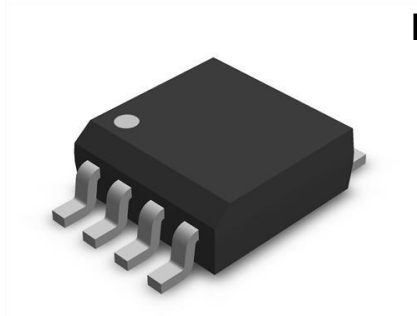


High ESD-Protected, RS-485 Transceivers

**RoHS****Features**

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

Description

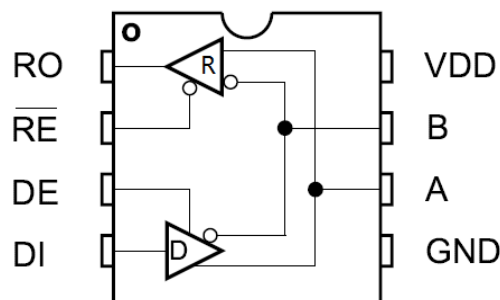
The TC3085 is a half-duplex RS-485 transceiver with ± 15 kV IEC 61000-4-2 contact discharge protection. The TC3085 contains one driver and one receiver. The device features fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or shorted. This means that the receiver output will be logic high even if all transmitters on a terminated bus are disabled. The TC3085 features reduced slew-rate driver that minimizes EMI and reduces reflections caused by improperly terminated cables, allowing error-free data transmission up to 500 kbps. The TC3085 has a 1/8 unit load receiver input impedance that allows up to 256 transceivers on the bus.

Applications

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

Mechanical Data

- SOP8 package
- Molding compound flammability rating: UL 94V-0
- Packaging: Tape and Reel
- RoHS/WEEE Compliant

Typical Application & PIN Configuration

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	VCC	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 Rating

Parameter	Symbol	Rating	Units
Power Supply	VCC	+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

Electrical Performance

 ($V_{CC}=+5V\pm 5\%$, $T_A=-40^{\circ}C \sim +85^{\circ}C$, 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	
Driver							
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)	ΔV_{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)	ΔV_{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 , $V_{CC}=GND$ or $5.25V$	$V_{IN}=12V$		125	μA	
			$V_{IN}=-7V$		-75		
Driver Short-Circuit Output Current	I_{OSD}	$-7V \leq V_{OUT} \leq V_{CC}$	-100			mA	
		$0V \leq V_{OUT} \leq 12V$			100		
Receiver							
Receiver Differential Threshold Voltage	V_{TH}	$-7V \leq V_{CM} \leq 12V$	-200	-125	-50	mV	
Receive Input Hysteresis	ΔV_{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}	$0.4V \leq V_O \leq 2.4V$			± 1	μA	
Receive Input Resistance	R_{IN}	$-7V \leq V_{CM} \leq 12V$	96			k Ω	
Receiver Output Short-Circuit Current	I_{OSR}	$0V \leq V_{RO} \leq V_{CC}$	± 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

($V_{CC}=+5V\pm 5\%$, $T_A=-40^{\circ}C\sim +85^{\circ}C$, 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, $R_{DIFF}=54\ \Omega$		450	800	ns
	T_{DPHL}	$C_{L1}=C_{L2}=100\ pF$		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 Closed			200	ns
Driver Enable to Output	T_{DZL}	Figure 4 and 6, $C_L=100\ pF$, S1 Closed			200	ns
Driver Disable Time from Low	T_{DLZ}	Figure 4 and 6, $C_L=15\ pF$, S1 Closed			300	ns
Driver Disable Time from High	T_{DHZ}	Figure 4 and 6, $C_L=15\ pF$, 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, $C_L=100\ pF$, S1 Closed		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

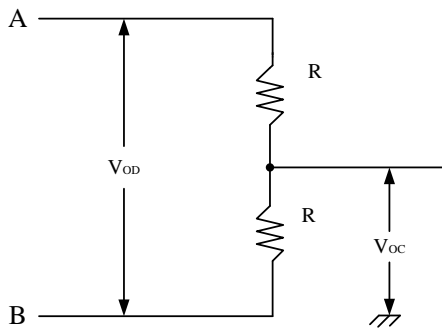


Figure 1: Driver DC Test Load

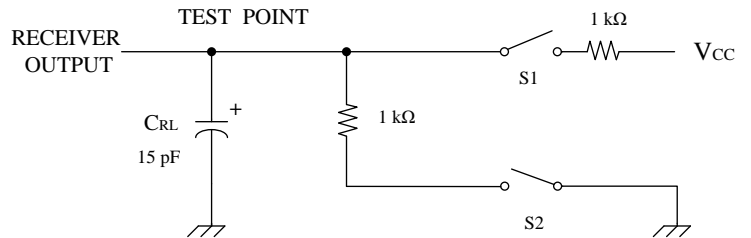


Figure 2: Receiver Enable/Disable Timing Test Load

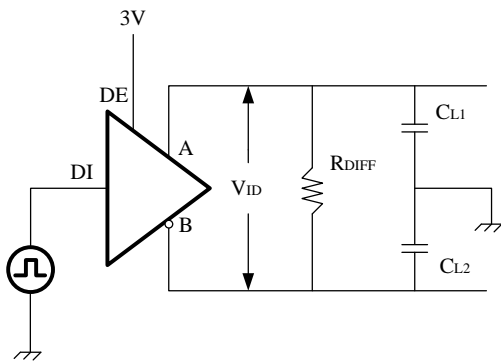


Figure 3: Driver Timing Test Circuit

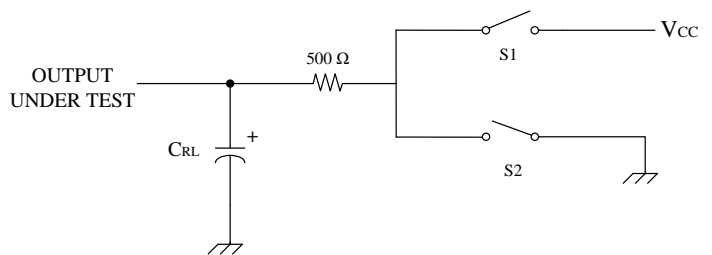


Figure 4: Driver Enable/Disable Timing test Load

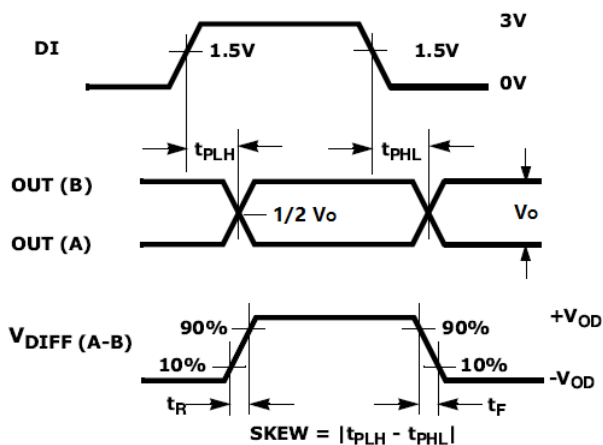


Figure 5: Driver Propagation Delays

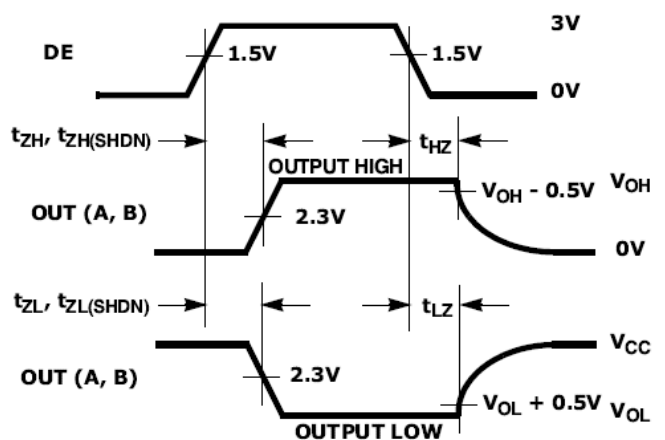


Figure 6: Driver Enable and Disable Times

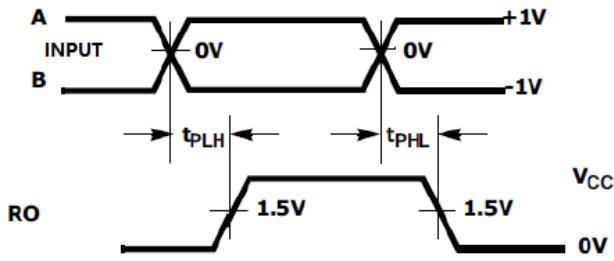


Figure 7: Receiver Propagation Delays

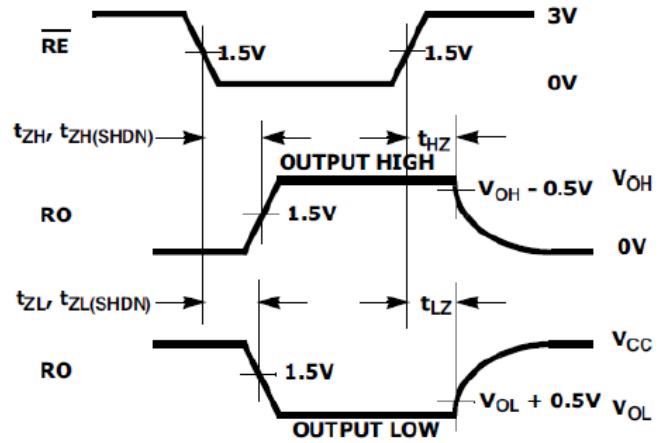


Figure 8: Receiver Enable and Disable Times

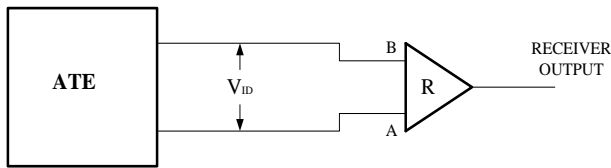


Figure 9: Receiver Propagation Delay Test Circuit

Outline Drawing – SOP8

PACKAGE OUTLINE

SYMBOL	INCHES		MILIMETER	
	MIN	MAX	MIN	MAX
A	0.054	0.068	1.35	1.75
a1	0.004	0.008	0.10	0.25
a2	0.050	0.060	1.25	1.50
D	0.189	0.196	4.80	5.00
F	0.150	0.157	3.80	4.00
E	0.229	0.244	5.80	6.20
b	0.014	0.022	0.35	0.56
b1	0.007	0.010	0.18	0.25
C	0.010	0.020	0.25	0.50
e	0.05BSC		1.27BSC	
L	0.016	0.049	0.40	1.25
θ	0°	10°	0°	10°

DIM	INCHES	MILLIMETERS
C	0.205	5.20
G	0.160	4.06
P	0.050	1.27
X	0.015	0.38
Y	0.045	1.14
Z	0.291	7.40

Notes

1. This land pattern is for reference purposes only consult your manufacturing group to ensure your company's manufacturing guidelines are met. Reference ipc-sm-782a..

Ordering information

Order code	Marking	Package	Base qty	Delivery mode
TC3085	TC3085	SOP8	3000	Tape and reel