



钰地半导体
Tudi Semiconductor

Product Specification

TUDI-SP3088

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

网址 www.sztdbdt.com 🔍

用芯智造 · 卓越品质

**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



FEATURES

- Single supply operation 4.5-5.5V
- Receiver is fail-safe in the event of an open, shorted, terminated line
- 1/8 unit load, 256 transceivers on the bus
- Robust ESD protection on RS-485 pins
±15V air gap discharge
±15kV human model
±8kV contact discharge
- Controllable driver rise time
- Hot plug interference protection on control
- Thermal shutdown of driver short-circuit
- current limit and over-load protection

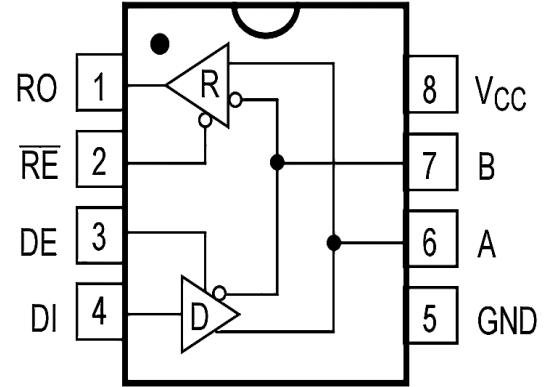


Figure 1. Pin Diagram

Description

The SP3088 high-speed transceivers are for RS-485/RS-422 communication and contain a driver a receiver. These devices guarantee a receiver output of logic high when the receiver input is open or shorted. This means that if all the drivers on the terminated bus are disabled (impedance), the receiver output will be logic high. The driver of the SP3088 has an unrestricted slew rate that makes transmission speeds up to 10Mbps possible. These transceivers typically consume low power currents when idle or when the driver is disabled. All devices have a receiver input impedance of 1/8 load, allowing a of 256 transceivers on the bus. The SP3088 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, if $A-B \geq -10\text{mV}$, then RO=high. If $A-B \leq -200\text{mV}$, then RO=low
2	/RE	Receiver Output Enable. A low 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 Pin A 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 output high to disable	tpRHZ	CL=15pF See Figures 7 and 8		20	45	ns
Off state Enable to output high time	tRPSH	CL=15pF See Figures 7 and 8		200	1400	ns
Off state Enable 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 case	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 ,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} =27 (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 =110 (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 =110 (see Figure 5 and 6)		20	80	ns
Enable high input	t _{PHZ}			20	80	ns
Enable high outputunder off condition	t _{DSh}	R=110 (see Figure 5 and 6)		500	900	ns
Enable low output under shutdown conditions	t _{DsL}	R _L =110 (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=54	1.5		VCC	V
		graph 2,RL=100	2		VCC	
Variation in the amplitude of the output voltage (NOTE1)	VoD	graph 2,RL=54			0.2	V
Output common mode voltage	Voc	graph 2,RL=54			3	V
Amplitude Variation of Common Mode Output Voltage (NOTE1)	Voc	graph 2,RL=54			0.2	V
High-level input	VH	DE,DI,/RE	2.0			V
Low level input	V	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	I _{osD1}	Short circuit to 0V~12V			250	mA
Output the current during a short circuit, down to low	I _{osD2}	Short circuit to -7V~0V	-250			mA
Overtemperature shutdown threshold temperature				140		
Overtemperature turn-off hysteresis temperature				20		



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 Vcm 12V			+200	mV
Reverse input threshold voltage	VIT-	-7V Vcm 12V	-200			mV
Input hysteresis voltage	Vhys	-7V Vcm 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 current	IozR	0.4V<Vo<2.4V			±1	uA
Input resistance of receiver	RIn	-7V Vcm 12V	96			k
Receiver short circuit current	IosR	0V Vo 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

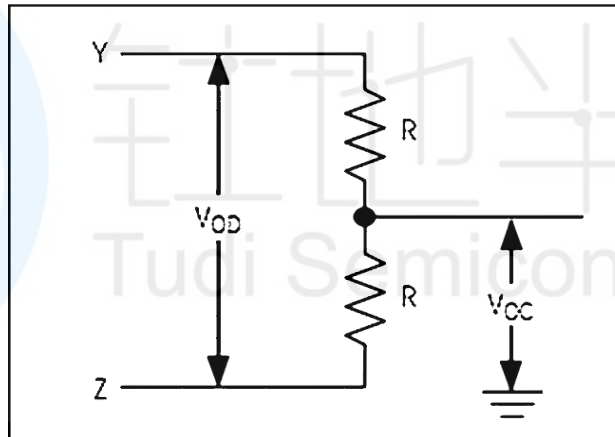


Figure 2 DC test load of the driver

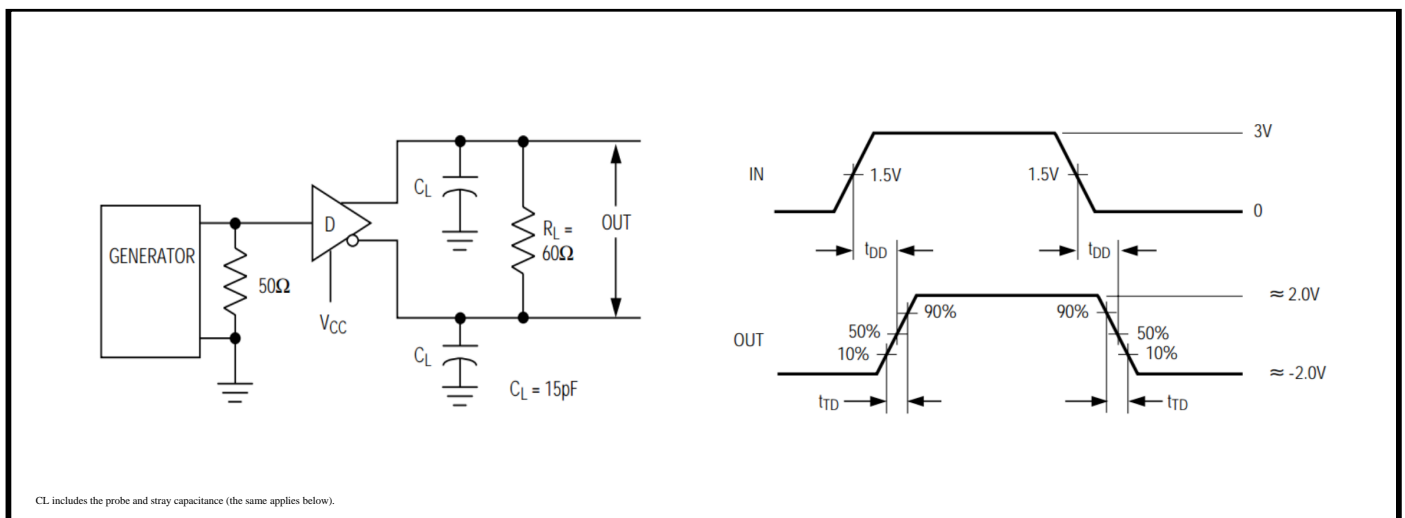


Figure 3 Differential delay and transit time of driver

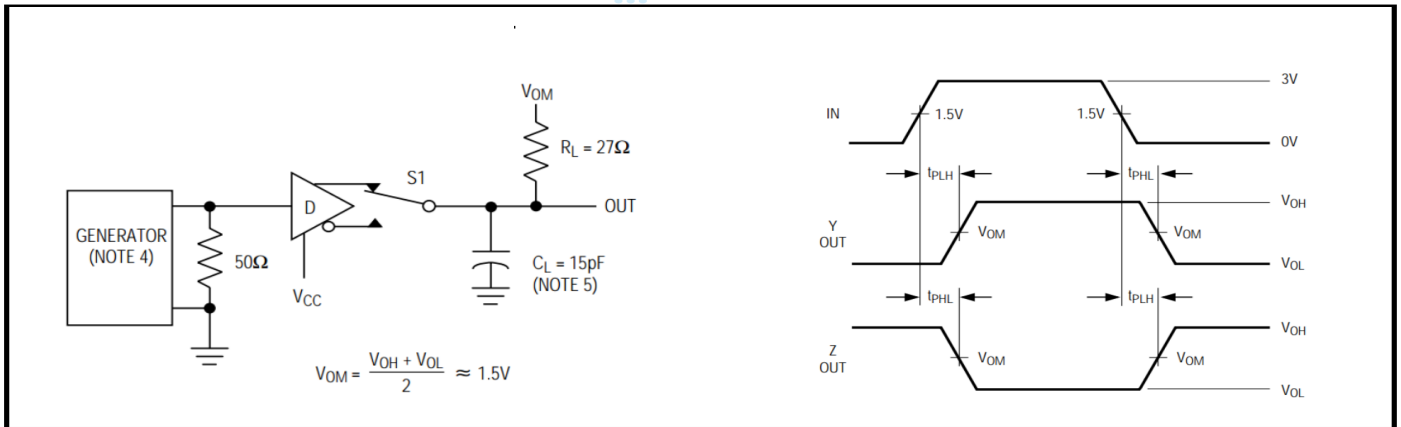


Figure 4 Propagation Delay of Driver

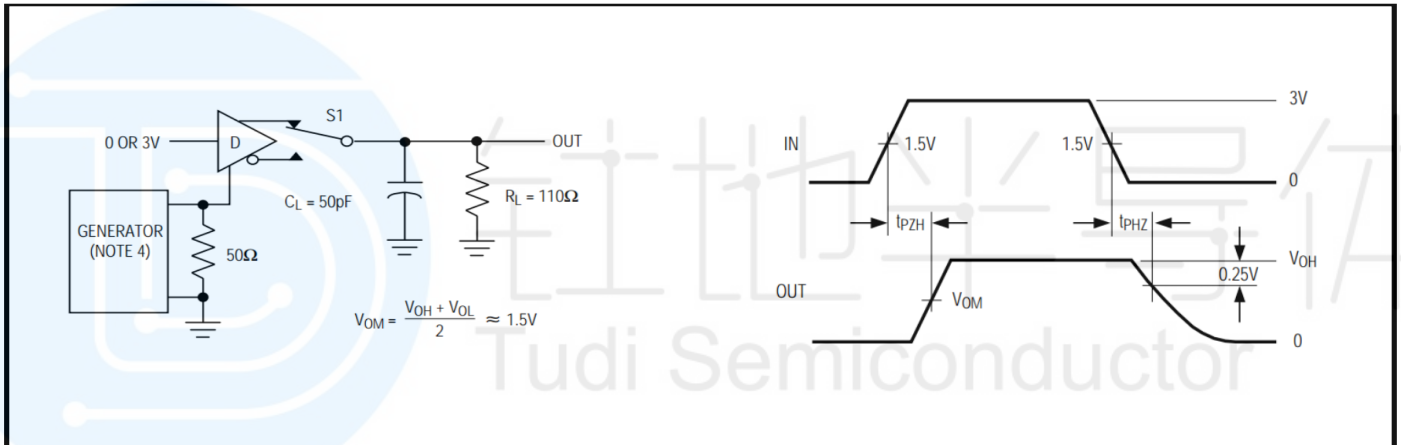


Figure 5 Driver enable and disable time

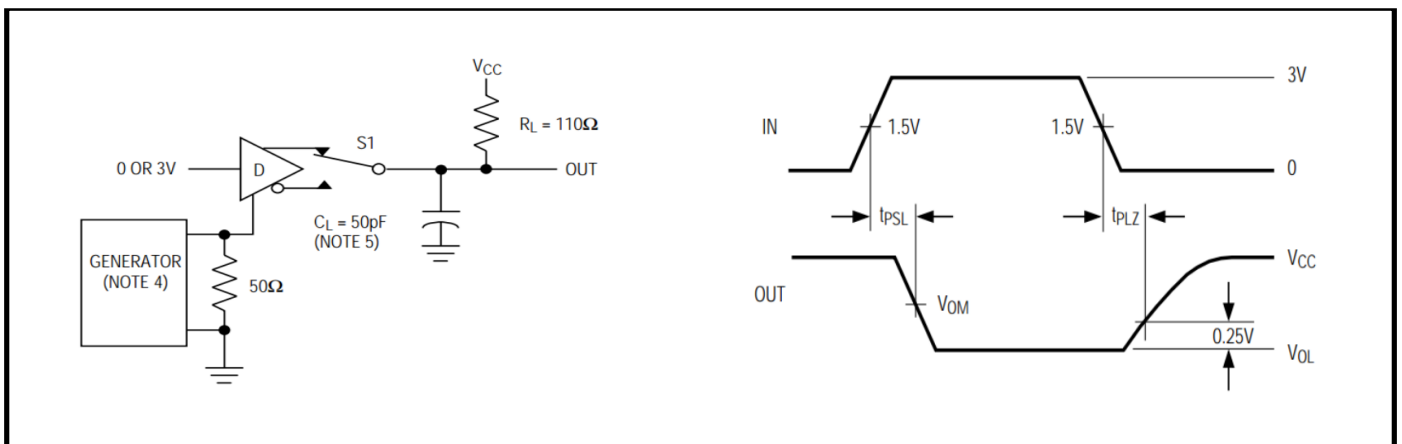


Figure 6 Driver enable and disable time

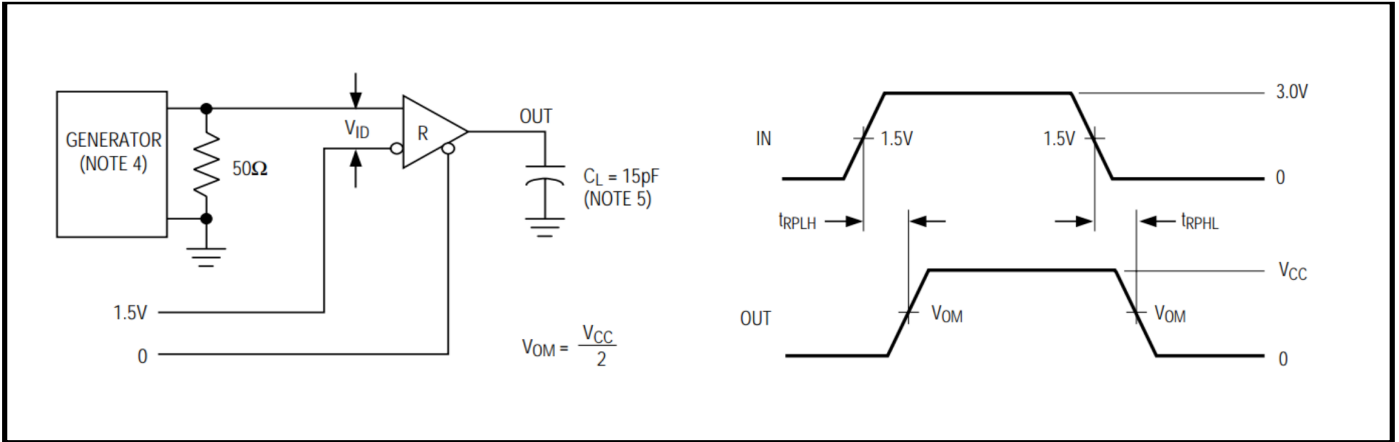


Figure 7 Receiver propagation delay test circuit

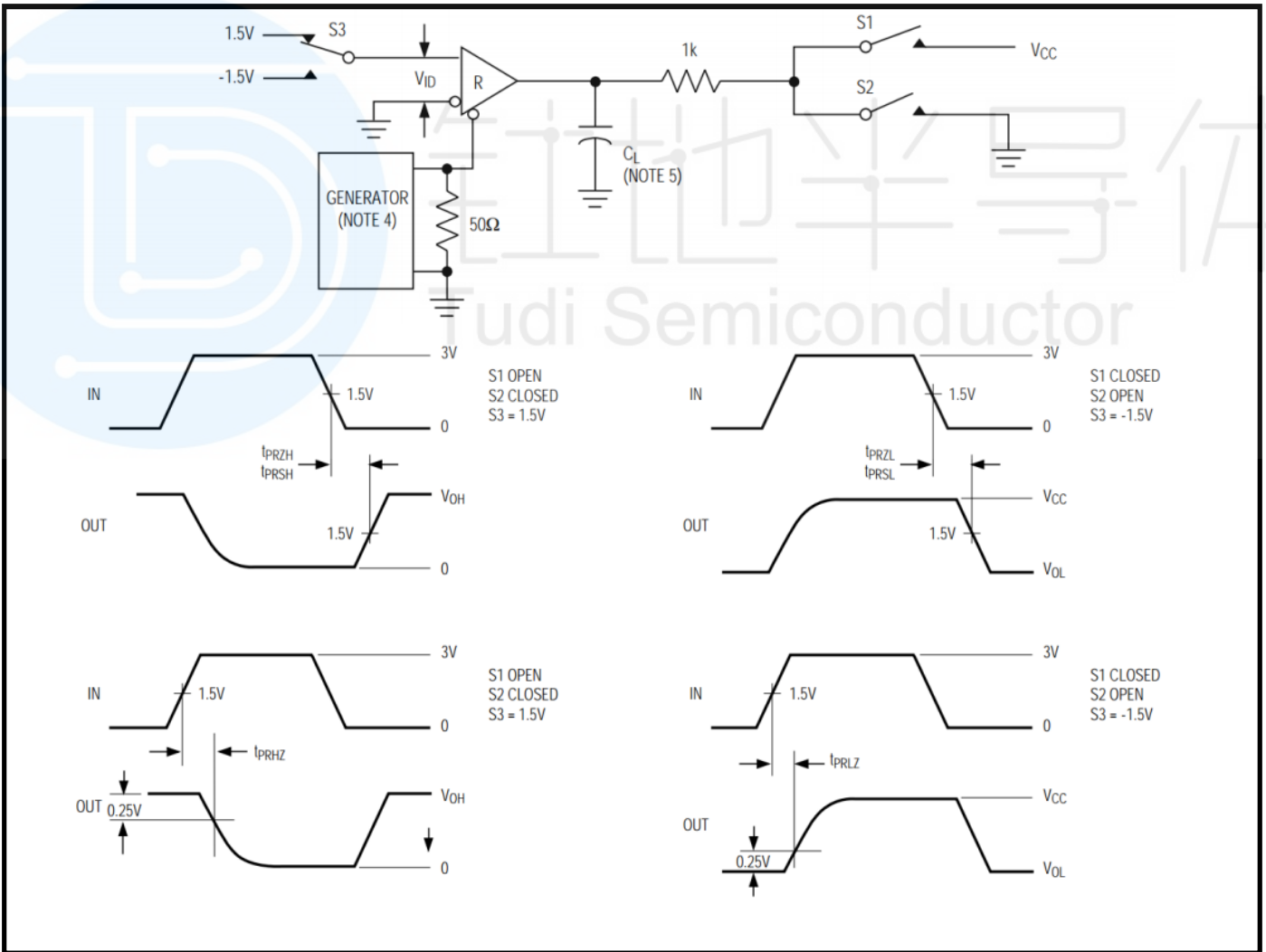


Figure 8 Receiver Enable and Disable Time

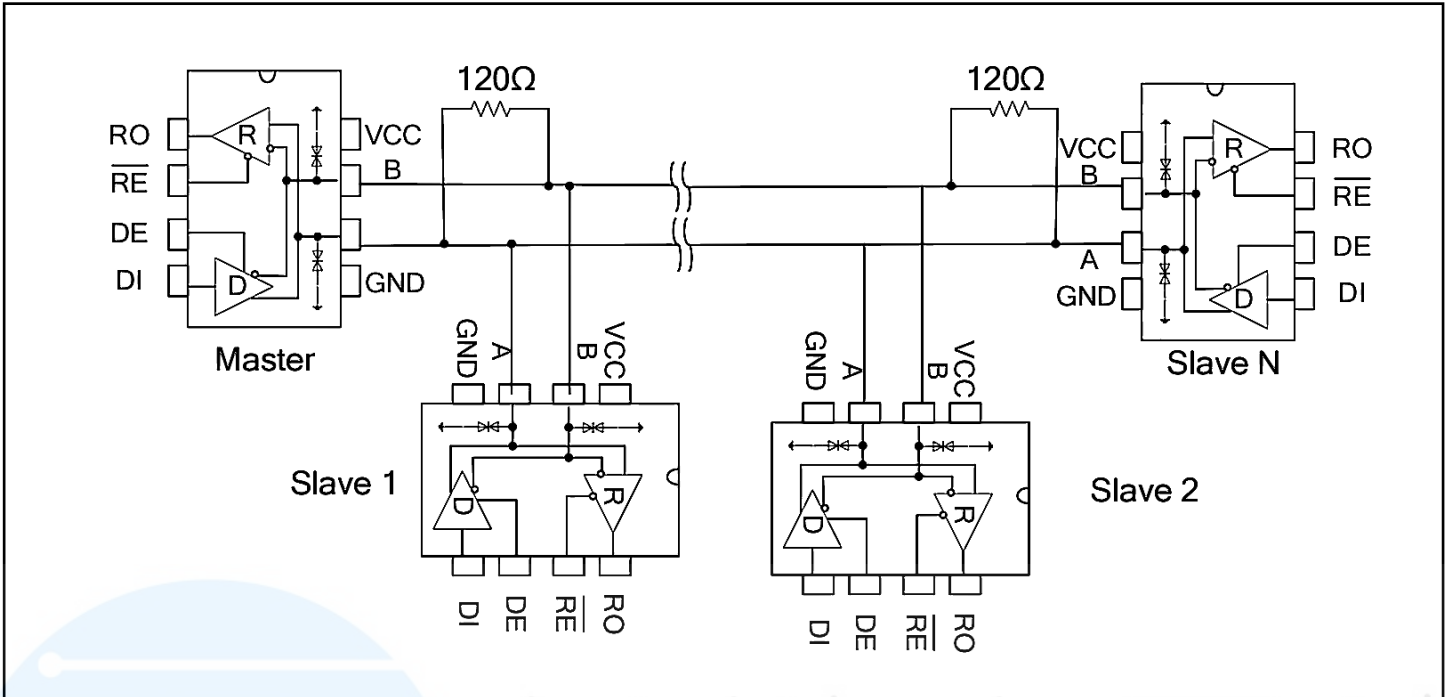


Fig11 Backbone cable type RS485 communications network

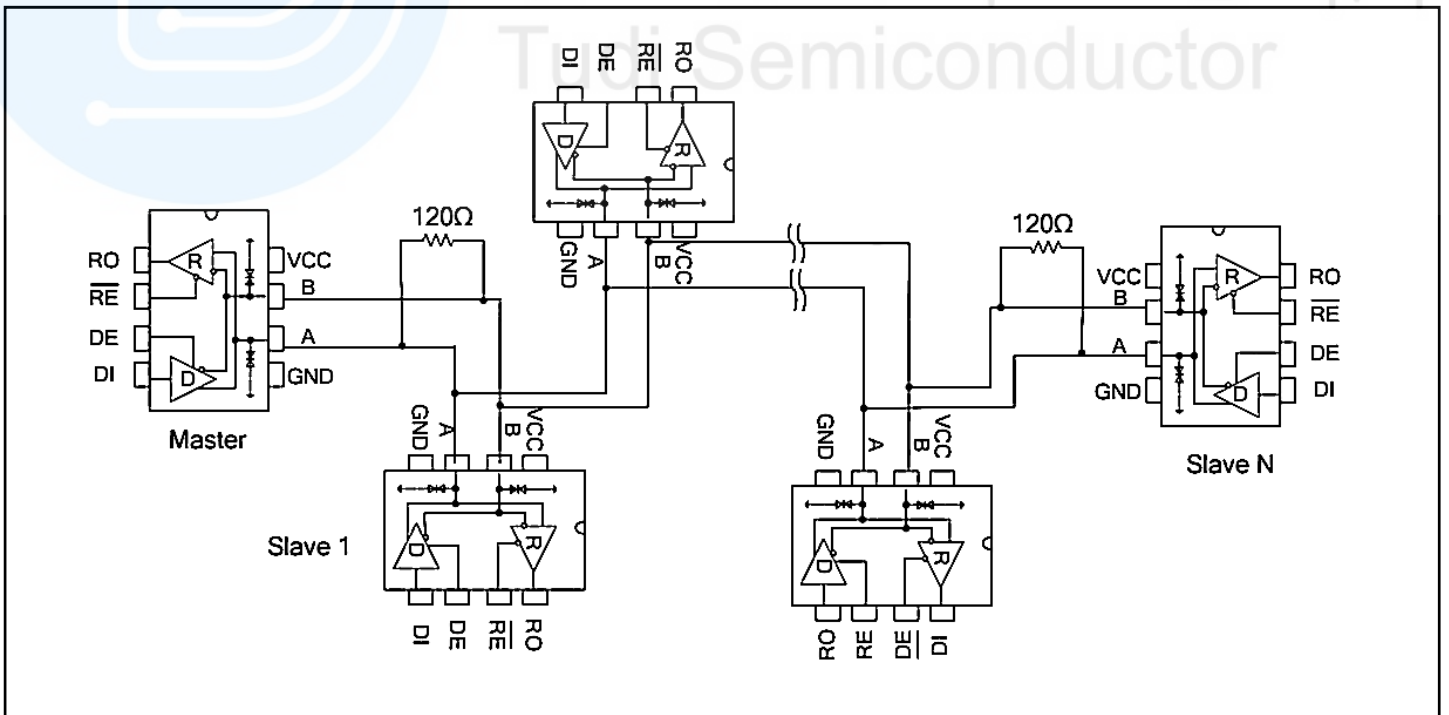


Fig12 Daisy chain topology type RS485 communications network

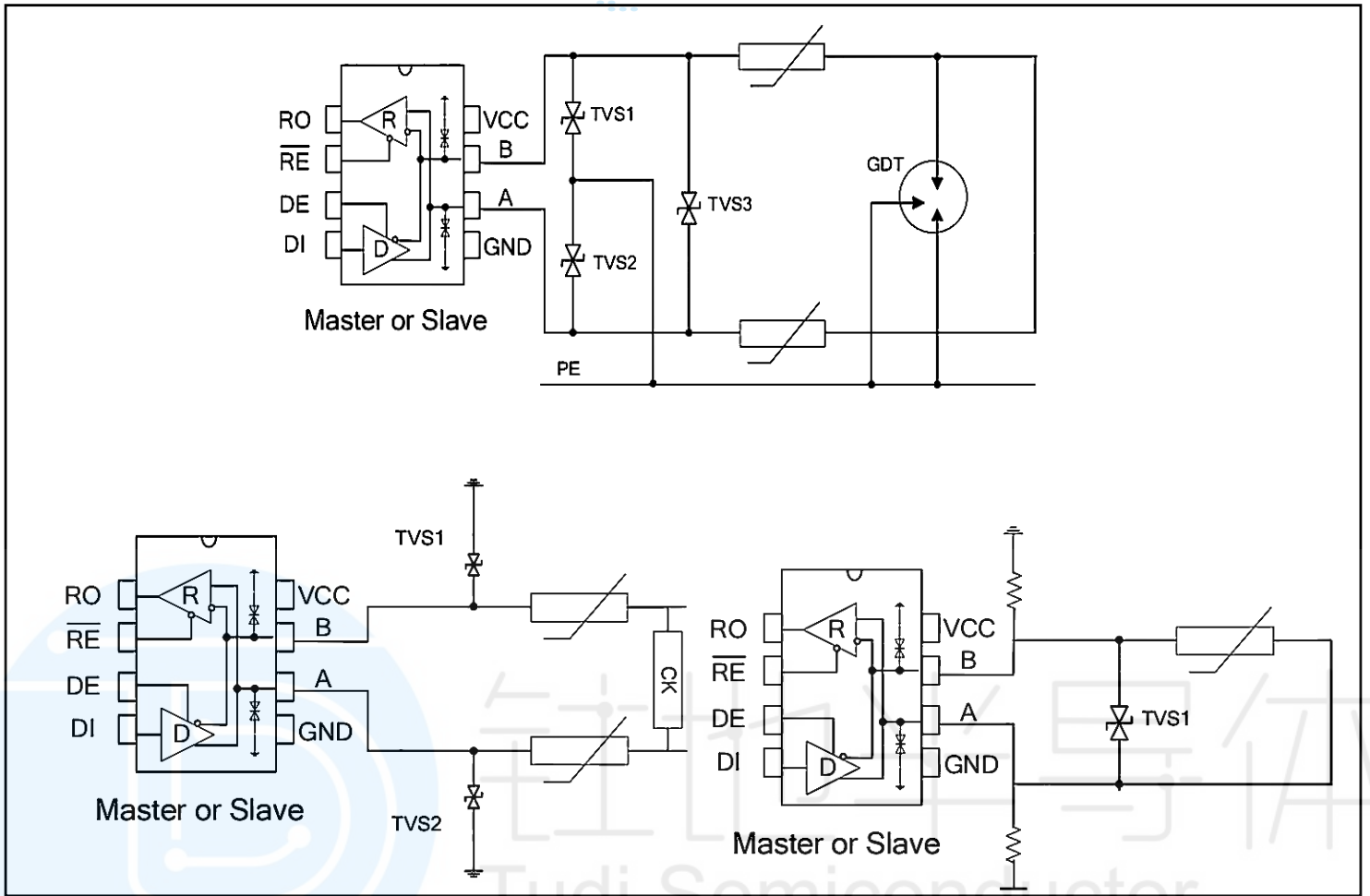


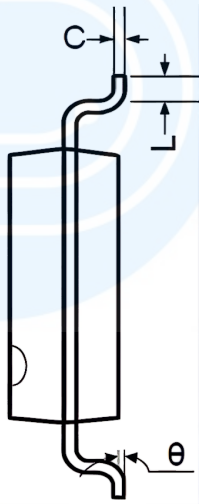
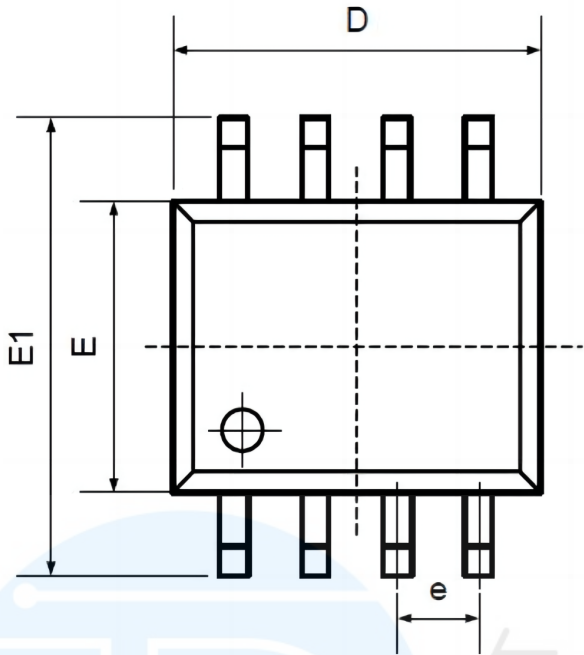
Fig13 RS485 bus ports Protection configuration

Order information

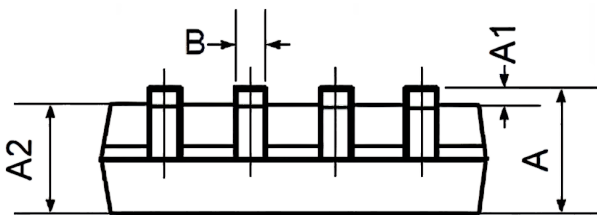
Order Number	Package	Package Quantity	Marking On The park	Temperature	Data Rate
SP3088ECN-L/TR-TUDI	SOP8	Tape,Reel,2500	SP3088EC	0°C to 70°C	4.5-5.5V
SP3088EEN-L/TR-TUDI	SOP8	Tape,Reel,2500	SP3088EE	-40°C to 85°C	



Package SOP8

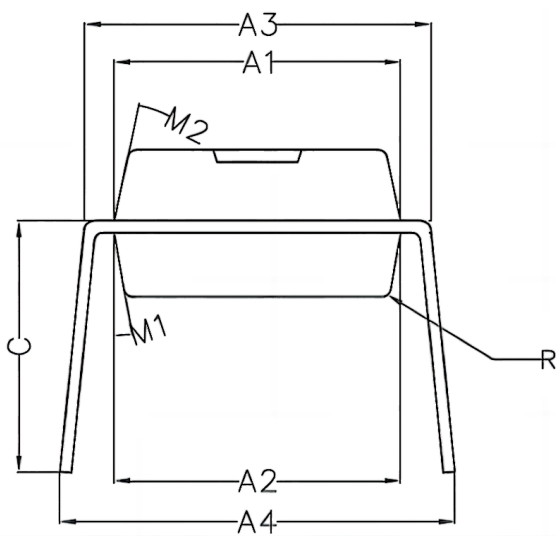
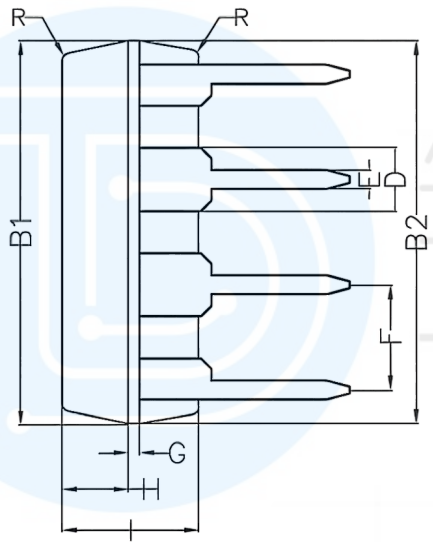
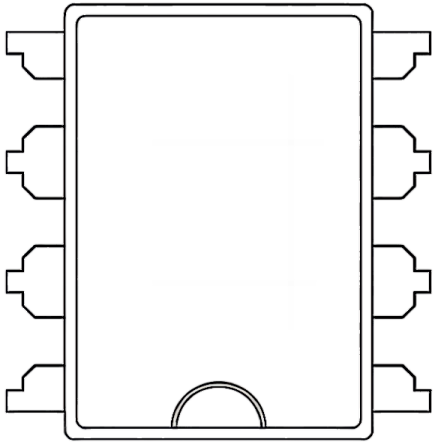


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP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