+15kV ESD Protected、1Mbps Data Rate RS-485

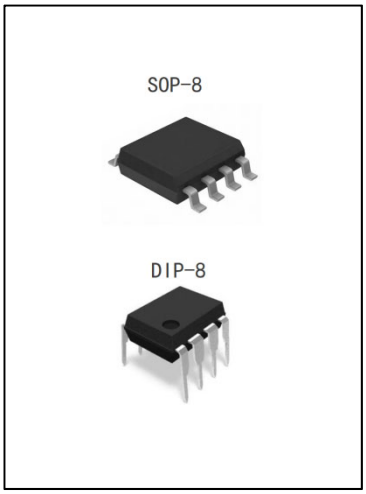
MAX3085

General Description

The MAX3085 is a half-duplex high speed transceiver for RS-485 and RS422 communication. IC contains one driver and one receiver.

The MAX3085 has a fail-safe circuit, ensure logical high level of receiver output when receiver input is open or short. It can achieve error-free data transmission of up to 500kbps.

The MAX3085 receiver has 1/8 unit load input impedance, allows up to 256 devices can be attached to the bus.



Features

- ESD protection：+15kV HBM
- Fractional unit load allows up to 256 devices on the bus
- + 5V operating voltage
- Data transmission up to 1Mbps
- Tri-state output
- SOP8 and DIP8 package

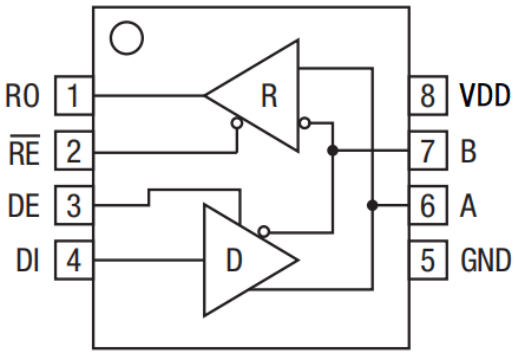
Applications

- RS-485/RS-422 transceiver
- Industrial process control
- Electric meter
- Industrial motor drive
- Automatic HVAC system

Order specification

Part No	Package	Manner of Packing	Devices per bag/reel
MAX3085	SOP8	Reel	4000

Block Diagram and Pin Arrangement Diagram



Pin Assignment

Pin No.	Pin Name	Description	I/O
1	RO	Receiver output: If A-B≥-0.05V，RO will be high; If A-B≤-0.2V，RO will be low; If A and B are open or shorted，RO will be high.	O
2	$\overline{RE}$	Receiver output enable: RO is enabled when $\overline{RE}$ is low; RO is high impedance when $\overline{RE}$ is high.	I
3	DE	Driver output enable: The driver outputs，A and B are enabled by bringing DE high. They are high impedance when DE is low.	I
4	DI	Driver input: A low on DI forces output A low and output B high. Similarly, a high on DI forces output A high and output B low.	I
5	GND	Ground	
6	A	Receiver input and driver output	I/O
7	B	Receiver input and driver output	I/O
8	VDD	Supply voltage	

Functional Description

The MAX3085 is a half-duplex high speed transceiver for RS-485 and RS422 communication. IC contains one driver and one receiver.The MAX3085 receiver has 1/8 unit load input impedance, allows up to 256 devices can be attached to the bus.

Receiver Truth Table

Input			Output
$\overline{RE}$	DE	A - B	RO
L	X	≥-0.05V	H
L	X	≤-0.2V	L
L	X	Open/shorted	H
H	H	X	Z
H	L	X	Z

Driver Truth Table

Input			Output	
$\overline{RE}$	DE	DI	B	A
X	H	H	L	H
X	H	L	H	L
L	L	X	Z	Z
H	L	X	Z	

Absolute Maximum Ratings

Unless specified otherwise, Tamb= 25℃

Parameter	Symbol	Value	Unit
Supply Voltage	V_{DD}	-0.5~6	V
Input Voltage	V_{IN}	-0.5~6	V
Output Voltage	V_{OUT}	GND-0.3~V_{DD}+0.3	V
A/B Input / Output Voltage	$V_{INA/B}$/$V_{OUTA/B}$	-7~12	V
Operating Temperature	T_{amb}	-40~85	℃
Storage Temperature	T_{stg}	-65~150	℃
Soldering Temperature(10s)	T_{sol}	300	℃

DC Electrical Characteristics

Unless specified otherwise，V_{CC}=5V±5%，Tamb= 25°C

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Driver							
Differential driver output	V_{OD1}	No load				5	V
Differential driver output	V_{OD2}	R=50Ω or 27Ω(1)		2.0	3.0		V
Change in magnitude of driver differential output voltage for complementary output states	ΔV_{OD}	R=50Ω or 27Ω(1)				0.2	V
Driver common-mode output voltage	V_{OC}	R=50Ω or 27Ω(1)			V_{DD}/2	3	V
Change in magnitude of driver common-mode output voltage for complementary output states	ΔV_{OC}	R=50Ω or 27Ω(1)				0.2	V
Input high voltage	V_{IH1}	DE、$\overline{RE}$、DI		2.0			V
Input low voltage	V_{IL1}	DE、$\overline{RE}$、DI				0.8	V
Input current	I_{IN1}	DE、$\overline{RE}$、DI				±2	μA
Input current (A, B)	I_{IN2}	DE=GND，V_{CC}= 5V	Vin=5V		40	90	μA
			Vin=-0V		60	100	μA
Receiver							
Differential threshold voltage	V_{TH}	-7V≤V_{CM}≤12V		-250		-10	mV
input hysteresis voltage	ΔV_{TH}				25		mV
output high voltage	V_{OH}	I_O=-4mA		V_{CC}-1.5			V
output low voltage	V_{OL}	I_O=4mA				0.4	V
3-state(high impedance) output current at receiver	I_{OZR}	0.4V≤V_O≤2.4V			±1		μA
input resistance	R_{IN}	-7V≤V_{CM}≤12V		96			kΩ
Receiver short-circuit current	I_{OSR}	0V≤V_{RO}≤V_{DD}			±80		mA
Supply Current	I_{CC}	No load，$\overline{RE}$=DI=GND or V_{DD}	DE=V_{DD}		480	800	μA
			DE=GND		450	700	μA
ESD Protection（A/B）	ESD	Human Body Model		±15			kV

Transmission characteristics

Unless specified otherwise, V_{CC}=5V±5%, Tamb= 25℃

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Driver Input to Output	t_{DPLH}	R_{DIFF}=50Ω, C_{L1}=C_{L2}=100pF(3)(6)	250		1000	ns
Driver Input to Output	t_{DPHL}	R_{DIFF}=50Ω, C_{L1}=C_{L2}=100pF(3)(6)	250		1000	ns
$\|t_{DPLH}-t_{DPHL}\|$	t_{DSKEW}	R_{DIFF}=50Ω, CL1=CL2=100pF(3)(6)		-3	±100	ns
Driver Rise or Fall Time	t_{DR},t_{DF}	R_{DIFF}=50Ω, C_{L1}=C_{L2}=100pF(3)(6)	200		750	ns
Maximum Data Rate	f_{MAX}			1		Mbps
Driver Enable to Output High	t_{DZH}	C_L=100pF, S2 closed(4)(7)			2500	ns
Driver Enable to Output Low	t_{DZL}	C_L=100pF, S1 closed(4)(7)			2500	ns
Driver Disable Time from Low	t_{DLZ}	C_L=15pF, S1 closed(4)(7)			100	ns
Driver Disable Time from Low	t_{DHZ}	C_L=15pF, S2 closed(4)(7)			100	ns
Receiver Input to Output	t_{RPLH}	$\|V_{ID}\|$≥2.0V Rise or Fall Time≤15ns(5)(8)			200	ns
Receiver Input to Output	t_{RPHL}				200	ns
$\|t_{RPLH}-t_{RPHL}\|$	t_{RSKD}	$\|V_{ID}\|$≥2.0V Rise or Fall Time≤15ns(5)(8)		3	±30	ns
Receiver Enable to Output Low	t_{RZL}	C_L=100pF, S1 closed(2)(9)		20	50	ns
Receiver Enable to Output High	t_{RZH}	C_L=100pF, S2 closed(2)(9)		20	50	ns
Receiver Disable Time from Low	t_{RLZ}	C_L=100pF, S1 closed(2)(9)		20	50	ns
Receiver Disable Time from High	t_{RHZ}	C_L=100pF, S2 closed(2)(9)		20	50	ns

Note:

(1) Test circuit is shown in Figure 1
(2) Test circuit is shown in Figure 2
(3) Test circuit is shown in Figure 3
(4) Test circuit is shown in Figure 4
(5) Test circuit is shown in Figure 5
(6) Test circuit is shown in Figure 6
(7) Test circuit is shown in Figure 7
(8) Test circuit is shown in Figure 8

(9) Test circuit is shown in Figure 9

Test Circuit

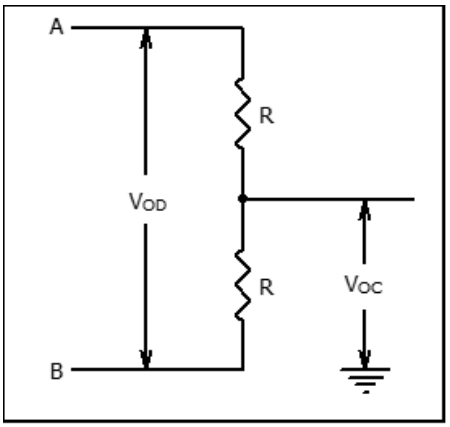


Figure 1 Driver DC Test Load

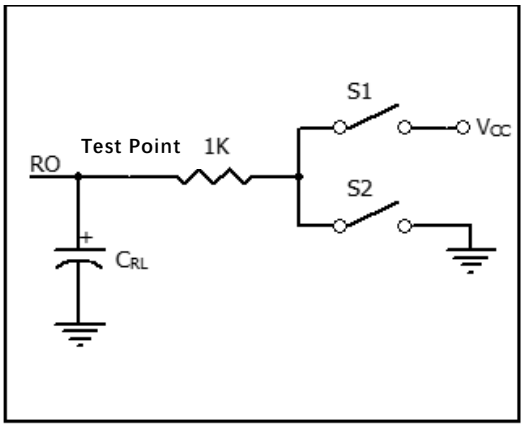


Figure 2 Receiver Enable/Invalid Timing Test Circuit

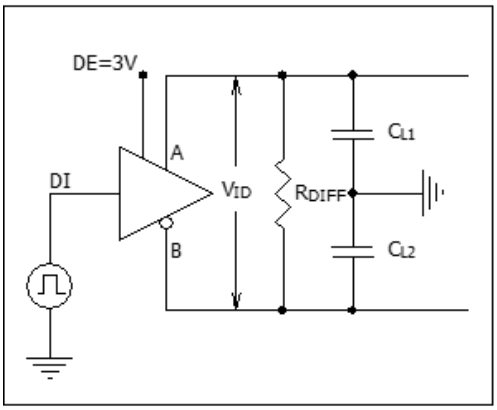


Figure 3 Driver Timing Test Circuit

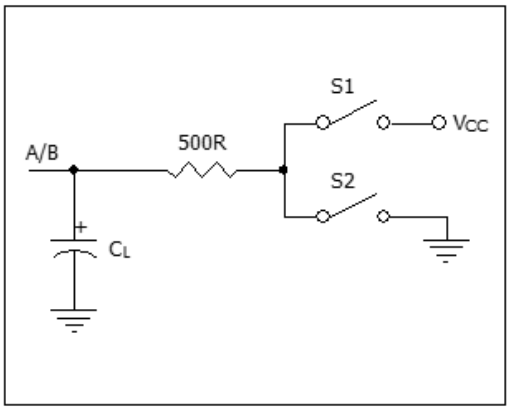


Figure 4 Driver Enable/Invalid Timing Test Circuit

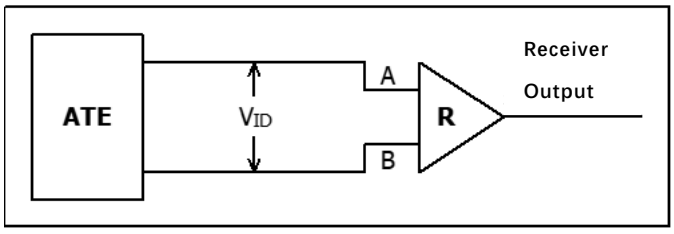


Figure 5 Receiver Propagation Delay Test Circuit

Switching Waveforms

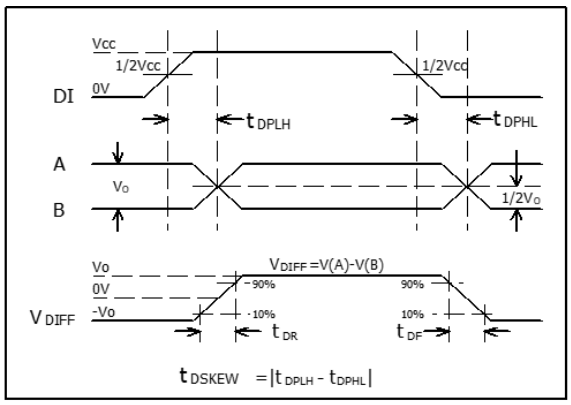


Figure 6 Driver Propagation Delays

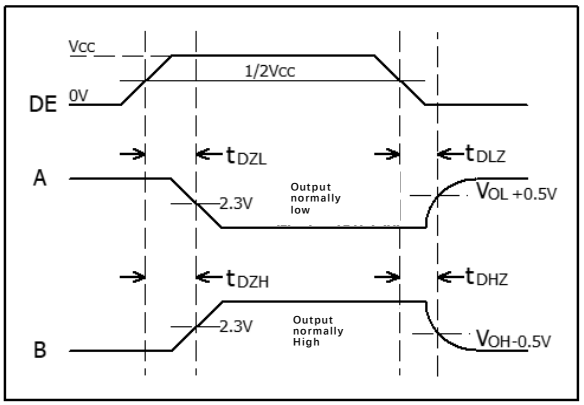


Figure 7 Driver Enable and Disable Times

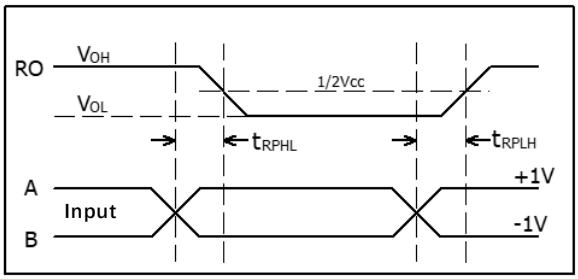


Figure 8 Receiver Propagation Delays

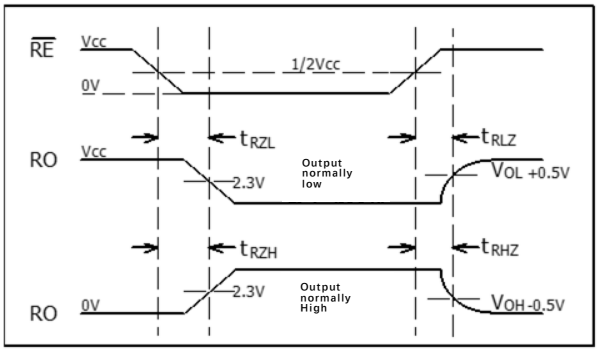


Figure 9 Receiver Enable and Disable Times

Application Circuits

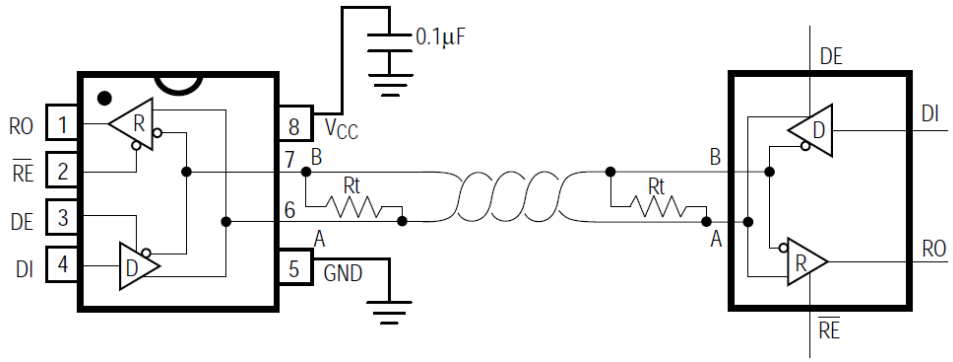


Figure 10 Typical Application Chart

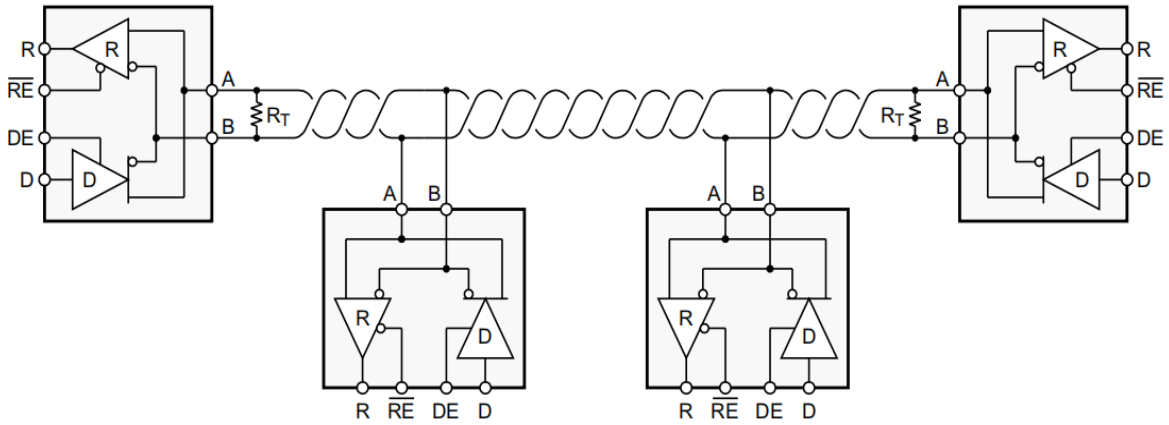
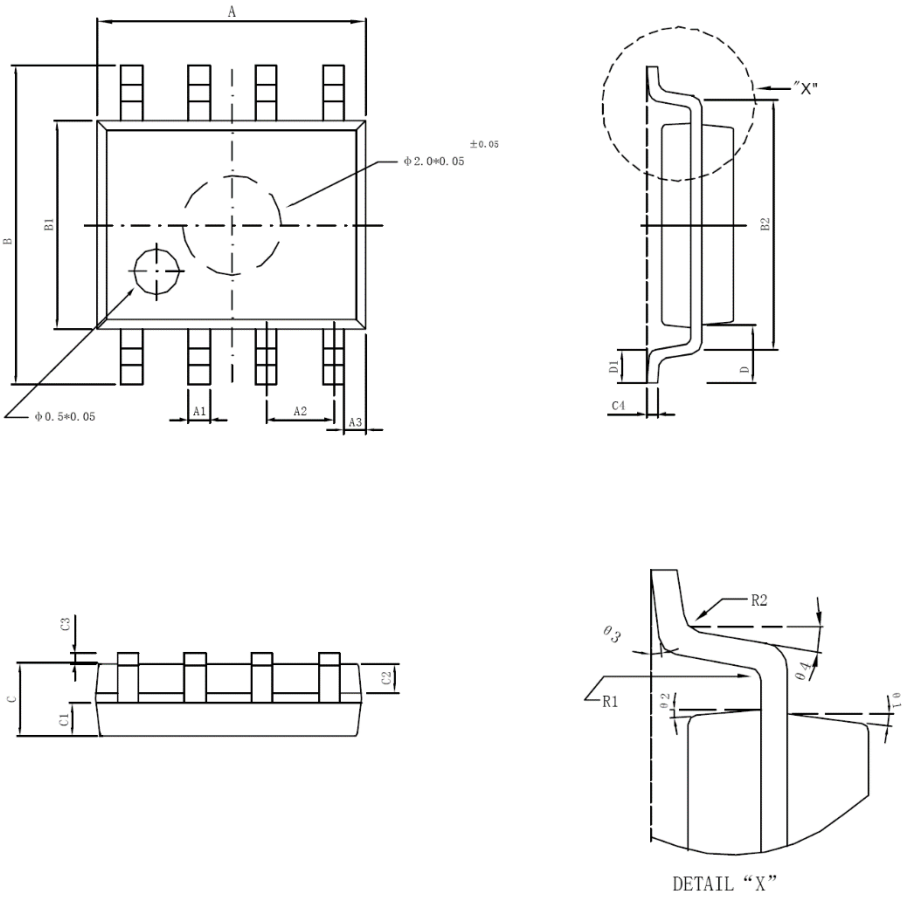


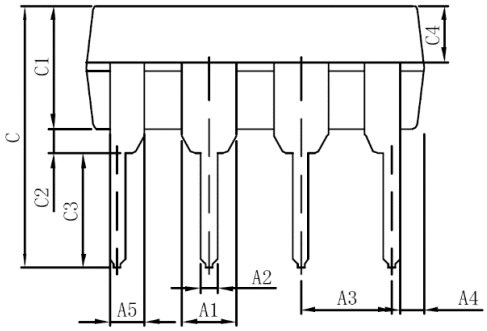
Figure 11 Typical Half-duplex 485 Network

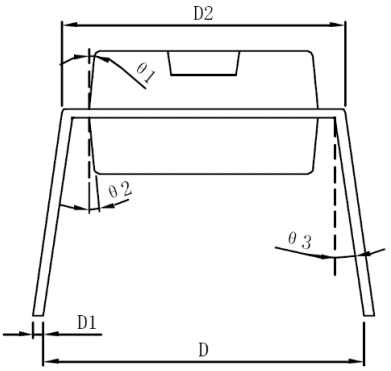
Package Information（SOP8）

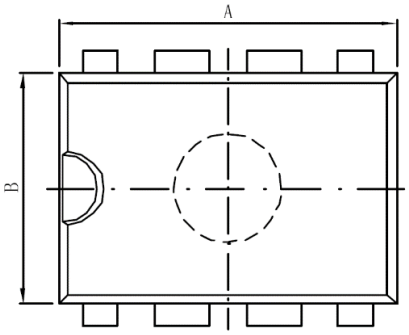


Symbol	Min.（mm）	Max.（mm）	Symbol	Min.（mm）	Max.（mm）
A	4.95	5.15	**C3**	0.10	0.20
A1	0.37	0.47	**C4**	0.20TYP	
A2	1.27TYP		**D**	1.05TYP	
A3	0.41TYP		**D1**	0.50TYP	
B	5.80	6.20	**R1**	0.07TYP	
B1	3.80	4.00	**R2**	0.07TYP	
B2	5.0TYP		**θ1**	17°TYP	
C	1.30	1.50	**θ2**	13°TYP	
C1	0.55	0.65	**θ3**	4°TYP	
C2	0.55	0.65	**θ4**	12°TYP	

Package Information（DIP8）







Symbol	Min.（mm）	Max.（mm）	Symbol	Min.（mm）	Max.（mm）
A	9.30	9.50	**C2**	0.50	
A1	1.524		**C3**	3.3	
A2	0.39	0.53	**C4**	1.57TYP	
A3	2.54		**D**	8.20	8.80
A4	0.66TYP		**D1**	0.20	0.35
A5	0.99TYP		**D2**	7.62	7.87
B	6.3	6.5	**θ1**	8°TYP	
C	7.20		**θ2**	8°TYP	
C1	3.30	3.50	**θ3**	5°TYP	

Special Instructions

The company reserves the right of final interpretation of this specification.

Version Change Description

Version：V1.3	Author：Yangyang	Time：2021.8.12

Modify the record：

1. Re-typesetting the manual and checking some data

Statement

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