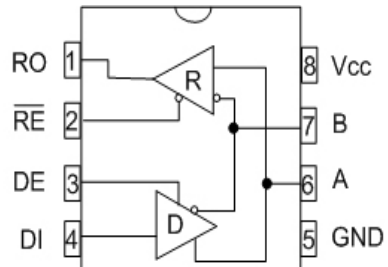




**SP3483**

## +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	
$\overline{RE}$	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
$\overline{RE}$	DE		R
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 <sub>CC</sub> .....	+6.0V
<b>Input Voltages</b>	
Logic.....	-0.3V to +6.0V
Drivers.....	-0.3V to +6.0V
Receivers.....	+/-15V
<b>Output Voltages</b>	
Drivers.....	+/-15V
Receivers.....	-0.3V to +6.0V
Storage Temperature.....	-65°C to +150°C
<b>Power Dissipation</b>	
8-pin NSOIC.....	500mW
	(derate 6.14mW/°C above +70°C)



**CAUTION:**  
ESD (ElectroStatic Discharge) sensitive device. Permanent damage may occur on unconnected devices subject to high energy electrostatic fields. Unused devices must be stored in conductive foam or shunts. Personnel should be properly grounded prior to handling this device. The protective foam should be discharged to the destination socket before devices are removed.

## ELECTRICAL CHARACTERISTICS

T<sub>MIN</sub> to T<sub>MAX</sub> and V<sub>CC</sub> = +3.3V +/-5% unless otherwise noted.

PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
<b>DRIVER</b>					
<b>DC Characteristics</b>					
Differential Output Voltage	GND		V <sub>CC</sub>	Volts	Unloaded; R = ∞ ; Figure 1
Differential Output Voltage	2		V <sub>CC</sub>	Volts	With Load; R = 50Ω (RS-422); Figure 1
Differential Output Voltage	1.5		V <sub>CC</sub>	Volts	With Load; R = 27Ω (RS-485); Figure 1
Change in Magnitude of Driver Differential Output Voltage for Complimentary states			0.2	Volts	R = 27Ω or R = 50Ω; Figure 1
Driver Common Mode Output Voltage			3	Volts	R = 27Ω or R = 50Ω; 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 <sub>OUT</sub> = HIGH			+/-250	mA	-7V ≤ V <sub>O</sub> ≤ +12V; Figure 8
Driver Short Circuit Current, V <sub>OUT</sub> = LOW			+/-250	mA	-7V ≤ V <sub>O</sub> ≤ +12V; Figure 8
<b>DRIVER</b>					
<b>AC Characteristics</b>					
Max. Transmission Rate	250			kbps	$\overline{RE}$ = V <sub>CC</sub> , DE = V <sub>CC</sub>
Driver Input to Output, t <sub>PLH</sub>	400	900	1500	ns	Figures 2 & 9
Driver Input to Output, t <sub>PHL</sub>	400	900	1500	ns	Figures 2 & 9
Differential Driver Skew		10		ns	t <sub>DO1</sub> - t <sub>DO2</sub>  , 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.

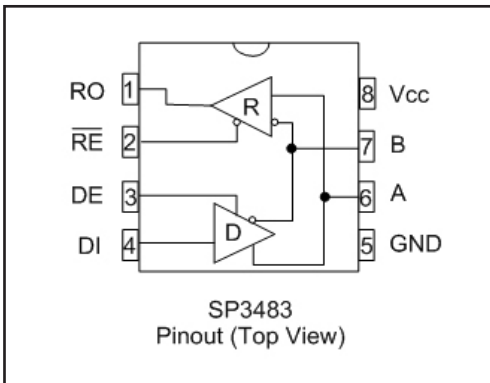
PARAMETERS	MIN.	TYP.	MAX.	UNITS	CONDITIONS
<b>DRIVER (continued)</b>					
<b>AC Characteristics</b>					
Driver Enable to Output High		700	1300	ns	Figures 4 and 11,
Driver Enable to Output Low		690	1300	ns	Figures 5 and 11
Driver Disable Time from High		80	120	ns	Figures 5 and 11
Driver Disable Time from Low		90	120	ns	Figures 4 and 11
<b>RECEIVER</b>					
<b>DC Characteristics</b>					
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	$\mu A$	$0V \leq V_O \leq V_{CC}; \overline{RE} = V_{CC}$
Input Resistance	12	15		k $\Omega$	$-7V \leq V_{CM} \leq +12V$
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	$0V \leq V_{CM} \leq V_{CC}$
<b>RECEIVER</b>					
<b>AC Characteristics</b>					
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
<b>Shutdown Timing</b>					
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
<b>POWER REQUIREMENTS</b>					
Supply Current					
No Load		1000	2000	$\mu A$	$\overline{RE}, DI = 0V$ or $V_{CC}$ ; $DE = V_{CC}$
		800	1500	$\mu A$	$\overline{RE} = 0V, DI = 0V$ or $5V$ ; $DE = 0V$
Shutdown Mode			10	$\mu A$	$DE = 0V, \overline{RE} = V_{CC}$

## 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

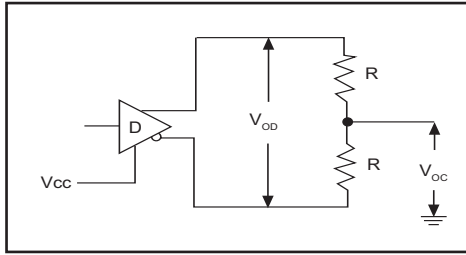


Figure 1. Driver DC Test Load Circuit

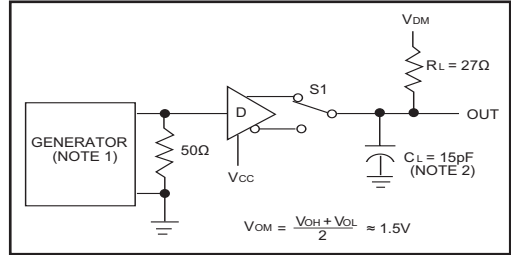


Figure 2. Driver Propagation Delay Test Circuit

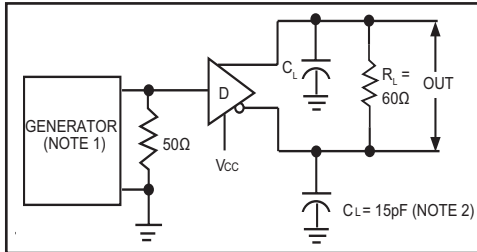


Figure 3. Driver Differential Output Delay and Transition Time Circuit.

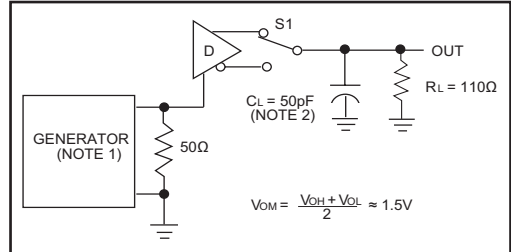


Figure 4. Driver Enable and Disable Timing Circuit, Output High

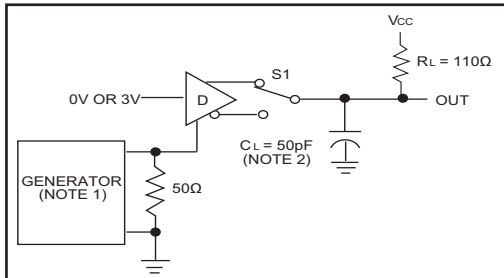


Figure 5. Driver Enable and Disable Timing Circuit, Output Low

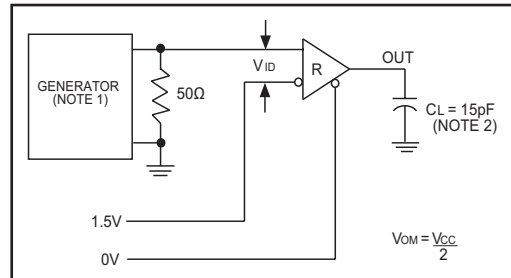


Figure 6. Receiver Propagation Delay Test Circuit

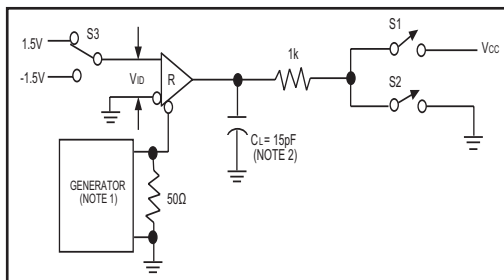


Figure 7. Receiver Enable and Disable Timing Circuit

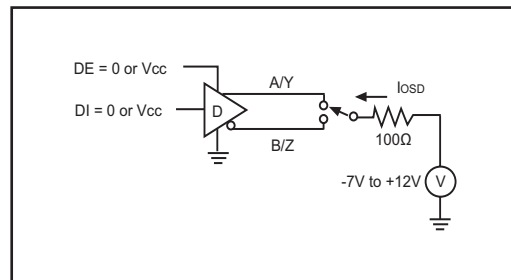


Figure 8. Driver Short Circuit Current Limit Test

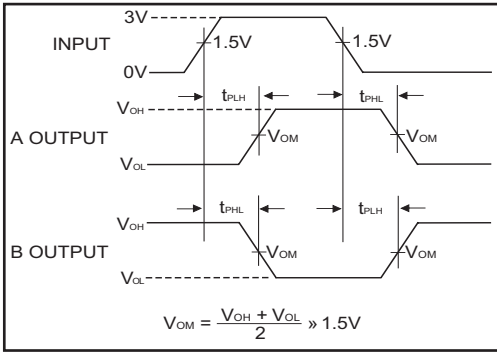


Figure 9. Driver Propagation Delay Waveforms

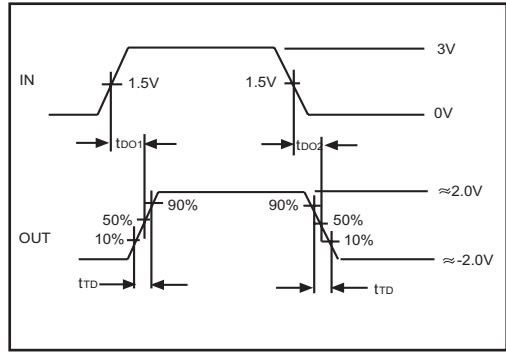


Figure 10. Driver Differential Output Delay and Transition Time Waveforms

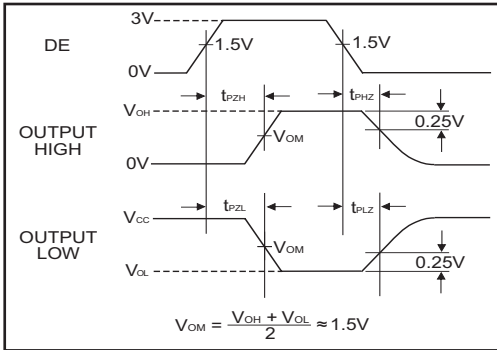


Figure 11. Driver Enable and Disable Timing Waveforms

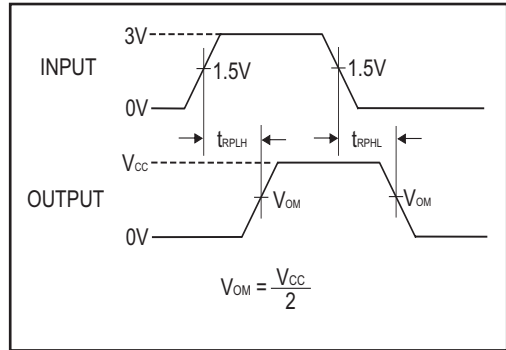


Figure 12. Receiver Propagation Delay Waveforms

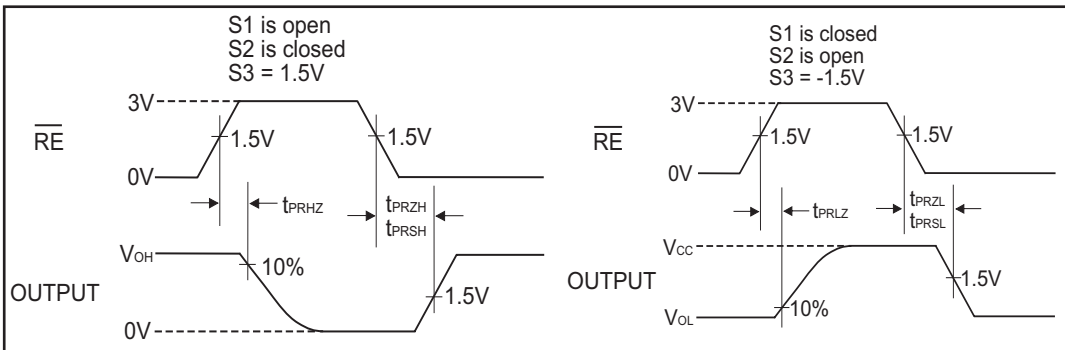


Figure 13. Receiver Enable and Disable Waveforms

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 $\Omega$  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

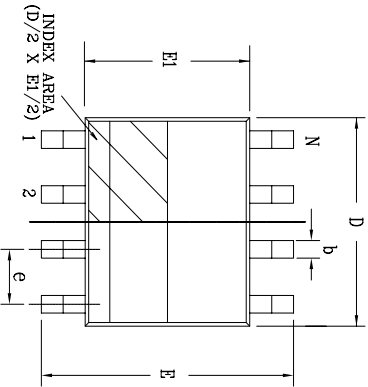
The **SP3483** receiver has differential inputs with an input sensitivity as low as  $\pm 200$ mV. Input impedance of the receivers is typically 15k $\Omega$  (12k $\Omega$  minimum). A wide common mode range of -7V to +12V allows for large ground potential differences between systems. The receiver of 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

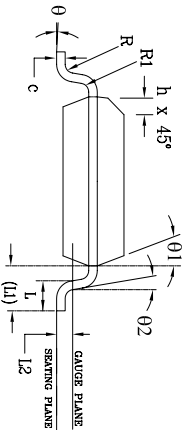
The **SP3483** is equipped with a Shutdown mode. To enable the shutdown state, both driver and receiver must be disabled simultaneously. A logic LOW on DE (pin 3) and a Logic HIGH on  $\overline{RE}$  (pin 2) will put the **SP3483** into Shutdown mode. In Shutdown, supply current will drop to typically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

REVISION HISTORY			
REV.	DESCRIPTION	DATE	APPR'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

SYMBOLS	8 Pin SOICN			JEDEC MS-012			Variation AA		
	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					



Side View

Front View

		<b>EXAR CORPORATION</b> <i>Revolving Connectivity</i>	
Packaging Approval:		Drawing No:	
By: JL	Date: 11/16/07	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

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Datasheet January 2012

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