



ON Semiconductor®

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# LA72702NV

Monolithic Linear IC

## BTSC Decoder for US TV

### Overview

The LA72702NV is a US TV BTSC Decoder.

### Features

- With SIF circuit, alignment-free\* STEREO channel separation.
- \* When base band signal input, separation is adjusted by input level.
- Dual slave address(80h, 84h).

### Functions

- SIF FM-Demodulator
- STEREO detection
- STEREO decoder
- STEREO detection sensitivity change function
- dbx Noise Reduction
- SAP demodulator
- SAP detection
- SAP output select 2-levels
- SAP detection sensitivity change function

### Specifications

**Maximum Ratings** at Ta = 25°C

| Parameter                    | Symbol                | Conditions                               | Ratings     | Unit |
|------------------------------|-----------------------|------------------------------------------|-------------|------|
| Maximum power supply voltage | V <sub>CC</sub> H max |                                          | 7.0         | V    |
| Allowable power dissipation  | Pd max                | Ta ≤ 85°C, Mounted on a specified board* | 290         | mW   |
| Operating temperature        | Topr                  |                                          | -20 to +85  | °C   |
| Storage temperature          | Tstg                  |                                          | -55 to +150 | °C   |

\* Mounted on a specified board: 114.3mm×76.1mm×1.6mm, glass epoxy board

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**Operating Conditions** at Ta = 25°C

| Parameter                         | Symbol               | Conditions | Ratings    | Unit |
|-----------------------------------|----------------------|------------|------------|------|
| Recommended operating voltage     | vacate               |            | 5.0        | V    |
| Allowable operating voltage range | V <sub>CC</sub> H op |            | 4.5 to 5.5 | V    |

# LA72702NV

## Electrical Characteristics at Ta = 25°C, V<sub>DD</sub> = 5.0V

| Parameter                         | Symbol              | Conditions                                                                                                                                                        | Ratings |       |        | Unit |
|-----------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------|--------|------|
|                                   |                     |                                                                                                                                                                   | min     | typ   | max    |      |
| Current dissipation               | I <sub>CC</sub>     | No signal Inflow current at pin 19, default condition                                                                                                             | 30      | 40    | 50     | mA   |
| SIF input level (Reference)       | V <sub>I</sub> LIM  | f <sub>c</sub> = 4.5MHz<br>Deviation<br>MONO (300Hz, Mod = 100%, Pre-emphasis ON)<br>→ ±25kHz                                                                     | (80)    | (90)  | (100)  | dBμV |
| Base band input level (Reference) | V <sub>I</sub> LIMB | 100% Modulation<br>MONO(L+R) : 530mVp-p (300Hz, Pre-emphasis ON)<br>SUB(L-R) : 380mVp-p (300Hz, dbx-NR ON), Pilot : 110mVp-p<br>SAP : 300mVp-p (300Hz, dbx-NR ON) |         |       |        |      |
| MONO output level                 | V <sub>O</sub> MON  | f <sub>m</sub> =1kHz, 100% Mod, 15kHz LPF                                                                                                                         | -7.0    | -5.5  | -4.5   | dBV  |
| MONO distortion                   | THDMON              | f <sub>m</sub> =1kHz, 100% Mod, 15kHz LPF                                                                                                                         |         | 0.15  | 0.6    | %    |
| MONO frequency characteristics    | FCM1                | f <sub>m</sub> =3kHz, 30% Mod, Pre-emphasis ON<br>* Measure ratio from f <sub>m</sub> =1kHz level.                                                                | -2      | 0     | 2      | dB   |
| MONO S/N ratio                    | SNM                 | S=V <sub>O</sub> MON, N=0% Mod, 15kHz LPF                                                                                                                         | 55      | 65    |        | dB   |
| STEREO output level               | V <sub>O</sub> ST   | f <sub>m</sub> =1kHz, 100% Mod, 15kHz LPF                                                                                                                         | -7.0    | -5.5  | -4.5   | dBV  |
| STEREO distortion                 | THDS                | f <sub>m</sub> =1kHz, 100% Mod, 15kHz LPF                                                                                                                         |         | 0.5   | 1.0    | %    |
| STEREO frequency characteristics  | FCS1                | f <sub>m</sub> =3kHz, 30% Mod, 15kHz LPF<br>* Measure ratio from f <sub>m</sub> =1kHz level.                                                                      | -2      | 0     | 2      | dB   |
| STEREO S/N ratio                  | SNS                 | S=V <sub>O</sub> ST, N=0% Mod, 15kHz LPF                                                                                                                          | 50      | 60    |        | dB   |
| STEREO separation 1               | STSE1               | f=300Hz (R/L), 30% Mod, 15kHz LPF                                                                                                                                 | 20      | 25    |        | dB   |
| STEREO separation 2               | STSE2               | f=3kHz (R/L), 30% Mod, 15kHz LPF                                                                                                                                  | 20      | 25    |        | dB   |
| STEREO Detection level-1          | V <sub>IN</sub> SD1 | Except Stereo Detection → Stereo Detection<br>* Serial control "SENS HI" Pilot (fH)=15.73kHz<br>* Measure pilot level.                                            | 30      | 38    | 45     | %    |
| STEREO Detection level-2          | V <sub>IN</sub> SD2 | Except Stereo Detection → Stereo Detection<br>* Serial control "SENS LO"                                                                                          | 38      | 47    | 53     | %    |
| STEREO Detection hysteresis       | HYST                | Input Mod. Difference at Stereo/Except Stereo Det.<br>* Serial control "SENS HI"                                                                                  | 10      | 20    | 30     | %    |
| SAP output level-1                | V <sub>O</sub> SA1  | f <sub>m</sub> =1kHz, 100% Mod, 15kHz LPF<br>* SAP-1 (serial control)                                                                                             | -14.0   | -11.0 | -8.0   | dBV  |
| SAP output level-2                | V <sub>O</sub> SA2  | f <sub>m</sub> =1kHz, 100% Mod, 15kHz LPF<br>* SAP-2 (serial control)                                                                                             | -7.5    | -5.5  | -3.5   | dBV  |
| SAP distortion                    | THDSA               | f <sub>m</sub> =1kHz, 100% Mod, 15kHz LPF                                                                                                                         |         | 0.7   | 1.5    | %    |
| SAP S/N ratio                     | SNSA                | S=V <sub>O</sub> SA2, N=0% Mod, 15kHz LPF                                                                                                                         | 50      | 60    |        | dB   |
| SAP detection level-1             | V <sub>IN</sub> SA1 | Except SAP → SAP Det.<br>* Serial control "SENS HI" SAP Carrier=5fH only<br>* Measure output level.                                                               | 10      | 17    | 24     | %    |
| SAP detection level-2             | V <sub>IN</sub> SA2 | Except SAP → SAP Det.<br>* Serial control "SENS LO"<br>* Measure output level.                                                                                    | 17      | 24    | 31     | %    |
| SAP detection hysteresis          | HYS A               | Input Mod. Difference at SAP/Except SAP Det.<br>* SAP carrier only.<br>* Serial control "SENS HI"                                                                 | 2       | 5     | 10     | %    |
| MODE output MONO                  | MODMO               | Input=MONO : f=1kHz, 0% Mod                                                                                                                                       | 0.7     | 1     | 1.3    | V    |
| MODE output SAP                   | MODSA               | Input=SAP : Carrier                                                                                                                                               | 1.6     | 1.9   | 2.2    | V    |
| MODE output STEREO                | MODST               | Input=STEREO : Pilot                                                                                                                                              | 2.5     | 2.8   | 3.1    | V    |
| MODE output ST + SAP              | MODSS               | Input=STEREO : Pilot, SAP : Carrier                                                                                                                               | 3.5     | 3.8   | 4.2    | V    |
| Stereo detect speed (Reference )  | STDT                | Input=STEREO : Pilot<br>I <sup>2</sup> C data no-send<br>Measure pin 20 voltage change to 2.8V timing from Power ON                                               |         | (480) | (1000) | ms   |
| SAP detect speed (Reference )     | SAPDT               | SAP : Carrier<br>I <sup>2</sup> C data no-send<br>Measure pin 20 voltage change to 1.9V timing from Power ON                                                      |         | (350) | (1000) | ms   |

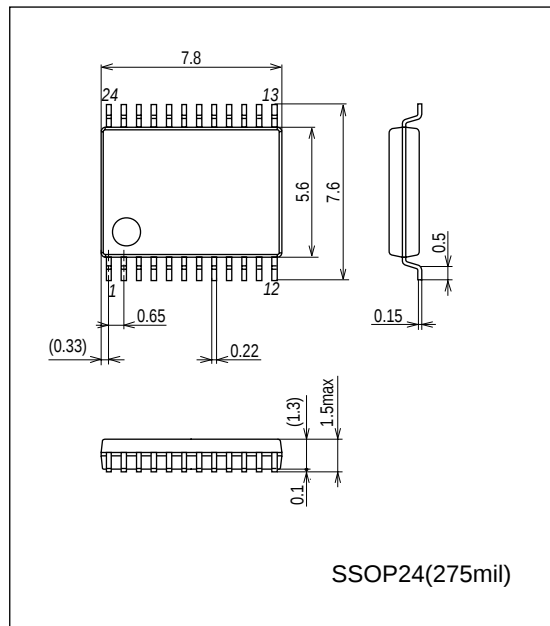
\* Normally measurement condition is Input = SIF mode (90dBμV)

\* " Reference " Items are reference levels, their specs are no-guarantee.

## Package Dimensions

unit : mm (typ)

3175C



## Mode Condition

| Signal          | I <sup>2</sup> C data in |                                   |        |        |                                       |    |    |     |           | Output mode |                |    | I <sup>2</sup> C out |            |        |
|-----------------|--------------------------|-----------------------------------|--------|--------|---------------------------------------|----|----|-----|-----------|-------------|----------------|----|----------------------|------------|--------|
|                 | D8                       | D7                                | D6     | D5     | D4                                    | D3 | D2 | D1  | Lch pin18 | Rch pin17   | Mode condition | D8 | D7                   | Mode pin20 |        |
| Stereo<br>+ SAP | (0)<br>FIX               | (0)<br>SIF<br>(1)<br>BASE<br>band | *      | (0)    | (0)<br>SAP<br>SENS<br>Lo<br>(1)<br>Hi | 0  | 0  | 0   | L         | R           | Stereo         | 1  | 1                    | 3.8V       |        |
|                 |                          |                                   | 0      | STEREO |                                       | 0  | 0  | 1   | SAP       | SAP         | SAP-1          |    |                      |            |        |
|                 |                          |                                   | 1      | SENS   |                                       | 0  | 0  | 1   | SAP       | SAP         | SAP-2          |    |                      |            |        |
|                 |                          |                                   | 0      | Lo     |                                       | 0  | 1  | 0   | L+R       | SAP         | MULTI-1        |    |                      |            |        |
|                 |                          |                                   | 1      | (1)    |                                       | 0  | 1  | 0   | L+R       | SAP         | MULTI-2        |    |                      |            |        |
|                 |                          |                                   | *      | Hi     |                                       | 1  | 0  | 0   | L+R       | L+R         | F-MONO         |    |                      |            |        |
|                 |                          |                                   | *      |        |                                       | 1  | 0  | 1   | L+R       | L+R         | F-MONO         |    |                      |            |        |
|                 |                          |                                   | *      |        |                                       | 1  | 1  | 0   | L+R       | L+R         | F-MONO         |    |                      |            |        |
|                 |                          |                                   | *      |        |                                       | *  | 1  | 1   | Off       | Off         | MUTE           |    |                      |            |        |
|                 |                          |                                   | Stereo | *      |                                       |    | 0  | 0   | 0         | L           | R              |    |                      |            | Stereo |
| *               |                          |                                   |        |        | 0                                     | 0  | 1  | L   | R         | Stereo      |                |    |                      |            |        |
| *               |                          |                                   |        |        | 0                                     | 1  | 0  | L   | R         | Stereo      |                |    |                      |            |        |
| *               |                          |                                   |        |        | 1                                     | 0  | 0  | L+R | L+R       | F-MONO      |                |    |                      |            |        |
| *               |                          |                                   |        |        | 1                                     | 0  | 1  | L+R | L+R       | F-MONO      |                |    |                      |            |        |
| *               |                          |                                   |        |        | 1                                     | 1  | 0  | L+R | L+R       | F-MONO      |                |    |                      |            |        |
| *               |                          |                                   |        |        | *                                     | 1  | 1  | Off | Off       | MUTE        |                |    |                      |            |        |
| Mono<br>+ SAP   |                          |                                   |        | *      |                                       | *  | 0  | 0   | L+R       | L+R         | MONO           | 0  | 1                    | 1.9V       |        |
|                 |                          |                                   | 0      |        | 0                                     | 0  | 1  | SAP | SAP       | SAP-1       |                |    |                      |            |        |
|                 |                          |                                   | 1      |        | 0                                     | 0  | 1  | SAP | SAP       | SAP-2       |                |    |                      |            |        |
|                 |                          |                                   | 0      |        | 0                                     | 1  | 0  | L+R | SAP       | MULTI-1     |                |    |                      |            |        |
|                 |                          |                                   | 1      |        | 0                                     | 1  | 0  | L+R | SAP       | MULTI-2     |                |    |                      |            |        |
|                 |                          |                                   | *      |        | *                                     | 1  | 1  | Off | Off       | MUTE        |                |    |                      |            |        |
|                 |                          |                                   | MONO   | *      |                                       | *  | 0  | 0   | L+R       | L+R         | MONO           |    |                      |            | 0      |
| *               |                          |                                   |        |        | *                                     | 0  | 1  | L+R | L+R       | MONO        |                |    |                      |            |        |
| *               |                          |                                   |        |        | *                                     | 1  | 0  | L+R | L+R       | MONO        |                |    |                      |            |        |
| *               |                          |                                   |        |        | *                                     | 1  | 1  | Off | Off       | MUTE        |                |    |                      |            |        |

\* : no care

**I<sup>2</sup>C Control Table****Grp-1 (Normally use : group-1 only)**

|   | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | Condition            |
|---|----|----|----|----|----|----|----|----|----------------------|
| * |    |    |    |    |    |    | 0  | 0  | Stereo               |
|   |    |    |    |    |    |    | 0  | 1  | SAP                  |
|   |    |    |    |    |    |    | 1  | 0  | Both                 |
|   |    |    |    |    |    |    | 1  | 1  | MUTE                 |
| * |    |    |    |    |    | 0  |    |    | Normal (Auto DET)    |
|   |    |    |    |    |    | 1  |    |    | Forced Mono          |
| * |    |    |    |    | 0  |    |    |    | SAP SENS LO          |
|   |    |    |    |    | 1  |    |    |    | SAP SENS HI          |
| * |    |    |    | 0  |    |    |    |    | Stereo SENS LO       |
|   |    |    |    | 1  |    |    |    |    | Stereo SENS HI       |
| * |    |    | 0  |    |    |    |    |    | SAP Level-1          |
|   |    |    | 1  |    |    |    |    |    | SAP Level-2          |
| * |    | 0  |    |    |    |    |    |    | SIF mode             |
|   |    | 1  |    |    |    |    |    |    | Base Band mode       |
| * | 0  |    |    |    |    |    |    |    | Fix                  |
|   | 1  |    |    |    |    |    |    |    | Prohibit (TEST MODE) |

\* : Shows Initial condition

**Read out data**

| D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | Condition  |
|----|----|----|----|----|----|----|----|------------|
|    |    | 0  | 0  | 0  | 0  | 0  | 0  | Fixed      |
|    | 0  |    |    |    |    |    |    | Normal     |
|    | 1  |    |    |    |    |    |    | SAP det    |
| 0  |    |    |    |    |    |    |    | Normal     |
| 1  |    |    |    |    |    |    |    | Stereo det |

**Test mode condition(Reference)**

When STOP condition transform at Grp-1 data-end, controlled NORMAL mode.

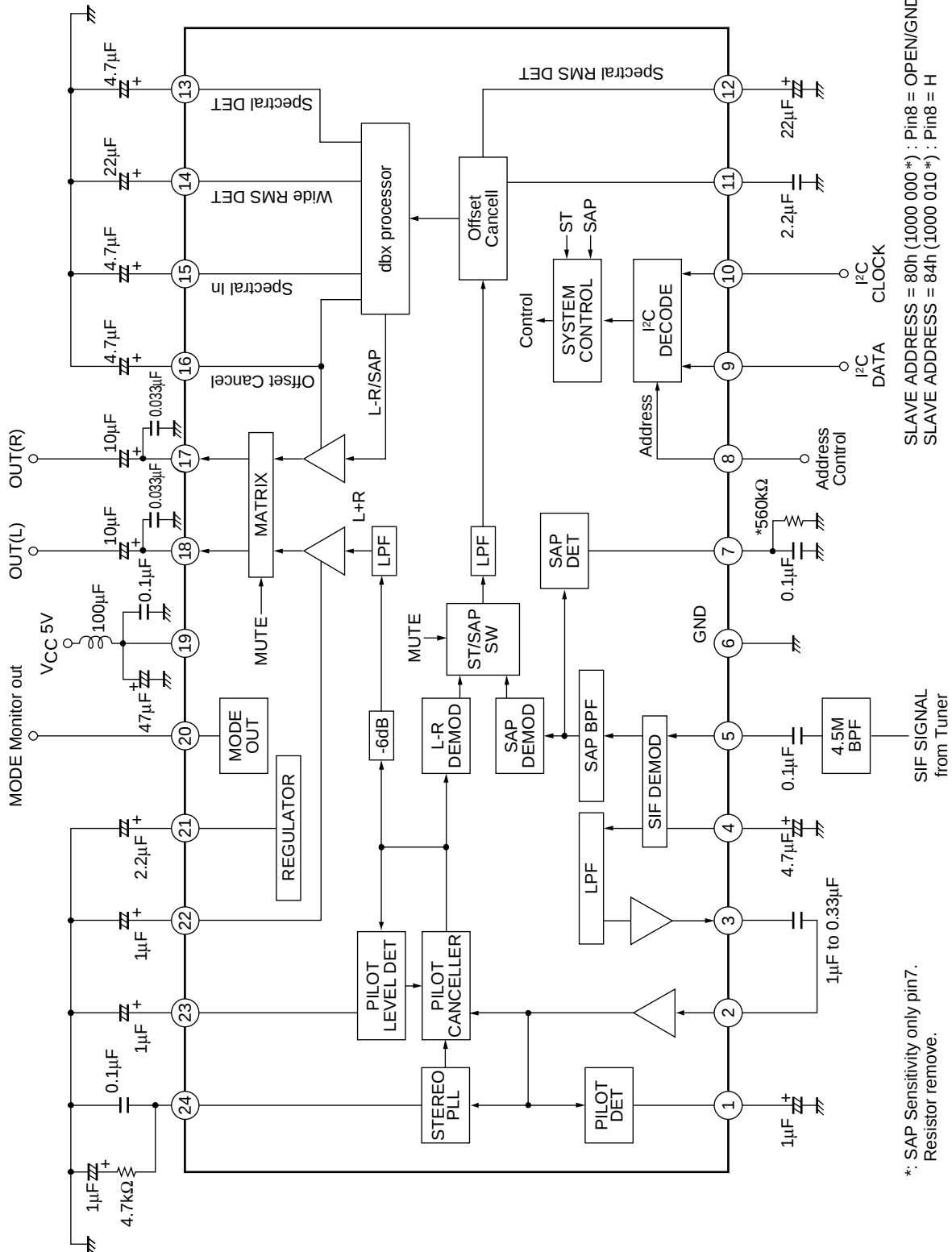
Grp-2 is only test condition. Usually, these data are no-need. Their data are no guarantee, except all L condition.

| D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | Condition/Monitor position  |
|----|----|----|----|----|----|----|----|-----------------------------|
| 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | Normal (Usually, Fixed)     |
|    |    |    |    | 0  | 0  | 0  | 1  | TEST-1 SIF output           |
|    |    |    |    | 0  | 0  | 1  | 0  | TEST-2 SAP BPF              |
|    |    |    |    | 0  | 0  | 1  | 1  | TEST-3 (reserved)           |
|    |    |    |    | 0  | 1  | 0  | 0  | TEST-4 ST VCO               |
|    |    |    |    | 0  | 1  | 0  | 1  | TEST-5 (reserved)           |
|    |    |    |    | 0  | 1  | 1  | 0  | TEST-6 SAP monitor          |
|    |    |    |    | 0  | 1  | 1  | 1  | TEST-7 ST monitor           |
|    |    |    |    | 1  | 0  | 0  | 0  | TEST-8 Pilot cancel monitor |
|    |    |    |    | 1  | 0  | 0  | 1  | TEST-9 dbx 2.19k LPF        |
|    |    |    |    | 1  | 0  | 1  | 0  | TEST-10 dbx 408 LPF         |
|    |    |    |    | 1  | 0  | 1  | 1  | TEST-11 dbx DET 10k LPF     |
|    |    |    |    | 1  | 1  | 0  | 0  | TEST-12 dbx SPEC 7.6k LPF   |
|    |    |    |    | 1  | 1  | 0  | 1  | TEST-13 dbx SPEC output     |
|    |    |    |    | 1  | 1  | 1  | 0  | TEST-14 L+R/L-R monitor     |
|    |    |    |    | 1  | 1  | 1  | 1  | TEST-15 dbx 2.09k LPF       |

Blank Bits are no-care

Slave addresses are 80h (1000 000\*, at pin8 Open/GND) and 84h (1000 010\*, at pin8 H).

## Block Diagram and Application



\*: SAP Sensitivity only pin7.  
Resistor remove.

SLAVE ADDRESS = 80h (1000 000 \*) : Pin8 = OPEN/GND  
SLAVE ADDRESS = 84h (1000 010 \*) : Pin8 = H

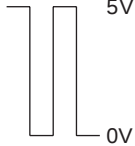
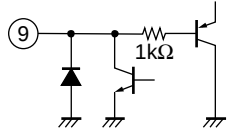
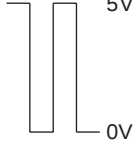
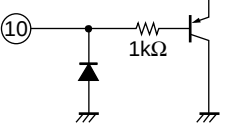
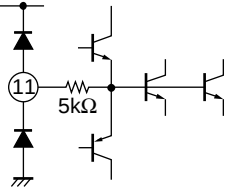
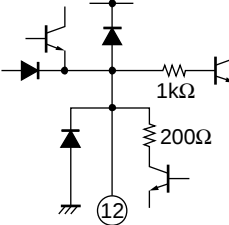
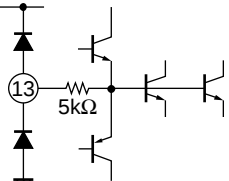
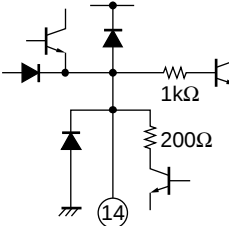
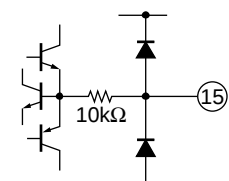
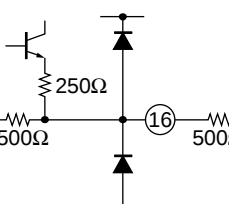
## Pin Functions

| Pin No. | Pin Name | Function                                                       | DC: voltage<br>AC: level  | Equivalent Circuit |
|---------|----------|----------------------------------------------------------------|---------------------------|--------------------|
| 1       | PCPLDET  | Pilot level detect for stereo detection                        | DC : 2.4V                 |                    |
| 2       | PC_DC_IN | AC coupling (Input)                                            | DC : 2.4V<br>AC : 2.4Vp-p |                    |
| 3       | PC_DCOUT | AC coupling (Output)                                           | DC : 2.4V<br>AC : 2.4Vp-p |                    |
| 4       | PC FIL   | SIF offset cancel                                              | DC : 2.6V                 |                    |
| 5       | PISIF    | Signal input<br>Common input at SIF, Base band                 | DC : 3.7V                 |                    |
| 6       | GND      |                                                                |                           |                    |
| 7       | CSAPDET  | SAP carrier level detect for SAP detection                     | DC : 2.8V                 |                    |
| 8       | ADDSEL   | Slave address change control<br><br>OPEN/GND : 80h<br>5V : 84h | DC : 0V                   |                    |

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| Pin No. | Pin Name | Function                           | DC: voltage<br>AC: level                                                                   | Equivalent Circuit                                                                    |
|---------|----------|------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 9       | SDA      | Serial data input                  |  5V<br>0V |    |
| 10      | SCL      | Serial clock input                 |  5V<br>0V |    |
| 11      | PC DBXIN | Offset cancel feedback filter      | DC: 2.4V                                                                                   |    |
| 12      | PCDETSPE | Spectral band RMS detect           | DC: 2.3V                                                                                   |   |
| 13      | PCTIMSPE | dbx spectral detect                | DC: 2.4V                                                                                   |  |
| 14      | PCTNWID  | Wide band RMS detect               | DC: 2.4V                                                                                   |  |
| 15      | PCSPECIN | dbx main signal V/I convert filter | DC: 2.4V                                                                                   |  |
| 16      | PC KE6B  | Offset cancel feedback filter      | DC: 2.4V<br>AC: 220mVp-p                                                                   |  |

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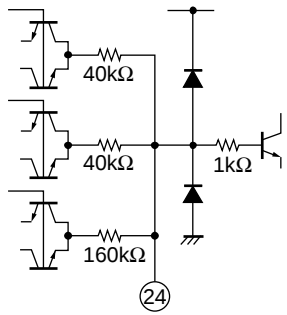
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| Pin No. | Pin Name        | Function                                                                      | DC: voltage<br>AC: level       | Equivalent Circuit |
|---------|-----------------|-------------------------------------------------------------------------------|--------------------------------|--------------------|
| 17      | PORCH           | Line out R                                                                    | DC: 2.4V<br>AC: 1.4Vp-p        |                    |
| 18      | POLCH           | Line out L                                                                    | DC: 2.4V<br>AC: 1.4Vp-p        |                    |
| 19      | V <sub>CC</sub> |                                                                               |                                |                    |
| 20      | POLED           | Mode out<br>MONO = 0.9V<br>SAP = 2.0V<br>STEREO = 3.0V<br>STEREO + SAP = 3.8V | DC: See Right<br>AC: Test only |                    |
| 21      | PCREG           | Reference voltage                                                             | DC: 2.4V                       |                    |
| 22      | PMAINOUT        | Offset cancel feedback filter                                                 | DC: 1.6V                       |                    |
| 23      | PCPLC           | Pilot level detect for pilot canceller                                        | DC: 2.4V                       |                    |

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| Pin No. | Pin Name | Function                             | DC: voltage<br>AC: level | Equivalent Circuit                                                                  |
|---------|----------|--------------------------------------|--------------------------|-------------------------------------------------------------------------------------|
| 24      | PCPTFILT | Pilot level detect for ST PLL filter | DC: 2.4V                 |  |

## I<sup>2</sup>C BUS Serial Interface Specification

### (1) Data transfer manual

This IC adopts control method (I<sup>2</sup>C-BUS) with serial data, and controlled by two terminals which called SCL (serial clock) and SDA (serial data). At first, set up <sup>\*1</sup> the condition of starting data transfer, and after that, input 8 bit data to SDA terminal with synchronized SCL terminal clock. The order of transferring is first, MSB (the Most Scale of Bit), and save the order. The 9th bit takes ACK (Acknowledge) period, during SCL terminal takes 'H', this IC pull down the SDA terminal. After transferred the necessary data, two terminals lead to set up and of <sup>\*2</sup> data transfer stop condition, thus the transfer comes to close.

<sup>\*1</sup> Defined by SCL rise down SDA during 'H' period.

<sup>\*2</sup> Defined by SCL rise up SDA during 'H' period.

### (2) Transfer data format

After transfer start condition, transfers slave address (1000 000\*) to SDA terminal, control data, then, stop condition (See figure 1).

Slave address is made up of 7bits, <sup>\*3</sup>8th bit shows the direction of transferring data, if it is 'L' takes write mode (As this IC side, this is input operation mode), and in case of 'H' reading mode (As this IC side, this is output operation mode). Data works with all of bit, transfer the stop condition before stop 8bit transfer, and to stop transfer, it will be canceled the transfer dates.

<sup>\*3</sup> It is called R/W bit.

Fig.1 DATA STRUCTURE "WRITE" mode

|                 |               |                 |     |              |     |                |
|-----------------|---------------|-----------------|-----|--------------|-----|----------------|
| START Condition | Slave Address | R/W<br><u>L</u> | ACK | Control data | ACK | STOP condition |
|-----------------|---------------|-----------------|-----|--------------|-----|----------------|

Fig.2 DATA STRUCTURE "READ" mode

|                 |               |                 |     |                 |     |                |
|-----------------|---------------|-----------------|-----|-----------------|-----|----------------|
| START condition | Slave Address | R/W<br><u>H</u> | ACK | Internal Data * | ACK | STOP condition |
|-----------------|---------------|-----------------|-----|-----------------|-----|----------------|

\* The output data synchronizes with the clock of SCL pin. Then, the ACK output is made after the output data.

bit8 is result of STERO DET (H : STEREO)

bit7 is result of SAP DET (H : SAP)

bit6 to bit1 are fixed to 'L'

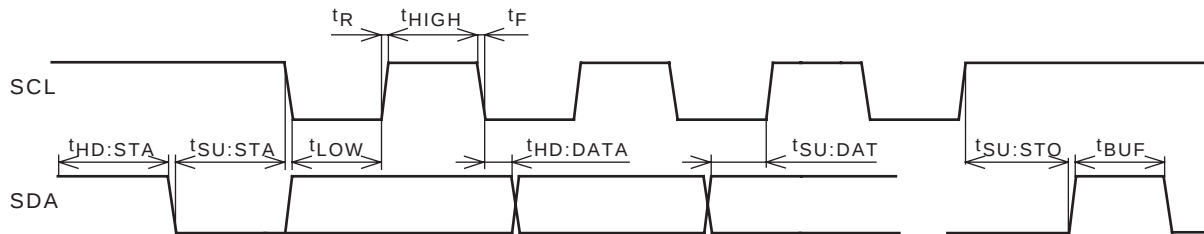
### (3) Initialize

This IC is initialized for circuit protection. Initial condition is "0 (All bits)".

## Reference

| Parameter                                                                        | Symbol         | min  | max | unit    |
|----------------------------------------------------------------------------------|----------------|------|-----|---------|
| LOW level input voltage                                                          | $V_{IL}$       | -0.5 | 1.5 | V       |
| HIGH level input voltage                                                         | $V_{IH}$       | 2.5  | 5.5 | V       |
| LOW level output current                                                         | $I_{OL}$       |      | 3.0 | mA      |
| SCL clock frequency                                                              | $f_{SCL}$      | 0    | 100 | kHz     |
| Set-up time for a repeated START condition                                       | $t_{SU : STA}$ | 4.7  |     | $\mu s$ |
| Hold time START condition. After this period, the first clock pulse is generated | $t_{HD : STA}$ | 4.0  |     | $\mu s$ |
| LOW period of the SCL clock                                                      | $t_{LOW}$      | 4.7  |     | $\mu s$ |
| Rise time of both SDA and SDL signals                                            | $t_R$          | 0    | 1.0 | $\mu s$ |
| HIGH period of the SCL clock                                                     | $t_{HIGH}$     | 4.0  |     | $\mu s$ |
| Fall time of both SDA and SDL signals                                            | $t_F$          | 0    | 1.0 | $\mu s$ |
| Data hold time                                                                   | $t_{HD : DAT}$ | 0    |     | $\mu s$ |
| Data set-up time                                                                 | $t_{SU : DAT}$ | 250  |     | ns      |
| Set-up time for STOP condition                                                   | $t_{SU : STO}$ | 4.0  |     | $\mu s$ |
| BUS free time between a STOP and START condition                                 | $t_{BUF}$      | 4.7  |     | $\mu s$ |

## Definition of timing



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