



钲地半导体
Tudi Semiconductor

Product Specification

TUDI-MAX3088E

Fail-Safe, High-Speed (10Mbps),
Slew-Rate-Limited RS-485/RS-422 Transceivers

网址 www.sztdbdt.com

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**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



FEATURES

- ESD protection for RS-485 I/O pins $\pm 15\text{kV}$, Human Body Model
- Low current shutdown mode
- Up to 256 transceivers allowed on the bus
- True fail-safe receiver maintains IA/IA-485 compatibility
- Enhanced slew rate limiting to facilitate error-free data transmission

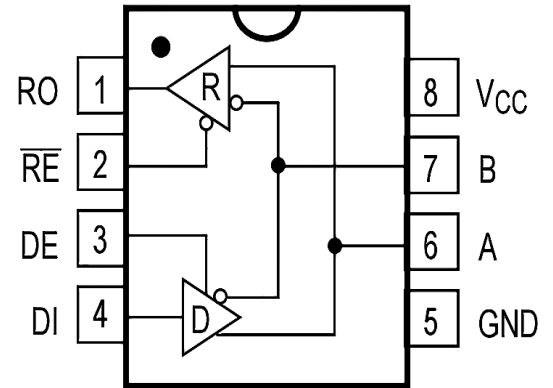


Figure 1. Pin Diagram

Description

The MAX3088E is a high-speed, RS-485/RS-422 communication transceiver with $\pm 15\text{kV}$ ESD protection that contains a driver and a receiver. These devices guarantee a receiver output of logic high when the receiver input is either open or shorted. This means that all the drivers on the terminated bus are disabled (high impedance), the receiver output will be logic high. The driver of the MAX3088E has an unrestricted rate that allows transmission speeds up to 10Mbps. All driver outputs and receiver inputs are protected to $\pm 15\text{kV}$ using the human body model. These transceivers typically consume low power currents into a terminated bus with no load or with the driver disabled. All devices have a receiver input impedance of 1/8 unit load, allowing a of 256 transceivers on a bus. The MAX3088E is for half-duplex communication.

Applications

- RS-422/RS-485 Communications
- Level Translators
- Transceivers for EMI-Sensitive Applications
- Industrial-Control Local Area Networks



Pin description

Pin Number	Pin Name	FUNCTION
1	RO	Receiver Output.When enabled,ifA-B $\geq$ -10mV,then RO=high.IfA-B $\leq$ -200 mV,then RO=low
2	/RE	Receiver Output Enable.Alow level enables the RO;a high level places it in a high impedance state.
3	DE	Driver Output Enable.A high level enables the driver differential outputs,Pin A and Pin B;a low level places the driver in a high impedance state.
4	DI	Driver Input.When the driver is enabled,a logic low on DI forces Pin A low and Pin B high;a logic high on DI forces PinA high and Pin B low.
5	GND	Ground Connection (0V).
6	A	No inverting Receiver Input A/Driver Output A
7	B	Inverting Receiver Input B/Driver Output B.
8	VCC	Power Supply

Parameter limit

PARAMETER	Symbol	Value	Unit
CTR Port	/RE,DE,DI	-0.3~VCC+0.3	V
Driver Output Voltage	A、B	-7~13	V
Receiver Output Voltage	RO	-0.3~VCC+0.3	V
Supply Voltage	VCC	+7	V
Continuous Power Dissipation	MSOP8.SOP8.DIP8	830	mW
Soldering Temperature (reflow)		300	°C
Storage Temperature Range		-60~150	°C
Temperature Range		- 40 ~ 125	°C

Stresses beyond those listed under “Parameter limit” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability



Receiver Switching Characteristics

Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Propagation delay from receiver input to output, from low to high	tRPLH	CL=15pF See Figures 7 and 8		80	150	ns
The propagation delay from receiver input to output is from high to low	tRPHL			80	150	ns
tRPLH-tRPHL	tRPDS			7	10	ns
Enable low time out	tRPZL	CL=15pF See Figures 7 and 8		20	50	ns
Enable to output high time	tRPZH	CL=15pF See Figures 7 and 8		20	50	ns
Time from output low to disable	tpRLZ	CL=15pF See Figures 7 and 8		20	45	ns
Time from out-put high to disable	tpRHZ	CL=15pF See Figures 7 and 8		20	45	ns
Off stateEnable to output high time	tRPSH	CL=15pF See Figures 7 and 8		200	1400	ns
Off stateEnable low time out	tRPSL	CL=15pF See Figures 7 and 8		200	1400	ns
Time to turn off	tsHDN	NOTE	80		300	ns

NOTE: When /RE=1 and DE=0, the device will not enter shutdown mode if the duration is less than 80ns;however, it will definitely enter shutdown mode if the duration exceeds 300ns



supply current						
Parameter	symbol	Test condition	Minimum	Typical canse	Maximum	Unit
Supply current	I _{CC1}	/RE=0V,DE=0V		520	800	uA
	I _{CC2}	/RE=VCC,DE=VCC		540	700	uA
Turn-off current	I _{sHDN}	/RE=VCC,DE=0V		0.5	10	uA
Drive Switch Characterist-ics						
Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Driver differen-tial output delay	t _{DD}	R _{DIFF} =60 Ω,CL ₁ =CL ₂ =100pF(see Fi-gure 3 and Figure 4)		10	35	ns
Drive differentialoutput transition time	t _{TD}			12	25	ns
Drive propagation delay from low to high	t _{PLH}	R _{DIFE} =27Ω(see Figure 3 and Figure 4)		8	35	ns
Drive propagationdelay from high to low	t _{PHL}			8	35	ns
t _{PLH} -t _{PHL}	t _{PDS}			1	8	ns
Enable to output high	t _{pZH}	R _L =110Ω(see Figure 5 and 6)		20	90	ns
Enable to output low	t _{pZL}			20	90	ns
Input low to disable	t _{PLZ}	R _L =110Ω(see Figure 5 and 6)		20	80	ns
Enable high input	t _{PHZ}			20	80	ns
Enable high outputunder off condition	t _{DSH}	R=110Ω(see Figure 5 and 6)		500	900	ns
Enable low output under shutdown conditions	t _{DSL}	R _L =110Ω(see Figure 5 and 6)		500	900	ns



DC electrical characteristics of the driver

Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Driver differential output (non-loaded)	VoD ₁			3.3		V
Drive differential output	VoD ₂	graph 2,RL=54Ω	1.5		VCC	V
		graph 2,RL=100Ω	2		VCC	
Variation in the amplitude of the output voltage (NOTE1)	△VoD	graph 2,RL=54Ω			0.2	V
Output common mode voltage	Voc	graph 2,RL=54Ω			3	V
Amplitude Variation of Common Mode Output Voltage (NOTE1)	△Voc	graph 2,RL=54Ω			0.2	V
High-level input	VH	DE,DI,/RE	2.0			V
Low level input	V _π	DE,DI,/RE			0.8	V
Logic input current	IN1	DE,DI,/RE	-2		2	uA
Output the current during a short circuit, with high short-circuit	IosD ₁	Short circuit to 0V~12V			250	mA
Output the current during a short circuit, down to low	IosD ₂	Short circuit to -7V~0V	-250			mA
Overtemperature shutdown threshold temperature				140		°C
Overtemperature turn-off hysteresis temperature				20		°C



DC Electrical Characteristics of the Receiver

Parameter	symbol	Test condition	Minimum	Typical case	Maximum	Unit
Input current(A,B)	IN2	DE=0V,VCC=0 or 3.3V VIn=12V			125	uA
		DE=0V,VCC=0 or 3.3V VIn=-7V	-100			uA
Forward input threshold voltage	VIT+	$-7V \leq V_{cm} \leq 12V$			+200	mV
Reverse input threshold voltage	VIT-	$-7V \leq V_{cm} \leq 12V$	-200			mV
Input hysteresis voltage	Vhys	$-7V \leq V_{cm} \leq 12V$	10	30		mV
High level output voltage	VoH	IoUT=-2.5mA,VID=+200 mV	VCC-1.5			V
Low level output voltage	VoL	IoUT=+2.5mA,VD=-200 mV			0.4	V
Three-state input leakage cur-rent	IozR	$0.4V < V_o < 2.4V$			±1	uA
Input resistance of receiver	RIn	$-7V \leq V_{cm} \leq 12V$	96			kΩ
Receiver short circuit curr-ent	IosR	$0V \leq V_o \leq VCC$	±8		±60	mA



FUNCTION TABLES

TRANSMITTING						RECEIVING			
CTR	/RE	X	X	0	1	0	0	0	1
	DE	1	1	0	0	X	X	X	X
INPUTS	DI	1	0	X	X				
	A-B					$\geq -10\text{mV}$	$\leq -200\text{mV}$	Open/shorted	X
OUTPUTS	A	H	L	Z					
	B	L	H	Z					
	RO					H	L	H	Z

X:Don't care;Z:high impedance.

TEST CIRCUIT

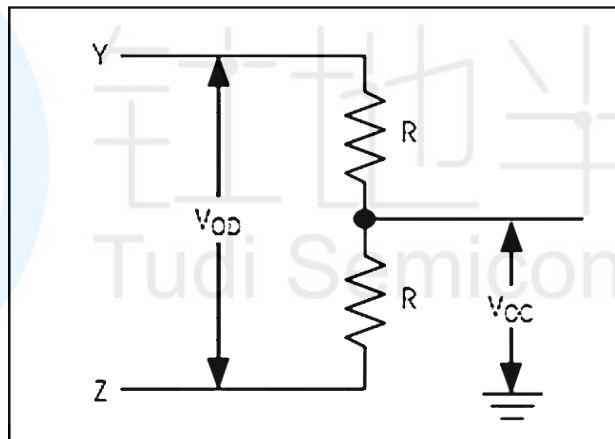


Figure 2 DC test load of the driver

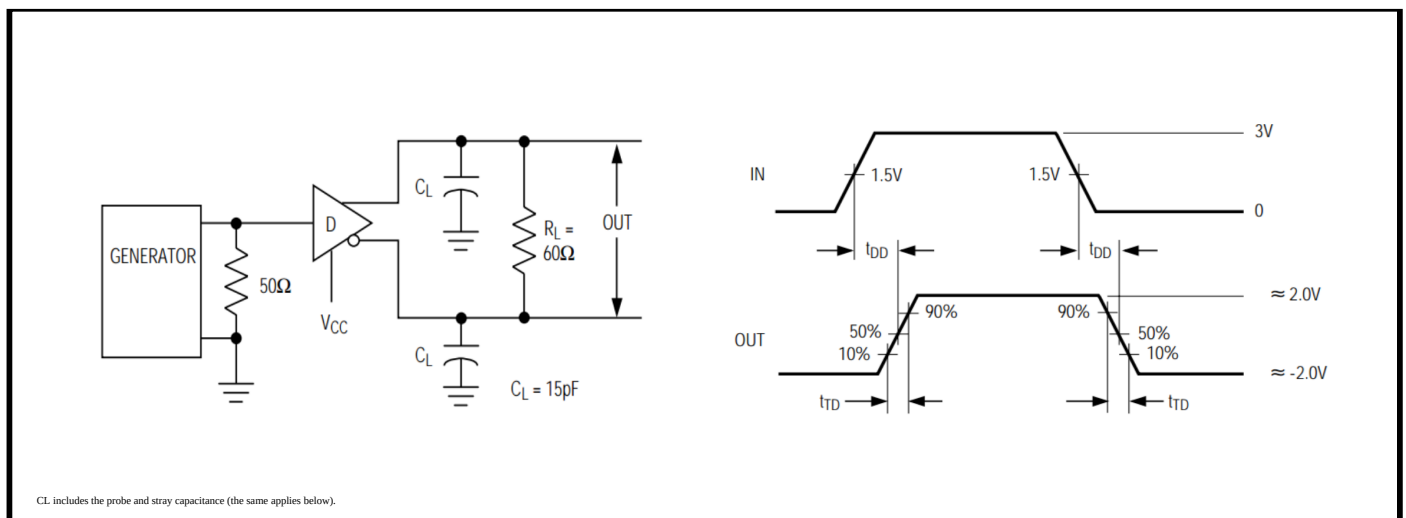


Figure 3 Differential delay and transit time of driver

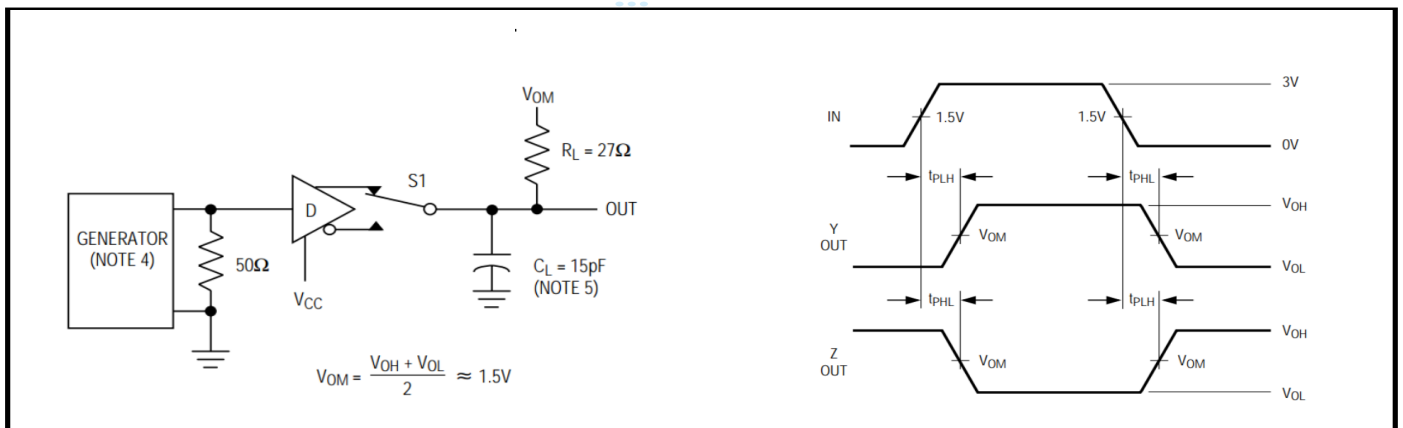


Figure 4 Propagation Delay of Driver

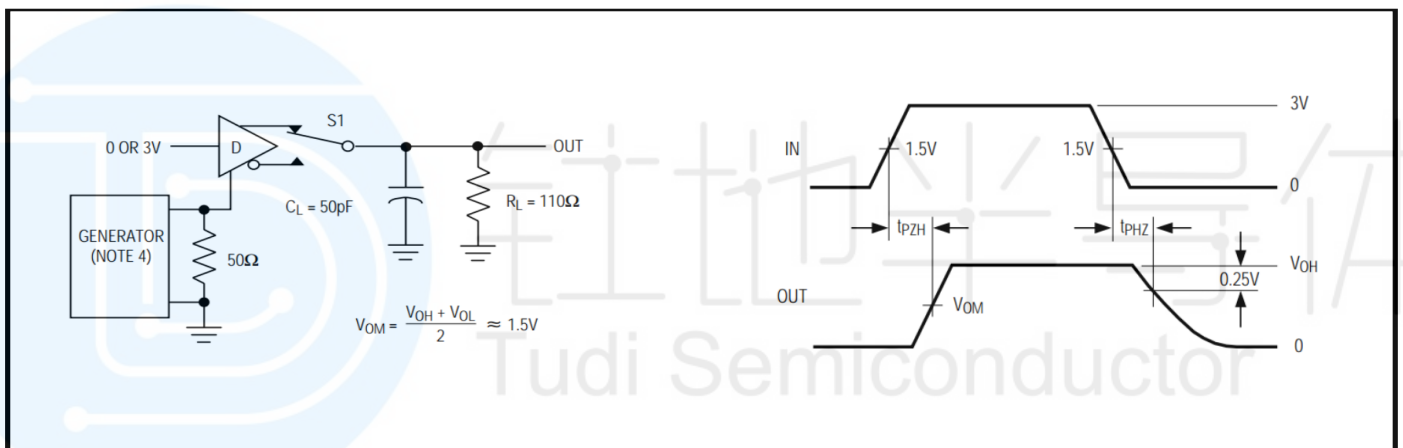


Figure 5 Driver enable and disable time

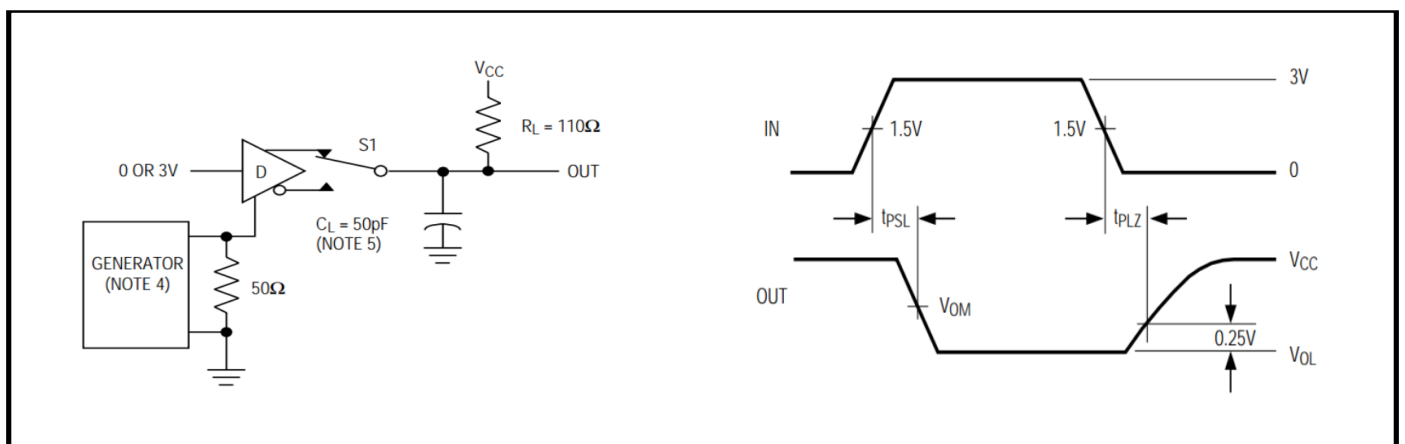


Figure 6 Driver enable and disable time

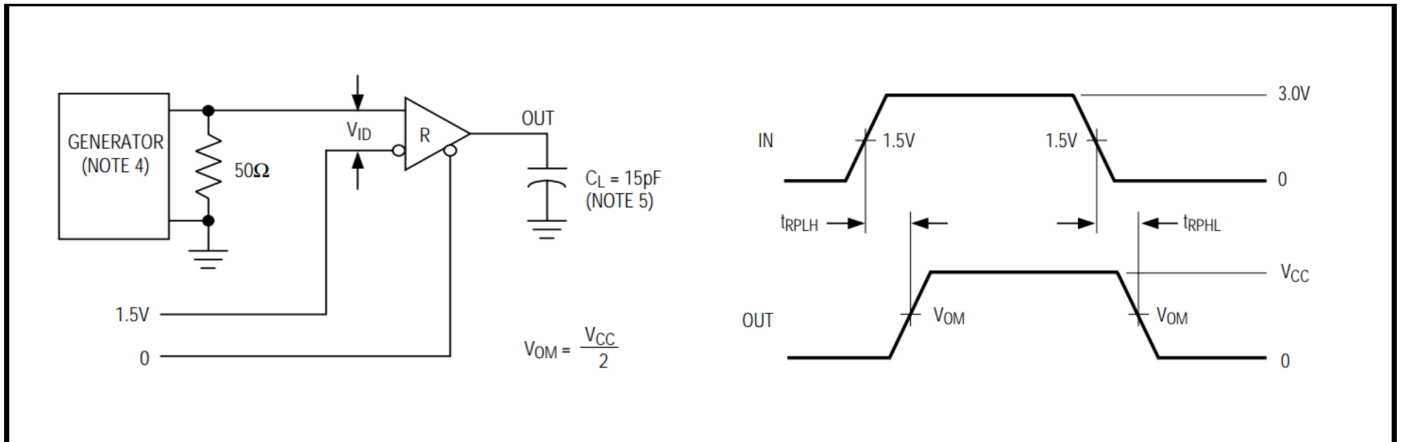


Figure 7 Receiver propagation delay test circuit

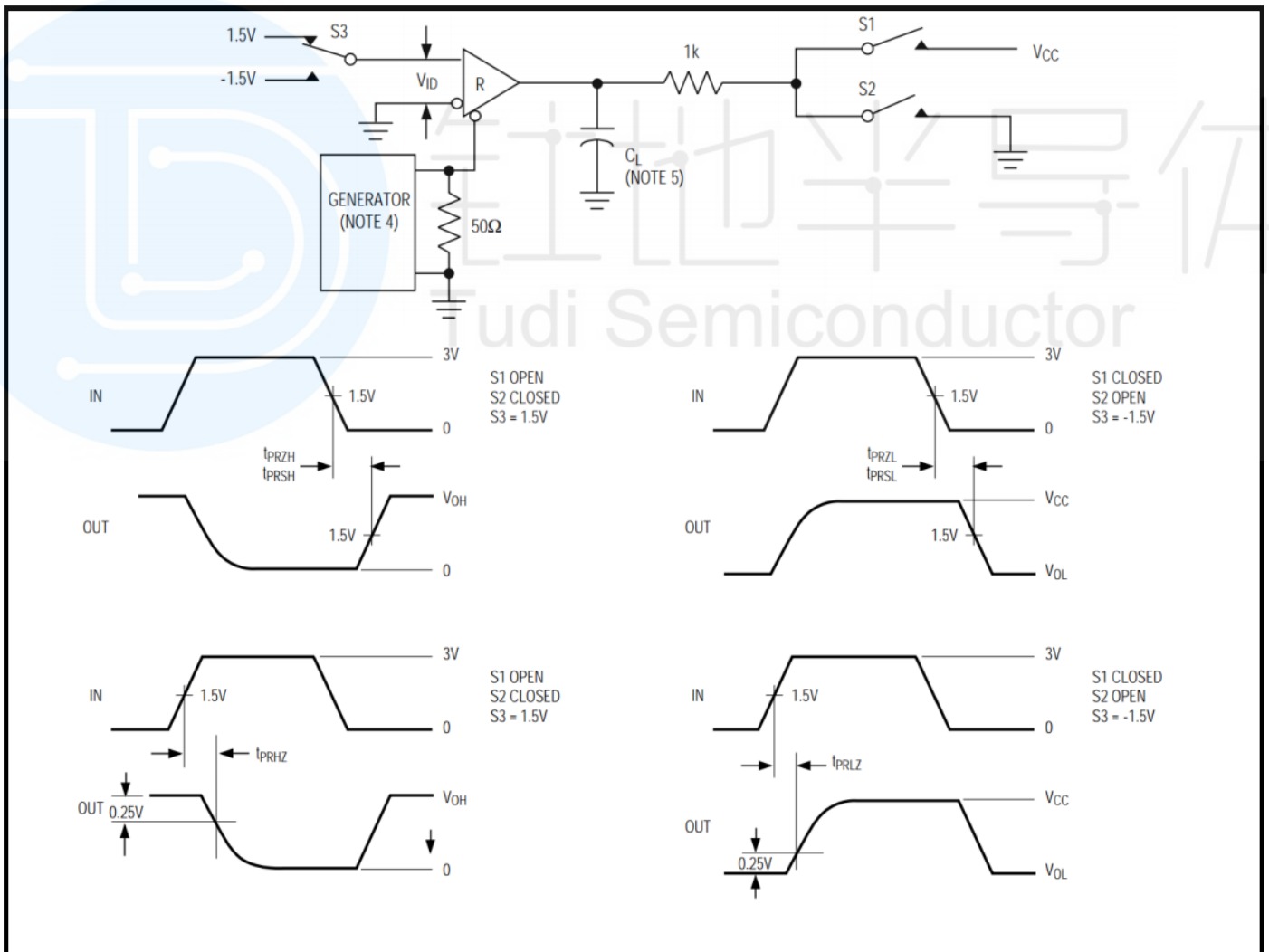


Figure 8 Receiver Enable and Disable Time

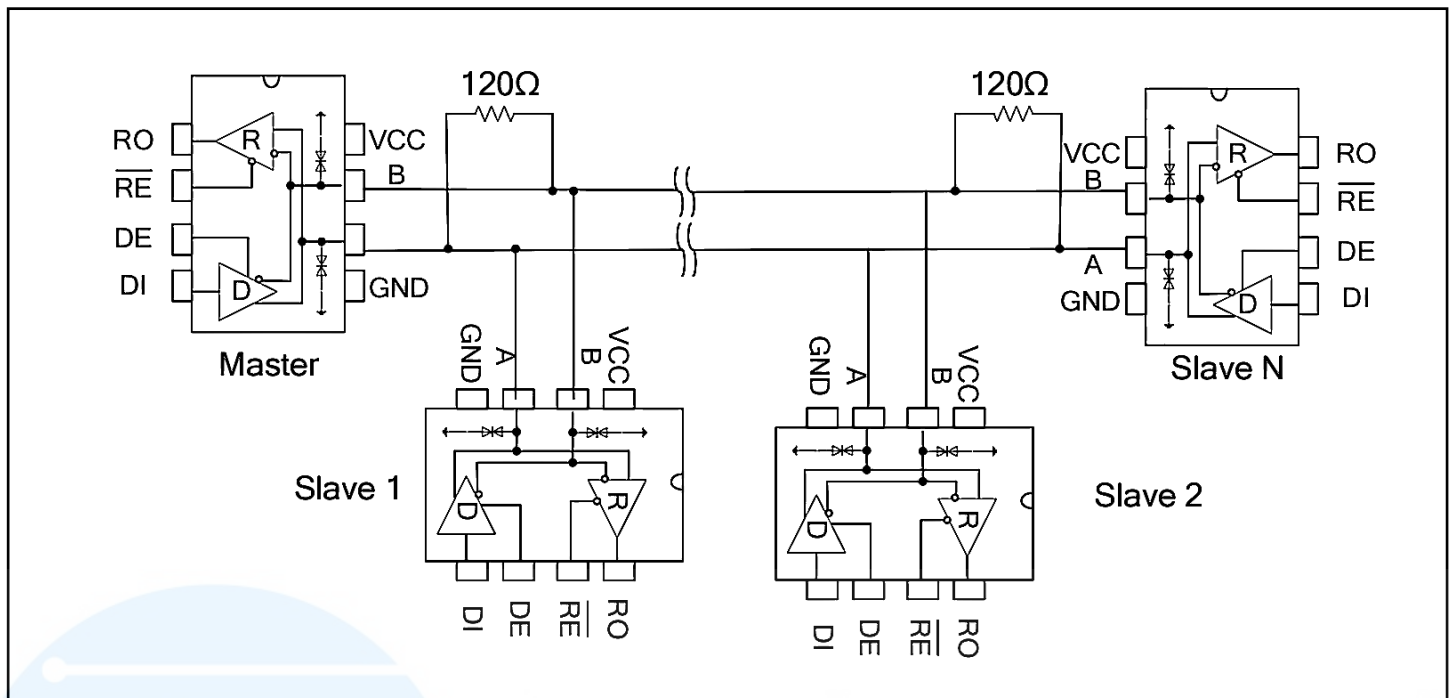


Fig11 Backbone cable type RS485 communications network

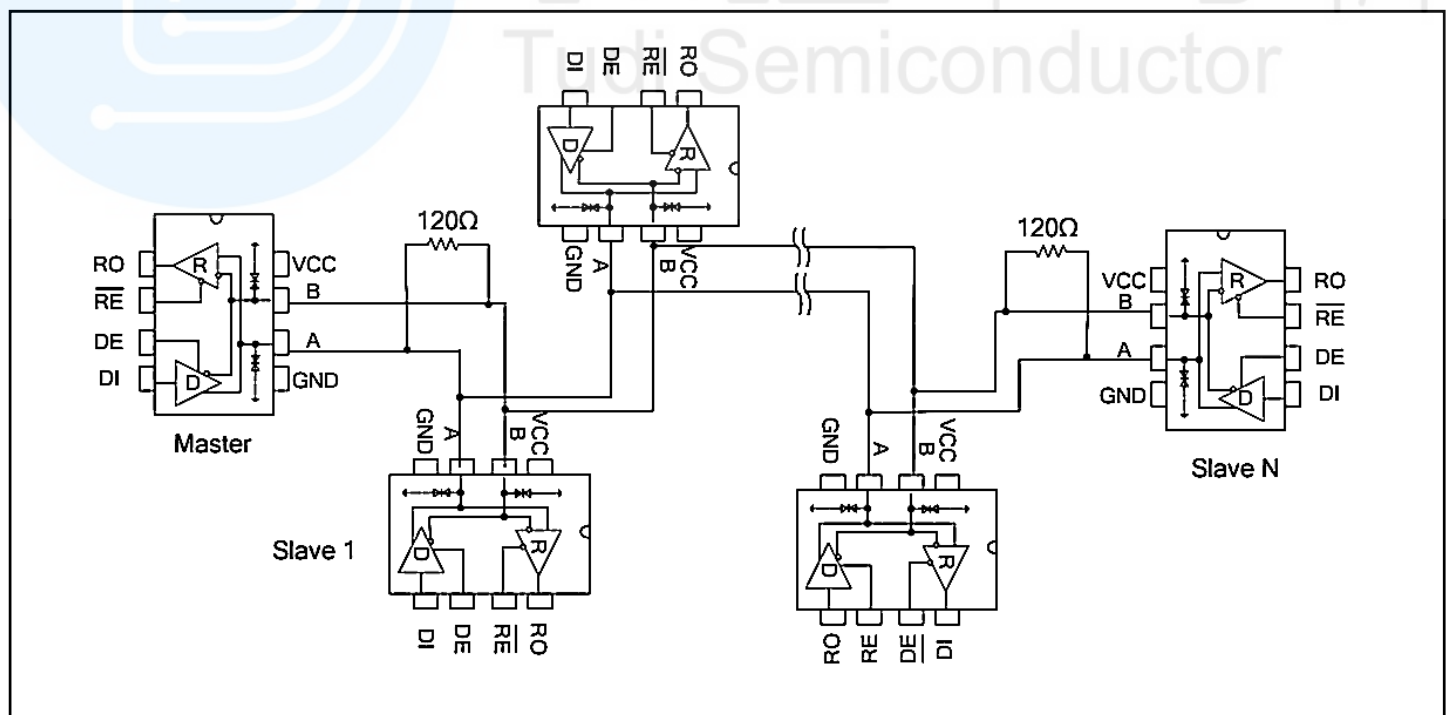


Fig12 Daisy chain topology type RS485 communications network

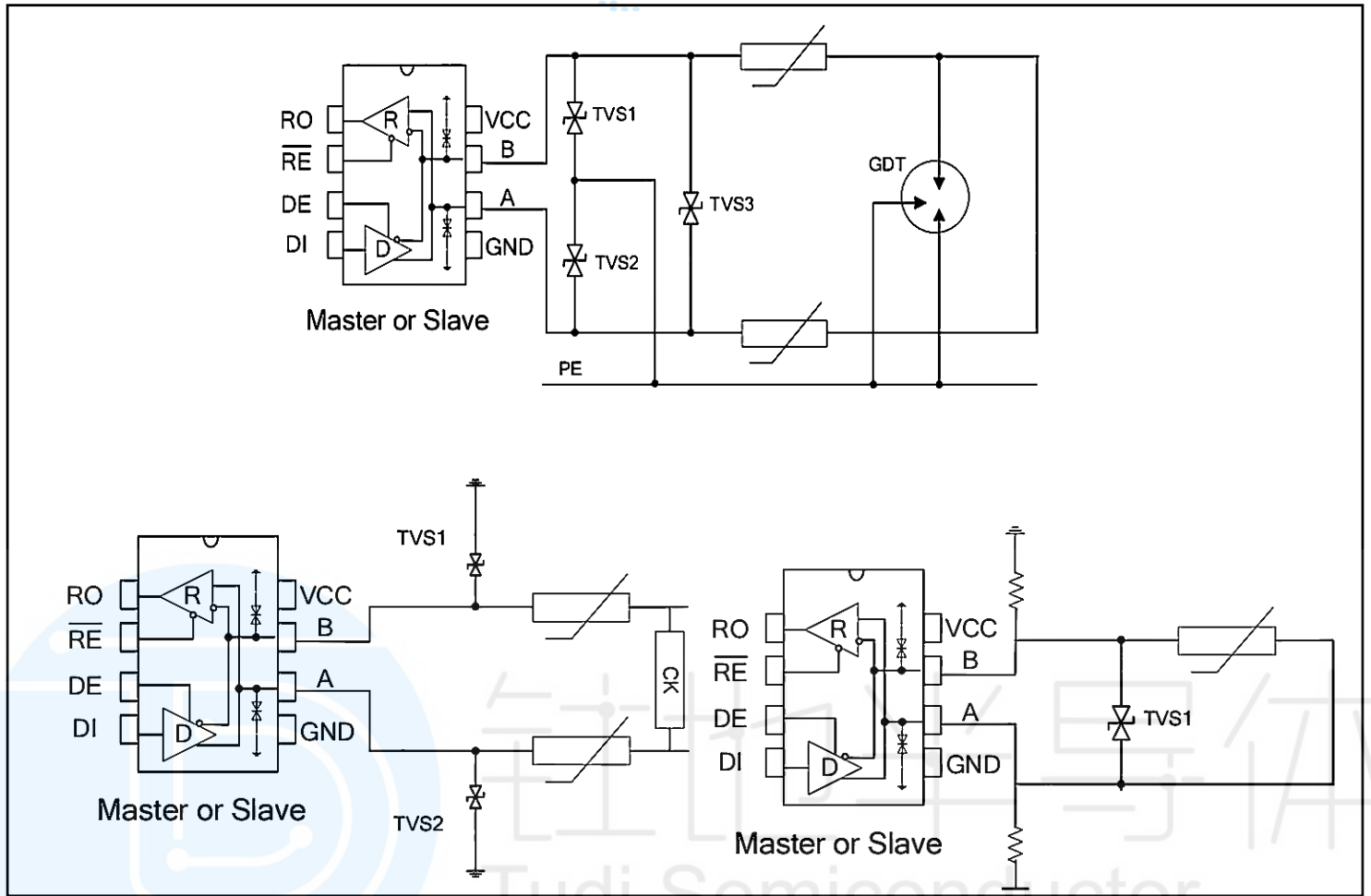
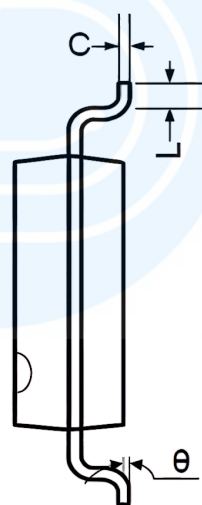
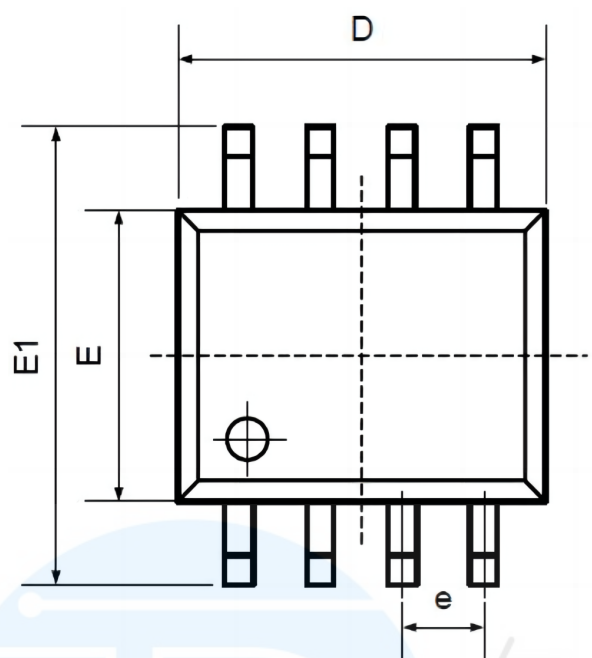


Fig13 RS485 bus ports Protection configuration

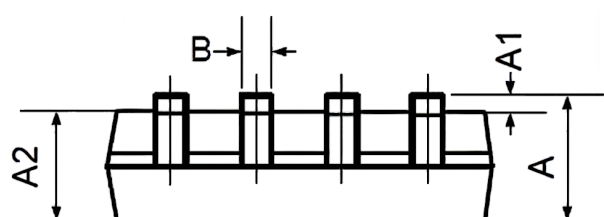
Order information

Order Number	Package	Package Quantity	Marking On The park	Temperature
MAX3088ECSA-TUDI	SOP8	Tape,Reel,2500	MAX3088ECSA	0°C to 70°C
MAX3088ECPA-TUDI	DIP8	Tube,50A box of 2000	MAX3088ECPA	
MAX3088EESA-TUDI	SOP8	Tape,Reel,2500	MAX3088EESA	- 40°C to 85°C
MAX3088EEPA-TUDI	DIP8	Tube,50A box of 2000	MAX3088EEPA	

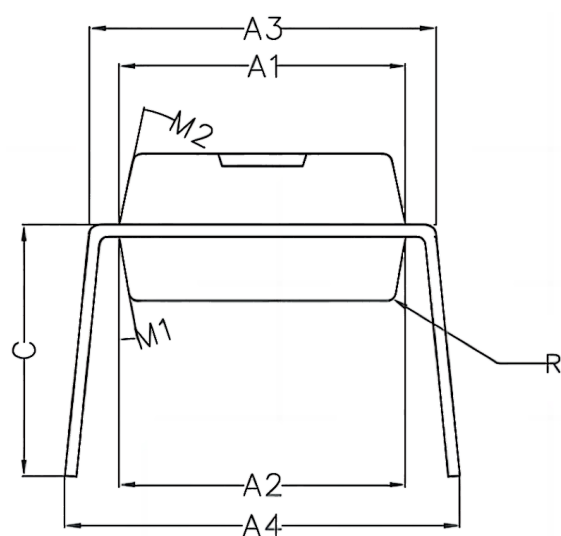
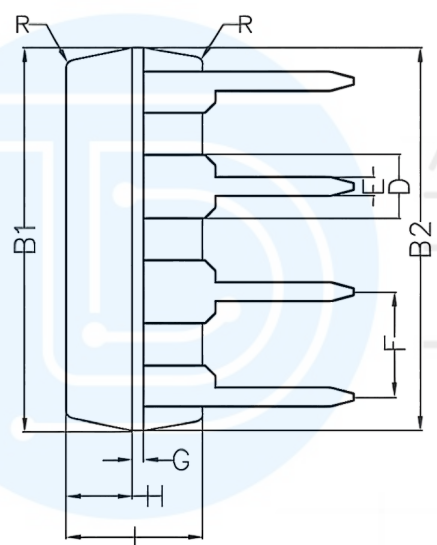
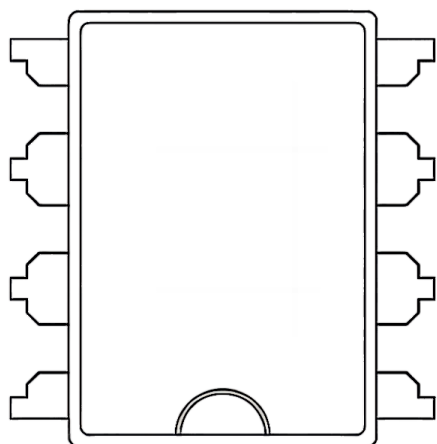
Package SOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



Package DIP8



Symbol	Min	Non	Max
A1	6.28	6.33	6.38
A2	6.33	6.38	6.43
A3	7.52	7.62	7.72
A4	7.80	8.40	9.00
B1	9.15	9.20	9.25
B2	9.20	9.25	9.30
C		5.57	
D		1.52	
E	0.43	0.45	0.47
F		2.54	
G		0.25	
H	1.54	1.59	1.64
I	3.22	3.27	3.32
R		0.20	
M1	9°	10°	11°
M2	11°	12°	13°



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