNAL NAME        | 420 PKG BALL# | 484 PKG BALL # | TYPE | OUTPUT DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------|----------------|------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RxSYNC0/<br>RxNEG0 | D9            | A8             | I/O  | 12                | <p><b>Receive Single Frame Sync Pulse (RxSYNCn):</b></p> <p>The exact function of these pins depends on the mode of operation selected, as described below.</p> <p><b>DS1/E1 Base Rate Mode (1.544MHz/2.048MHz) - RxSYNCn:</b></p> <p>These RxSYNCn pins are used to indicate the single frame boundary within an inbound T1/E1 frame. In both DS1 or E1 mode, the single frame boundary repeats every 125 microseconds (8kHz).</p> <p>In DS1/E1 base rate, RxSYNCn can be configured as either input or output depending on the slip buffer configuration as described below.</p> <p><b>When RxSYNCn is configured as an Input:</b></p> <p>Users must provide a signal which must pulse "High" for one period of RxSERCLK and repeats every 125μS. The receive serial Interface will output the first bit of an inbound DS1/E1 frame during the provided RxSYNC pulse.</p> <p><b>NOTE:</b> <i>It is imperative that the RxSYNC input signal be synchronized with the RxSERCLK input signal.</i></p> <p><b>When RxSYNCn is configured as an Output:</b></p> <p>The receive T1/E1 framer will output a signal which pulses "High" for one period of RxSERCLK during the first bit of an inbound DS1/E1 frame.</p> <p><b>DS1/E1 High-Speed Backplane Modes* - RxSYNCn as INPUT ONLY:</b></p> <p>In this mode, RxSYNCn must be an input regardless of the slip buffer configuration. In 2.048MVIP/4.096/8.192MHz high-speed modes, RxSYNCn pins must be pulsed 'High' for one period of RxSERCLK during the first bit of the inbound T1/E1 frame. In H.100 mode, RxSYNCn must be pulsed 'High' for 4 clock cycles of the RxSERCLK signal in the position of the first two and the last two bits of a multiplexed frame. In H.100 mode, RxSYNCn must be pulsed 'High' for 2 clock cycles of the RxSERCLK signal in the position of the first and the last bit of a multiplexed frame.</p> <p><b>DS1 or E1 Framer Bypass Mode - RxNEGn</b></p> <p>In this mode, RxSYNCn is used as the Receive negative digital output pin (RxNEG) from the LIU.</p> <p><b>NOTE:</b> <i>*High-speed backplane modes include (For T1/E1) 2.048MVIP, 4.096MHz, 8.192MHz, 16.384MHz H.100, Bit-multiplexed modes, and (For T1 only) 12.352MHz Bit-multiplexed mode.</i></p> <p><b>NOTE:</b> <i>In DS1 high-speed modes, the DS-0 data is mapped into an E1 frame by ignoring every fourth time slot (don't care).</i></p> <p><b>NOTE:</b> <i>These 8 pins are internally pulled "Low" for each channel.</i></p> |
| RxSYNC1/<br>RxNEG1 | D15           | E16            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSYNC2/<br>RxNEG2 | D19           | A18            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSYNC3/<br>RxNEG3 | G23           | D22            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSYNC4/<br>RxNEG4 | AE26          | Y20            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSYNC5/<br>RxNEG5 | AF19          | Y15            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSYNC6/<br>RxNEG6 | AB11          | AA6            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSYNC7/<br>RxNEG7 | AC6           | Y3             |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**RECEIVE SYSTEM SIDE INTERFACE**

| SIGNAL NAME | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------|------------------|-------------------|------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RxCRCsync0  | B8               | B8                | O    | 12                   | <b>Receive Multiframe Sync Pulse (RxCRCsyncN):</b><br>The RxCRCsyncN pins are used to indicate the receive multi-frame boundary. These pins pulse "High" for one period of RxSERCLK when the first bit of an inbound DS1/E1 Multi-frame is being output on the RxCRCsyncN pin.<br><ul style="list-style-type: none"> <li>In DS1 ESF mode, RxCRCsyncN repeats every 3ms</li> <li>In DS1 SF mode, RxCRCsyncN repeats every 1.5ms</li> <li>In E1 mode, RxCRCsyncN repeats every 2ms.</li> </ul> |
| RxCRCsync1  | D13              | B12               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCRCsync2  | E20              | A20               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCRCsync3  | G25              | G20               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCRCsync4  | AB25             | Y21               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCRCsync5  | AF21             | AA17              |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCRCsync6  | AE10             | Y9                |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCRCsync7  | AD5              | V9                |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCASync0   | E10              | C10               | O    | 12                   | <b>Receive CAS Multiframe Sync Pulse (RxCASyncN):</b><br><b>- E1 Mode Only</b><br>The RxCASyncN pins are used to indicate the E1 CAS Multif-frame boundary. These pins pulse "High" for one period of RxSERCLK when the first bit of an E1 CAS Multi-frame is being output on the RxCASyncN pin.                                                                                                                                                                                             |
| RxCASync1   | E15              | B14               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCASync2   | A23              | C18               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCASync3   | H23              | F21               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCASync4   | AD24             | V17               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCASync5   | AE19             | AB17              |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCASync6   | AC9              | Y8                |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RxCASync7   | AF6              | W10               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**RECEIVE SYSTEM SIDE INTERFACE**

| SIGNAL NAME                                                                                                                                                                                                                                                                                                                                                 | 420 PKG BALL#              | 484 PKG BALL # | TYPE | OUTPUT DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------|---------------------------|-------|--------------------------|-------|--------------------------|-------|--------------------------------------|--------|---------------------------|--------|-------------------------------|--------|-------------------------------|--------|
| RxSERCLK0/<br>RxLINECLK0                                                                                                                                                                                                                                                                                                                                    | A6                         | D9             | I/O  | 12                | <p><b>Receive Serial Clock Signal (RxSERCLKn) / Receive Line Clock (RxLINECLKn):</b></p> <p>The exact function of these pins depends on the mode of operation selected, as described below.</p> <p><b>In Base-Rate Mode (1.544MHz/2.048MHz) - RxSER-CLKn:</b></p> <p>These pins are used as the receive serial clock on the system side interface which can be configured as either input or output. The receive serial interface outputs data on RxSERn on the rising edge of RxSERCLKn.</p> <p><b>When RxSERCLKn is configured as Input:</b></p> <p>These pins will be inputs if the slip buffer on the Receive path is enabled. System side equipment must provide a 1.544MHz clock rate to this input pin for T1 mode of operation, and 2.048MHz clock rate in E1 mode.</p> <p><b>When RxSERCLKn is configured as Output:</b></p> <p>These pins will be outputs if slip buffer is bypassed. The receive framer will output a 1.544MHz clock rate in T1 mode of operation, and a 2.048MHz clock rate in E1 mode.</p> <p><b>DS1/E1 High-Speed Backplane Modes* - (RxSERCLK as INPUT ONLY)</b></p> <p>In this mode, this pin must be used as the high-speed input clock for the backplane interface to output high-speed or multiplexed data on the RxSERn pin. The frequency of RxSERCLK is presented in the table below.</p> <table><tr><th>OPERATION MODE</th><th>FREQUENCY OF RxSERCLK(MHz)</th></tr><tr><td>2.048MVIP non-multiplexed</td><td>2.048</td></tr><tr><td>4.096MHz non-multiplexed</td><td>4.096</td></tr><tr><td>8.192MHz non-multiplexed</td><td>8.192</td></tr><tr><td>12.352MHz Bit-multiplexed (DS1 ONLY)</td><td>12.352</td></tr><tr><td>16.384MHz Bit-multiplexed</td><td>16.384</td></tr><tr><td>16.384 HMVIP Byte-multiplexed</td><td>16.384</td></tr><tr><td>16.384 H.100 Byte-multiplexed</td><td>16.384</td></tr></table> | OPERATION MODE | FREQUENCY OF RxSERCLK(MHz) | 2.048MVIP non-multiplexed | 2.048 | 4.096MHz non-multiplexed | 4.096 | 8.192MHz non-multiplexed | 8.192 | 12.352MHz Bit-multiplexed (DS1 ONLY) | 12.352 | 16.384MHz Bit-multiplexed | 16.384 | 16.384 HMVIP Byte-multiplexed | 16.384 | 16.384 H.100 Byte-multiplexed | 16.384 |
| OPERATION MODE                                                                                                                                                                                                                                                                                                                                              | FREQUENCY OF RxSERCLK(MHz) |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 2.048MVIP non-multiplexed                                                                                                                                                                                                                                                                                                                                   | 2.048                      |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 4.096MHz non-multiplexed                                                                                                                                                                                                                                                                                                                                    | 4.096                      |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 8.192MHz non-multiplexed                                                                                                                                                                                                                                                                                                                                    | 8.192                      |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 12.352MHz Bit-multiplexed (DS1 ONLY)                                                                                                                                                                                                                                                                                                                        | 12.352                     |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 16.384MHz Bit-multiplexed                                                                                                                                                                                                                                                                                                                                   | 16.384                     |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 16.384 HMVIP Byte-multiplexed                                                                                                                                                                                                                                                                                                                               | 16.384                     |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| 16.384 H.100 Byte-multiplexed                                                                                                                                                                                                                                                                                                                               | 16.384                     |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| RxSERCLK1/<br>RxLINECLK1                                                                                                                                                                                                                                                                                                                                    | B13                        | A12            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| RxSERCLK2/<br>RxLINECLK2                                                                                                                                                                                                                                                                                                                                    | C20                        | B18            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| RxSERCLK3/<br>RxLINECLK3                                                                                                                                                                                                                                                                                                                                    | H25                        | H20            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| RxSERCLK4/<br>RxLINECLK4                                                                                                                                                                                                                                                                                                                                    | AD26                       | W20            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| RxSERCLK5/<br>RxLINECLK5                                                                                                                                                                                                                                                                                                                                    | AC19                       | V16            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| RxSERCLK6/<br>RxLINECLK6                                                                                                                                                                                                                                                                                                                                    | AB12                       | W12            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| RxSERCLK7/<br>RxLINECLK7                                                                                                                                                                                                                                                                                                                                    | AB6                        | W6             |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |
| <p><b>NOTES:</b></p> <p>1. <i>*High-speed backplane modes include (For T1/ E1) 2.048MVIP, 4.096MHz, 8.192MHz, 16.384MHz HMVIP, H.100, Bit-multiplexed modes, and (For T1 only) 12.352MHz Bit-multiplexed mode.</i></p> <p>2. <i>For DS1 high-speed modes, the DS-0 data is mapped into an E1 frame by ignoring every fourth time slot (don't care).</i></p> |                            |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                            |                           |       |                          |       |                          |       |                                      |        |                           |        |                               |        |                               |        |

## RECEIVE SYSTEM SIDE INTERFACE

| SIGNAL NAME              | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|------------------|-------------------|------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RxSERCLK0/<br>RxLINECLK0 | A6               | D9                | I/O  | 12                   | <b>(Continued)</b><br><b>DS1 or E1 Framer Bypass Mode - RxLINECLKn</b><br>In this mode, RxSERCLKn is used as the Receive Line Clock output pin (RxLineClk) from the LIU.<br><br><b>NOTE:</b> These 8 pins are internally pulled "High" for each channel.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| RxSERCLK1/<br>RxLINECLK1 | B13              | A12               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSERCLK2/<br>RxLINECLK2 | C20              | B18               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSERCLK3/<br>RxLINECLK3 | H25              | H20               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSERCLK4/<br>RxLINECLK4 | AD26             | W20               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSERCLK5/<br>RxLINECLK5 | AC19             | V16               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSERCLK6/<br>RxLINECLK6 | AB12             | W12               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSERCLK7/<br>RxLINECLK7 | AB6              | W6                |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSER0/<br>RxPOS0        | C7               | B7                | O    | 12                   | <b>Receive Serial Data Output (RxSERn):</b><br>The exact function of these pins depends on the mode of operation selected, as described below.<br><b>DS1/E1 Mode - RxSERn</b><br>These pins function as the receive serial data output on the system side interface, which are updated on the rising edge of the RxSERCLKn pin. All the framing alignment bits, facility data link bits, CRC bits, and signaling information will also be extracted to this output pin.<br><b>DS1 or E1 High-Speed Multiplexed Mode* - RxSERn</b><br>In this mode, these pins are used as the high-speed multiplexed data output pin on the system side. High-speed multiplexed data of channels 0-3 will output on RxSER0 and high-speed multiplexed data of channels 4-7 will output on RxSER4 in a byte or bit-interleaved way. The framer outputs the multiplexed data on RxSER0 and RxSER4 using the high-speed input clock (RxSERCLKn).<br><b>DS1 or E1 Framer Bypass Mode</b><br>In this mode, RxSERn is used as the positive digital output pin (RxPOSn) from the LIU.<br><b>NOTE:</b> *High-speed multiplexed modes include (For T1/E1) 16.384MHz HMPV, H.100, Bit-multiplexed modes, and (For T1 only) 12.352MHz Bit-multiplexed mode.<br><br><b>NOTE:</b> In DS1 high-speed modes, the DS-0 data is mapped into an E1 frame by ignoring every fourth time slot (don't care). |
| RxSER1/<br>RxPOS1        | B14              | E14               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSER2/<br>RxPOS2        | C21              | D17               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSER3/<br>RxPOS3        | D26              | F20               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSER4/<br>RxPOS4        | AC25             | W19               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSER5/<br>RxPOS5        | AC18             | AA15              |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSER6/<br>RxPOS6        | AE12             | AA9               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxSER7/<br>RxPOS7        | AB7              | AB2               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                          |                  |                   |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                          |                  |                   |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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|                          |                  |                   |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                          |                  |                   |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



**RECEIVE SYSTEM SIDE INTERFACE**

| SIGNAL NAME         | 420 PKG BALL# | 484 PKG BALL # | TYPE | OUTPUT DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| RxCHN0_0/<br>RxSig0 | D8            | A7             | O    | 8                 | <b>Receive Time Slot Octet Identifier Output (RxCHNn_0) / Receive Serial Signaling Output (RxSIGn):</b><br>The exact function of these pins depends on whether or not the receive framer enables the receive fractional/signaling interface, as described below:<br><b>If receive fractional/signaling interface is disabled - RxCHNn_0:</b><br>These output pins (RxCHNn_4 through RxCHNn_0) reflect the five-bit binary value of the current time slot being output by the receive serial interface. System equipment can use the RxCHCLKn to sample the five output pins of each channel to identify the time slot being output on these pins. RxCHNn_0 indicates the Least Significant Bit (LSB) of the time slot channel being output.<br><b>If receive fractional/signaling interface is enabled - RxSIGn:</b><br>These pins can be used to output robbed-bit signaling data within an inbound DS1 frame or to output Channel Associated Signaling (CAS) data within an inbound E1 frame, as described below.<br><b>T1 Mode:</b> Signaling data (A,B,C,D) of each channel will be output on bit 4,5,6,7 of each time slot on the RxSIG pin if 16-code signaling is used. If 4-code signaling is selected, signaling data (A,B) of each channel will be output on bit 4, 5 of each time slot on the RxSIG pin. If 2-code signaling is selected, signaling data (A) of each channel will be output on bit 4 of each time slot on the RxSIG pin.<br><b>E1 Mode:</b> Signaling data in E1 mode will be output on the RxSIGn pins on a time-slot-basis as in T1 mode, or it can be output on time slot 16 only via the RxSIGn output pins. In the latter case, signaling data (A,B,C,D) of channel 1 and channel 17 will be output on the RxSIGn pin during time slot 16 of frame 1, signaling data (A,B,C,D) of channel 2 and channel 18 will be output on the RxSIGn pin during time slot 16 of frame 2...etc. The CAS multiframe Alignments bits (0000 bits) and the extra bits/alarm bit (xyxx) will be output on the RxSIGn pin during time slot 16 of frame 0.<br><b>NOTE:</b> Receive Fractional/signaling interface can be enabled by programming to bit 4 - RxFr1544/RxFr2048 bit from register 0xn122 to '1'. |
| RxCHN1_0/<br>RxSig1 | D14           | B13            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| RxCHN2_0/<br>RxSig2 | A22           | B19            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| RxCHN3_0/<br>RxSig3 | G26           | H19            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| RxCHN4_0/<br>RxSig4 | AD25          | AA22           |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| RxCHN5_0/<br>RxSig5 | AD18          | U14            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| RxCHN6_0/<br>RxSig6 | AC13          | AA10           |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| RxCHN7_0/<br>RxSig7 | AB8           | Y7             |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                     |               |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                     |               |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                     |               |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                     |               |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                     |               |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                     |               |                |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## RECEIVE SYSTEM SIDE INTERFACE

| SIGNAL NAME           | 420 PKG BALL# | 484 PKG BALL # | TYPE | OUTPUT DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------|---------------|----------------|------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RxCHN0_1/<br>RxFrTD0  | E9            | C9             | O    | 8                 | <p><b>Receive Time Slot Octet Identifier Output Bit 1 (RxCHNn_1) / Receive Serial Fractional Output (RxFrTDn):</b></p> <p>The exact function of these pins depends on whether or not the receive framer enables the receive fractional/signaling interface, as described below:</p> <p><b>If receive fractional/signaling interface is disabled - RxCHNn_1:</b></p> <p>These output pins (RxCHNn_4 through RxCHNn_0) reflect the five-bit binary value of the current time slot being output by the receive serial interface. System equipment can use the RxCHCLKn to sample the five output pins of each channel to identify the time slot being output on these pins. RxCHNn_1 indicates Bit 1 of the time slot channel being output.</p> <p><b>If receive fractional/signaling interface is enabled - RxFrTDn:</b></p> <p>These pins are used as the fractional data output pins to output fractional DS1/E1 payload data within an inbound DS1/E1 frame. In this mode, system equipment can use either RxCHCLK or RxSERCLK to clock out fractional DS1/E1 payload data depending on the framer configuration.</p> <p><b>NOTE:</b> Receive Fractional/Signaling interface can be enabled by programming to bit 4 - RxFr1544/RxFr2048 bit from register 0xn122 to '1'.</p> |
| RxCHN1_1/<br>RxFrTD1  | E14           | C13            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN2_1/<br>RxFrTD2  | B22           | C19            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN13_1/<br>RxFrTD3 | H26           | G21            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN4_1/<br>RxFrTD4  | AE25          | AA21           |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN5_1/<br>RxFrTD5  | AF18          | AB16           |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN6_1/<br>RxFrTD6  | AB13          | V12            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN7_1/<br>RxFrTD7  | AC7           | W8             |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN0_2/<br>RxCHN0   | C9            | D10            | O    | 8                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN1_2/<br>RxCHN1   | A15           | D13            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN2_2/<br>RxCHN2   | C22           | F17            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN3_2/<br>RxCHN3   | J23           | J19            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN4_2/<br>RxCHN4   | AF26          | W18            |      |                   | <p><b>Receive Time Slot Octet Identifier Output-Bit 2 (RxCHNn_2) / Receive Time Slot Identifier Serial Output (RxCHNn):</b></p> <p>The exact function of these pins depends on whether or not the receive framer enables the receive fractional/signaling interface, as described below:</p> <p><b>If receive fractional/signaling interface is disabled - RxCHNn_2:</b></p> <p>These output pins (RxCHNn_4 through RxCHNn_0) reflect the five-bit binary value of the current time slot being output by the receive serial interface. System equipment can use the RxCHCLKn to sample the five output pins of each channel to identify the time slot being output on these pins. RxCHNn_2 indicates Bit 2 of the time slot channel being output.</p> <p><b>If receive fractional/signaling interface is enabled - RxCHNn</b></p> <p>These pins serially output the five-bit binary value of the time slot being output by the receive serial interface.</p> <p><b>NOTE:</b> Receive Fractional/Signaling interface can be enabled by programming to bit 4 - RxFr1544/RxFr2048 bit from register 0xn122 to '1'.</p>                                                                                                                                                           |
| RxCHN5_2/<br>RxCHN5   | AB17          | AB15           |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN6_2/<br>RxCHN6   | AF12          | AB9            |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RxCHN7_2/<br>RxCHN7   | AF4           | Y4             |      |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**RECEIVE SYSTEM SIDE INTERFACE**

| SIGNAL NAME                                                                                                                                                                                  | 420 PKG BALL#                                           | 484 PKG BALL #                                        | TYPE | OUTPUT DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------|------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RxCHN0_3/<br>Rx8KHZ0<br>RxCHN1_3/<br>Rx8KHZ1<br>RxCHN2_3/<br>Rx8KHZ2<br>RxCHN3_3/<br>Rx8KHZ3<br>RxCHN4_3/<br>Rx8KHZ4<br>RxCHN5_3/<br>Rx8KHZ5<br>RxCHN6_3/<br>Rx8KHZ6<br>RxCHN7_3/<br>Rx8KHZ7 | C10<br>B16<br>C23<br>J26<br>AC23<br>AC17<br>AD12<br>AE5 | E11<br>A15<br>D19<br>H21<br>AB22<br>V14<br>AB8<br>AA3 | O    | 8                 | <p><b>Receive Time Slot Octet Identifier Output-Bit 3 (RxCHNn_3) / Receive 8KHz Clock Output (Rx8KHZn):</b></p> <p>The exact function of these pins depends on whether or not the receive framer enables the receive fractional/signaling interface, as described below:</p> <p><b>If receive fractional/signaling interface is disabled - RxCHNn_3:</b></p> <p>These output pins (RxCHNn_4 through RxCHNn_0) reflect the five-bit binary value of the current time slot being output by the receive serial interface. System equipment can use the RxCHCLKn to sample the five output pins of each channel to identify the time slot being output on these pins. RxCHNn_3 indicates Bit 3 of the time slot channel being output.</p> <p><b>If receive fractional/signaling interface is enabled - Rx8KHZn:</b></p> <p>These pins output a reference 8KHz clock signal derived from the MCLKIN input.</p> <p><b>NOTE:</b> Receive Fractional/Signaling interface can be enabled by programming to bit 4 - RxFr1544/RxFr2048 bit from register 0xn122 to '1'.</p>                                                                                                            |
| RxCHN0_4/<br>RxSCLK0<br>RxCHN1_4/<br>RxSCLK1<br>RxCHN2_4/<br>RxSCLK2<br>RxCHN3_4/<br>RxSCLK3<br>RxCHN4_4/<br>RxSCLK4<br>RxCHN5_4/<br>RxSCLK5<br>RxCHN6_4/<br>RxSCLK6<br>RxCHN7_4/<br>RxSCLK7 | A10<br>C17<br>A26<br>K25<br>AB22<br>AD17<br>AF11<br>AF3 | B10<br>F16<br>B21<br>J22<br>Y19<br>W14<br>AB7<br>W7   | O    | 8                 | <p><b>Receive Time Slot Octet Identifier Output-Bit 4 (RxCHNn_4) / Receive Recovered Line Clock Output (RxSCLKn):</b></p> <p>The exact function of these pins depends on whether or not the receive framer enables the receive fractional/signaling interface, as described below:</p> <p><b>If receive fractional/signaling interface is disabled - RxCHNn_4:</b></p> <p>These output pins (RxCHNn_4 through RxCHNn_0) reflect the five-bit binary value of the current time slot being output by the receive serial interface. System equipment can use the RxCHCLKn to sample the five output pins of each channel to identify the time slot being output on these pins. RxCHNn_4 indicates the Most Significant Bit (MSB) of the time slot channel being output.</p> <p><b>If receive fractional/signaling interface is enabled - Receive Recovered Line Clock Output (RxSCLKn):</b></p> <p>These pins output the recovered T1/E1 line clock (1.544MHz in T1 mode and 2.048MHz in E1 mode) for each channel.</p> <p><b>NOTE:</b> Receive Fractional/Signaling interface can be enabled by programming to bit 4 - RxFr1544/RxFr2048 bit from register 0xn122 to '1'.</p> |

## RECEIVE SYSTEM SIDE INTERFACE

| SIGNAL NAME | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------|------------------|-------------------|------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RxCHCLK0    | A8               | E10               | O    | 8                    | <p><b>Receive Channel Clock Output (RxCHCLKn):</b></p> <p>The exact function of this pin depends on whether or not the receive framer enables the receive fractional/signaling interface to output fractional data, as described below.</p> <p><b>If receive fractional/signaling interface is disabled:</b></p> <p>This pin indicates the boundary of each time slot of an inbound DS1/E1 frame. In T1 mode, each of these output pins is a 192kHz clock which pulses "High" during the LSB of each 24 time slots. In E1 mode, each of these output pins is a 256kHz clock which pulses "High" during the LSB of each 32 time slots. System Equipment can use this clock signal to sample the RxCHN0 through RxCHN4 time slot identifier pins to determine which time slot is being output.</p> <p><b>If receive fractional/signaling interface is enabled:</b></p> <p>RxCHCLKn is the fractional interface clock which either outputs a clock signal for the time slot that has been configured to output fractional data, or outputs an enable signal for the fractional time slot so that fractional data can be clocked out of the device using the RxSERCLK pin.</p> <p><b>NOTE:</b> Receive fractional interface can be enabled by programming to bit 4 - RxFr1544/RxFr2048 bit from register 0xn122 to '1'.</p> |
| RxCHCLK1    | A14              | E15               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxCHCLK2    | A24              | B20               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxCHCLK3    | F25              | G19               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxCHCLK4    | AB24             | U18               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxCHCLK5    | AE21             | AB19              |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxCHCLK6    | AE11             | AA8               |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| RxCHCLK7    | AF5              | Y5                |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**RECEIVE LINE INTERFACE**

| SIGNAL NAME                                                                          | 420 PKG<br>BALL#                                       | 484 PKG<br>BALL #                                  | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------|------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RTIP0<br>RTIP1<br>RTIP2<br>RTIP3<br>RTIP4<br>RTIP5<br>RTIP6<br>RTIP7                 | D1<br>F1<br>H1<br>K1<br>M1<br>P1<br>T1<br>V1           | G2<br>H2<br>K4<br>L2<br>M2<br>P3<br>T2<br>U4       | I    | -                    | <b>Receive Positive Analog Input (RTIPn):</b><br>RTIP is the positive differential input from the line interface. This input pin, along with the RRING input pin, functions as the "Receive DS1/E1 Line Signal" input for the XRT86VL38 device.<br>The user is expected to connect this signal and the RRING input signal to a 1:1 transformer for proper operation. The center tap of the receive transformer should have a bypass capacitor of 0.1μF to ground (Chip Side) to improve long haul application receive capabilities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| RRING0<br>RRING1<br>RRING2<br>RRING3<br>RRING4<br>RRING5<br>RRING6<br>RRING7         | E1<br>G1<br>J1<br>L1<br>N1<br>R1<br>U1<br>W1           | G3<br>H1<br>K3<br>L1<br>M1<br>P2<br>T3<br>U3       | I    | -                    | <b>Receive Negative Analog Input (RRINGn):</b><br>RRING is the negative differential input from the line interface. This input pin, along with the RTIP input pin, functions as the "Receive DS1/E1 Line Signal" input for the XRT86VL38 device.<br>The user is expected to connect this signal and the RTIP input signal to a 1:1 transformer for proper operation. The center tap of the receive transformer should have a bypass capacitor of 0.1μF to ground (Chip Side) to improve long haul application receive capabilities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| RxLOS_0<br>RxLOS_1<br>RxLOS_2<br>RxLOS_3<br>RxLOS_4<br>RxLOS_5<br>RxLOS_6<br>RxLOS_7 | E8<br>A16<br>B20<br>H24<br>AC26<br>AF20<br>AC12<br>AD4 | C8<br>C14<br>D16<br>F22<br>W21<br>W15<br>Y10<br>U8 | O    | 4                    | <b>Receive Loss of Signal Output Indicator (RLOSn):</b><br>The XRT86VL38 device will assert this output pin (i.e., toggle it "high") anytime (and for the duration that) the Receive DS1/E1 Framer or LIU block declares the LOS defect condition.<br>Conversely, the XRT86VL38 will <b>"TRI-State"</b> this pin anytime (and for the duration that) the Receive DS1/E1 Framer or LIU block is NOT declaring the LOS defect condition.<br><b>NOTE:</b> Since the XRT86VL38 tri-states this output pin (anytime the channel is not declaring the LOS defect condition), the user <b>MUST</b> connect a "pull-down" resistor (ranging from 1K to 10K) to each RxLOS output pin, to pull this output pin to the logic "LOW" condition, whenever the Channel is NOT declaring the LOS defect condition.<br>This output pin will toggle "High" (declare LOS) if the Receive Framer or the Receive LIU block associated with Channel N determines that an RLOS condition occurs. In other words, this pin is OR-ed with the LIU RLOS and the Framer RLOS bit. If either the LIU RLOS or the Framer RLOS bit associated with channel N pulses high, the corresponding RLOS pin of that particular channel will be set to "High". |

## RECEIVE LINE INTERFACE

| SIGNAL NAME  | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |                |   |          |   |          |
|--------------|------------------|-------------------|------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------|---|----------|---|----------|
| RxTSEL       | D5               | C6                | I    | -                    | <p><b>Receive Termination Control (RxTSEL):</b></p> <p>Upon power up, the receivers are in "High" impedance. Switching to internal termination can be selected through the microprocessor interface by programming the appropriate channel register. However, to switch control to the hardware pin, RxTCNTL must be programmed to "1" in the appropriate global register (0x0FE2). Once control has been granted to the hardware pin, it must be pulled "High" to switch to internal termination.</p> <p><b>NOTE:</b> Internally pulled "Low" with a 50kΩ resistor.</p> <table><tr><th>RxTSEL (pin)</th><th>Rx Termination</th></tr><tr><td>0</td><td>External</td></tr><tr><td>1</td><td>Internal</td></tr></table> <p><i>Note: RxTCNTL (bit) must be set to "1"</i></p> | RxTSEL (pin) | Rx Termination | 0 | External | 1 | Internal |
| RxTSEL (pin) | Rx Termination   |                   |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |                |   |          |   |          |
| 0            | External         |                   |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |                |   |          |   |          |
| 1            | Internal         |                   |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |              |                |   |          |   |          |

## TRANSMIT LINE INTERFACE

| SIGNAL NAME                                                                  | 420 PKG<br>BALL#                             | 484 PKG<br>BALL #                            | TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------|----------------------------------------------|----------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TTIP0<br>TTIP1<br>TTIP2<br>TTIP3<br>TTIP4<br>TTIP5<br>TTIP6<br>TTIP7         | F3<br>G3<br>J3<br>K3<br>M3<br>P3<br>T3<br>U3 | F3<br>H4<br>J3<br>K1<br>M5<br>N2<br>R4<br>T1 | O    | <p><b>Transmit Positive Analog Output (TTIPn):</b></p> <p>TTIP is the positive differential output to the line interface. This output pin, along with the corresponding TRING output pin, function as the Transmit DS1/E1 output signal drivers for the XRT86VL38 device.</p> <p>The user is expected to connect this signal and the corresponding TRING output signal to a 1:2 step up transformer for proper operation.</p> <p>This output pin will be tri-stated whenever the user sets the "TxON" input pin or register bit (0xnF02, bit 3) to "0".</p> <p><b>NOTE:</b> This pin should have a series line capacitor of 0.68<math>\mu</math>F for DC blocking purposes.</p> |
| TRING0<br>TRING1<br>TRING2<br>TRING3<br>TRING4<br>TRING5<br>TRING6<br>TRING7 | G4<br>H4<br>K4<br>L4<br>M4<br>P4<br>R4<br>U4 | F1<br>J5<br>J1<br>L4<br>M3<br>P5<br>R2<br>U2 | O    | <p><b>Transmit Negative Analog Output (TRINGn):</b></p> <p>TRING is the negative differential output to the line interface. This output pin, along with the corresponding TTIP output pin, function as the Transmit DS1/E1 output signal drivers for the XRT86VL38 device.</p> <p>The user is expected to connect this signal and the corresponding TRING output signal to a 1:2 step up transformer for proper operation.</p> <p><b>NOTE:</b> This output pin will be tri-stated whenever the user sets the "TxON" input pin or register bit (0xnF02, bit 3) to "0".</p>                                                                                                       |

**TRANSMIT LINE INTERFACE**

| SIGNAL NAME | 420 PKG BALL# | 484 PKG BALL # | TYPE | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------|---------------|----------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TxON        | Y3            | W1             | I    | <p><b>Transmitter On</b></p> <p>This input pin permits the user to either enable or disable the Transmit Output Driver within the Transmit DS1/E1 LIU Block. If the TxON pin is pulled "Low", all 8 Channels are tri-stated. When this pin is pulled 'High', turning on or off the transmitters will be determined by the appropriate channel registers (address 0x0Fn2, bit 3)</p> <p><b>LOW</b> = Disables the Transmit Output Driver within the Transmit DS1/E1 LIU Block. In this setting, the TTIP and TRING output pins of all 8 channels will be tri-stated.</p> <p><b>HIGH</b> = Enables the Transmit Output Driver within the Transmit DS1/E1 LIU Block. In this setting, the corresponding TTIP and TRING output pins will be enabled or disabled by programming the appropriate channel register. (address 0x0Fn2, bit 3)</p> <p><b>NOTE:</b> Whenever the transmitters are turned off, the TTIP and TRING output pins will be tri-stated.</p> |

**TIMING INTERFACE**

| SIGNAL NAME | 420 PKG BALL# | 484 PKG BALL # | TYPE | OUTPUT DRIVE (mA) | DESCRIPTION                                                                                                                                                                                                                   |
|-------------|---------------|----------------|------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MCLKIN      | A4            | A5             | I    | -                 | <p><b>Master Clock Input:</b></p> <p>This pin is used to provide the timing reference for the internal master clock of the device. The frequency of this clock is programmable from 8kHz to 16.384MHz in register 0x0FE9.</p> |
| E1MCLKnOUT  | B5            | A4             | O    | 12                | <p><b>LIU E1 Output Clock Reference</b></p> <p>This output pin is defaulted to 2.048MHz, but can be programmed to 4.096MHz, 8.192MHz, or 16.384MHz in register 0x0FE4.</p>                                                    |
| T1MCLKnOUT  | D6            | F9             | O    | 12                | <p><b>LIU T1 Output Clock Reference</b></p> <p>This output pin is defaulted to 1.544MHz, but can be programmed to output 3.088MHz, 6.176MHz, or 12.352MHz in register 0x0FE4.</p>                                             |
| E1OSCCLK    | Y5            | V4             | O    | 8                 | <p><b>Framer E1 Output Clock Reference</b></p> <p>This output pin is defaulted to 2.048MHz, but can be programmed to 65.536MHz in register 0x011E.</p>                                                                        |
| T1OSCCLK    | AC1           | V3             | O    | 8                 | <p><b>Framer T1 Output Clock Reference</b></p> <p>This output pin is defaulted to 1.544MHz, but can be programmed to output 49.408MHz in register 0x011E.</p>                                                                 |
| 8KSYNC      | AB3           | W2             | O    | 8                 | <p><b>8kHz Clock Output Reference</b></p> <p>This pin is an output reference of 8kHz based on the MCLKIN input. Therefore, the duty cycle of this output is determined by the time period of the input clock reference.</p>   |

**TIMING INTERFACE**

| SIGNAL NAME | 420 PKG<br>BALL# | 484 PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                      |
|-------------|------------------|-------------------|------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8KEXTOSC    | AA2              | U5                | I    | -                    | <b>External Oscillator Select</b><br>For normal operation, this pin should not be used, or pulled "Low".<br>This pin is internally pulled "Low" with a 50k $\Omega$ resistor.                                                                                                                                                                    |
| ANALOG      | C5               | D4                | O    |                      | <b>Factory Test Mode Pin</b><br><i>NOTE: For Internal Use Only</i>                                                                                                                                                                                                                                                                               |
| LOP         | AB1              | V2                | I    | -                    | <b>Loss of Power for E1 Only</b><br>This is a Loss of Power pin in the E1 application only. Upon detecting LOP in E1 mode, the device will automatically transmit the Sa5 and Sa6 bit to a different pattern, so that the Receive terminal can detect a power failure in the network.<br>Please see register 0xn131 for the Transmit SA control. |
| SENSE       | E6               | E6                | O    |                      | <i>NOTE: For Internal Use Only</i>                                                                                                                                                                                                                                                                                                               |



**GPIO INTERFACE**

| SIGNAL NAME                              | 420 PKG<br>BALL#             | 484PKG<br>BALL #           | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------|------------------------------|----------------------------|------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GPIO1_3<br>GPIO1_2<br>GPIO1_1<br>GPIO1_0 | B21<br>G22<br>AE24<br>AE22   | A19<br>G18<br>AA20<br>AA18 | I/O  | 8                    | <p><b>General Purpose Input/Output Pins</b></p> <p>Each of these pins can be configured to function as either a general-purpose input or output pin. The exact function of these pins depend on whether these GPIO pins are configured as input or output pins as follows.</p> <p><b>If GPIO1_n pins are configured as input pins:</b></p> <p>The state of these input pins can be monitored by reading the GPIO1_n Control Bits (Bit 3-0) within the "General Purpose Input/Output 1 Control Register (address 0x4102).</p> <p><b>If GPIO1_n pins are configured as output pins:</b></p> <p>The state of these output pins can be controlled by writing the appropriate value into the GPIO1_n Control Bits (Bit 3-0) within the "General Purpose Input/Output 1 Control Register (address 0x4102).</p> <p>Finally, users can configure a given GPIO1_n pin to be an input pin by setting the corresponding GPIO1_nDIR Bit (from Bit 7-4), within the "General Purpose Input/Output 1 Control Register (address 0x4102) to '0'.</p> <p>Conversely, users can configure the GPIO1_n pin to be an output pin by setting the corresponding GPIO1_nDIR Bit (from Bit 7-4), within the "General Purpose Input/Output 1 Control Register (address 0x4102) to '1'.</p> |
| GPIO0_3<br>GPIO0_2<br>GPIO0_1<br>GPIO0_0 | AD20<br>AB18<br>AD13<br>AD11 | U16<br>V15<br>Y11<br>AB6   | I/O  | 8                    | <p><b>General Purpose Input/Output Pins</b></p> <p>Each of these pins can be configured to function as either a general-purpose input or output pin. The exact function of these pins depend on whether these GPIO pins are configured as input or output pins as follows.</p> <p><b>If GPIO0_n pins are configured as input pins:</b></p> <p>The state of these input pins can be monitored by reading the GPIO0_n Control Bits (Bit 3-0) within the "General Purpose Input/Output 0 Control Register (address 0x0102).</p> <p><b>If GPIO0_n pins are configured as output pins:</b></p> <p>The state of these output pins can be controlled by writing the appropriate value into the GPIO0_n Control Bits (Bit 3-0) within the "General Purpose Input/Output 0 Control Register (address 0x0102).</p> <p>Finally, users can configure a given GPIO0_n pin to be an input pin by setting the corresponding GPIO0_nDIR Bit (from Bit 7-4), within the "General Purpose Input/Output 0 Control Register (address 0x0102) to '0'.</p> <p>Conversely, users can configure the GPIO0_n pin to be an output pin by setting the corresponding GPIO0_nDIR Bit (from Bit 7-4), within the "General Purpose Input/Output 0 Control Register (address 0x0102) to '1'.</p> |

**JTAG INTERFACE**

The XRT86VL38 device's JTAG features comply with the IEEE 1149.1 standard. Please refer to the industry specification for additional information on boundary scan operations.

| SIGNAL NAME | 420 PKG<br>BALL# | 484PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                              |
|-------------|------------------|------------------|------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TCK         | A7               | F10              | I    | -                    | <b>Test clock: Boundary Scan Test clock input:</b><br>The TCLK signal is the clock for the TAP controller, and it generates the boundary scan data register clocking. The data on TMS and TDI is loaded on the positive edge of TCK. Data is observed at TDO on the falling edge of TCK. |
| TMS         | A5               | B6               | I    | -                    | <b>Test Mode Select:</b> Boundary Scan Test Mode Select input.<br>The TMS signal controls the transitions of the TAP controller in conjunction with the rising edge of the test clock (TCK).<br><b>NOTE:</b> For normal operation this pin must be pulled 'High'.                        |
| TDI         | D7               | E9               | I    | -                    | <b>Test Data In:</b> Boundary Scan Test data input<br>The TDI signal is the serial test data input.<br><b>NOTE:</b> This pin is internally pulled 'high'.                                                                                                                                |
| TDO         | B6               | D8               | O    | 8                    | <b>Test Data Out:</b> Boundary Scan Test data output<br>The TDO signal is the serial test data output.                                                                                                                                                                                   |
| TRST        | B7               | A6               | I    | -                    | <b>Test Reset Input:</b><br>The TRST signal (Active Low) asynchronously resets the TAP controller to the Test-Logic-Reset state.<br><b>NOTE:</b> This pin is internally pulled 'high'                                                                                                    |
| TEST        | B11              | E12              | I    | -                    | <b>Factory Test Mode Pin</b><br><b>NOTE:</b> This pin is internally pulled 'low', and should be pulled 'low' for normal operation.                                                                                                                                                       |
| aTEST       | E7               | C7               | I    | -                    | <b>Factory Test Mode Pin</b><br><b>NOTE:</b> This pin is internally pulled 'low', and should be pulled 'low' for normal operation.                                                                                                                                                       |
| JTAG_Ring   | D4               | C2               | I    | -                    | <b>JTAG_Ring Test Pin</b>                                                                                                                                                                                                                                                                |
| JTAG_Tip    | F5               | E5               | I    | -                    | <b>JTAG_Tip Test Pin</b>                                                                                                                                                                                                                                                                 |

**MICROPROCESSOR INTERFACE**

| SIGNAL NAME                                                          | 420 PKG<br>BALL#                                     | 484PKG<br>BALL #                                     | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DATA0<br>DATA1<br>DATA2<br>DATA3<br>DATA4<br>DATA5<br>DATA6<br>DATA7 | Y26<br>W24<br>T25<br>T26<br>P24<br>N25<br>N24<br>M25 | T19<br>U20<br>P21<br>N18<br>M22<br>M20<br>M21<br>L21 | I/O  | 8                    | <b>Bidirectional Microprocessor Data Bus</b><br>These pins are used to drive and receive data over the bi-directional data bus, whenever the Microprocessor performs READ or WRITE operations with the Microprocessor Interface of the XRT86VL38 device.<br>When DMA interface is enabled, these 8-bit bidirectional data bus is also used by the T1/E1 Framer or the external DMA Controller for storing and retrieving information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| $\overline{\text{REQ0}}$                                             | AB26                                                 | U19                                                  | O    | 8                    | <b>DMA Cycle Request Output—DMA Controller 0 (Write):</b><br>These output pins are used to indicate that DMA transfers (Write) are requested by the T1/E1 Framer.<br>On the transmit side (i.e., To transmit data from external DMA controller to HDLC buffers within the XRT86VL38), DMA transfers are only requested when the transmit buffer status bits indicate that there is space for a complete message or cell.<br>The DMA Write cycle starts by T1/E1 Framer asserting the DMA Request ( $\overline{\text{REQ0}}$ ) 'low', then the external DMA controller should drive the DMA Acknowledge ( $\overline{\text{ACK0}}$ ) 'low' to indicate that it is ready to start the transfer. The external DMA controller should place new data on the Microprocessor data bus each time the Write Signal is Strobed low if the $\overline{\text{WR}}$ is configured as a Write Strobe. If $\overline{\text{WR}}$ is configured as a direction signal, then the external DMA controller would place new data on the Microprocessor data bus each time the Read Signal ( $\overline{\text{RD}}$ ) is Strobed low.<br>The Framer asserts this output pin (toggles it "Low") when at least one of the Transmit HDLC buffers are empty and can receive one more HDLC message.<br>The Framer negates this output pin (toggles it "High") when the HDLC buffer can no longer receive another HDLC message. |

## MICROPROCESSOR INTERFACE

| SIGNAL NAME              | 420 PKG<br>BALL# | 484PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (mA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------|------------------|------------------|------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\overline{\text{REQ1}}$ | AA24             | Y22              | O    | 8                    | <p><b>DMA Cycle Request Output—DMA Controller 1 (Read):</b></p> <p>These output pins are used to indicate that DMA transfers (Read) are requested by the T1/E1 Framer.</p> <p>On the receive side (i.e., To transmit data from HDLC buffers within the XRT86VL38 to external DMA Controller), DMA transfers are only requested when the receive buffer contains a complete message or cell.</p> <p>The DMA Read cycle starts by T1/E1 Framer asserting the DMA Request (<math>\overline{\text{REQ1}}</math>) 'low', then the external DMA controller should drive the DMA Acknowledge (<math>\overline{\text{ACK1}}</math>) 'low' to indicate that it is ready to receive the data. The T1/E1 Framer should place new data on the Microprocessor data bus each time the Read Signal is Strobed low if the <math>\overline{\text{RD}}</math> is configured as a Read Strobe. If <math>\overline{\text{RD}}</math> is configured as a direction signal, then the T1/E1 Framer would place new data on the Microprocessor data bus each time the Write Signal (<math>\overline{\text{WR}}</math>) is Strobed low.</p> <p>The Framer asserts this output pin (toggles it "Low") when one of the Receive HDLC buffer contains a complete HDLC message that needs to be read by the <math>\mu\text{C}/\mu\text{P}</math>.</p> <p>The Framer negates this output pin (toggles it "High") when the Receive HDLC buffers are depleted.</p> |
| $\overline{\text{INT}}$  | R26              | N22              | O    | 8                    | <p><b>Interrupt Request Output:</b></p> <p>This active-low output signal will be asserted when the XRT86VL38 device is requesting interrupt service from the Microprocessor. This output pin should typically be connected to the "Interrupt Request" input of the Microprocessor.</p> <p>The Framer will assert this active "Low" output (toggles it "Low"), to the local <math>\mu\text{P}</math>, anytime it requires interrupt service.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**MICROPROCESSOR INTERFACE**

| SIGNAL NAME                | 420 PKG<br>BALL#  | 484PKG<br>BALL #  | TYPE                   | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              |              |              |                        |   |   |   |                      |   |   |   |              |   |   |   |                  |
|----------------------------|-------------------|-------------------|------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|------------------------|---|---|---|----------------------|---|---|---|--------------|---|---|---|------------------|
| PCLK                       | Y25               | V22               | I                      | -                    | <p><b>Microprocessor Clock Input:</b></p> <p>This clock input signal is only used if the Microprocessor Interface has been configured to operate in the Synchronous Modes (e.g., Power PC 403 Mode). If the Microprocessor Interface is configured to operate in this mode, then it will use this clock signal to do the following.</p> <ol style="list-style-type: none"><li>1. To sample the <math>\overline{CS}</math>, <math>\overline{WR}/R/\overline{W}</math>, A[14:0], D[7:0], <math>\overline{RD}/\overline{DS}</math> and DBEN input pins, and</li><li>2. To update the state of the D[7:0] and the RDY/DTACK output signals.</li></ol> <p><b>NOTES:</b></p> <ol style="list-style-type: none"><li>1. The Microprocessor Interface can work with PCLK frequencies ranging up to 33MHz.</li><li>2. This pin is inactive if the user has configured the Microprocessor Interface to operate in either the Intel-Asynchronous or the Motorola-Asynchronous Modes. In this case, the user should tie this pin to GND.</li></ol> <p>When DMA interface is enabled, the PCLK input pin is also used by the T1/E1 Framer to latch in or latch out receive or output data respectively.</p> |              |              |              |                        |   |   |   |                      |   |   |   |              |   |   |   |                  |
| iADDR                      | W22               | R18               | I                      | -                    | <p><b>This Pin Must be Tied “Low” for Normal Operation.</b></p> <p>This pin is internally pulled “High” with a 50k<math>\Omega</math> resistor.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |              |              |              |                        |   |   |   |                      |   |   |   |              |   |   |   |                  |
| fADDR                      | AA26              | T18               | I                      | -                    | <p><b>This Pin Must be Tied “High” for Normal Operation.</b></p> <p>This pin is internally pulled “Low” with a 50k<math>\Omega</math> resistor.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |              |              |              |                        |   |   |   |                      |   |   |   |              |   |   |   |                  |
| PTYPE0<br>PTYPE1<br>PTYPE2 | W23<br>W26<br>R25 | V20<br>T20<br>N21 | I                      | -                    | <p><b>Microprocessor Type Input:</b></p> <p>These input pins permit the user to specify which type of Microprocessor/Microcontroller to be interfaced to the XRT86VL38 device. The following table presents the three different microprocessor types that the XRT86VL38 supports.</p> <table><tr><th><math>\mu</math>PType2</th><th><math>\mu</math>PType1</th><th><math>\mu</math>PType0</th><th>MICROPROCESSOR<br/>TYPE</th></tr><tr><td>0</td><td>0</td><td>0</td><td>68HC11, 8051, 80C188</td></tr><tr><td>0</td><td>0</td><td>1</td><td>MOTOROLA 68K</td></tr><tr><td>1</td><td>0</td><td>1</td><td>IBM POWER PC 403</td></tr></table> <p><b>NOTE:</b> These pins are internally pulled “Low” with a 50k<math>\Omega</math> resistor.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                | $\mu$ PType2 | $\mu$ PType1 | $\mu$ PType0 | MICROPROCESSOR<br>TYPE | 0 | 0 | 0 | 68HC11, 8051, 80C188 | 0 | 0 | 1 | MOTOROLA 68K | 1 | 0 | 1 | IBM POWER PC 403 |
| $\mu$ PType2               | $\mu$ PType1      | $\mu$ PType0      | MICROPROCESSOR<br>TYPE |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |              |              |                        |   |   |   |                      |   |   |   |              |   |   |   |                  |
| 0                          | 0                 | 0                 | 68HC11, 8051, 80C188   |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |              |              |                        |   |   |   |                      |   |   |   |              |   |   |   |                  |
| 0                          | 0                 | 1                 | MOTOROLA 68K           |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |              |              |                        |   |   |   |                      |   |   |   |              |   |   |   |                  |
| 1                          | 0                 | 1                 | IBM POWER PC 403       |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |              |              |                        |   |   |   |                      |   |   |   |              |   |   |   |                  |

**MICROPROCESSOR INTERFACE**

| SIGNAL NAME             | 420 PKG<br>BALL# | 484PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (mA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------|------------------|------------------|------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\overline{\text{RDY}}$ | V24              | R19              | O    | 12                   | <p><b>Ready/Data Transfer Acknowledge Output:</b></p> <p>The exact behavior of this pin depends upon the type of Microprocessor/Microcontroller the XRT86VL38 has been configured to operate in, as defined by the PTYPE[2:0] pins.</p> <p><b>Intel Asynchronous Mode - <math>\overline{\text{RDY}}</math> - Ready Output</b></p> <p>This output pin will function as the “active-low” READY output.</p> <p>During a READ or WRITE cycle, the Microprocessor Interface block will toggle this output pin to the logic low level, ONLY when the Microprocessor Interface is ready to complete or terminate the current READ or WRITE cycle. Once the Microprocessor has determined that this input pin has toggled to the logic “low” level, then it is now safe for it to move on and execute the next READ or WRITE cycle.</p> <p>If (during a READ or WRITE cycle) the Microprocessor Interface block is holding this output pin at a logic “high” level, then the Microprocessor is expected to extend this READ or WRITE cycle, until it detects this output pin being toggled to the logic low level.</p> <p><b>Motorola Asynchronous Mode - <math>\overline{\text{DTACK}}</math> - Data Transfer Acknowledge Output</b></p> <p>This output pin will function as the “active-low” DTACK output.</p> <p>During a READ or WRITE cycle, the Microprocessor Interface block will toggle this output pin to the logic low level, ONLY when the Microprocessor Interface is ready to complete or terminate the current READ or WRITE cycle. Once the Microprocessor has determined that this input pin has toggled to the logic “low” level, then it is now safe for it to move on and execute the next READ or WRITE cycle.</p> <p>If (during a READ or WRITE cycle) the Microprocessor Interface block is holding this output pin at a logic “high” level, then the Microprocessor is expected to extend this READ or WRITE cycle, until it detects this output pin being toggled to the logic low level.</p> |

**MICROPROCESSOR INTERFACE**

| SIGNAL NAME                                                                                                                              | 420 PKG<br>BALL#                                                                                      | 484PKG<br>BALL #                                                                                      | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\overline{\text{RDY}}$                                                                                                                  | V24                                                                                                   | R19                                                                                                   | O    | 12                   | <p><b>(Con't)</b></p> <p><b>Power PC 403 Mode - RDY Ready Output:</b></p> <p>This output pin will function as the "active-high" READY output.</p> <p>During a READ or WRITE cycle, the Microprocessor Interface block will toggle this output pin to the logic high level, ONLY when the Microprocessor Interface is ready to complete or terminate the current READ or WRITE cycle. Once the Microprocessor has sampled this signal being at the logic "high" level upon the rising edge of PCLK, then it is now safe for it to move on and execute the next READ or WRITE cycle.</p> <p>If (during a READ or WRITE cycle) the Microprocessor Interface block is holding this output pin at a logic "low" level, then the Microprocessor is expected to extend this READ or WRITE cycle, until it samples this output pin being at the logic low level.</p> <p><b>NOTE:</b> The Microprocessor Interface will update the state of this output pin upon the rising edge of PCLK.</p> |
| ADDR0<br>ADDR1<br>ADDR2<br>ADDR3<br>ADDR4<br>ADDR5<br>ADDR6<br>ADDR7<br>ADDR8<br>ADDR9<br>ADDR10<br>ADDR11<br>ADDR12<br>ADDR13<br>ADDR14 | V25<br>V26<br>U22<br>U23<br>U24<br>U25<br>U26<br>T22<br>T24<br>R23<br>R24<br>P22<br>P25<br>N23<br>N22 | P18<br>N17<br>T21<br>T22<br>R20<br>R21<br>R22<br>P19<br>P20<br>N19<br>N20<br>M18<br>M19<br>L18<br>L22 | I    | -                    | <p><b>Microprocessor Interface Address Bus Input</b></p> <p>These pins permit the Microprocessor to identify on-chip registers and Buffer/Memory locations within the XRT86VL38 device whenever it performs READ and WRITE operations with the XRT86VL38 device.</p> <p><b>NOTE:</b> These pins are internally pulled "Low" with a 50k<math>\Omega</math> resistor, except ADDR[8:14].</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| $\overline{\text{DBEN}}$                                                                                                                 | V23                                                                                                   | U22                                                                                                   | I    | -                    | <p><b>Data Bus Enable Input pin.</b></p> <p>This active-low input pin permits the user to either enable or tri-state the Bi-Directional Data Bus pins (D[7:0]), as described below.</p> <ul style="list-style-type: none"> <li>Setting this input pin "low" enables the Bi-directional Data bus.</li> <li>Setting this input pin "high" tri-states the Bi-directional Data Bus.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## MICROPROCESSOR INTERFACE

| SIGNAL NAME     | 420 PKG<br>BALL# | 484PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------|------------------|------------------|------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ALE             | R22              | P22              | I    | -                    | <p><b>Address Latch Enable Input Address Strobe</b></p> <p>The exact behavior of this pin depends upon the type of Microprocessor/Microcontroller the XRT86VL38 has been configured to operate in, as defined by the PTYPE[2:0] pins.</p> <p><b>Intel-Asynchronous Mode - ALE</b></p> <p>This active-high input pin is used to latch the address (present at the Microprocessor Interface Address Bus pins (A[14:0]) into the XRT86VL38 Microprocessor Interface block and to indicate the start of a READ or WRITE cycle. Pulling this input pin "high" enables the input bus drivers for the Address Bus input pins (A[14:0]). The contents of the Address Bus will be latched into the XRT86VL38 Microprocessor Interface circuitry, upon the falling edge of this input signal.</p> <p><b>Motorola-Asynchronous (68K) Mode - <math>\overline{AS}</math></b></p> <p>This active-low input pin is used to latch the data residing on the Address Bus, A[14:0] into the Microprocessor Interface circuitry of the XRT86VL38 device. Pulling this input pin "low" enables the input bus drivers for the Address Bus input pins. The contents of the Address Bus will be latched into the Microprocessor Interface circuitry, upon the rising edge of this signal.</p> <p><b>Power PC 403 Mode - No Function -Tie to GND:</b></p> <p>This input pin has no role nor function and should be tied to GND.</p> |
| $\overline{CS}$ | L26              | K21              | I    | -                    | <p><b>Microprocessor Interface—Chip Select Input:</b></p> <p>The user must assert this active low signal in order to select the Microprocessor Interface for READ and WRITE operations between the Microprocessor and the XRT86VL38 on-chip registers and buffer/memory locations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



**MICROPROCESSOR INTERFACE**

| SIGNAL NAME     | 420 PKG<br>BALL# | 484PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------|------------------|------------------|------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\overline{RD}$ | W25              | U21              | I    | -                    | <p><b>Microprocessor Interface—Read Strobe Input:</b><br/>The exact behavior of this pin depends upon the type of Microprocessor/Microcontroller the Framer has been configured to operate in, as defined by the PTYPE[2:0] pins.</p> <p><b>Intel-Asynchronous Mode - <math>\overline{RD}</math> - READ Strobe Input:</b><br/>This input pin will function as the <math>\overline{RD}</math> (Active Low Read Strobe) input signal from the Microprocessor. Once this active-low signal is asserted, then the XRT86VL38 device will place the contents of the addressed register (or buffer location) on the Microprocessor Interface Bi-directional data bus (D[7:0]). When this signal is negated, then the Data Bus will be tri-stated.</p> <p><b>Motorola-Asynchronous (68K) Mode - <math>\overline{DS}</math> - Data Strobe:</b><br/>This input pin will function as the <math>\overline{DS}</math> (Data Strobe) input signal.</p> <p><b>Power PC 403 Mode - <math>\overline{WE}</math> - Write Enable Input:</b><br/>This input pin will function as the <math>\overline{WE}</math> (Write Enable) input pin.<br/>Anytime the Microprocessor Interface samples this active-low input signal (along with <math>\overline{CS}</math> and <math>\overline{WR/R/W}</math>) also being asserted (at a logic low level) upon the rising edge of PCLK, then the Microprocessor Interface will (upon the very same rising edge of PCLK) latch the contents on the Bi-Directional Data Bus (D[7:0]) into the “target” on-chip register or buffer location within the XRT86VL38 device.</p> |
| $\overline{WR}$ | M23              | L20              | I    | -                    | <p><b>Microprocessor Interface—Write Strobe Input</b><br/>The exact behavior of this pin depends upon the type of Microprocessor/Microcontroller the XRT86VL38 has been configured to operate in, as defined by the PTYPE[2:0] pins.</p> <p><b>Intel-Asynchronous Mode - <math>\overline{WR}</math> - Write Strobe Input:</b><br/>This input pin functions as the <math>\overline{WR}</math> (Active Low WRITE Strobe) input signal from the Microprocessor. Once this active-low signal is asserted, then the input buffers (associated with the Bi-Directional Data Bus pin, D[7:0]) will be enabled.<br/>The Microprocessor Interface will latch the contents on the Bi-Directional Data Bus (into the “target” register or address location, within the XRT86VL38) upon the rising edge of this input pin.</p> <p><b>Motorola-Asynchronous Mode - <math>\overline{R/W}</math> - Read/Write Operation Identification Input Pin:</b><br/>This pin is functionally equivalent to the “<math>\overline{R/W}</math>” input pin. In the Motorola Mode, a “READ” operation occurs if this pin is held at a logic “1”, coincident to a falling edge of the RD/<math>\overline{DS}</math> (Data Strobe) input pin. Similarly a WRITE operation occurs if this pin is at a logic “0”, coincident to a falling edge of the RD/<math>\overline{DS}</math> (Data Strobe) input pin.</p>                                                                                                                                                                                                           |

## MICROPROCESSOR INTERFACE

| SIGNAL NAME     | 420 PKG<br>BALL# | 484PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------|------------------|------------------|------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\overline{WR}$ | M23              | L20              | I    | -                    | <p><b>(Con't)</b></p> <p><b>Power PC 403 Mode - <math>\overline{R/W}</math> - Read/Write Operation Identification Input:</b></p> <p>This input pin will function as the "Read/Write Operation Identification Input" pin.</p> <p>Anytime the Microprocessor Interface samples this input signal at a logic "High" (while also sampling the <math>\overline{CS}</math> input pin "Low") upon the rising edge of PCLK, then the Microprocessor Interface will (upon the very same rising edge of PCLK) latch the contents of the Address Bus (A[14:0]) into the Microprocessor Interface circuitry, in preparation for this forthcoming READ operation. At some point (later in this READ operation) the Microprocessor will also assert the <math>\overline{DBEN/OE}</math> input pin, and the Microprocessor Interface will then place the contents of the "target" register (or address location within the XRT86VL38 device) upon the Bi-Directional Data Bus pins (D[7:0]), where it can be read by the Microprocessor.</p> <p>Anytime the Microprocessor Interface samples this input signal at a logic "Low" (while also sampling the <math>\overline{CS}</math> input pin a logic "Low") upon the rising edge of PCLK, then the Microprocessor Interface will (upon the very same rising edge of PCLK) latch the contents of the Address Bus (A[14:0]) into the Microprocessor Interface circuitry, in preparation for the forthcoming WRITE operation. At some point (later in this WRITE operation) the Microprocessor will also assert the <math>\overline{RD/DS/WE}</math> input pin, and the Microprocessor Interface will then latch the contents of the Bi-Directional Data Bus (D[7:0]) into the contents of the "target" register or buffer location (within the XRT86VL38).</p> |

**MICROPROCESSOR INTERFACE**

| SIGNAL NAME              | 420 PKG<br>BALL# | 484PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------|------------------|------------------|------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\overline{\text{ACK0}}$ | Y23              | W22              | I    | -                    | <p><b>DMA Cycle Acknowledge Input—DMA Controller 0 (Write):</b></p> <p>The external DMA Controller will assert this input pin “Low” when the following two conditions are met:</p> <ol style="list-style-type: none"> <li>1. After the DMA Controller, within the Framer has asserted (toggled “Low”), the Req_0 output signal.</li> <li>2. When the external DMA Controller is ready to transfer data from external memory to the selected Transmit HDLC buffer.</li> </ol> <p>At this point, the DMA transfer between the external memory and the selected Transmit HDLC buffer may begin.</p> <p>After completion of the DMA cycle, the external DMA Controller will negate this input pin after the DMA Controller within the Framer has negated the <math>\overline{\text{Req\_0}}</math> output pin. The external DMA Controller must do this in order to acknowledge the end of the DMA cycle.</p> <p><b>DMA Cycle Acknowledge Input—DMA Controller 1 (Read):</b></p> <p>The external DMA Controller asserts this input pin “Low” when the following two conditions are met:</p> <ol style="list-style-type: none"> <li>1. After the DMA Controller, within the Framer has asserted (toggled “Low”), the Req_1 output signal.</li> <li>2. When the external DMA Controller is ready to transfer data from the selected Receive HDLC buffer to external memory.</li> </ol> <p>At this point, the DMA transfer between the selected Receive HDLC buffer and the external memory may begin.</p> <p>After completion of the DMA cycle, the external DMA Controller will negate this input pin after the DMA Controller within the Framer has negated the <math>\overline{\text{Req\_1}}</math> output pin. The external DMA Controller will do this in order to acknowledge the end of the DMA cycle.</p> <p><b>NOTE:</b> This pin is internally pulled “High” with a 50k<math>\Omega</math> resistor.</p> |
| $\overline{\text{ACK1}}$ | Y24              | V21              |      |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**MICROPROCESSOR INTERFACE**

| SIGNAL NAME | 420 PKG<br>BALL# | 484PKG<br>BALL # | TYPE | OUTPUT<br>DRIVE (MA) | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------|------------------|------------------|------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BLAST       | P23              | M17              | I    | -                    | <p><b>Last Cycle of Burst Indicator Input:</b></p> <p>If the Microprocessor Interface is operating in the Intel-I960 Mode, then this input pin is used to indicate (to the Microprocessor Interface block) that the current data transfer is the last data transfer within the current burst operation.</p> <p>The Microprocessor should assert this input pin (by toggling it "Low") in order to denote that the current READ or WRITE operation (within a BURST operation) is the last operation of this BURST operation.</p> <p><b>NOTES:</b></p> <ol style="list-style-type: none"> <li>1. If the user has configured the Microprocessor Interface to operate in the Intel-Asynchronous, the Motorola-Asynchronous or the Power PC 403 Mode, then he/she should tie this input pin to GND.</li> <li>2. This pin is internally pulled "High" with a 50k<math>\Omega</math> resistor.</li> </ol> |
| RESET       | Y4               | Y1               | I    | -                    | <p><b>Hardware Reset Input</b></p> <p>Reset is an active low input. If this pin is pulled "Low" for more than 10<math>\mu</math>S, the device will be reset. When this occurs, all output will be 'tri-stated', and all internal registers will be reset to their default values.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**POWER SUPPLY PINS (3.3V)**

| SIGNAL NAME | 420 PKG<br>BALL#                                                            | 484PKG<br>BALL #                                                        | TYPE | DESCRIPTION                                         |
|-------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------|------|-----------------------------------------------------|
| VDD         | Y2<br>AC4<br>AC11<br>AE18<br>AD23<br>AA25<br>N26<br>F24<br>A25<br>C15<br>C8 | G10<br>G12<br>G15<br>H17<br>L16<br>R17<br>T7<br>T9<br>T11<br>T13<br>T15 | PWR  | <b>Framer Block Power Supply (I/O)</b>              |
| RVDD        | D2<br>F2<br>H2<br>K2<br>M2<br>P2<br>T2<br>V2                                | E1<br>H5<br>K6<br>L6<br>M7<br>N4<br>R5<br>T5                            | PWR  | <b>Receiver Analog Power Supply for LIU Section</b> |

**POWER SUPPLY PINS (3.3V)**

| SIGNAL NAME | 420 PKG<br>BALL#                             | 484PKG<br>BALL #                             | TYPE | DESCRIPTION                                     |
|-------------|----------------------------------------------|----------------------------------------------|------|-------------------------------------------------|
| TVDD        | F4<br>H3<br>J4<br>L3<br>N3<br>R3<br>T4<br>V3 | F2<br>G1<br>J2<br>L3<br>M6<br>N1<br>R3<br>U1 | PWR  | Transmitter Analog Power Supply for LIU Section |

**POWER SUPPLY PINS (1.8V)**

| SIGNAL NAME | 420 PKG<br>BALL#                                                      | 484PKG<br>BALL #                                                  | TYPE | DESCRIPTION                          |
|-------------|-----------------------------------------------------------------------|-------------------------------------------------------------------|------|--------------------------------------|
| VDD18       | AD1<br>AD7<br>AF14<br>AB20<br>AC24<br>T23<br>J24<br>D24<br>E18<br>E12 | G11<br>G14<br>G16<br>J17<br>P17<br>T8<br>T10<br>T12<br>T14<br>T17 | PWR  | Framer Block Power Supply            |
| DVDD18      | A1                                                                    | F5                                                                | PWR  | Digital Power Supply for LIU Section |
| AVDD18      | B4                                                                    | A2                                                                | PWR  | Analog Power Supply for LIU Section  |
| VDDPLL18    | D3<br>C2<br>B1<br>C1                                                  | B1<br>C1<br>D2<br>E3                                              | PWR  | Analog Power Supply for PLL          |

## GROUND PINS

| SIGNAL NAME | 420 PKG<br>BALL#                                                                                                                                            | 484PKG<br>BALL #                                                                                                                                                                                                                                        | TYPE | DESCRIPTION                    |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------|
| VSS         | Y1<br>AA1<br>AE2<br>AD6<br>AD9<br>AF13<br>AC16<br>AB19<br>AC22<br>AB23<br>AA23<br>V22<br>P26<br>L23<br>H22<br>C25<br>B25<br>D20<br>B17<br>C13<br>D10<br>C06 | F6<br>G6<br>G7<br>G8<br>G9<br>G13<br>H6<br>H7<br>H16<br>J7<br>J16<br>K7<br>K16<br>L7<br>M16<br>N6<br>N7<br>N16<br>P6<br>P7<br>P16<br>R6<br>R7<br>R16<br>T6<br>T16<br>U6<br>H8-H15<br>J8-J15<br>K8-K15<br>L8-L15<br>M8-M15<br>N8-N15<br>P8-P15<br>R8-R15 | GND  | Framer Block Ground            |
| DGND        | A2                                                                                                                                                          | B5                                                                                                                                                                                                                                                      | GND  | Digital Ground for LIU Section |
| AGND        | A3                                                                                                                                                          | B3                                                                                                                                                                                                                                                      | GND  | Analog Ground for LIU Section  |

# GROUND PINS

| SIGNAL NAME | 420 PKG<br>BALL#                             | 484PKG<br>BALL #                             | TYPE | DESCRIPTION                               |
|-------------|----------------------------------------------|----------------------------------------------|------|-------------------------------------------|
| RGND        | E2<br>G2<br>J2<br>L2<br>N2<br>R2<br>U2<br>W2 | F4<br>H3<br>J4<br>K2<br>M4<br>N3<br>P1<br>T4 | GND  | Receiver Analog Ground for LIU Section    |
| TGND        | H5<br>J5<br>K5<br>L5<br>M5<br>N5<br>R5<br>T5 | G4<br>J6<br>K5<br>L5<br>N5<br>P4<br>R1<br>V1 | GND  | Transmitter Analog Ground for LIU Section |
| GNDPLL18    | C3<br>E4<br>E3<br>B2                         | D3<br>E4<br>D1<br>E2                         | GND  | Analog Ground for PLL                     |

**NO CONNECT PINS**

| SIGNAL NAME | 420 PKG<br>BALL#                                                                                                                           | 484PKG<br>BALL #                                                                                     | TYPE | DESCRIPTION   |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------|---------------|
| NC          | B3<br>B18<br>B23<br>C4<br>D23<br>E5<br>E16<br>E19<br>E22<br>G5<br>N4<br>P5<br>U5<br>V4<br>V5<br>W3<br>W4<br>W5<br>AA3<br>AA4<br>AA5<br>AF1 | A1<br>A3<br>A22<br>B2<br>C3<br>C4<br>C5<br>D5<br>D6<br>D7<br>E7<br>E8<br>F7<br>F8<br>G5<br>B4<br>F18 | NC   | No Connection |



## ELECTRICAL CHARACTERISTICS

### Absolute Maximums

|                                               |                                                           |
|-----------------------------------------------|-----------------------------------------------------------|
| Power Supply.....                             | Power Rating STBGA and PBGA Package..... 2.4              |
| VDD <sub>IO</sub> .. -0.5V to +3.465V         |                                                           |
| VDD <sub>CORE</sub> ..... -0.5V to +1.890V    |                                                           |
| Storage Temperature .....-65°C to 150°C       | Input Logic Signal Voltage (Any Pin) .....-0.5V to + 5.5V |
| Operating Temperature Range.....-40°C to 85°C | ESD Protection (HBM).....>2000V                           |
| Supply Voltage ..... GND-0.5V to +VDD + 0.5V  | Input Current (Any Pin) ..... ± 100mA                     |

### DC ELECTRICAL CHARACTERISTICS

| Test Conditions: TA = 25°C, VDD <sub>IO</sub> = 3.3V ± 5% , VDD <sub>CORE</sub> = 1.8V ± 5% unless otherwise specified |                                        |      |      |      |       |                          |
|------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------|------|------|-------|--------------------------|
| SYMBOL                                                                                                                 | PARAMETER                              | MIN. | TYP. | MAX. | UNITS | CONDITIONS               |
| I <sub>LL</sub>                                                                                                        | Data Bus Tri-State Bus Leakage Current | -10  |      | +10  | μA    |                          |
| V <sub>IL</sub>                                                                                                        | Input Low voltage                      |      |      | 0.8  | V     |                          |
| V <sub>IH</sub>                                                                                                        | Input High Voltage                     | 2.0  |      | VDD  | V     |                          |
| V <sub>OL</sub>                                                                                                        | Output Low Voltage                     | 0.0  |      | 0.4  | V     | I <sub>OL</sub> = -1.6mA |
| VOH                                                                                                                    | Output High Voltage                    | TBD  |      | VDD  | V     |                          |
| I <sub>OC</sub>                                                                                                        | Open Drain Output Leakage Current      |      |      |      | μA    |                          |
| I <sub>IH</sub>                                                                                                        | Input High Voltage Current             | -10  |      | 10   | μA    | V <sub>IH</sub> = VDD    |
| I <sub>IL</sub>                                                                                                        | Input Low Voltage Current              | -10  |      | 10   | μA    | V <sub>IL</sub> = GND    |

### XRT86VL38 POWER CONSUMPTION

| Test Conditions: TA = 25°C, VDD <sub>IO</sub> = 3.3V ± 5% , VDD <sub>CORE</sub> = 1.8V ± 5%, Internal termination, unless otherwise specified |           |      |      |      |       |                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------|------|------|------|-------|-------------------------------------|
| MODE                                                                                                                                          | IMPEDANCE | MIN. | TYP. | MAX. | UNITS | CONDITIONS                          |
| T1                                                                                                                                            | 100Ω      |      | 2.21 |      | W     | QRSS Pattern with All 8 Channels on |
| E1                                                                                                                                            | 75Ω       |      | 2.07 |      | W     | QRSS Pattern with All 8 Channels on |
| E1                                                                                                                                            | 120Ω      |      | 1.93 |      | W     | QRSS Pattern with All 8 Channels on |

TABLE 4: E1 RECEIVER ELECTRICAL CHARACTERISTICS

| VDD <sub>IO</sub> = 3.3V ± 5% , VDD <sub>CORE</sub> = 1.8V ± 5%, T <sub>A</sub> = -40° to 85°C, unless otherwise specified |      |           |      |                  |                                                                              |
|----------------------------------------------------------------------------------------------------------------------------|------|-----------|------|------------------|------------------------------------------------------------------------------|
| PARAMETER                                                                                                                  | MIN. | TYP.      | MAX. | UNIT             | TEST CONDITIONS                                                              |
| Receiver loss of signal:                                                                                                   |      |           |      |                  | Cable attenuation @1024kHz                                                   |
| Number of consecutive zeros before RLOS is set                                                                             |      | 32        |      |                  |                                                                              |
| Input signal level at RLOS                                                                                                 | 15   | 20        |      | dB               | ITU-G.775, ETSI 300 233                                                      |
| RLOS De-asserted                                                                                                           | 12.5 |           |      | % ones           |                                                                              |
| Receiver Sensitivity<br>(Short Haul with cable loss)                                                                       | 11   |           |      | dB               | With nominal pulse amplitude of 3.0V for 120Ω and 2.37V for 75Ω application. |
| <b>Receiver Sensitivity</b><br>(Long Haul with cable loss)                                                                 | 0    |           | 43   | dB               | With nominal pulse amplitude of 3.0V for 120Ω and 2.37V for 75Ω application. |
| Input Impedance                                                                                                            |      | 15        |      | kΩ               |                                                                              |
| <b>Input Jitter Tolerance:</b>                                                                                             |      |           |      |                  |                                                                              |
| 1 Hz                                                                                                                       | 37   |           |      | U <sub>Ipp</sub> | ITU G.823                                                                    |
| 10kHz-100kHz                                                                                                               | 0.3  |           |      | U <sub>Ipp</sub> |                                                                              |
| Recovered Clock Jitter                                                                                                     |      |           |      |                  |                                                                              |
| Transfer Corner Frequency                                                                                                  | -    | 20        |      | kHz              | ITU G.736                                                                    |
| Peaking Amplitude                                                                                                          |      |           | 0.5  | dB               |                                                                              |
| <b>Jitter Attenuator Corner Frequency</b> (-3dB curve) (JABW=0)<br>(JABW=1)                                                | -    | 10<br>1.5 | -    | Hz<br>Hz         | ITU G.736                                                                    |
| <b>Return Loss:</b>                                                                                                        |      |           |      |                  |                                                                              |
| 51kHz - 102kHz                                                                                                             | 12   | -         | -    | dB               | ITU-G.703                                                                    |
| 102kHz - 2048kHz                                                                                                           | 8    |           |      | dB               |                                                                              |
| 2048kHz - 3072kHz                                                                                                          | 8    |           |      | dB               |                                                                              |

**TABLE 5: T1 RECEIVER ELECTRICAL CHARACTERISTICS**

| <b>VDD<sub>IO</sub> = 3.3V ± 5% , VDD<sub>CORE</sub> = 1.8V ± 5%, T<sub>A</sub>=-40° to 85°C, unless otherwise specified</b> |             |             |             |             |                                                           |
|------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|-----------------------------------------------------------|
| <b>PARAMETER</b>                                                                                                             | <b>MIN.</b> | <b>TYP.</b> | <b>MAX.</b> | <b>UNIT</b> | <b>TEST CONDITIONS</b>                                    |
| Receiver loss of signal:                                                                                                     |             |             |             |             |                                                           |
| Number of consecutive zeros before RLOS is set                                                                               |             | 175         |             |             |                                                           |
| Input signal level at RLOS                                                                                                   | 15          | 20          | -           | dB          | Cable attenuation @772kHz                                 |
| RLOS Clear                                                                                                                   | 12.5        | -           | -           | % ones      | ITU-G.775, ETSI 300 233                                   |
| Receiver Sensitivity<br>(Short Haul with cable loss)                                                                         | 12          | -           |             | dB          | With nominal pulse amplitude of 3.0V for 100Ω termination |
| Receiver Sensitivity<br>(Long Haul with cable loss)                                                                          |             | -           |             |             | With nominal pulse amplitude of 3.0V for 100Ω termination |
| Normal                                                                                                                       | 0           |             | 36          | dB          |                                                           |
| Extended                                                                                                                     | 0           |             | 45          | dB          |                                                           |
| Input Impedance                                                                                                              |             | 15          | -           | kΩ          |                                                           |
| Jitter Tolerance:                                                                                                            |             |             |             |             |                                                           |
| 1Hz                                                                                                                          | 138         | -           | -           | UIpp        | AT&T Pub 62411                                            |
| 10kHz - 100kHz                                                                                                               | 0.4         | -           | -           |             |                                                           |
| Recovered Clock Jitter                                                                                                       |             |             |             |             |                                                           |
| Transfer Corner Frequency                                                                                                    | -           | 10          | -           | KHz         | TR-TSY-000499                                             |
| Peaking Amplitude                                                                                                            | -           |             | 0.1         | dB          |                                                           |
| Jitter Attenuator Corner Frequency<br>(-3dB curve)                                                                           | -           | 6           |             | Hz          | AT&T Pub 62411                                            |
| Return Loss:                                                                                                                 |             |             |             |             |                                                           |
| 51kHz - 102kHz                                                                                                               | -           | 14          | -           | dB          |                                                           |
| 102kHz - 2048kHz                                                                                                             | -           | 20          | -           | dB          |                                                           |
| 2048kHz - 3072kHz                                                                                                            | -           | 16          | -           | dB          |                                                           |

**TABLE 6: E1 TRANSMITTER ELECTRICAL CHARACTERISTICS**

| <b>VDD<sub>IO</sub> = 3.3V ± 5% , VDD<sub>CORE</sub> = 1.8V ± 5%, T<sub>A</sub>=-40° to 85°C, unless otherwise specified</b> |             |             |             |             |                        |
|------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|------------------------|
| <b>PARAMETER</b>                                                                                                             | <b>MIN.</b> | <b>TYP.</b> | <b>MAX.</b> | <b>UNIT</b> | <b>TEST CONDITIONS</b> |
| AMI Output Pulse Amplitude:                                                                                                  |             |             |             |             | 1:2 transformer        |
| 75Ω Application                                                                                                              | 2.13        | 2.37        | 2.60        | V           |                        |
| 120Ω Application                                                                                                             | 2.70        | 3.00        | 3.30        | V           |                        |
| Output Pulse Width                                                                                                           | 224         | 244         | 264         | ns          |                        |
| Output Pulse Width Ratio                                                                                                     | 0.95        | -           | 1.05        | -           | ITU-G.703              |
| Output Pulse Amplitude Ratio                                                                                                 | 0.95        | -           | 1.05        | -           | ITU-G.703              |

TABLE 6: E1 TRANSMITTER ELECTRICAL CHARACTERISTICS

| VDD <sub>IO</sub> = 3.3V ± 5% , VDD <sub>CORE</sub> = 1.8V ± 5%, T <sub>A</sub> =-40° to 85°C, unless otherwise specified |      |       |      |      |                                                        |
|---------------------------------------------------------------------------------------------------------------------------|------|-------|------|------|--------------------------------------------------------|
| PARAMETER                                                                                                                 | MIN. | TYP.  | MAX. | UNIT | TEST CONDITIONS                                        |
| Jitter Added by the Transmitter Output                                                                                    | -    | 0.025 | 0.05 | UIpp | Broad Band with jitter free TCLK applied to the input. |
| Output Return Loss:                                                                                                       |      |       |      |      |                                                        |
| 51kHz -102kHz                                                                                                             | 15   | -     | -    | dB   | ETSI 300 166                                           |
| 102kHz-2048kHz                                                                                                            | 9    | -     | -    | dB   |                                                        |
| 2048kHz-3072kHz                                                                                                           | 8    | -     | -    | dB   |                                                        |

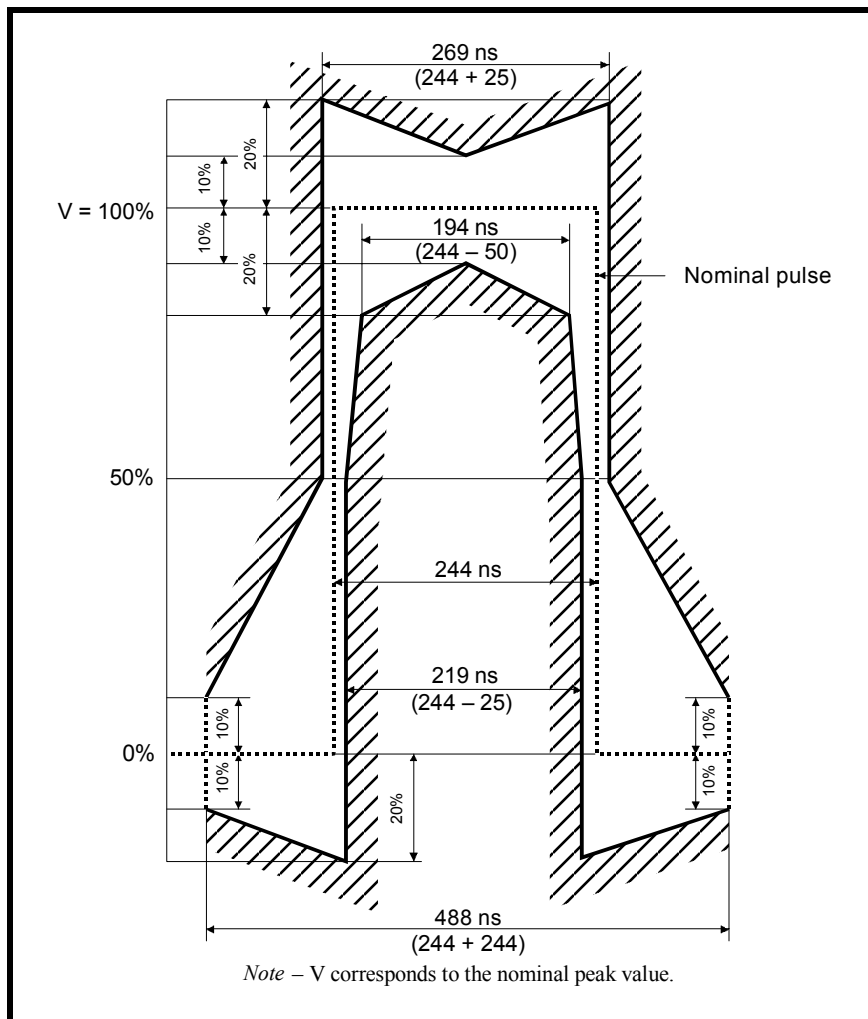
TABLE 7: E1 TRANSMIT RETURN LOSS REQUIREMENT

| FREQUENCY    | RETURN LOSS<br>ETS 300166 |
|--------------|---------------------------|
| 51-102kHz    | 6dB                       |
| 102-2048kHz  | 8dB                       |
| 2048-3072kHz | 8dB                       |

TABLE 8: T1 TRANSMITTER ELECTRICAL CHARACTERISTICS

| VDD <sub>IO</sub> = 3.3V ± 5% , VDD <sub>CORE</sub> = 1.8V ± 5%, T <sub>A</sub> =-40° to 85°C, unless otherwise specified |      |       |      |      |                                                        |
|---------------------------------------------------------------------------------------------------------------------------|------|-------|------|------|--------------------------------------------------------|
| PARAMETER                                                                                                                 | MIN. | TYP.  | MAX. | UNIT | TEST CONDITIONS                                        |
| AMI Output Pulse Amplitude:                                                                                               | 2.4  | 3.0   | 3.60 | V    | 1:2 transformer measured at DSX-1.                     |
| Output Pulse Width                                                                                                        | 338  | 350   | 362  | ns   | ANSI T1.102                                            |
| Output Pulse Width Imbalance                                                                                              | -    | -     | 20   | -    | ANSI T1.102                                            |
| Output Pulse Amplitude Imbalance                                                                                          | -    | -     | ±200 | mV   | ANSI T1.102                                            |
| Jitter Added by the Transmitter Output                                                                                    | -    | 0.025 | 0.05 | UIpp | Broad Band with jitter free TCLK applied to the input. |
| Output Return Loss:                                                                                                       |      |       |      |      |                                                        |
| 51kHz -102kHz                                                                                                             | -    | 17    | -    | dB   |                                                        |
| 102kHz-2048kHz                                                                                                            | -    | 12    | -    | dB   |                                                        |
| 2048kHz-3072kHz                                                                                                           | -    | 10    | -    | dB   |                                                        |

### FIGURE 2. ITU G.703 PULSE TEMPLATE

**TABLE 9: TRANSMIT PULSE MASK SPECIFICATION**

| Test Load Impedance                             | 75Ω Resistive (Coax) | 120Ω Resistive (twisted Pair) |
|-------------------------------------------------|----------------------|-------------------------------|
| Nominal Peak Voltage of a Mark                  | 2.37V                | 3.0V                          |
| Peak voltage of a Space (no Mark)               | 0 ± 0.237V           | 0 ± 0.3V                      |
| Nominal Pulse width                             | 244ns                | 244ns                         |
| Ratio of Positive and Negative Pulses Imbalance | 0.95 to 1.05         | 0.95 to 1.05                  |

FIGURE 3. DSX-1 PULSE TEMPLATE (NORMALIZED AMPLITUDE)

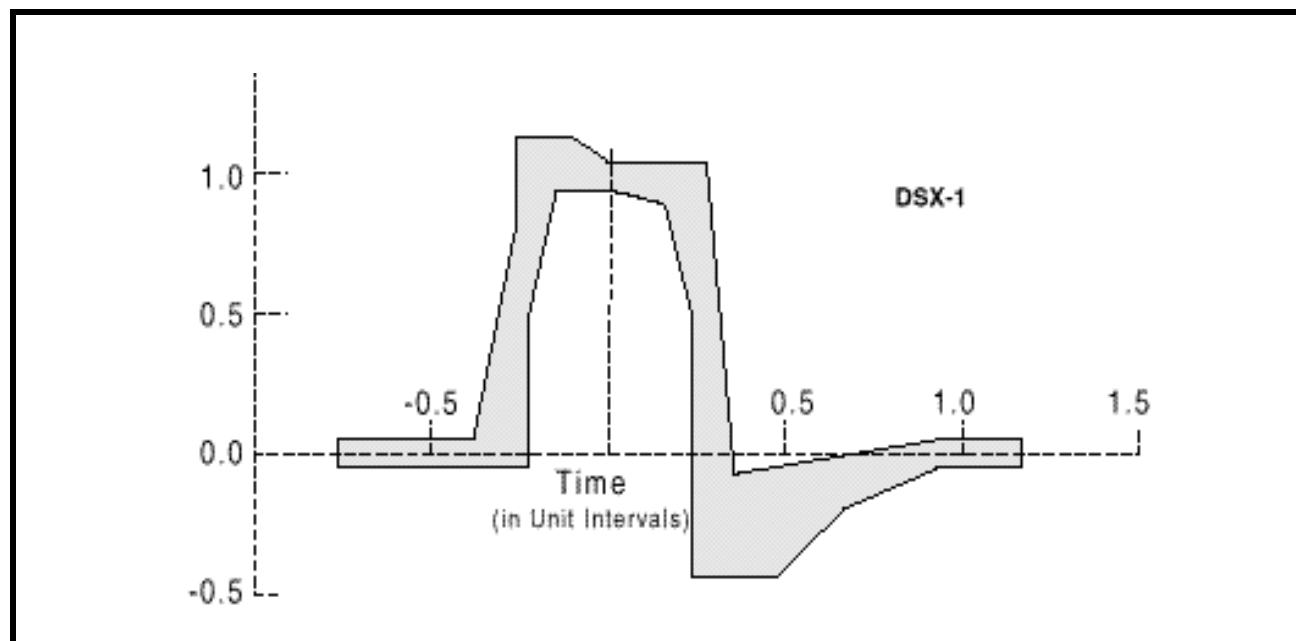


TABLE 10: DSX1 INTERFACE ISOLATED PULSE MASK AND CORNER POINTS

| MINIMUM CURVE |                      | MAXIMUM CURVE |                      |
|---------------|----------------------|---------------|----------------------|
| TIME (UI)     | NORMALIZED AMPLITUDE | TIME (UI)     | NORMALIZED AMPLITUDE |
| -0.77         | -0.05V               | -0.77         | .05V                 |
| -0.23         | -0.05V               | -0.39         | .05V                 |
| -0.23         | 0.5V                 | -0.27         | .8V                  |
| -0.15         | 0.95V                | -0.27         | 1.15V                |
| 0.0           | 0.95V                | -0.12         | 1.15V                |
| 0.15          | 0.9V                 | 0.0           | 1.05V                |
| 0.23          | 0.5V                 | 0.27          | 1.05V                |
| 0.23          | -0.45V               | 0.35          | -0.07V               |
| 0.46          | -0.45V               | 0.93          | 0.05V                |
| 0.66          | -0.2V                | 1.16          | 0.05V                |
| 0.93          | -0.05V               |               |                      |
| 1.16          | -0.05V               |               |                      |

**TABLE 11: AC ELECTRICAL CHARACTERISTICS**

| <b>VDD<sub>IO</sub> = 3.3V ± 5% , VDD<sub>CORE</sub> = 1.8V ± 5%, TA=25°C, UNLESS OTHERWISE SPECIFIED</b> |               |             |             |             |              |
|-----------------------------------------------------------------------------------------------------------|---------------|-------------|-------------|-------------|--------------|
| <b>PARAMETER</b>                                                                                          | <b>SYMBOL</b> | <b>MIN.</b> | <b>TYP.</b> | <b>MAX.</b> | <b>UNITS</b> |
| MCLKIN Clock Duty Cycle                                                                                   |               | 40          | -           | 60          | %            |
| MCLKIN Clock Tolerance                                                                                    |               | -           | ±50         | -           | ppm          |

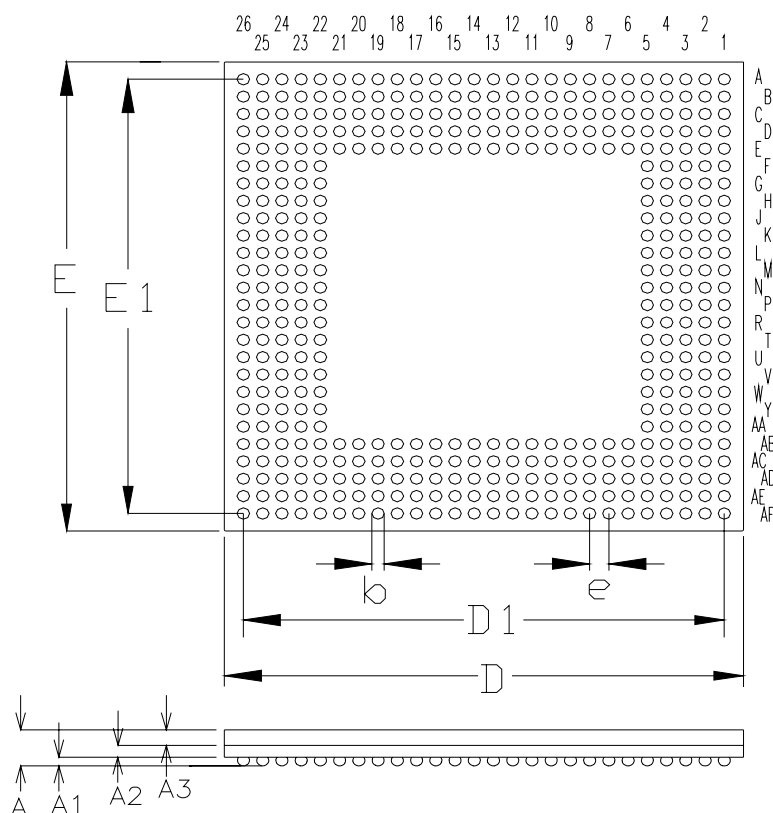
**ORDERING INFORMATION**

| PRODUCT NUMBER | PACKAGE                         | OPERATING TEMPERATURE RANGE |
|----------------|---------------------------------|-----------------------------|
| XRT86VL38IB    | 420 Plastic Ball Grid Array     | -40°C to +85°C              |
| XRT86VL38IB484 | 484 Shrink Thin Ball Grid Array | -40°C to +85°C              |

**PACKAGE DIMENSIONS FOR 420 PLASTIC BALL GRID ARRAY**

420 Plastic Ball Grid Array  
(35.0 mm x 35.0 mm, PBGA)

Rev. 1.00



Note: The control dimension is in millimeter.

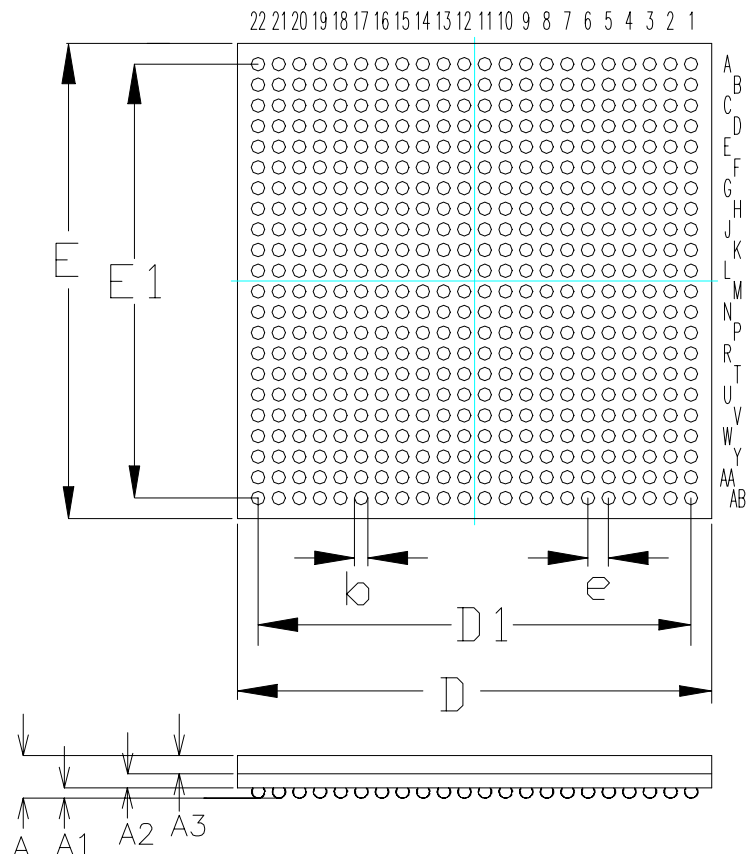
| SYMBOL | INCHES     |       | MILLIMETERS |       |
|--------|------------|-------|-------------|-------|
|        | MIN        | MAX   | MIN         | MAX   |
| A      | 0.085      | 0.098 | 2.16        | 2.50  |
| A1     | 0.020      | 0.028 | 0.50        | 0.70  |
| A2     | 0.020      | 0.024 | 0.51        | 0.61  |
| A3     | 0.045      | 0.047 | 1.15        | 1.19  |
| D      | 1.370      | 1.386 | 34.80       | 35.20 |
| D1     | 1.2500 BSC |       | 31.75 BSC   |       |
| E      | 1.370      | 1.386 | 34.80       | 35.20 |
| E1     | 1.2500 BSC |       | 31.75 BSC   |       |
| b      | 0.024      | 0.035 | 0.60        | 0.90  |
| e      | 0.0500 BSC |       | 1.27 TYP.   |       |



**PACKAGE DIMENSIONS FOR 484 SHRINK THIN BALL GRID ARRAY**

**484 Shrink Thin Ball Grid Array  
(23.0 mm x 23.0 mm, STBGA)**

Rev. 1.00



Note: The control dimension is in millimeter.

| SYMBOL | INCHES     |       | MILLIMETERS |       |
|--------|------------|-------|-------------|-------|
|        | MIN        | MAX   | MIN         | MAX   |
| A      | 0.071      | 0.082 | 1.80        | 2.08  |
| A1     | 0.019      | 0.022 | 0.47        | 0.57  |
| A2     | 0.019      | 0.022 | 0.48        | 0.56  |
| A3     | 0.033      | 0.037 | 0.85        | 0.95  |
| D      | 0.898      | 0.913 | 22.80       | 23.20 |
| D1     | 0.8268 BSC |       | 21.00 BSC   |       |
| E      | 0.898      | 0.913 | 22.80       | 23.20 |
| E1     | 0.8268 BSC |       | 21.00 BSC   |       |
| b      | 0.024      | 0.028 | 0.60        | 0.70  |
| e      | 0.0394 BSC |       | 1.00 BSC    |       |

**REVISION HISTORY**

| REVISION # | DATE             | DESCRIPTION                                                                                                                                       |
|------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| V1.2.0     | January 29, 2007 | Released to production.                                                                                                                           |
| V1,2,1     | March 05, 2007   | Corrected RxLOS_n pin description. This pin will be Tri-Stated not pulled "Low" when the Framer or LIU is NOT declaring the LOS defect condition. |
|            |                  |                                                                                                                                                   |
|            |                  |                                                                                                                                                   |
|            |                  |                                                                                                                                                   |
|            |                  |                                                                                                                                                   |
|            |                  |                                                                                                                                                   |
|            |                  |                                                                                                                                                   |
|            |                  |                                                                                                                                                   |
|            |                  |                                                                                                                                                   |

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