

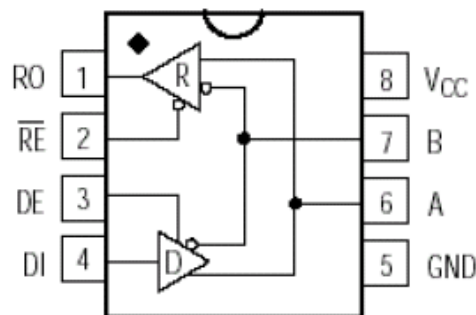
## High ESD-Protected, Fail-Safe, Slew-Rate-Limited

### RS-485 Transceivers

#### General Description

The BL3085B is a half-duplex RS-485 transceiver with  $\pm 18\text{kV}$  IEC 61000-4-2 contact discharge protection. The BL3085B 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 BL3085B features reduced slew-rate driver that minimizes EMI and reduces reflections caused by improperly terminated cables, allowing error-free data transmission up to 250kbps. The BL3085B has a  $1/8$  unit load receiver input impedance that allows up to 256 transceivers on the bus.

#### Configuration



Functional Block of BL3085B

#### Applications

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

## Pin Function Description

Pin Number	Name	Function
1	RO	Receiver Output.
2	/RE	Receiver Output Enable. /RE is low to enable the Receiver; /RE is high to disable the Receiver.
3	DE	Driver Output Enable: DE is high to enable the Driver; DE is low to disable the Driver.
4	DI	Driver Input
5	GND	Ground.
6	A	Non-inverting Receiver Input and Non-inverting Driver Output.
7	B	Inverting Receiver Input and Inverting Driver Output.
8	V <sub>CC</sub>	Power Supply.

## Function Table

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		-40 to +85	°C

## DC Electrical Characteristics

( $V_{CC}=+5V\pm 5\%$ ,  $T_A=-40^{\circ}C\sim +85^{\circ}C$ , 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
<b>Driver</b>						
Differential Driver Output(no load)	$V_{OD1}$	Figure 1			5	V
Differential Driver Output	$V_{OD2}$	Figure 1, $R=27\Omega$	1.5			V
Change in Magnitude of Differential Output Voltage (Note 2)	$\Delta V_{OD}$	Figure 1, $R=27\Omega$			0.2	V
Driver Common-mode Output Voltage	$V_{OC}$	Figure 1, $R=27\Omega$			3	V
Change in Magnitude of Common-Mode Voltage (Note 2)	$\Delta V_{OC}$	Figure 1, $R=27\Omega$			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	$V_{IN}=12V$		125	$\mu A$	
		$V_{CC}=GND$ 5.25V	or $V_{IN}=-7V$		-75		
Driver Short-Circuit Output Current	$I_{OSD}$	$-7V \leq V_{OUT} \leq V_{CC}$		-100		$mA$	
		$0V \leq V_{OUT} \leq 12V$			100		
<b>Receiver</b>							
Receiver Differential Threshold Voltage	$V_{TH}$	$-7V \leq V_{CM} \leq 12V$		-200	-125	-50	mV
Receiver Input Hysteresis	$\Delta V_{TH}$				40		mV
Receiver Output High Voltage	$V_{OH}$	$I_O=-4mA, V_{ID}=-50mV$		$V_{CC}-1.5$			V
Receiver Output Low Voltage	$V_{OL}$	$I_O=4mA, V_{ID}=-200mV$				0.4	V
Three-State Output Current at Receiver	$I_{OZR}$	$0.4V \leq V_O \leq 2.4V$				$\pm 1$	$\mu A$
Receiver Input Resistance	$R_{IN}$	$-7V \leq V_{CM} \leq 12V$		96			K $\Omega$
Receiver Output Short-Circuit Current	$I_{OSR}$	$0V \leq V_{RO} \leq V_{CC}$		$\pm 7$		$\pm 95$	$mA$
<b>Supply Current</b>							
Supply Current	$I_{CC}$	No load ,/RE=DI= GND or $V_{CC}$	DE= $V_{CC}$		150	600	$\mu A$
			DE=GND		185	600	$\mu A$
Supply Current in Shutdown Mode	$I_{SHDN}$	DE=GND, /RE= $V_{CC}$ , DI= $V_{CC}$ or GND				10	$\mu A$

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:  $\Delta V_{OD}$  and  $\Delta V_{OC}$  are the changes in  $V_{OD}$  and  $V_{OC}$ , respectively, when the DI input changes state.

## Switching Characteristics

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

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNITS
Driver Input to Output	$T_{DPLH}$	Figure 3 and 5, $R_{DIFF}=54\Omega$		450	800	ns
	$T_{DPLH}$	$C_{L1}=C_{L2}=100pF$		450	800	

Driver Output Skew $ T_{DPLH} - T_{DPHL} $	$T_{DSKEW}$	Figure 3 and 5, $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$			100	ns
Driver Rise or Fall Time	$T_{DR}, T_{DF}$	Figure 3 and 5, $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$		150	500	ns
Maximum Data Rate	$F_{MAX}$		250			kbps
Driver Enable to Output High	$T_{DZH}$	Figure 4 and 6, $C_L=100pF$ S2 Closed			200	ns
Driver Enable to Output Low	$T_{DZL}$	Figure 4 and 6, $C_L=100pF$ S1 Closed			200	ns
Driver Disable Time from Low	$T_{DLZ}$	Figure 4 and 6, $C_L=15pF$ S1 Closed			300	ns
Driver Disable Time from High	$T_{DHZ}$	Figure 4 and 6, $C_L=15pF$ S2 Closed			300	ns
Receiver Input to Output	$T_{RPLH}$ $T_{RPHL}$	Figure 7 and 9, $ V_{ID}  \geq 2.0V$ ; rise and fall time of $V_{ID} \leq 15ns$		450	800	ns
$ 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, $C_L=100pF$ S1 Closed		20	50	ns
Receiver Enable to Output High	$T_{RZH}$	Figure 2 and 8, $C_L=100pF$ S2 Closed		20	50	ns
Receiver Disable Time from Low	$T_{RLZ}$	Figure 2 and 8, $C_L=100pF$ S1 Closed		80	150	ns
Receiver Disable Time from High	$T_{RHZ}$	Figure 2 and 8, $C_L=100pF$ 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, $C_L=15pF$ S2 Closed			200	ns
Driver Enable from Shutdown to Output Low	$T_{DZL(SHDN)}$	Figure 4 and 6, $C_L=15pF$ S1 Closed			200	ns
Receiver Enable from Shutdown to Output High	$T_{RZH(SHDN)}$	Figure 2 and 8, $C_L=100pF$ S2 Closed			300	ns
Receiver Enable from Shutdown to Output Low	$T_{RZL(SHDN)}$	Figure 2 and 8, $C_L=100pF$ S1 Closed			300	ns

## Test Circuits and Timing Diagrams

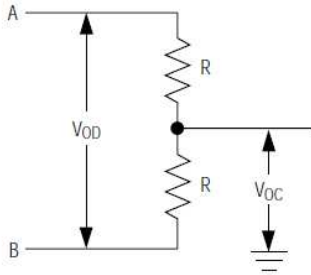


Figure 1: Driver DC Test Load

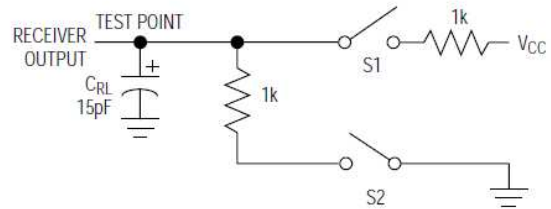


Figure 2: Receiver Enable/Disable Timing Test Load

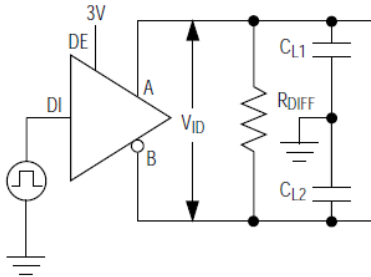


Figure 3: Driver Timing Test Circuit

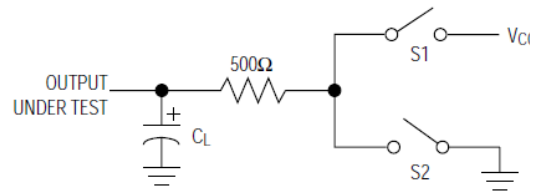


Figure 4: Driver Enable/Disable Timing test Load

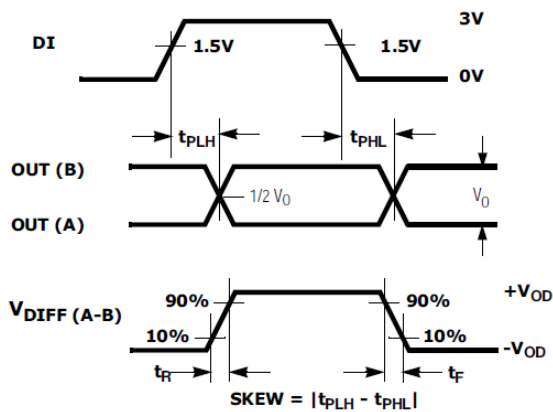


Figure 5: Driver Propagation Delays

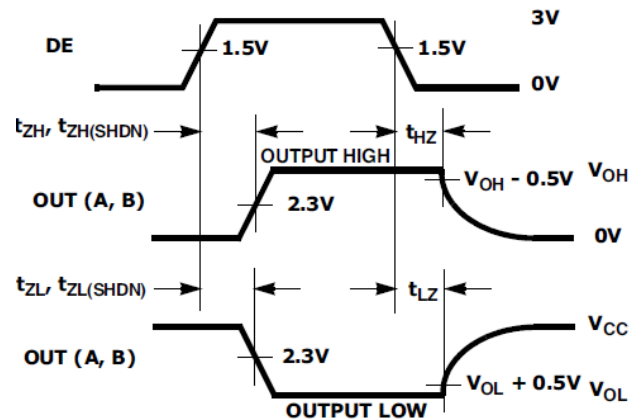


Figure 6: Driver Enable and Disable Times

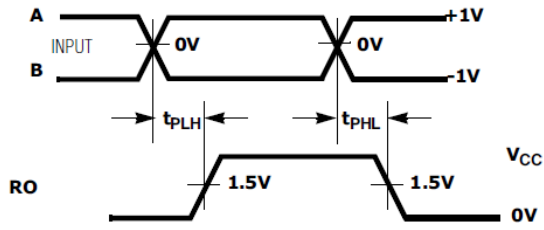


Figure 7: Receiver Propagation Delays

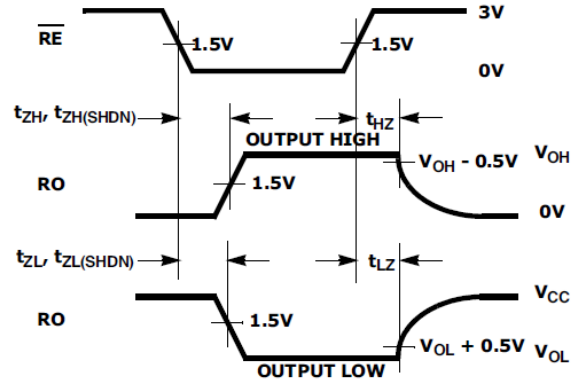


Figure 8: Receiver Enable and Disable Times

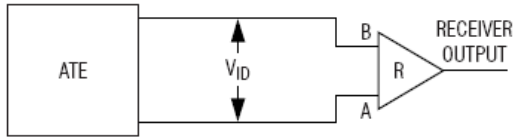
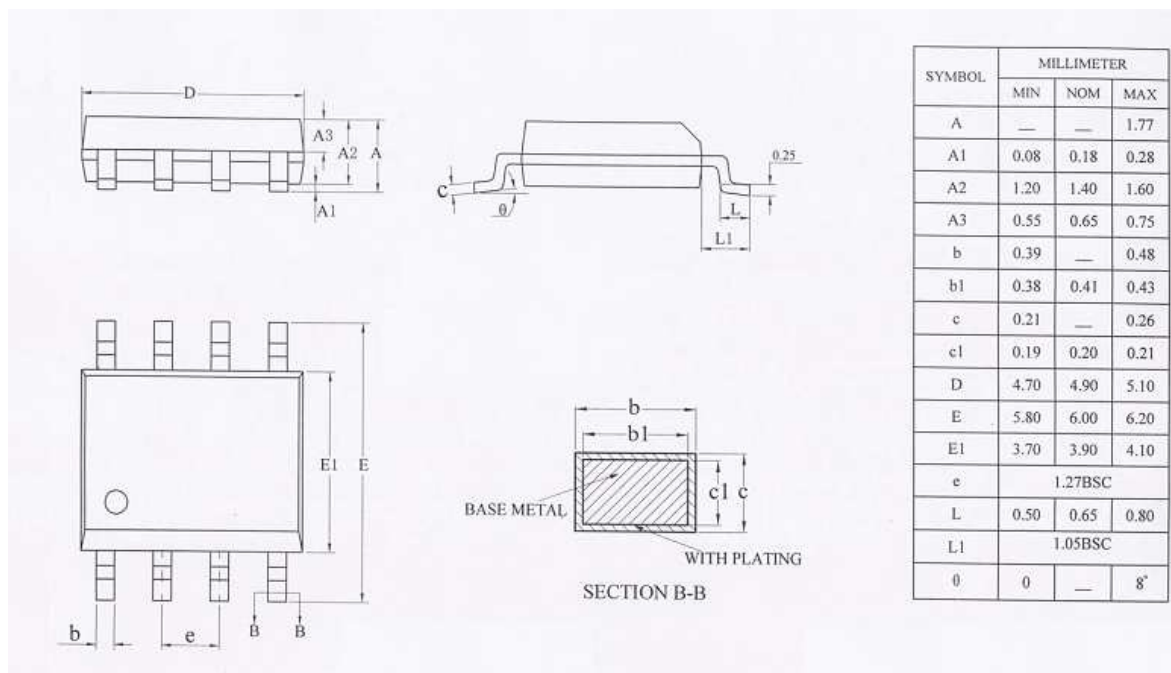


Figure 9: Receiver Propagation Delay Test Circuit

## Package Information SOP8L





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