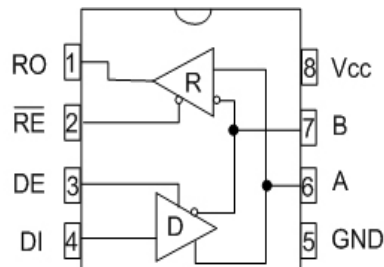


+3.3V Low Power Slew Rate Limited Half-Duplex RS-485 Transceiver

- RS-485 and RS-422 Transceiver
- Operates from a single +3.3V Supply
- Interoperable with +5.0V logic
- Driver/Receiver Enable
- Low Power Shutdown mode
- -7V to +12V Common-Mode Input Voltage Range
- Allows up to 32 transceivers on the serial bus
- Compatibility with the industry standard 75176 pinout
- Driver Output Short-Circuit Protection
- Slew Rate Limited Driver for Low EMI



SP3483
Pinout (Top View)

DESCRIPTION

The **SP3483** device is part of a family of +3.3V low power half-duplex transceivers that meet the specifications of the RS-485 and RS-422 serial protocols. This device is pin-to-pin compatible with the **Exar** SP483 device as well as popular industry standards. The **SP3483** features **Exar's** BiCMOS design allowing low power operation without sacrificing performance. The **SP3483** is slew rate limited to reduce EMI and can meet the requirements of the RS-485 and RS-422 protocols up to 250kbps.

TRUTH TABLES

INPUTS			LINE CONDITION	OUTPUTS	
$\overline{\text{RE}}$	DE	DI		B	A
X	1	1	No Fault	0	1
X	1	0	No Fault	1	0
X	0	X	X	Z	Z

Table 1. Transmit Function Truth Table

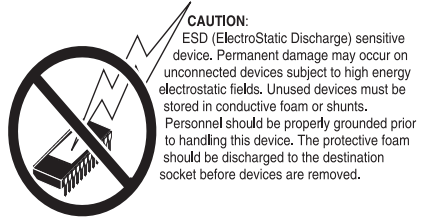
INPUTS		A - B	OUTPUTS R
$\overline{\text{RE}}$	DE		
0	0	+0.2V	1
0	0	-0.2V	0
0	0	Inputs Open	1
1	0	X	Z

Table 2. Receive Function Truth Table

ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

V_{CC}	+6.0V
Input Voltages	
Logic.....	-0.3V to +6.0V
Drivers.....	-0.3V to +6.0V
Receivers.....	+/-15V
Output Voltages	
Drivers.....	+/-15V
Receivers.....	-0.3V to +6.0V
Storage Temperature.....	-65°C to +150°C
Power Dissipation	
8-pin NSOIC.....	500mW
(derate 6.14mW/°C above +70°C)	



ELECTRICAL CHARACTERISTICS

T_{MIN} to T_{MAX} and $V_{CC} = +3.3V \pm 5\%$ unless otherwise noted.

PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
DRIVER					
DC Characteristics					
Differential Output Voltage	GND		V_{CC}	Volts	Unloaded; $R = \infty$; Figure 1
Differential Output Voltage	2		V_{CC}	Volts	With Load; $R = 50\Omega$ (RS-422); Figure 1
Differential Output Voltage	1.5		V_{CC}	Volts	With Load; $R = 27\Omega$ (RS-485); Figure 1
Change in Magnitude of Driver Differential Output Voltage for Complimentary states			0.2	Volts	$R = 27\Omega$ or $R = 50\Omega$; Figure 1
Driver Common Mode Output Voltage			3	Volts	$R = 27\Omega$ or $R = 50\Omega$; Figure 1
Input High Voltage	2.0			Volts	Applies to DE, DI, $\overline{RE}$
Input Low Voltage			0.8	Volts	Applies to DE, DI, $\overline{RE}$
Input Current			+/-10	μA	Applies to DE, DI, $\overline{RE}$
Driver Short Circuit Current, $V_{OUT} = HIGH$			+/-250	mA	$-7V \leq V_O \leq +12V$; Figure 8
Driver Short Circuit Current, $V_{OUT} = LOW$			+/-250	mA	$-7V \leq V_O \leq +12V$; Figure 8
DRIVER					
AC Characteristics					
Max. Transmission Rate	250			kbps	$\overline{RE} = V_{CC}$, DE = V_{CC}
Driver Input to Output, t_{PLH}	400	900	1500	ns	Figures 2 & 9
Driver Input to Output, t_{PHL}	400	900	1500	ns	Figures 2 & 9
Differential Driver Skew		10		ns	$ t_{D01} - t_{D02} $, Figures 2 and 10,
Driver Rise or Fall Time		700	1000	ns	From 10%-90%; Figures 3 and 10

ELECTRICAL CHARACTERISTICS

T_{MIN} to T_{MAX} and $V_{CC} = +3.3V \pm 5\%$ unless otherwise noted.

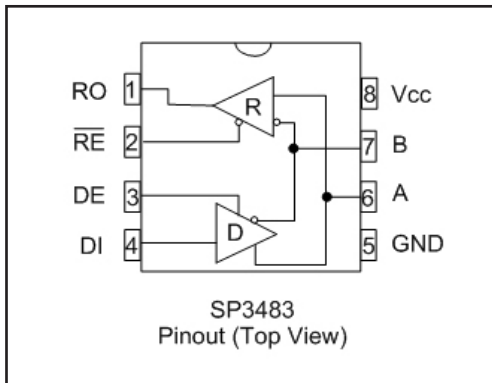
PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
DRIVER (continued)					
AC Characteristics					
Driver Enable to Output High		700	1300	ns	Figures 4 and 11,
Driver Enable to Output Low		690	1300	ns	Figures 5 and 11
Driver Disable Time from High		80	120	ns	Figures 5 and 11
Driver Disable Time from Low		90	120	ns	Figures 4 and 11
RECEIVER					
DC Characteristics					
Differential Input Threshold	-0.2		+0.2	Volts	$-7V \leq V_{CM} \leq +12V$
Input Hysteresis		20		mV	$V_{CM} = 0V$
Output Voltage High	$V_{CC}-0.4$			Volts	$I_O = -1.5mA, V_{ID} = +200mV$
Output Voltage Low			0.4	Volts	$I_O = +2.5mA, V_{ID} = -200mV$
Three-State (High Impedance) Output Current			+/-1	μA	$0V \leq V_O \leq V_{CC}; \overline{RE} = V_{CC}$
Input Resistance	12	15		k Ω	$-7V \leq V_{CM} \leq +12V$
Input Current (A, B); $V_{IN} = 12V$			+1.0	mA	$DE = 0V, V_{CC} = 0V$ or $3.6V, V_{IN} = 12V$
Input Current (A, B); $V_{IN} = -7V$			-0.8	mA	$DE = 0V, V_{CC} = 0V$ or $3.6V, V_{IN} = -7V$
Short Circuit Current	7		60	mA	$0V \leq V_{CM} \leq V_{CC}$
RECEIVER					
AC Characteristics					
Max. Transmission Rate	250			kbps	$\overline{RE} = 0V, DE = 0V$
Receiver Input to Output, t_{RPLH}	35	70	120	ns	Figures 6 and 12
Receiver Input to Output, t_{RPHL}	35	70	120	ns	Figures 6 and 12
Differential Receiver Skew		50		ns	$ t_{RPHL} - t_{RPLH} $, Figures 6 and 12
Receiver Enable to Output Low		45	70	ns	Figures 7 and 13; S_1 Closed, S_2 open
Receiver Enable to Output High		45	70	ns	Figures 7 and 13; S_2 Closed, S_1 open
Receiver Disable from LOW		45	70	ns	Figures 7 and 13; S_1 Closed, S_2 open
Receiver Disable from High		45	70	ns	Figures 7 and 13; S_2 Closed, S_1 open

ELECTRICAL CHARACTERISTICS

T_{MIN} to T_{MAX} and $V_{CC} = +3.3V \pm 5\%$ unless otherwise noted.

PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Shutdown Timing					
Time to Shutdown	50	200	600	ns	$\overline{RE} = 5V, DE = 0V$
Driver Enable from Shutdown to Output High			2000	ns	Figures 4 and 11
Driver Enable from Shutdown to Output Low			2000	ns	Figures 5 and 11
Receiver Enable from Shutdown to Output High			2500	ns	Figures 7 and 13; S_2 Closed, S_1 open
Receiver Enable from Shutdown to Output Low			2500	ns	Figures 7 and 13; S_1 Closed, S_2 open
POWER REQUIREMENTS					
Supply Current					
No Load		1000	2000	μA	$\overline{RE}, DI = 0V$ or V_{CC} ; $DE = V_{CC}$
		800	1500	μA	$\overline{RE} = 0V, DI = 0V$ or $5V$; $DE = 0V$
Shutdown Mode			10	μA	$DE = 0V, \overline{RE} = V_{CC}$

PIN FUNCTION



- Pin 1 - RO - Receiver Output
- Pin 2 - $\overline{RE}$ - Receiver Output Enable Active LOW
- Pin 3 - DE - Driver Output Enable Active HIGH
- Pin 4 - DI - Driver Input
- Pin 5 - GND - Ground Connection
- Pin 6 - A - Driver Output / Receiver Input
Non-Inverting
- Pin 7 - B - Driver Output / Receiver Input Inverting
- Pin 8 - Vcc - Positive Supply

TEST CIRCUITS

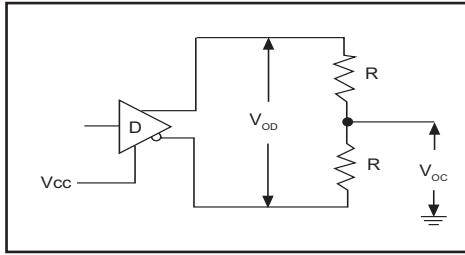


Figure 1. Driver DC Test Load Circuit

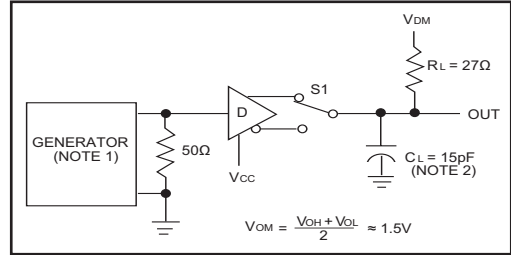


Figure 2. Driver Propagation Delay Test Circuit

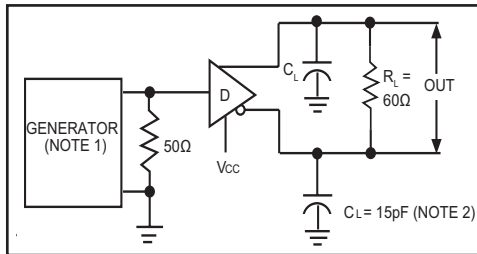


Figure 3. Driver Differential Output Delay and Transition Time Circuit.

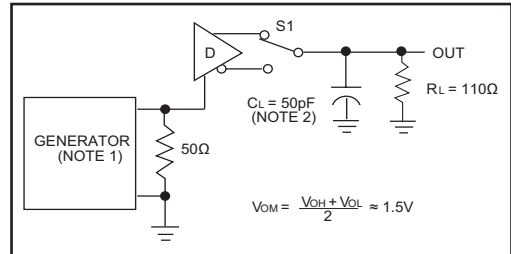


Figure 4. Driver Enable and Disable Timing Circuit, Output High

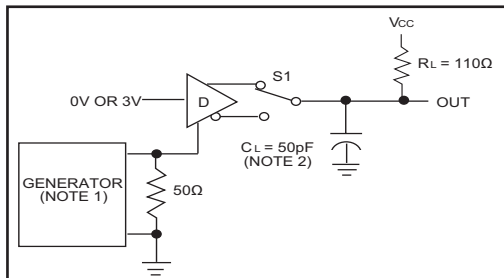


Figure 5. Driver Enable and Disable Timing Circuit, Output Low

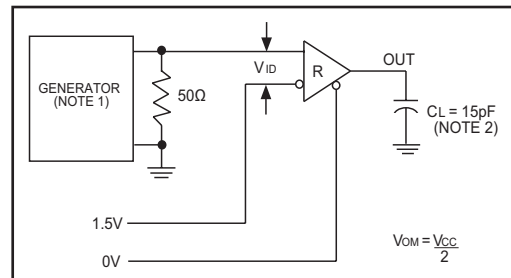


Figure 6. Receiver Propagation Delay Test Circuit

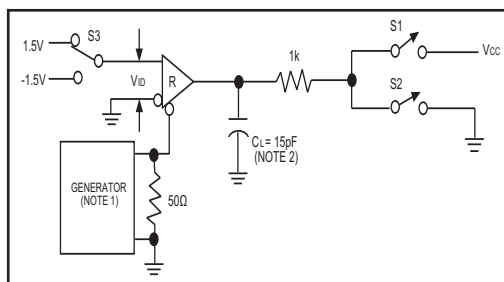


Figure 7. Receiver Enable and Disable Timing Circuit

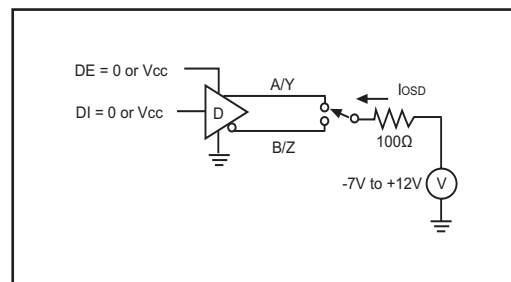


Figure 8. Driver Short Circuit Current Limit Test

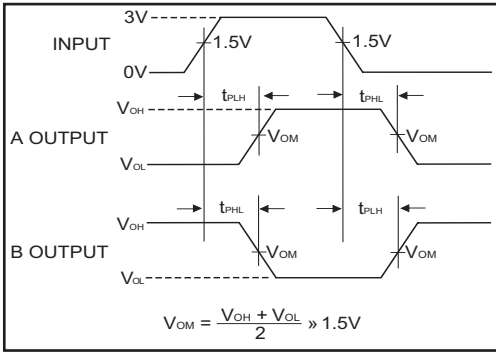


Figure 9. Driver Propagation Delay Waveforms

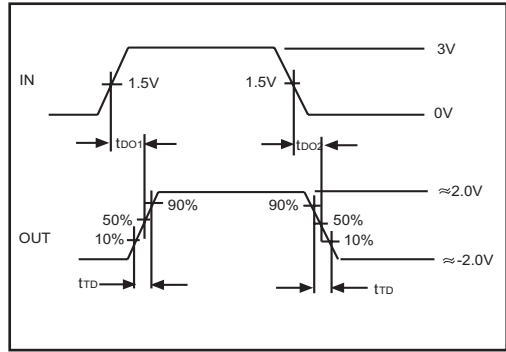


Figure 10. Driver Differential Output Delay and Transition Time Waveforms

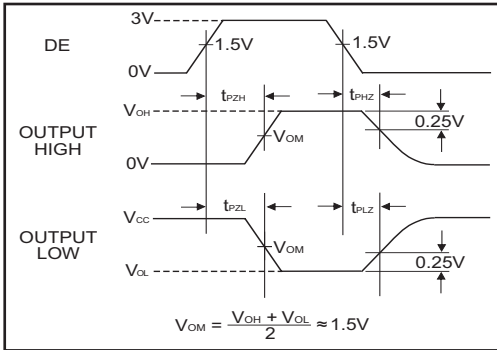


Figure 11. Driver Enable and Disable Timing Waveforms

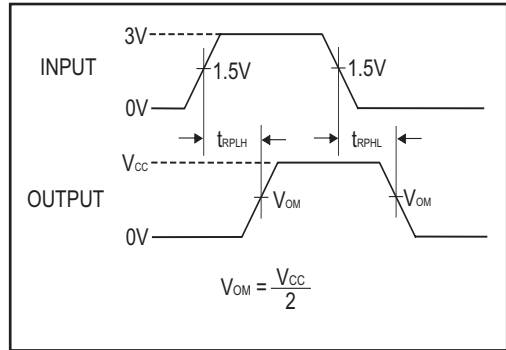


Figure 12. Receiver Propagation Delay Waveforms

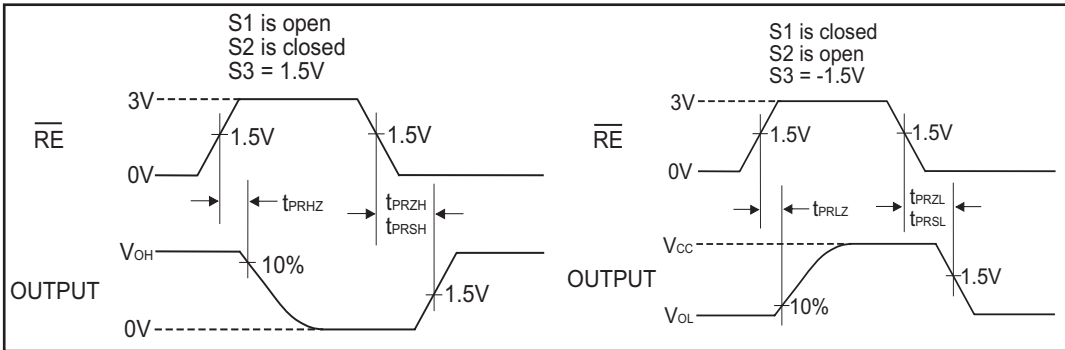


Figure 13. Receiver Enable and Disable Waveforms

NOTE 1: The input pulse is supplied by a generator with the following characteristics:

PRR = 250kHz, 50% duty cycle, $t_r < 6.0ns$, $Z_o = 50\Omega$.

NOTE 2: C_L includes probe and stray capacitance.

The **SP3483** device is part of a family of +3.3V low power half-duplex transceivers that meet the specifications of the RS-485 and RS-422 serial protocols. This device is pin-to-pin compatible with the **Exar** SP483 device as well as popular industry standards. The **SP3483** features **Exar's** BiCMOS process allowing low power operation without sacrificing performance.

The RS-485 standard is ideal for multi-drop applications and for long-distance interfaces. RS-485 allows up to 32 drivers and 32 receivers to be connected to a data bus, making it an ideal choice for multi-drop applications. Since the cabling can be as long as 4,000 feet, RS-485 transceivers are equipped with a wide (-7V to +12V) common mode range to accommodate ground potential differences. Because RS-485 is a differential interface, data is virtually immune to noise in the transmission line.

Drivers

The driver outputs of the **SP3483** are differential outputs meeting the RS-485 and RS-422 standards. The typical voltage output swing with no load will be 0 Volts to +3.3 Volts. With worst case loading of 54 Ω across the differential outputs, the drivers can maintain greater than 1.5V voltage levels. The drivers have an enable control line which is active HIGH. A logic HIGH on DE (pin 3) will enable the differential driver outputs. A logic LOW on the DE (pin 3) will force the driver outputs into high impedance (high-Z).

The **SP3483** has internally slew rate limited driver outputs to minimize EMI. The transceivers will operate up to 250kbps. The 250mA I_{sc} maximum limit on the driver output allows the **SP3483** to withstand an infinite short circuit over the -7.0V to +12V common mode range without catastrophic damage to the IC.

Receivers

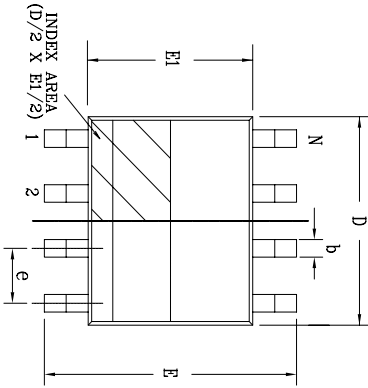
The **SP3483** receiver has differential inputs with an input sensitivity as low as $\pm 200\text{mV}$. Input impedance of the receivers is typically 15k Ω (12k Ω minimum). A wide common mode range of -7V to +12V allows for large ground potential differences between systems. The receiver of the **SP3483** has a tri-state enable control input $\overline{RE}$ (Pin 2). A logic LOW on $\overline{RE}$ will enable the receiver, a logic HIGH on $\overline{RE}$ will disable the receiver.

The receiver of the **SP3483** will operate up to 250kbps. The receiver is equipped with the fail-safe feature. Fail-safe guarantees that the receiver output will be in a HIGH state when the input is left unconnected (open circuit).

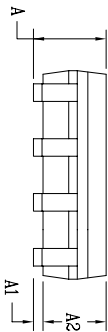
Shutdown Mode

The **SP3483** is equipped with a Shutdown mode. To enable the shutdown state, both driver and receiver must be disabled simultaneously. A logic LOW on DE (pin 3) and a Logic HIGH on $\overline{RE}$ (pin 2) will put the **SP3483** into Shutdown mode. In Shutdown, supply current will drop to typically 1 μA , 10 μA maximum.

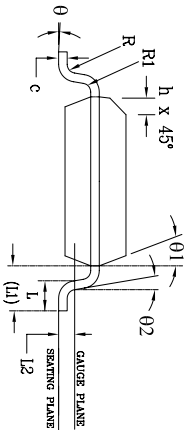
REVISION HISTORY				
REV.	DESCRIPTION	DATE	APP'D	
A	DRAWING ORIGINATOR	08/16/05	JL	
B	DRAWING FORMAT MODIFICATION	07/19/06	JL	
C	CHANGE DRAWING LOGO AND COMPANY NAME	11/16/07	JL	



Top View



Side View



Front View

8 Pin SOICN		JEDEC MS-012		Variation AA		
SYMBOLS		DIMENSIONS IN MM (Control Unit)		DIMENSIONS IN INCH (Reference Unit)		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.35	—	1.75	0.053	—	0.069
A1	0.10	—	0.25	0.004	—	0.010
A2	1.25	—	1.65	0.049	—	0.065
b	0.31	—	0.51	0.012	—	0.020
c	0.17	—	0.25	0.007	—	0.010
E	6.00 BSC			0.236 BSC		
E1	3.90 BSC			0.154 BSC		
e	1.27 BSC			0.050 BSC		
h	0.25	—	0.50	0.010	—	0.020
L	0.40	—	1.27	0.016	—	0.050
L1	1.04 REF			0.041 REF		
L2	0.25 BSC			0.010 BSC		
R	0.07	—	—	0.003	—	—
R1	0.07	—	—	0.003	—	—
θ	0°	—	8°	0°	—	8°
θ1	5°	—	15°	5°	—	15°
θ2	0°	—	—	0°	—	—
D	4.90 BSC			0.193 BSC		
N	8			8		

		EXAR CORPORATION	
Packaging Approval:		8 PIN SOICN PACKAGE OUTLINE	
By: JL	Date: 11/16/07	Drawing No: 8-PIN SOICN	Revision: C
		Sheet: 1 OF 1	

ORDERING INFORMATION		
Model	Temperature Range	Package Types
SP3483CN-L	0°C to +70°C	8-pin NSOIC
SP3483CN-L/TR	0°C to +70°C	8-pin NSOIC
SP3483EN-L	-40°C to +85°C	8-pin NSOIC
SP3483EN-L/TR	-40°C to +85°C	8-pin NSOIC

Note: /TR = Tape and Reel

REVISION HISTORY

DATE	REVISION	DESCRIPTION
06/23/04	--	Legacy Sipex Datasheet
01/09/12	1.0.0	Convert to Exar Format. Update ordering information as a result of discontinued Lead type package options. Add new Figure 8 - Driver Short Circuit Current Limit Test Circuit. Correct type error for no load supply current.

Notice

EXAR Corporation reserves the right to make changes to any products contained in this publication in order to improve design, performance or reliability. EXAR Corporation assumes no representation that the circuits are free of patent infringement. Charts and schedules contained herein are only for illustration purposes and may vary depending upon a user's specific application. While the information in this publication has been carefully checked; no responsibility, however, is assumed for inaccuracies.

EXAR Corporation does not recommend the use of any of its products in life support applications where the failure or malfunction of the product can reasonably be expected to cause failure of the life support system or to significantly affect its safety or effectiveness. Products are not authorized for use in such applications unless EXAR Corporation receives, in writing, assurances to its satisfaction that: (a) the risk of injury or damage has been minimized ; (b) the user assumes all such risks; (c) potential liability of EXAR Corporation is adequately protected under the circumstances.

Copyright 2012 EXAR Corporation

Datasheet January 2012

Send your serial transceiver technical inquiry with technical details to: serialtechsupport@exar.com

Reproduction, in part or whole, without the prior written consent of EXAR Corporation is prohibited.