



钛迪半导体
Tudi Semiconductor

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Product Specification

TUDI-ISL8485

ESD Protected to $\pm 15kV$, 5V, Low Power, High Speed or
Slew Rate Limited, RS-485/RS-422 Transceivers

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**semiconductor device
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- Design
- research and development
- production
- and sales



FEATURES

- RoHS-compliant lead-free option available
- Military and extended industrial temperature options available
- RS-485 I/O ESD protection $\pm 15\text{kV}$ HBM
- 3rd level ESD rating of 7kV HBM for all other pins
- Specified 10 tolerance power supply
- High data rate version (ISL8485E) available
- Unit load allows a maximum of 32 devices on the line
- static current
- Common mode input voltage range of -7V to 1V
- Three-state receive and transmit outputs
- 30ns propagation delay, ns offset
- Operates from a single 5V power supply (10% tolerance)
- Current limiting and thermal shutdown for driver overload

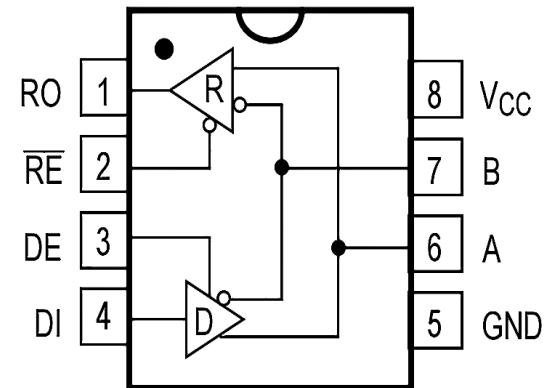


Figure 1. Pin Diagram

Description

The RS-485/RS-422 device with ESD protection features, 5V powered, is a single receiver/mitter that meets the balanced communication standards for RS-485 and RS-422. Each driver output/receiver input is protected against $\pm 5\text{kV}$ ESD without any lockup. Unlike competitive devices, this series is specified over a 10% tolerant power supply (4.5V to 5.5V).

the ISL8485 with a higher conversion rate, data rates up to 6M can be achieved. Both devices present a “single unit load” on RS-485 bus, allowing for 32 transceivers on the network. The receiver (Rx) input is “open safe” designed to ensure the Rx is logic high if the Rx input is floating. The driver (Tx) output is protected against over-voltage even above the power supply voltage. Additionally, an on-chip shutdown circuit disables the Tx output to prevent damage when the power dissipation is too high. These half-duplex configurations share the Rx input and Tx output for transceivers with Rx and Tx disable features in an 8-pin package.

Applications

- Factory Automation
- Security Networks
- Building Environmental Control Systems
- Industrial/Process Control Networks
- Level Translators (e.g., RS-232 to RS-422)
- RS-232 “Extension Cords”



Pin description

Pin Number	Pin Name	FUNCTION
1	RO	Receiver Output. When enabled, if $A-B \geq -10mV$, then $RO=high$. If $A-B \leq -200 mV$, 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		-40~85	°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



PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
SWITCHING CHARACTERISTICS OF RECEIVER						
Receiver Enable to Output Low	tRZL	CL=100 pF, S1closed		20	50	ns
Receiver Enable to Output High	tRZH	CL=100 pF, S2 closed		20	50	ns
Receiver Disable Time from Low	tRLZ	CL=100 pF,		20	50	ns
Receiver Disable Time from High	tRHZ	CL=100pF, S2 closed		20	50	ns
Receiver Propagation Delay (low to high)	tRPLH	Fig 7 and 8 VD \geq 2.0V; Rise and fall time VID \leq 15ns		50	200	ns
Receiver Propagation Delay (high to low)	tRPHL			50	200	ns
tRPLH-tRPHL	tsKEW2			13	15	ns
SWITCHING CHARACTERISTICS OF DRIVER						
Driver Enable to Output High	tDzH	CL=100 pF, S1 closed (Fig 5,6)			70	ns
Driver Enable to Output Low	tDzL				70	ns
Driver Disable Time from Low	tDLz	CL=15 pF, S2 closed (Fig 5,6)			70	ns
Driver Disable Time from High	tDHZ				70	ns
Driver Propagation Delay(low to high)	tDPLH	RDIFF=54Ω, CLi=CL ₂ =100pF (Fig 3,4)		60		ns
Driver Propagation Delay (high to low)	tDPHL			60		ns
tDPLH-tDPHL	tsKEW1			5	\pm 10	ns
Driver Differential Output Rise or Fall Time	tDR,tDF			40		ns



PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
SUPPLY CURRENT						
Supply Current	I _{cc1}	/RE=0V or VCC, DE=0V		200	500	uA
	I _{cc2}	/RE=VCC, DE=VCC		300	600	uA
	I _{cc3}	/RE=0, DE=VCC		0.5	10	uA
DC ELECTRICAL CHARACTERISTICS OF RECEIVER						
Receiver Input Resistance	R _N	-7V≤V _{cM} ≤12V	12			kΩ
Receiver Output Short-Circuit	I _{osR}	0V≤V _o ≤VCC	±7		±95	mA
RO Output-Low Voltage	V _{oL}	I _{oUT} =+4mA, VID=-200 mV			0.4	V
Three-State Output Current at Receiver	I _{ozR}	0.4V<V _o <2.4V			±1	uA
Receiver Input Hysteresis	V _{hys}	-7V≤V _{cM} ≤12V		30		mV
RO Output-High Voltage	V _{oH}	I _{oUT} =-4mA, VID=+200 mV	3.5			V
Positive-going input threshold voltage	V _{IT+}	-7V≤V _{cM} ≤12V			-10	mV
Negative-going input threshold voltage	V _{IT-}	-7V≤V _{cM} ≤12V	-200			mV
Input Current(A,B)	IN2	DE=0V, VCC=0 or 5V			1.0	mA
		DE=0V, VCC=0 or 5V	0.8			mA

NOTE

If no special situation occurs , VCC=5V±5% ,Temp=T^{MIN}~T^{MAX} , typically VCC=+5V , Temp = 25



PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC ELECTRICAL CHARACTERISTICS OF DRIVER						
Input High Voltage	VH	DE,DI,/RE	2.0			V
Input Low Voltage	Vn	DE,DI,/RE			0.8	V
Input Current (RE,DI,/RE)	IN1	DE,DI,/RE	-2		2	uA
Thermal-Shutdown Threshold				150		°C
Thermal-Shutdown Hysteresis				20		°C
Differential Driver Output(no load)	VoD1			5		V
Differential Driver Output	VoD2	Fig 2,RL=27Ω	1.5		VCC	V
		Fig 2,RL=50	2		VCC	
Change in Magnitude of Differential Output Voltage (NOTE1)	ΔVoD	Fig 2,RL=27Ω			0.2	V
Driver Common-Mode Output Voltage	Voc	Fig 2,RL=27Ω			3	V
Change In Magnitude of Common-Mode Voltage (NOTE1)	ΔVoc	Fig 2,RL=27Ω			0.2	V
Driver Short-Circuit Output Current (short to high)	IosD1	Short to 0V~12V	35		250	mA
Driver Short-Circuit Output Current (short to low)	IosD2	Short to -7V~0V	-250		-35	mA

TEST CIRCUIT

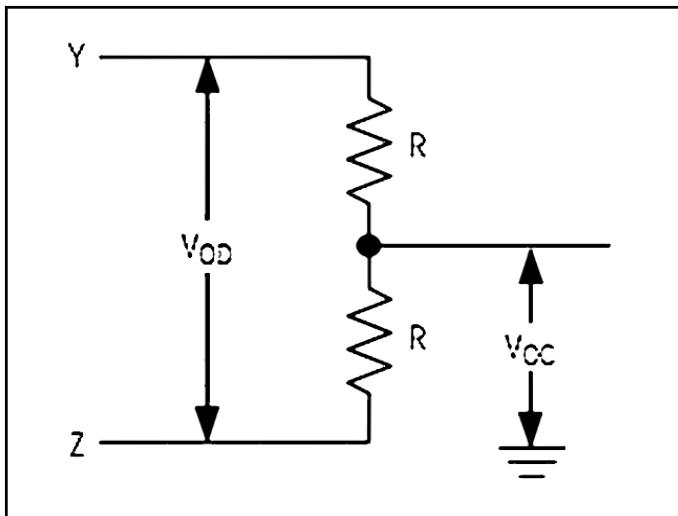


Fig 2 Driver DC Test Load

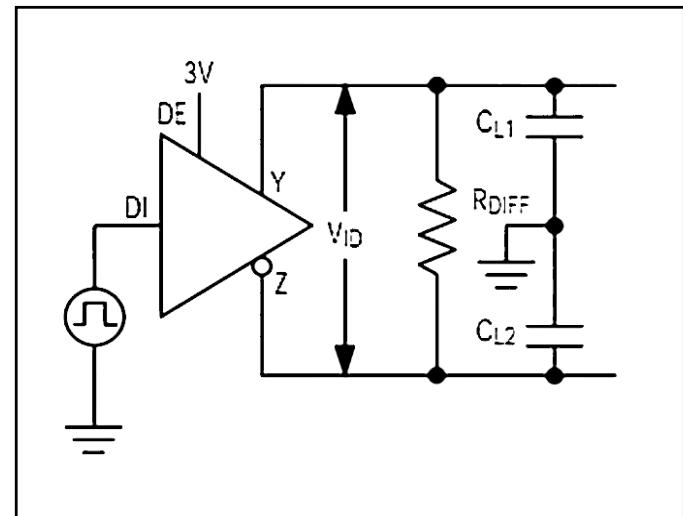


Fig 3 Driver Timing Test Circuit

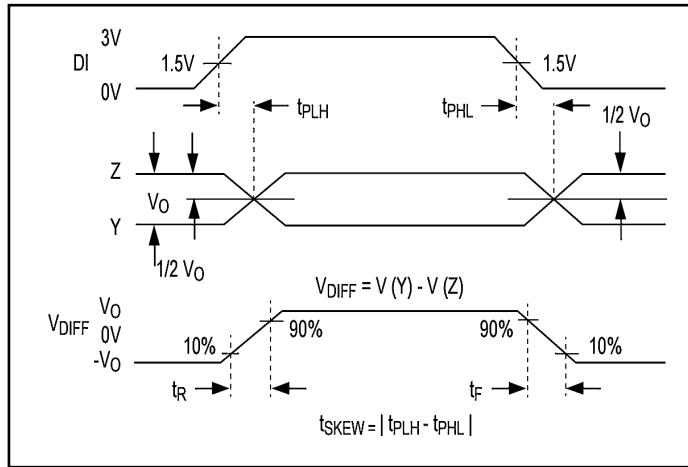


Fig 4 Driver Propagation Delays

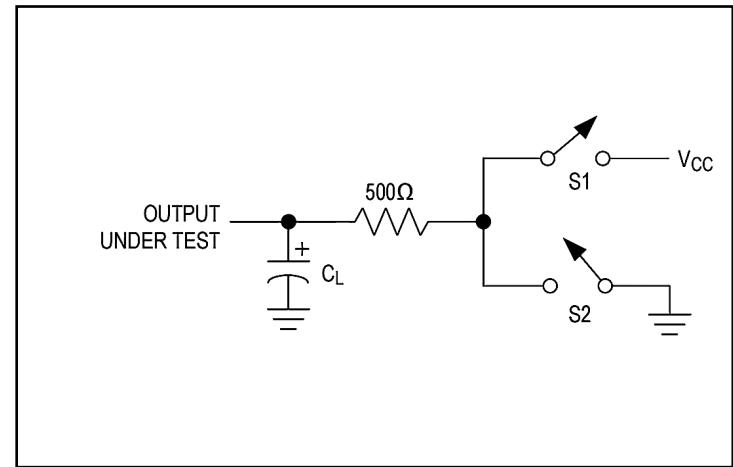


Fig 5 Driver Enable/Disable Timing Test Load

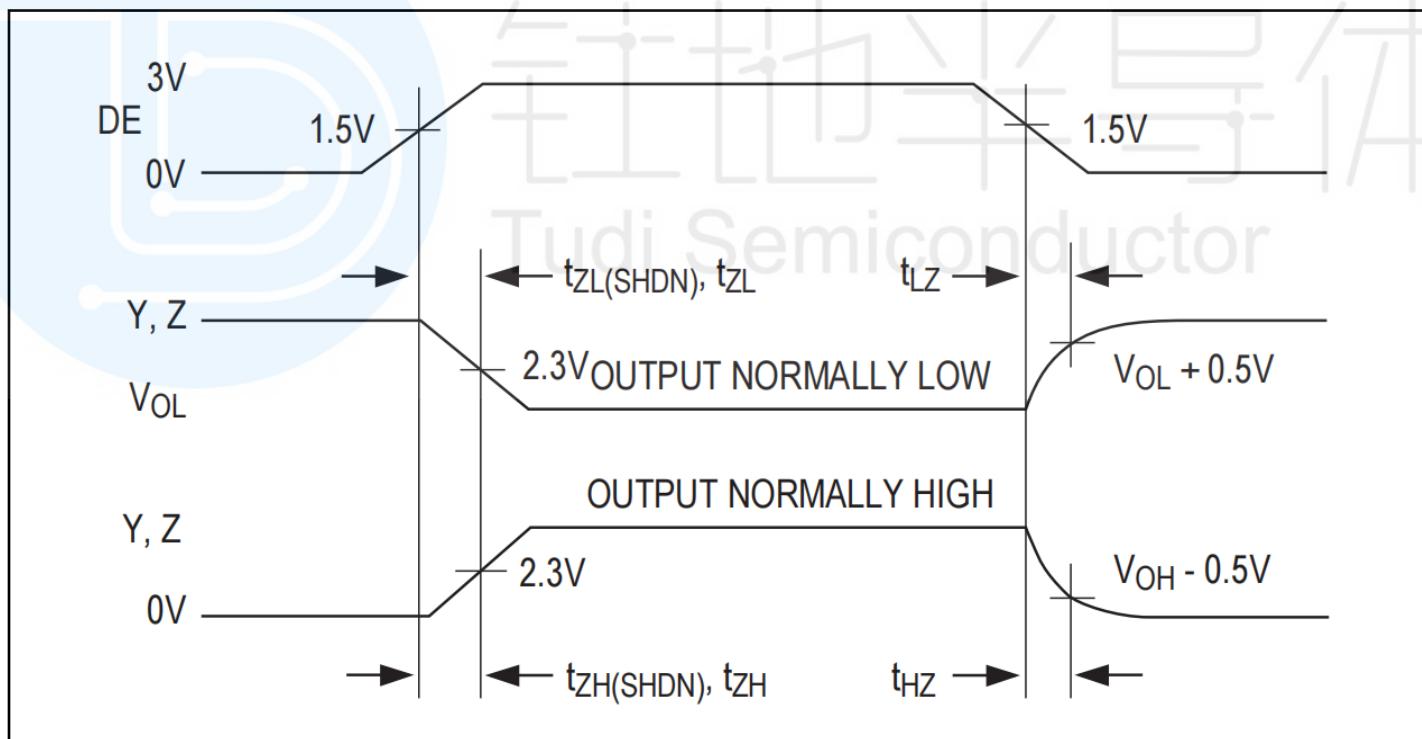


Fig 6 Driver Enable and Disable Times

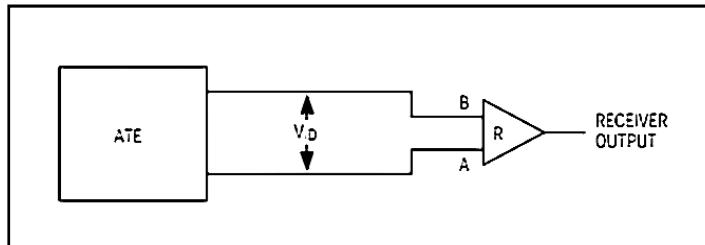


Fig 7 Receiver Propagation Delay Test Circuit

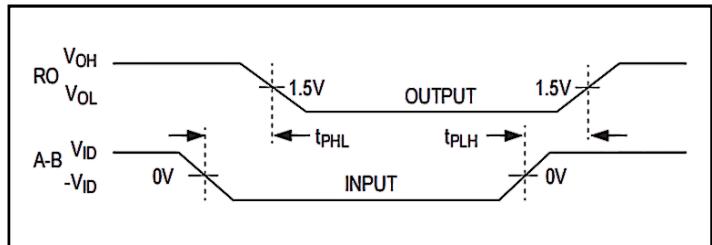


Fig 8 Receiver Propagation Delays

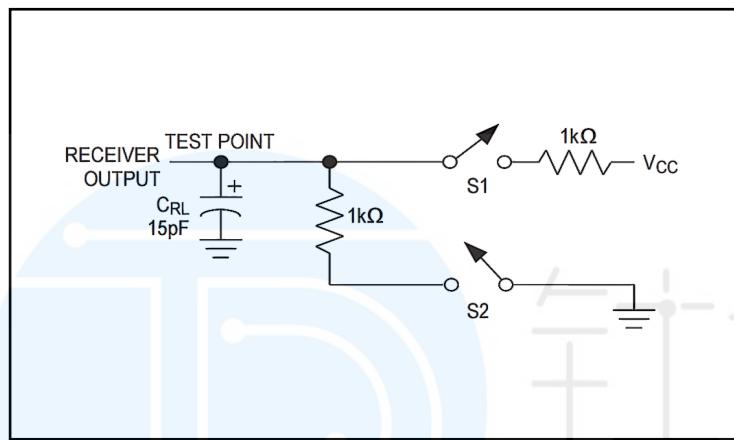


Fig 9 Receiver Enable/Disable Timing Test Load

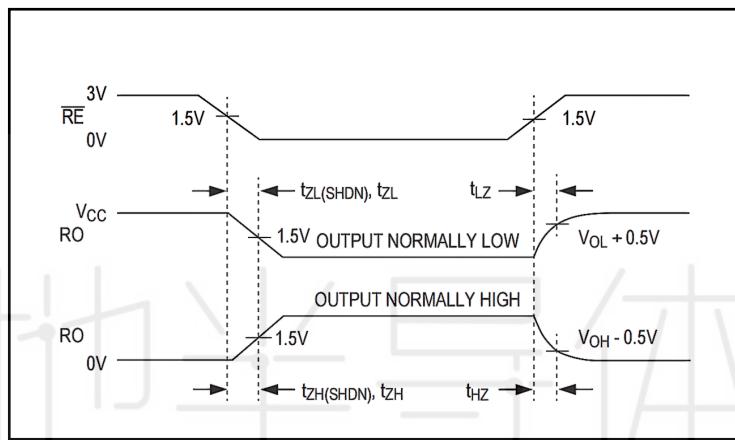


Fig 10 Receiver Enable and Disable Times

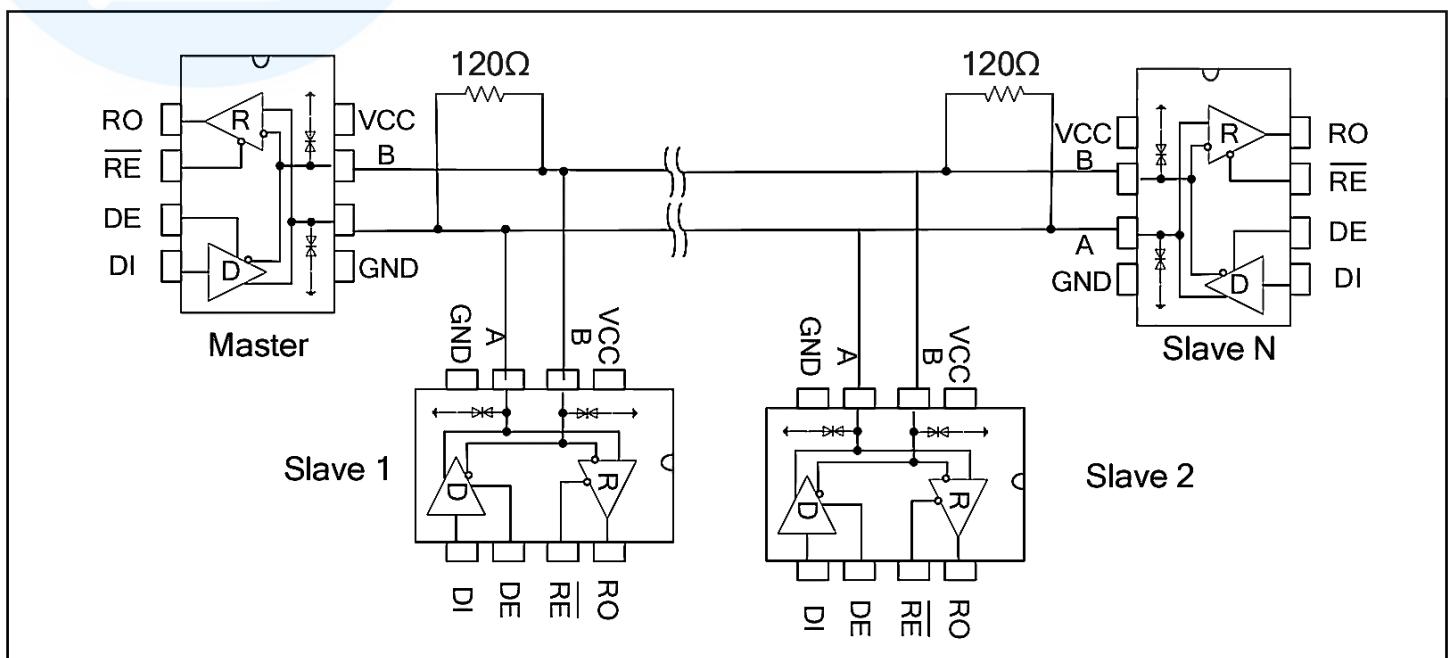


Fig 11 Backbone cable type RS485 communications network

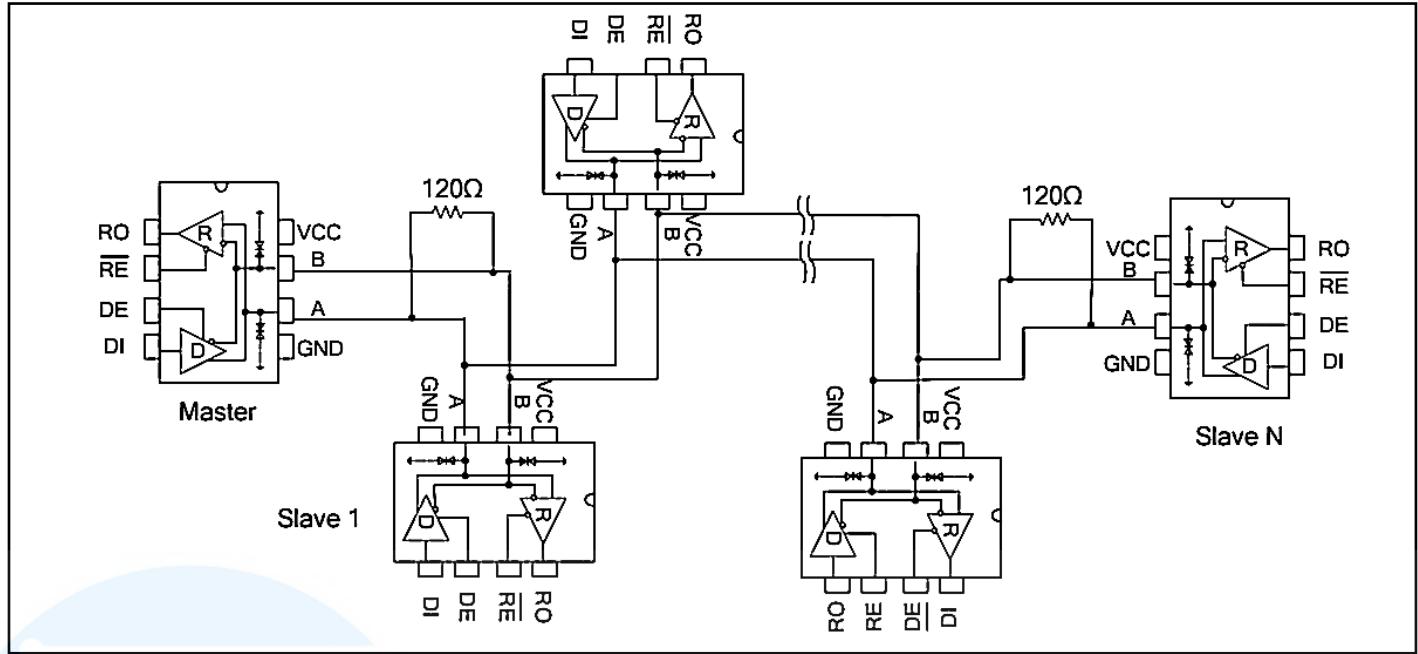


Fig12 Daisy chain topology type RS485 communications network

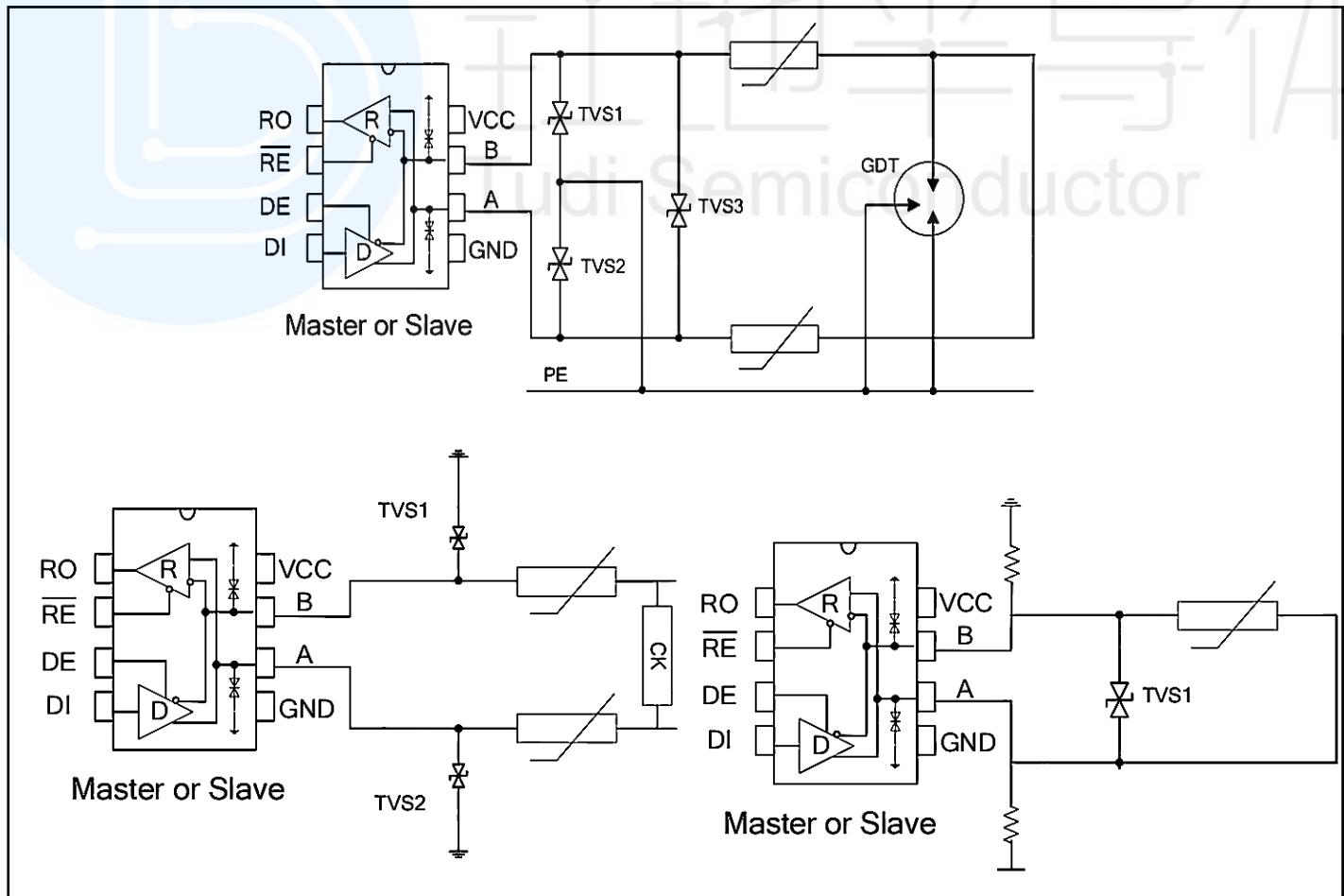


Fig13 RS485 bus ports Protection configuration



Additional description

Description

8485, including a driver and a receiver, is a half-duplex high-speed transceivers for RS-485 / RS-422 communications. 485 features fail-safe, overvoltage protection, overcurrent protection, thermal protection, and allows / RE, DE hot-swappable. The 8485 allows an error-free data transmission up to 6M.

Typical Application

Backbone cable type: 8485 transceiver is designed for multi-point bi-directional data communication bus transmission lines. Figure 11 shows a typical network application circuit. These devices can also be used as a cable longer than 4,000 feet of line repeater, to reduce the reflection, the transmission line should be in its ends terminated in its characteristic impedance, and stub lengths off the main line should be as short as possible. Hand in hand type: Also known as daisy chain topology, is the prior RS485 bus topology recommended by the TIA organization. The routing method is the master device and a number of slave devices connected in hand-handle configuration, as shown in Figure 12. It's should be noted at that hand in handle means no branch line. This kind of topology has the advantages of small reflection and high rate of success communication. The bus port protection : In harsh environments, RS485 communication ports are usually done with static protection, lightning surge protection, and other additional protection, even prepared to prevent 380V electricity access by mistake. To avoid the destruction of intelligent instruments and industrial control host, figure 13 demonstrates three general kinds of RS485 bus port protection configuration.

Connecting 32 Transceivers on one Bus

The standard 8485 receiver input impedance is guaranteed $>12k\Omega$, the standard driver can drive up to 32 unit loads. These devices can be any combination, or in combination with other RS-485 transceiver combination, as long as the total load does not load more than 32 units, can be connected on the same bus.

Drive Output Protection

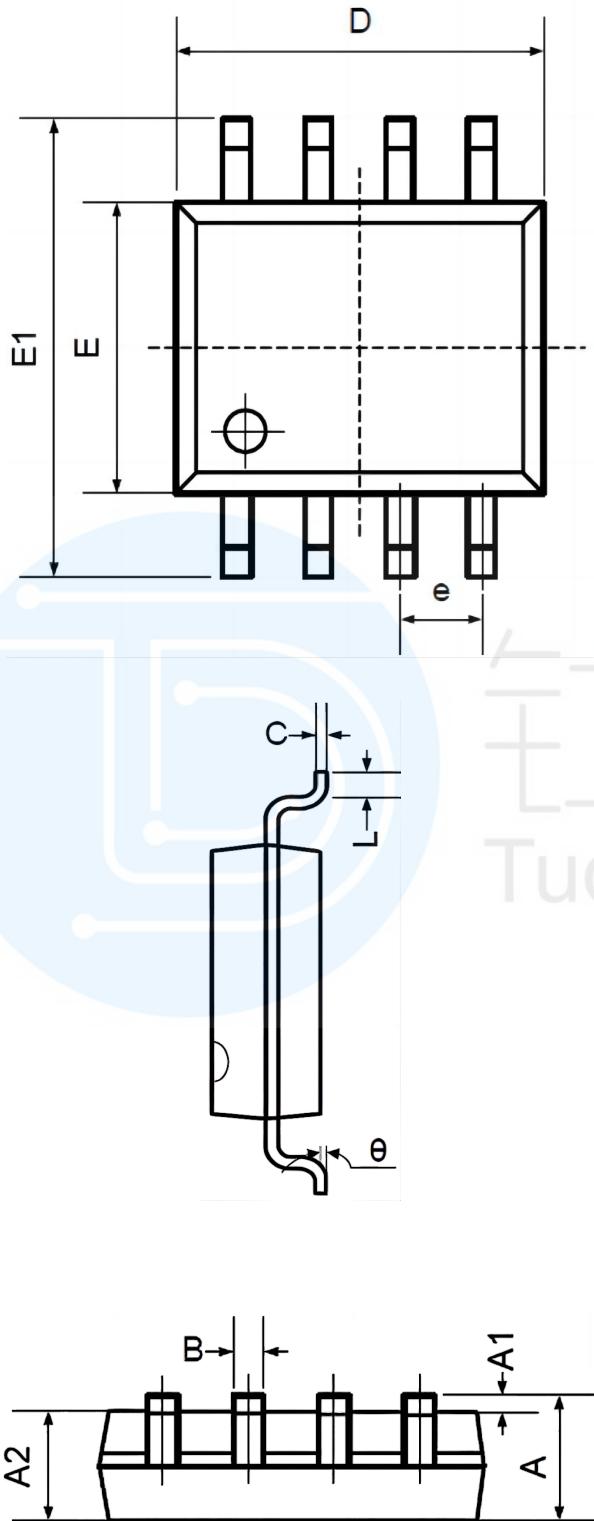
Through two mechanisms to avoid failure or a bus contention causes power consumption is too high. First, in the entire common Mode voltage range, overcurrent protection circuit provides a fast short protection. Second, when the die temperature exceeds 150°C , driver output is forced into a high impedance state by the thermal shutdown circuit.

Fail Safe

When the receiver inputs are shorted or open, or when they are connected to a terminated transmission line with all drivers disabled, 8485 guarantees a logic-high receiver output. This is done by the receiver input thresholds are set between -10mV and -200mV . If the differential receiver input voltage $(A-B) \geq -10\text{mV}$, RO is logic high; if the voltage $(A-B) \leq -200\text{mV}$, RO is logic low. When attached to the terminal all transmitters on the bus are disabled, the receiver differential input voltage is pulled to 0V by the termination resistor. With the receiver threshold of the 8485, this results in a logic-high with a 10mV minimum noise margin. The -10mV to -200mV threshold complies with the $\pm 200\text{mV}$ EIA/TIA-485 standard.



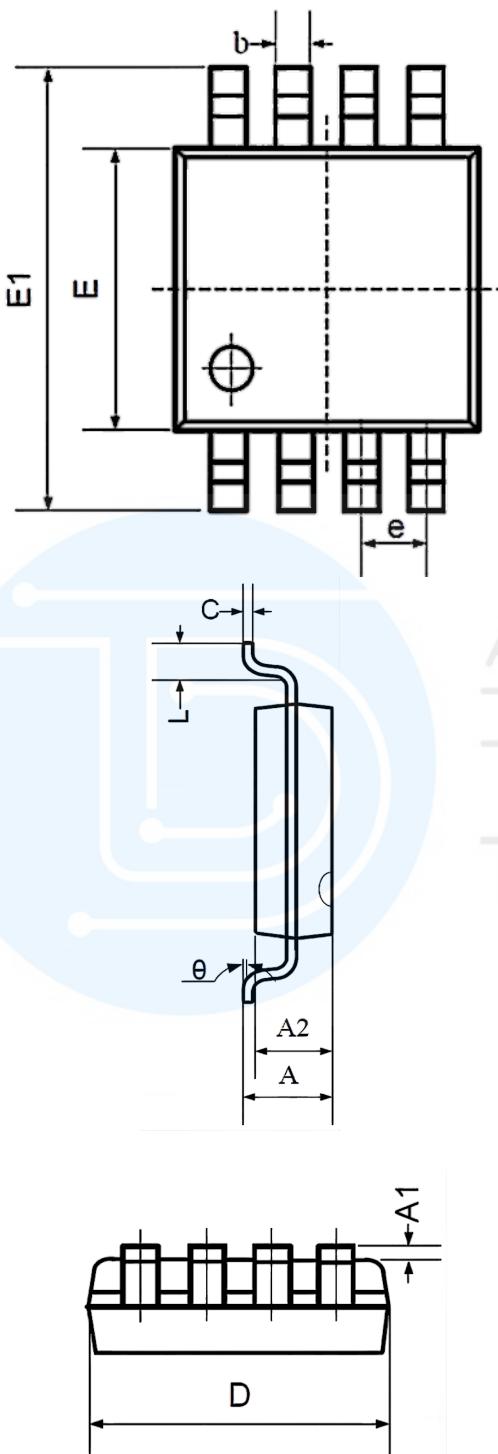
Package SOP8



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°



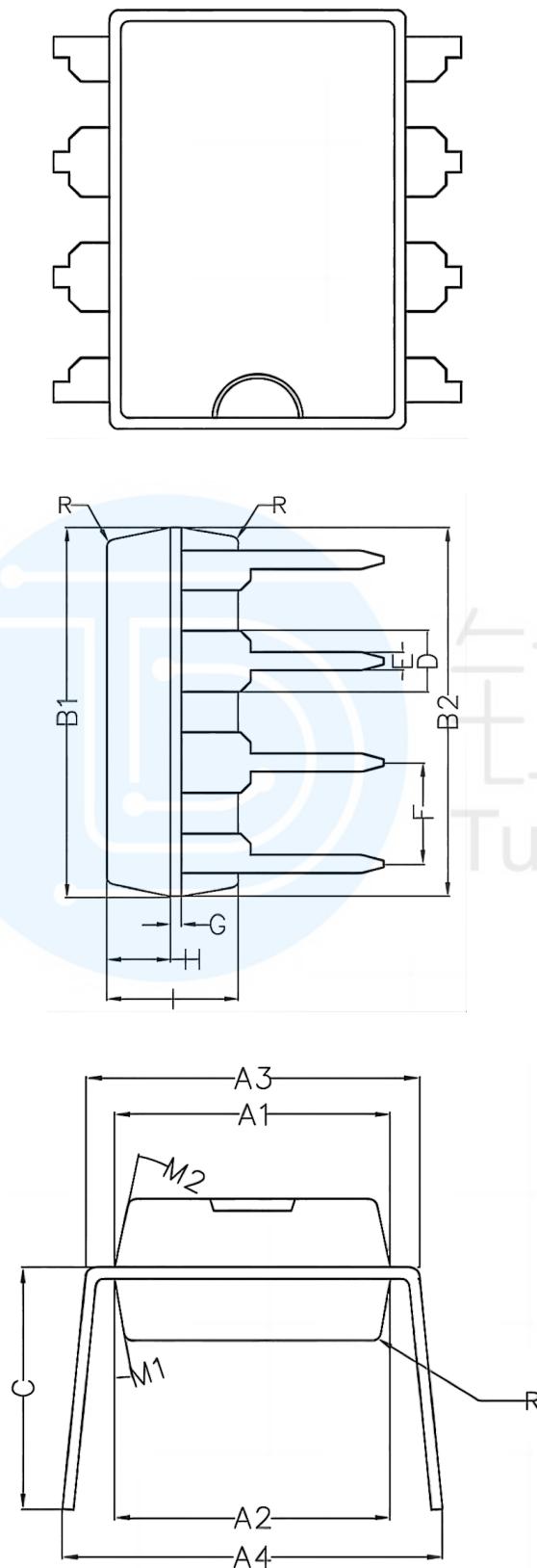
Package MSOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
L	0.410	0.650	0.016	0.026
θ	0°	6°	0°	6°



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
工	3.22	3.27	3.32
R		0.20	
M1	9°	10°	11°
M2	11°	12°	13°



Order information

Order Number	Package	Package Quantity	Marking On The park	Temperature
ISL8485ECUZ-T-TUDI	MSOP8	Tape,Reel,2500	8485ECU	0°C to 70°C
ISL8485ECPZ-TUDI	DIP8	Tube,50A box of 2000	ISL8485ECPZ	
ISL8485ECBZ-T-TUDI	SOP8	Tape,Reel,2500	8485ECB	
ISL8485EIUZ-T-TUDI	MSOP8	Tape,Reel,2500	8485EIU	- 40°C to 85°C
ISL8485EIPZ-TUDI	DIP8	Tube,50A box of 2000	ISL8485EIP	
ISL8485EIBZ-T-TUDI	SOP8	Tape,Reel,2500	8485EIBZ	



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