



DESCRIPTION

SP3485EN-L/TR is an RS-485 transceiver with a 3.3V power supply, half duplex, low power consumption, and fully functional compliance with TIA/EIA-485 standards. SP3485EN-L/TR includes a driver and a receiver, both of which can be independently enabled and disabled. When both are disabled, both the driver and receiver output a high resistance state. SP3485EN-L/TR has a 1/8 load and allows 256 SP3485EN-L/TR transceivers to be connected together on the same communication bus. Can achieve error free data transmission up to 12Mbps. The working voltage range of SP3485EN-L/TR is 3.0~3.6 V, and it has functions such as fail safe, over temperature protection, current limiting protection, and overvoltage protection.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CC}) 7V

Control Input Voltage -0.3V to +7V

Driver Input Voltage (DI) -0.3V to +7V

Driver Output Voltage (A, B) -7V to +13V

Receiver Input Voltage (A, B) -7V to +13V

Receiver Output Voltage (RO) -0.3V to +7V

Continuous Power Dissipation ($T_A = +70^\circ\text{C}$)

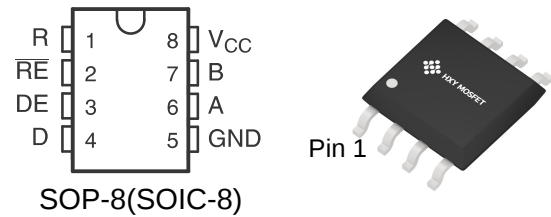
8-Pin SO (derate 5.88mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$)
400mW

Operating Temperature Ranges 0°C to $+70^\circ\text{C}$

Storage Temperature Range -65°C to $+150^\circ\text{C}$

Lead Temperature (soldering, 10sec) $+300^\circ\text{C}$

PIN CONFIGURATION



FEATURES

- 3.3V power supply, half-duplex
- 1/8 unit load, allowing up to 256 devices to be connected to the bus
- Driver short circuit output protection
- Over temperature protection function
- Low power shutdown function
- Receiver open circuit failure protection
- Has strong noise resistance
- Integrated transient voltage resistance function
- The data transmission rate in an electrical noise environment can reach 12Mbps

APPLICATIONS

- Industrial Networks
- Utility Meters
- Motor Control



DC ELECTRICAL CHARACTERISTICS

($V_{CC} = 3.3V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Differential Driver Output (no load)	V_{OD1}			3.3		V
Differential Driver Output (with load)	V_{OD2}	$R = 54\Omega$ (RS-422)	1.5		V_{CC}	V
		$R = 100\Omega$ (RS-485)	2		V_{CC}	
Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	ΔV_{OD}	$R = 54\Omega$			0.2	V
Driver Common-Mode Output Voltage	V_{OC}	$R = 54\Omega$			3	V
Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	ΔV_{OD}	$R = 54$			0.2	V
Input High Voltage	V_{IH}	DE, DI, RE	2.0			V
Input Low Voltage	V_{IL}	DE, DI, RE			0.8	V
Input Current	I_{IN1}	DE, DI, RE			± 2	μA
Input Current (A, B)	I_{IN2}	DE = 0V; $V_{CC} = 0V$ or 3.3V,	$V_{IN} = 12V$		125	μA
			$V_{IN} = -7V$	-100		
Receiver Differential Threshold Voltage	V_{TH}	$-7V \leq V_{CM} \leq 12V$	-0.2		0.2	V
Receiver Input Hysteresis	ΔV_{TH}	$V_{CM} = 0V$	10	30		mV
Receiver Output High Voltage	V_{OH}	$I_O = -2.5mA$, $V_{ID} = 200mV$	$V_{CC}-1.5$			V
Receiver Output Low Voltage	V_{OL}	$I_O = 2.5mA$, $V_{ID} = -200mV$			0.4	V
Three-State (high impedance) Output Current at Receiver	I_{OZR}	$0.4V \leq V_O \leq 2.4V$			± 1	μA
Receiver Input Resistance	R_{IN}	$-7V \leq V_{CM} \leq 12V$	96			k Ω

DC ELECTRICAL CHARACTERISTICS (continued)

($V_{CC} = 3.3V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
No-Load Supply Current	I_{CC}	DE = V_{CC}		520	800	μA
		RE = 0V or V_{CC}		540	700	
		DE = 0V				
Driver Short-Circuit Current,	I_{OSD}				± 250	mA



SWITCHING CHARACTERISTICS

($V_{CC} = 5V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise noted.) (Notes 1, 2)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Input to Output	t_{PLH}	$R_{DIFF} = 27\Omega$		8	35	ns
	t_{PHL}	$C_{L1} = C_{L2} = 100pF$		8	35	
Driver Output Skew to Output	t_{SKEW}	$R_{DIFF} = 60\Omega$, $C_{L1} = C_{L2} = 100pF$		10	35	ns
Driver Enable to Output High	t_{ZH}	$C_L = 110pF$, S2 closed		20	90	ns
Driver Enable to Output Low	t_{ZL}	$C_L = 110pF$, S1 closed		20	90	ns
Driver Disable Time from Low	t_{LZ}	$C_L = 110pF$, S1 closed		20	80	ns
Driver Disable Time from High	t_{HZ}	$C_L = 110pF$, S2 closed		20	80	ns
$t_{PLH} - t_{PHL}$ Differential	t_{SKD}	$R_{DIFF} = 54\Omega$		7	10	ns
Receiver Skew		$C_{L1} = C_{L2} = 100pF$				
Receiver Enable to Output Low	t_{ZL}	$C_{RL} = 15pF$, S1 closed		20	45	ns
Receiver Enable to Output High	t_{ZH}	$C_{RL} = 15pF$, S2 closed		20	45	ns
Receiver Disable Time from Low	t_{LZ}	$C_{RL} = 15pF$, S1 closed		200	1400	ns
Receiver Disable Time from High	t_{HZ}	$C_{RL} = 15pF$, S2 closed		200	1400	ns

TABLE OF SP3485EN OPERATION

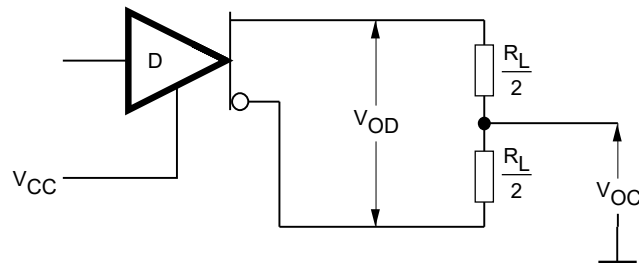
Transmission					Receipt			
Inputs			Outputs X		Inputs			Outputs
RE	DE	DI	A	B	RE	DE	A-B	RO
X	1	1	H	L	0	X	$\geq +0.2V$	H
X	1	0	L	H	0	X	$\leq -0.2V$	L
0	0	X	Z	Z	0	X	On/Short Circuit	H
1	0	X	Z(shutdown)		1	X	X	Z

X-Any level

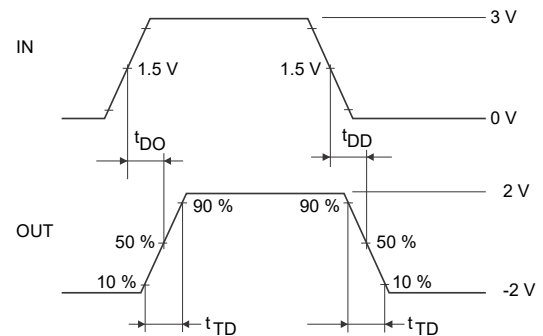
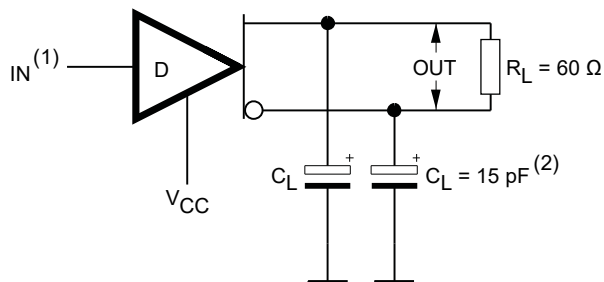
Z-High resistance



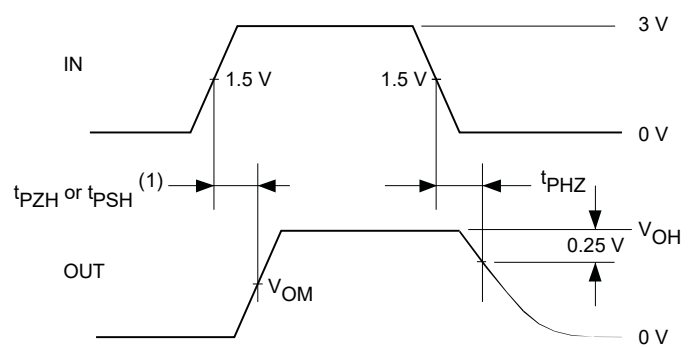
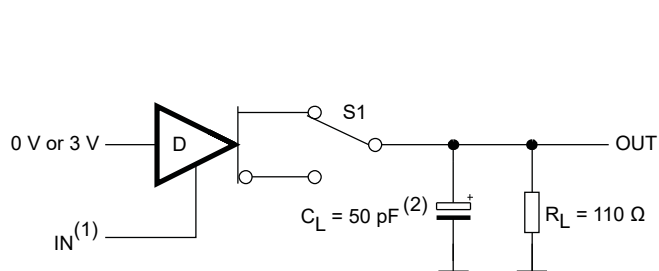
TEST CIRCUITS



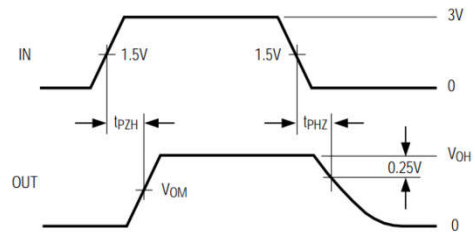
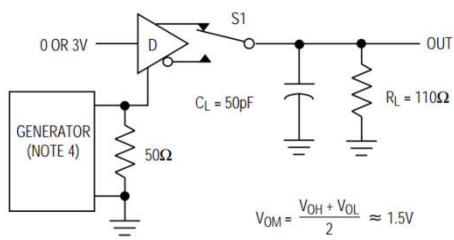
Driver and VOC test load



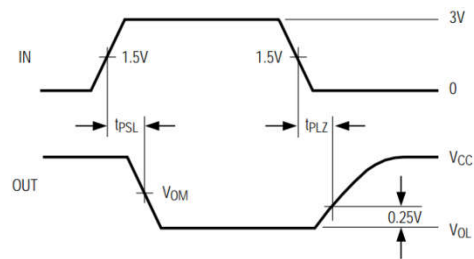
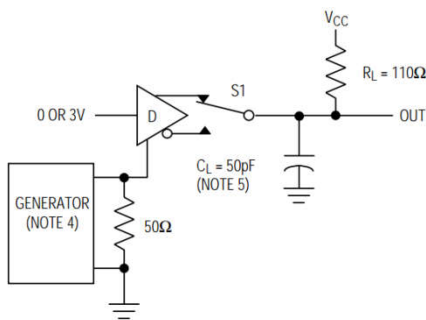
Driver differential delay and transition time



Drive propagation delay



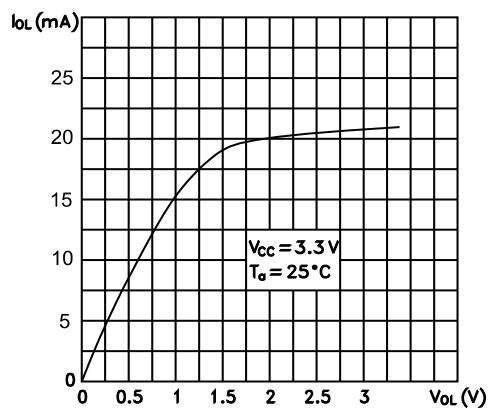
Drive enable and disable time



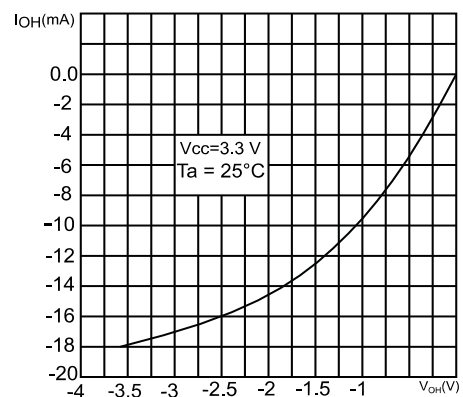
Drive enable and disable times test circuit (pull-up configuration)

TYPICAL CHARACTERISTICS

Receiver output current vs. output low voltage

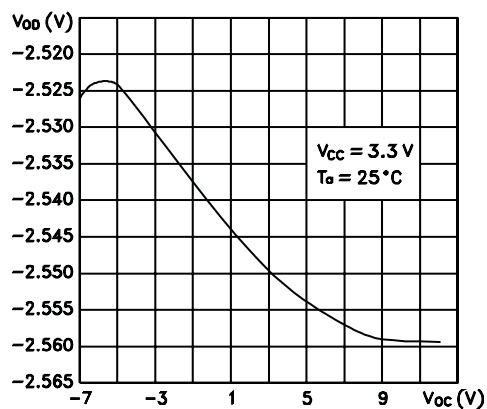


Receiver output current vs. output high voltage

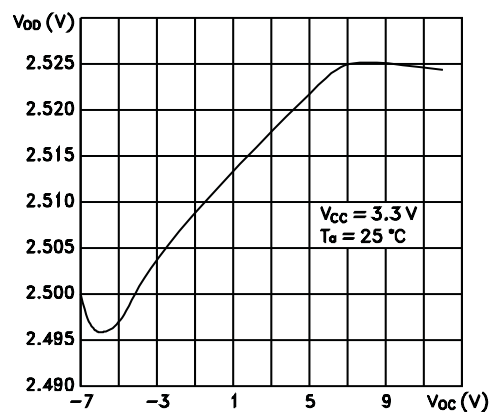




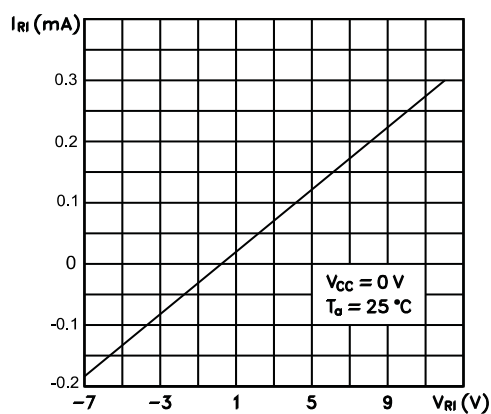
Low level driver output capability



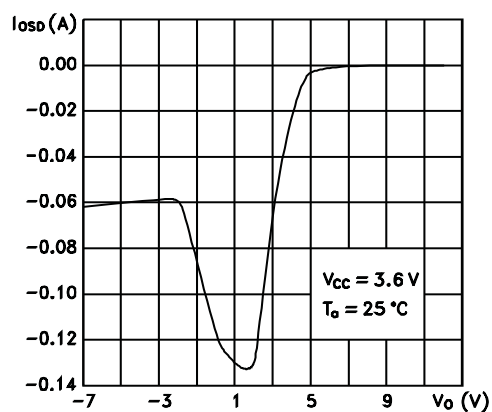
High level driver output capability



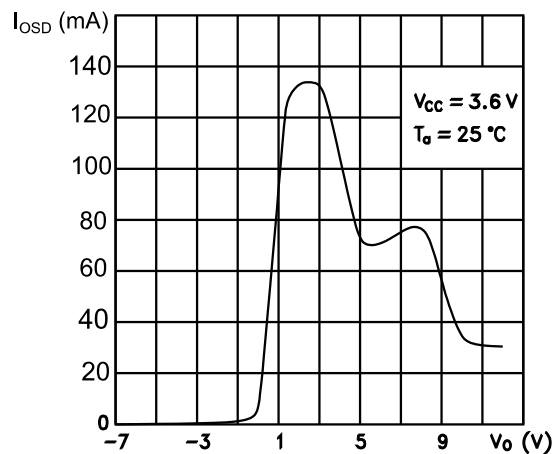
Receiver input characteristics



Driver short-circuit current



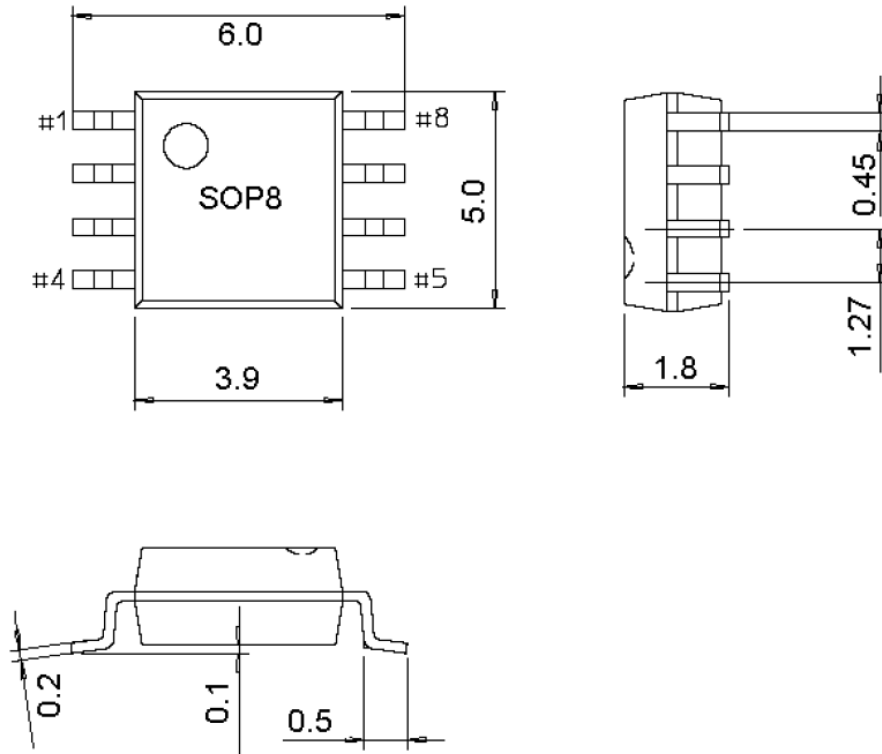
Driver short-circuit current





PACKAGE OUTLINE DIMENSIONS

SOP-8(SOIC-8)





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