



DESCRIPTION

The SN65LBC184DRG4 is a half-duplex RS-485 transceiver with $\pm 15\text{kV}$ IEC 61000-4-2 contact discharge protection. The SN65LBC184DRG4 contains one driver and one receiver. The device features fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or shorted. This means that the receiver output will be logic high even if all transmitters on a terminated bus are disabled. The SN65LBC184DRG4 features reduced slew-rate driver that minimizes EMI and reduces reflections caused by improperly terminated cables, allowing error-free data transmission up to 500kbps. The SN65LBC184DRG4 has a 1/8-unit load receiver input impedance that allows up to 256 transceivers on the bus.

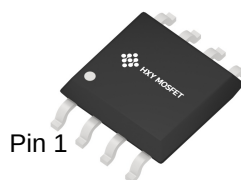
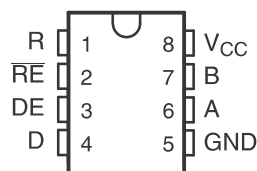
FEATURES

TIA/EIA RS-485/RS-422 compliant ESD protection
Integrated Transient Voltage Suppression
Contact discharge $\pm 15\text{KV}$
Data rates: 500 kbps
Half-duplex Reduced slew rates for low EMI
Common-mode input range: -7V to $+12\text{V}$

APPLICATIONS

RS-485 Communications
Level Translators
Transceivers for EMI-Sensitive Applications
Industrial Control Local Area Networks
Energy Meter Networks
Lighting Systems

PIN CONFIGURATION



SOP-8(SOIC-8)

Pin Functions

PIN		I/O	DESCRIPTION
NAME	NO.		
A	6	Bus input/output	Driver output or receiver input (complementary to B)
B	7	Bus input/output	Driver output or receiver input (complementary to A)
D	4	Digital input	Driver data input
DE	3	Digital input	Active-HIGH driver enable
GND	5	Reference potential	Local device ground
R	1	Digital output	Receiver data output
$\overline{\text{RE}}$	2	Digital input	Active-LOW receiver enable
V _{CC}	8	Supply	4.75-V to 5.25-V supply



FEATUER DESCRIPTION

Transmitting				
Inputs			Outputs	
/RE	DE	DI	B	A
X	1	1	0	1
X	1	0	1	0
0	0	X	High-Z	High-Z
1	0	X	Shutdown	

Receiving			
Inputs		Outputs	
/RE	DE	A-B	RO
0	X	$\geq -0.05V$	1
0	X	$\leq -0.2V$	0
0	X	Open/shorted	1
1	1	X	High-Z
1	0	X	Shutdown

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Units
Power Supply	V_{CC}	+7	V
Control Input Voltage	/RE, DE	-0.3 to $V_{CC}+0.3$	V
Transmitter Input Voltage	DI	-0.3 to $V_{CC}+0.3$	V
Transmitter Output Voltage	A, B	-8 to +13	V
Receiver Input Voltage	A, B	-8 to +13	V
Receiver Output Voltage	RO	-0.3 to $V_{CC}+0.3$	V
Operating Temperature	--	-25 to +85	°C



RECOMMENDED OPERATING CONDITIONS

($V_{CC}=+5V\pm5\%$, $T_A=-40^{\circ}C\sim+85^{\circ}C$, Typical Values are $V_{CC}=+5V$ and $T_A=25^{\circ}C$) (Note 1)

Parameter	Symbol	Conditions		MIN	TYP	MAX	UNITS
Power Supply	V _{CC}			4.5		5.5	V
Driver							
Differential Driver Output (no load)	V _{OD1}	Figure 1				5	V
Differential Driver Output	V _{OD2}	Figure 1, R = 27 Ω		1.5			V
Change in Magnitude of Differential Output Voltage (Note 2)	ΔV _{OD}	Figure 1, R = 27 Ω				0.2	V
Driver Common-mode Output Voltage	V _{OC}	Figure 1, R = 27 Ω				3	V
Change in Magnitude of Common-Mode	ΔV _{OC}	Figure 1, R = 27 Ω				0.2	V
Input High Voltage	V _{IH1}	DE, DI, /RE		2.0			V
Input Low Voltage	V _{IL1}	DE, DI, /RE				0.8	V
DI Input Hysteresis	V _{HYS}				100		mV
Input Current (A and B)	I _{IN4}	DE = GND, V _{CC} = GND or 5.25V	V _{IN} = 12 V			125	μA
			V _{IN} = -7 V			-75	
Driver Short-Circuit Output Current	I _{OSD}	-7V ≦ V _{OUT} ≦ V _{CC}		-100			mA
		0V ≦ V _{OUT} ≦ 12V				100	
Receiver							
Receiver Differential Threshold Voltage	V _{TH}	-7V ≦ V _{CM} ≦ 12V		-200	-125	-50	mV
Receive Input Hysteresis	ΔV _{TH}				40		mV
Receiver Output High Voltage	V _{OH}	I _O = -4 mA,V _{ID} = -50 mV		V _{CC} -1.5			V
Receiver Output Low Voltage	V _{OL}	I _O = 4 mA,V _{ID} = -200 mV				0.4	V
Three-State Output Current at Receiver	I _{OZR}	0.4V ≦ V _O ≦ 2.4V				±1	μA
Receive Input Resistance	R _{IN}	-7V ≦ V _{CM} ≦ 12V		96			kΩ
Receiver Output Short-Circuit Current	I _{OSR}	0V ≦ V _{RO} ≦ V _{CC}		±7		±95	mA
Supply Current							
Supply Current	I _{CC}	No load; /RE = DI = GND or V _{CC}	DE = V _{CC}		150	600	μA
			DE = GND		185	600	μA
Supply Current in Shutdown Mode	I _{SHDN}	DE = GND, /RE = V _{CC} , DI = V _{CC} or GND				10	μA

Note 1: All currents into the device are positive. All currents out of the device are negative. All voltages are referred to device ground unless otherwise noted.

Note 2: ΔV_{OD} and ΔV_{OC} are the changes in V_{OD} and V_{OC} , respectively, when the DI input changes state.



SWITCHING CHARACTERISTICS

($V_{CC}=+5V\pm5\%$, $T_A=-40^{\circ}C\sim+85^{\circ}C$, Typical Values are $V_{CC}=+5V$ and $T_A=25^{\circ}C$)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNITS
Driver Input to Output	T_{DPLH}	Figure 3 and 5, $R_{DIFF} = 54\ \Omega$ $C_{L1} = C_{L2} = 100\ pF$		450	800	ns
	T_{DPHL}			450	800	
Driver Output Skew $ T_{DPLH} - T_{DPHL} $	T_{DSKEW}	Figure 3 and 5, $R_{DIFF} = 54\ \Omega$ $C_{L1} = C_{L2} = 100\ pF$			100	ns
Driver Rise or Fall Time	T_{DR}, T_{DF}	Figure 3 and 5, $R_{DIFF} = 54\ \Omega$ $C_{L1} = C_{L2} = 100\ pF$		150	500	ns
Maximum Data Rate	F_{MAX}		500			kbps
Driver Enable to Output High	T_{DZH}	Figure 4 and 6, $C_L = 100\ pF$, S2			200	ns
Driver Enable to Output Low	T_{DZL}	Figure 4 and 6, $C_L = 100\ pF$, S1			200	ns
Driver Disable Time from Low	T_{DLZ}	Figure 4 and 6, $C_L = 15\ pF$, S1			300	ns
Driver Disable Time from High	T_{DHz}	Figure 4 and 6, $C_L = 15\ pF$, S2			300	ns
Receiver Input to Output	T_{RPLH}	Figure 7 and 9, $ V_{ID} \geq 2.0V$, rise and fall time of $V_{ID} \leq 1\ ns$		450	800	ns
	T_{RPHL}					
$ T_{RPLH} - T_{RPHL} $ Differential Receiver Skew	T_{RSKD}	Figure 7 and 9, $ V_{ID} \geq 2.0V$, rise and fall time of $V_{ID} \leq 15ns$		30		ns
Receiver Enable to Output Low	T_{RZL}	Figure 2 and 8, $C_L = 100\ pF$, S1		20	50	ns
Receiver Enable to Output High	T_{RZH}	Figure 2 and 8, $C_L = 100\ pF$, S2 Closed		20	50	ns
Receiver Disable Time from Low	T_{RLZ}	Figure 2 and 8, $C_L = 100\ pF$, S1 Closed		80	150	ns
Receiver Disable Time from High	T_{RHZ}	Figure 2 and 8, $C_L = 100\ pF$, S2 Closed		80	150	ns
Time to Shutdown	T_{SHDN}			50	300	ns
Driver Enable from Shutdown to Output High	$T_{DZH(SHDN)}$	Figure 4 and 6, $C_L = 15\ pF$, S2 Closed			200	ns
Driver Enable from Shutdown to Output Low	$T_{DZL(SHDN)}$	Figure 4 and 6, $C_L = 15\ pF$, S1 Closed			200	ns
Receiver Enable from Shutdown to Output High	$T_{RZH(SHDN)}$	Figure 2 and 8, $C_L = 100\ pF$, S2 Closed			300	ns
Receiver Enable from Shutdown to Output Low	$T_{RZL(SHDN)}$	Figure 2 and 8, $C_L = 100\ pF$, S1 Closed			300	ns



TEST CIRCUITS AND TIMING DIAGRAMS

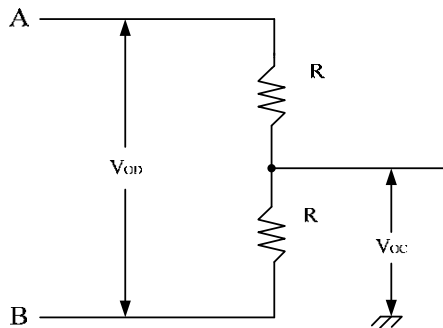


Figure 1: Driver DC Test Load

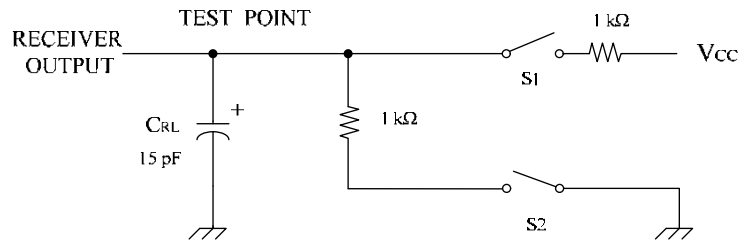


Figure 2: Receiver Enable/Disable Timing Test Load

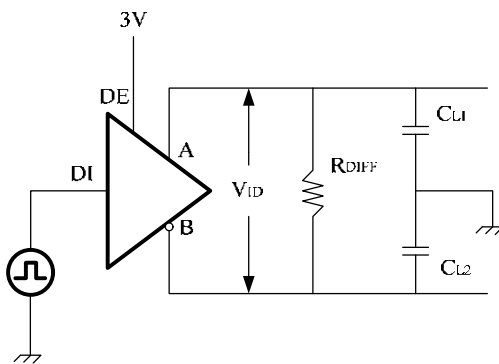


Figure 3: Driver Timing Test Circuit

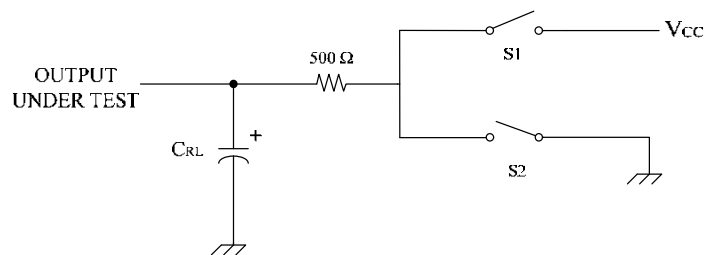


Figure 4: Driver Enable/Disable Timing test Load

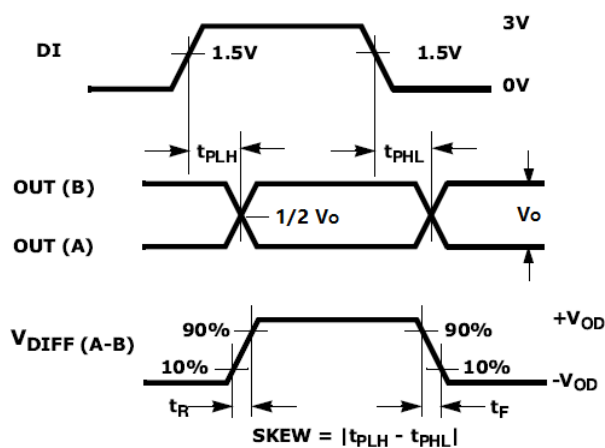


Figure 5: Driver Propagation Delays

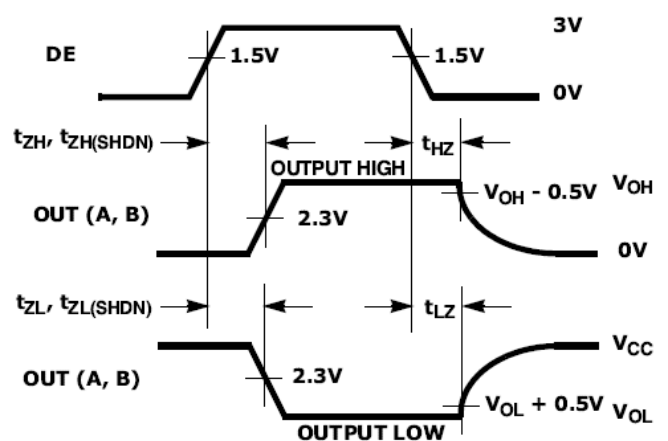


Figure 6: Driver Enable and Disable Times

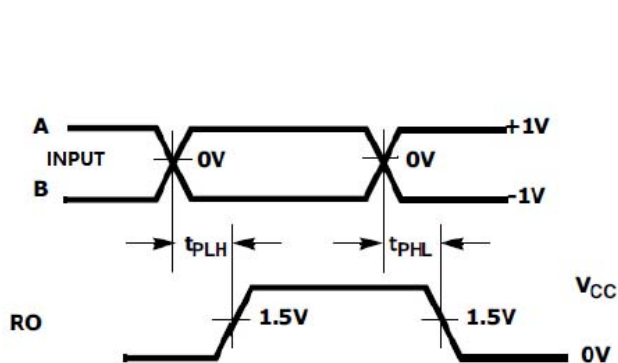


Figure 7: Receiver Propagation Delays

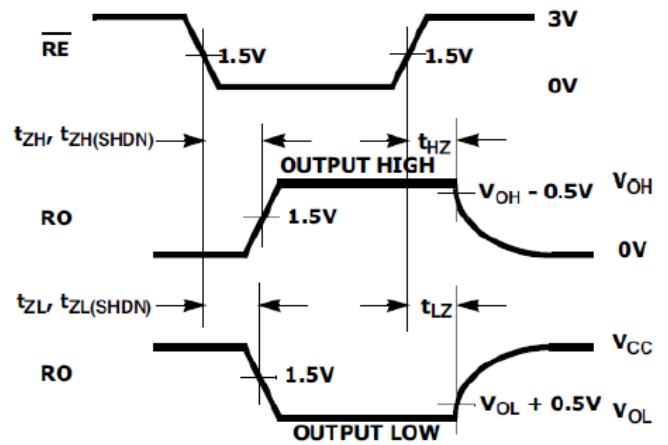


Figure 8: Receiver Enable and Disable Times

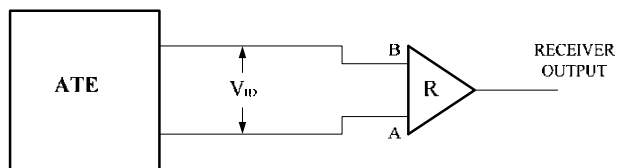
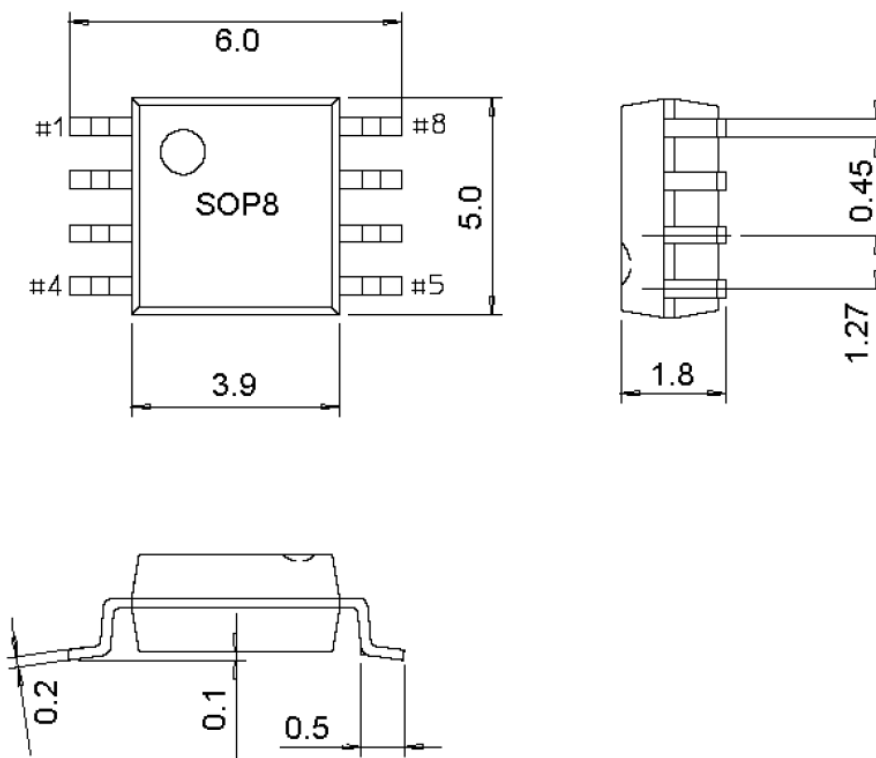


Figure 9: Receiver Propagation Delay Test Circuit



PACKAGE OUTLINE DIMENSIONS

SOP-8(SOIC-8)





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