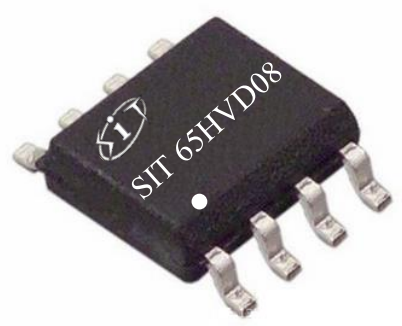
FEATURES：

- 3V~5.5V Power Supply, Half-duplex；
- ESD Protection for Bus Terminals：
  Contact Discharge±16KV；
- Bus Terminals Fault Voltage Up To ±15V
- 1/8-unit-load, allows up to 256 transceivers on the bus；
- Short-circuit protection；
- Thermal shutdown protection；
- Low-Current Shutdown Mode；
- True Fail-Safe Receiver；
- Excellent noise immunity；
- Integrated transient voltage suppression；
- 10Mbps in Electrically Noisy Environments；

Configuration：



PB Free Package (RoHS)

General Description

SIT65HVD08 is a 3.0V~5.5V power supply, the contact discharge voltage of A/B is ±16KV, the fault protected voltage is ±15V, half-duplex, low power, RS485 Transceiver. SIT65HVD08 fully meets the TIA/EIA-485 standard.

SIT65HVD08 includes a driver and a receiver, both of which can be independently enabled and disabled. When both are disabled, the driver and receiver outputs are high-impedance state. SIT65HVD08 has a 1/8-unit-load receiver input impedance, that allows up to 256 transceivers on the bus. The SIT65HVD08 allowing error-free data transmission up to 10Mbps.

SIT65HVD08 operates under the supply voltage of 3.0V to 5.5V. SIT65HVD08 is a true fail-safe transceiver. SIT65HVD08 also has the function of thermal shutdown protection, current limiting protection, overvoltage protection.

Functional Block

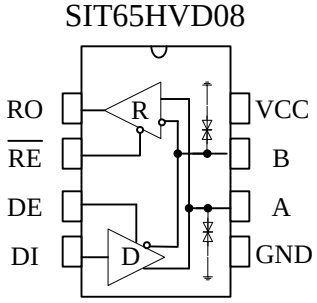


Fig1.Functional Block

ABSOLUTE MAXIMUM RATINGS

PARAMETER	Symbol	Value	Unit
Supply Voltage	VCC	+7	V
CTR Port	/RE，DE，DI	-0.3~VCC+0.5	V
Driver Output Voltage	A、B	-15~15	V
Receiver Output Voltage	RO	-0.3~VCC+0.5	V
Temperature Range		-40~85	℃
Storage Temperature Range		-60~150	℃
Soldering Temperature (reflow)		300	℃
Continuous Power Dissipation	SOP8	470	mW
	MSOP8	830	mW
	DIP8	700	mW

Stresses beyond those listed under "Absolute Maximum Ratings" 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.

Pin Description

Pin Number	Pin Name	FUNCTION
1	RO	Receiver Output. When enabled, if A –B ≥ 200 mV, then RO = high. If A -B ≤ -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 (0 V).
6	A	No inverting Receiver Input A/Driver Output A.
7	B	Inverting Receiver Input B/Driver Output B.
8	VCC	Power Supply

DC ELECTRICAL CHARACTERISTICS OF DRIVER

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Differential Driver Output(no load)	V_{OD1}		3.0		5.5	V
Differential Driver Output	V_{OD2}	Fig 2，RL = 54 Ω VCC=3.3V		2	VCC	V
		Fig 2，RL = 54 Ω VCC=5.0V		3.5	VCC	
Change in Magnitude of Differential Output Voltage (NOTE1)	ΔV_{OD}	Fig 2，RL = 54 Ω			0.2	V
Driver Common-Mode Output Voltage	V_{OC}	Fig 2，RL = 54 Ω			3	V
Change In Magnitude of Common-Mode Voltage (NOTE1)	ΔV_{OC}	Fig 2，RL = 54 Ω			0.2	V
Input High Voltage	V_{IH}	DE，DI，/RE	2.0			V
Input Low Voltage	V_{IL}	DE，DI，/RE			0.8	V
Input Current (RE,DI,/RE)	I_{IN1}	DE，DI，/RE	-2		2	uA
Driver Short-Circuit Output Current（short to high）	I_{OSD1}	Short to 0V~12V			250	mA
Driver Short-Circuit Output Current（short to low）	I_{OSD2}	Short to-7V~0V	-250			mA
Thermal-Shutdown Threshold				140		℃
Thermal-Shutdown Hysteresis				20		℃

（If no special situation occurs Temp=T_{MIN}~T_{MAX}， Temp＝25℃）

NOTE1：ΔV_{OD} and ΔV_{OC} are the changes in V_{OD} and V_{OC}, respectively, when the DI input changes state.

DC ELECTRICAL CHARACTERISTICS OF RECEIVER

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Current（A，B）	I_{IN2}	DE = 0 V, VCC=0 or3.3/ 5V, V_{IN} = 12 V			125	uA
		DE = 0 V,VCC=0 or 3.3/5V,VIN =-7 V	-100			uA

Positive-going input threshold voltage	V_{IT+}	-7V≦V_{CM}≦12V			+200	mV
Negative-going input threshold voltage	V_{IT-}	-7V≦V_{CM}≦12V	-200			mV
Receiver Input Hysteresis	V_{hys}	-7V≦V_{CM}≦12V	10	30		mV
RO Output-High Voltage	V_{OH}	I_{OUT} = −4mA，V_{ID} = +200 mV	VCC-1.5			V
RO Output-Low Voltage	V_{OL}	I_{OUT} = +4mA，V_{ID} = -200 mV			0.4	V
Three-State Output Current at Receiver	I_{OZR}	0.4 V < V_O < 2.4 V			±1	uA
Receiver Input Resistance	R_{IN}	-7V≦V_{CM}≦12V	96			kΩ
Receiver Output Short-Circuit	I_{OSR}	0 V≤V_O≤VCC	±8		±60	mA

（If no special situation occurs, Temp=T_{MIN}~T_{MAX}， Temp＝25℃）

SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	I_{CC1}	/RE=0V，DE = 0 V，VCC=3.3V		430	650	uA
		/RE=0V，DE = 0 V VCC=5V		470	750	uA
	I_{CC2}	/RE=VCC，DE=VCC，VCC=3.3V		450	650	uA
		/RE=0V，DE = 0 V，VCC=5V		510	750	uA
Supply Current in Shutdown Mode	I_{SHDN}	/RE=VCC，DE=0V，VCC=3.3V		0.4	10	uA
		/RE=VCC，DE=0V，VCC=5V		0.1	10	uA

SWITCHING CHARACTERISTICS OF DRIVER

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Differential Output Delay	t_{DD}	R_{DIFF} = 60 Ω, C_{L1}=C_{L2}=100pF (Fig 3,4)		12	32	ns
Driver Differential Output Transition Time	t_{TD}			15	28	ns
Driver Propagation Delay, Low-to-High Level	t_{DZH}	R_{DIFF} = 27 Ω (Fig 3,4)	18		40	ns
Driver Propagation Delay, High-to-Low Level	t_{DZL}		18		40	ns
|tPLH - tPHL| Driver Propagation-Delay Skew (Note 2)	t_{PDS}			2	2.5	ns
Driver-Output Enable Time to High Level	t_{PZH}	R_L = 110Ω, （Fig 5,6）			55	ns
Driver-Output Enable Time to Low Level	t_{PZL}				55	ns
Driver-Output Disable Time from Low Level	t_{PLZ}	R_L = 110Ω, （Fig 5,6）			85	ns
Driver-Output Disable Time from High Level	t_{PHZ}				85	ns
Driver-Output Enable Time from Shutdown to Low Level	t_{DSH}	R_L = 110Ω, （Fig 5,6）		400	1000	ns
Driver-Output Enable Time from Shutdown to High Level	t_{DSL}	R_L = 110Ω, （Fig 5,6）		400	1000	ns

SWITCHING CHARACTERISTICS OF RECEIVER

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Receiver Propagation Delay (low to high)	t_{RPLH}	C_L=15pF （Fig 7,8）		70		ns
Receiver Propagation Delay (high to low)	t_{RPHL}	C_L=15pF （Fig 7,8）		70		ns
$\|t_{RPLH} - t_{RPHL}\|$	t_{RPDS}	C_L=15pF （Fig 7,8）		5		ns
Receiver Enable to Output Low	t_{RPZL}	C_L=15pF （Fig 7,8）		15		ns
Receiver Enable to Output High	t_{RPZH}	C_L=15pF （Fig 7,8）		15		ns
Receiver Disable Time from Low	t_{PRLZ}	C_L=15pF （Fig 7,8）		25	55	ns
Receiver Disable Time from High	t_{PRHZ}	C_L=15pF （Fig 7,8）		25	55	ns
Receiver Enable from shutdown to Output High	t_{RPSH}	C_L=15pF （Fig 7,8）		250	1500	ns
Receiver Enable from Shutdown to Output Low	t_{RPSL}	C_L=15pF （Fig 7,8）		250	1500	ns
Time to Shutdown	t_{SHDN}	NOTE2	80		300	ns

NOTE2：

The device is put into shutdown by bringing RE high and DE low. If the enable inputs are in this state for less than 50ns, the device is guaranteed not to enter shutdown. If the enable inputs are in this state for at least 600ns, the device is guaranteed to have entered shutdown.

FUNCTION TABLES

TRANSMITTING

CTR		INPUTS	OUTPUTS	
/RE	DE	DI	A	B
X	1	1	H	L
X	1	0	L	H
0	0	X	Z	Z
1	0	X	Z(shutdown)	

X：Don’t care；Z：high impedance。

RECEIVING

CTR		INPUTS	OUTPUTS
/RE	DE	A-B	RO
0	X	≥200mV	H
0	X	≤-200mV	L
0	X	Open/shorted	H
1	X	X	Z

X：Don’t care；Z：high impedance。

TEST CIRCUIT

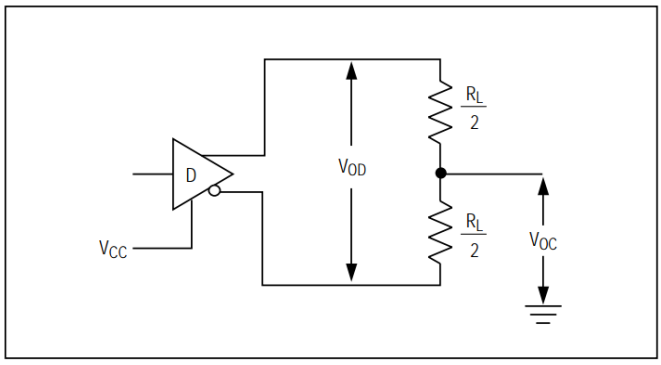
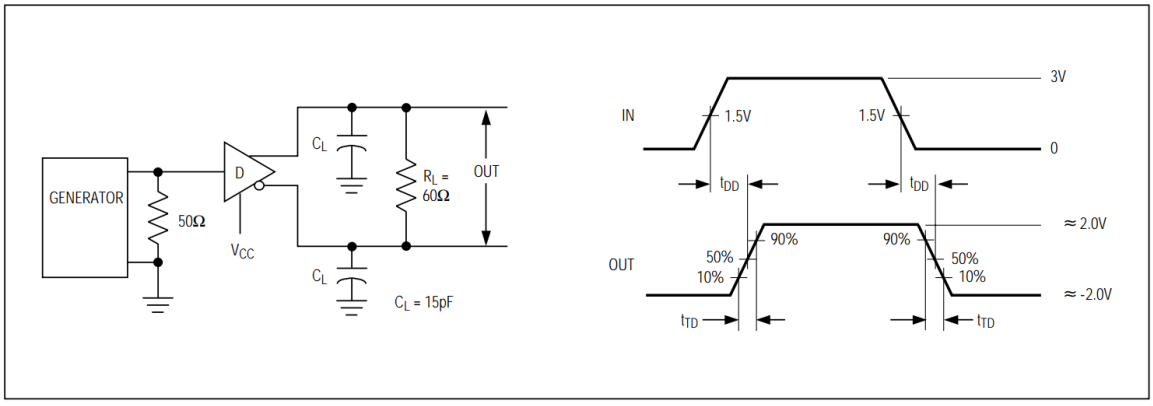


Fig 2 Driver DC Test Load



CL=15pF (CL includes probe and stray capacitance, Same as below)

Fig 3 Driver Differential Output Delay and Transition Times

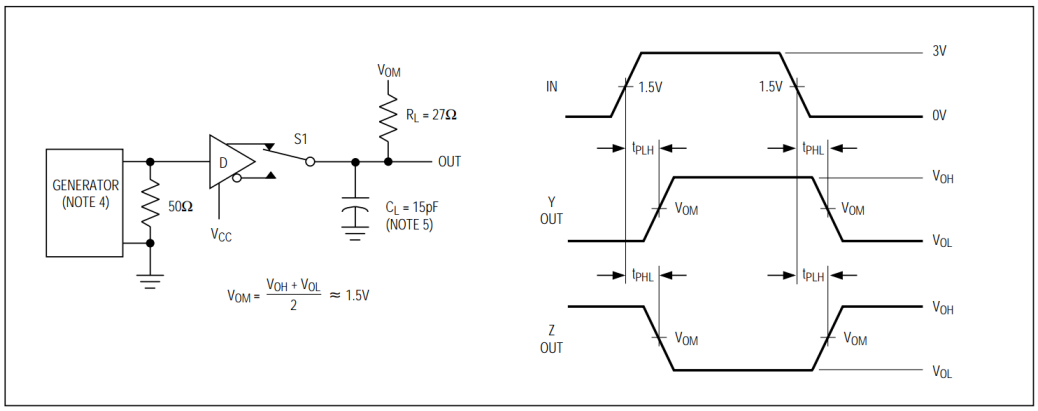


Fig 4 Driver Propagation Times

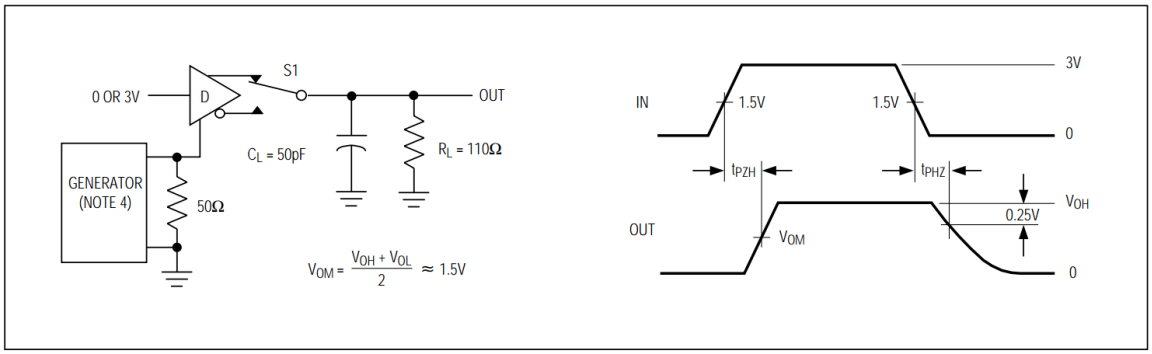


Fig 5 Driver Enable and Disable Times

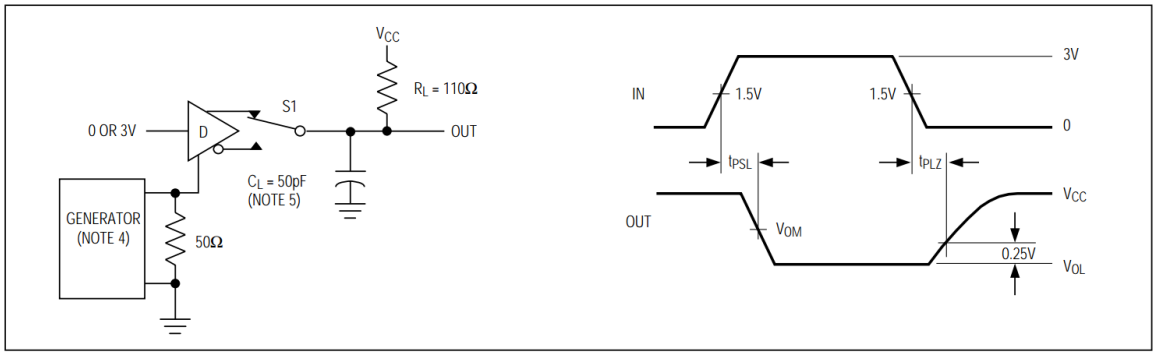


Fig 6 Driver Enable and Disable Times

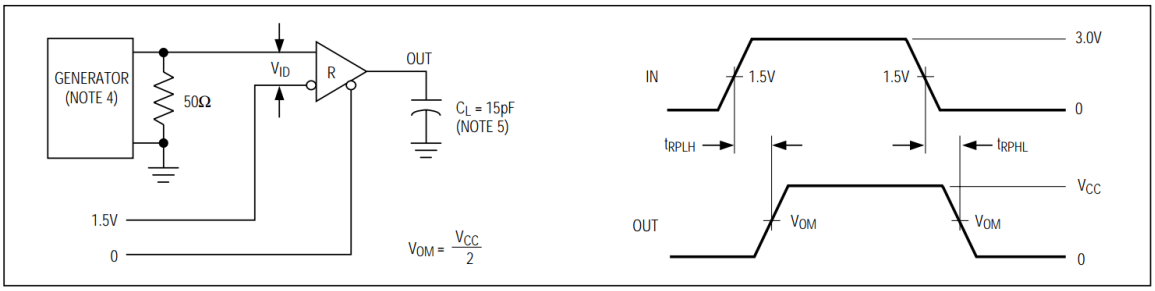


Fig 7 Receiver Propagation Delay

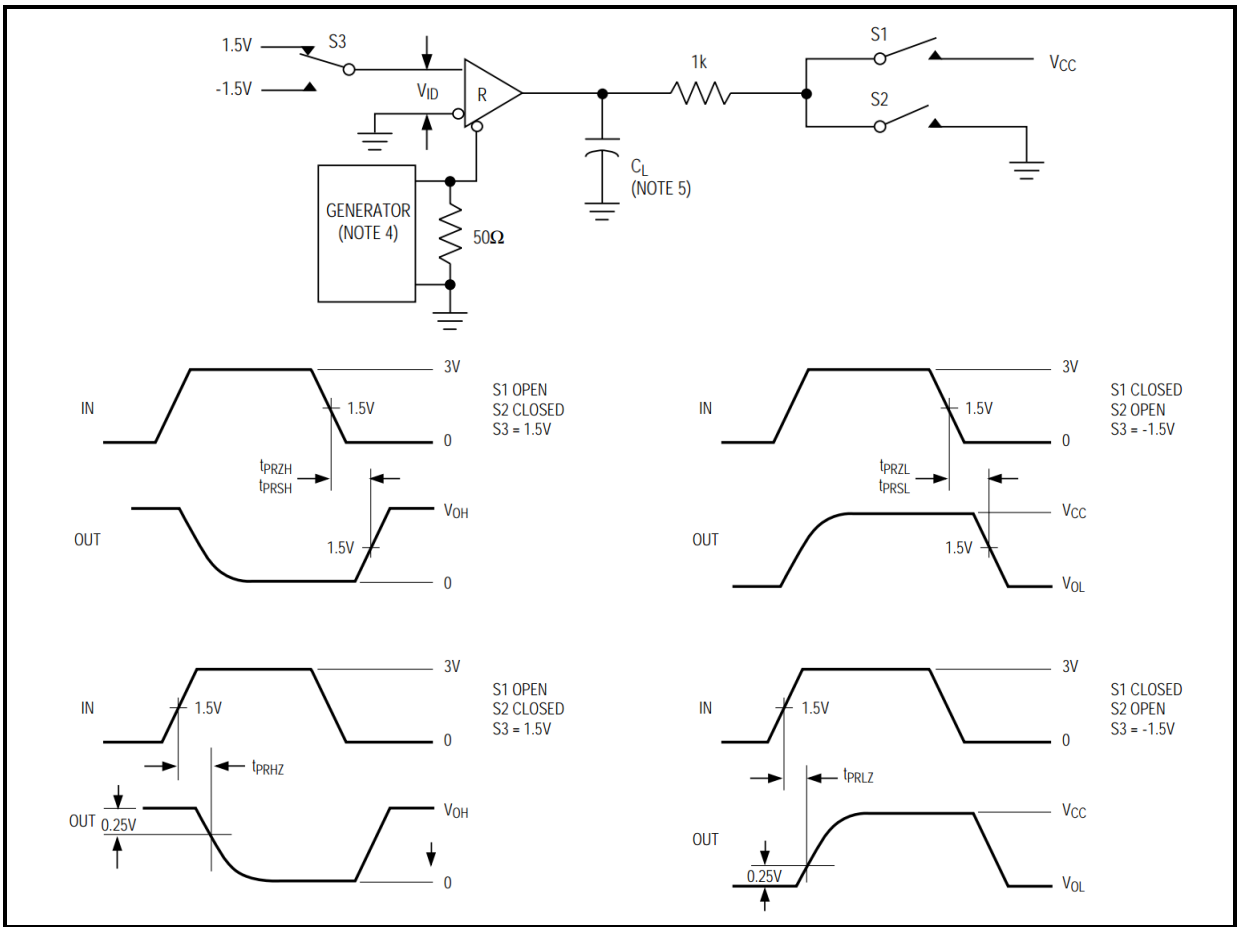


Fig 8 Receiver Enable and Disable Times

SUMMARY

1 Description

SIT65HVD08, is 3.0~5.5V power supply, ±16kV contact discharge capacity and ±15V fault protect voltage of the A/B terminal, including a driver and a receiver, half-duplex high-speed transceivers for RS-485 / RS-422 communications. SIT65HVD08 features fail-safe, overvoltage protection, overcurrent protection, thermal protection. The SIT65HVD08 allows error-free data transmission up to 10Mbps.

2 Connecting 256 Transceivers on one Bus

The standard RS-485 receiver input impedance is 12kΩ (1 unit load), the standard driver can drive up to 32 unit loads. Receiver SIT65HVD08 transceiver has a 1/8 unit load receiver input impedance (96kΩ), allowing up to 256 transceivers to be connected in parallel on one bus. 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.

3 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 140℃, driver output is forced into a high impedance state by the thermal shutdown circuit.

4 Typical Application

4.1 **Backbone cable type:** SIT65HVD08 transceiver is designed for multi-point bi-directional data communication bus transmission lines. Figure 9 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.

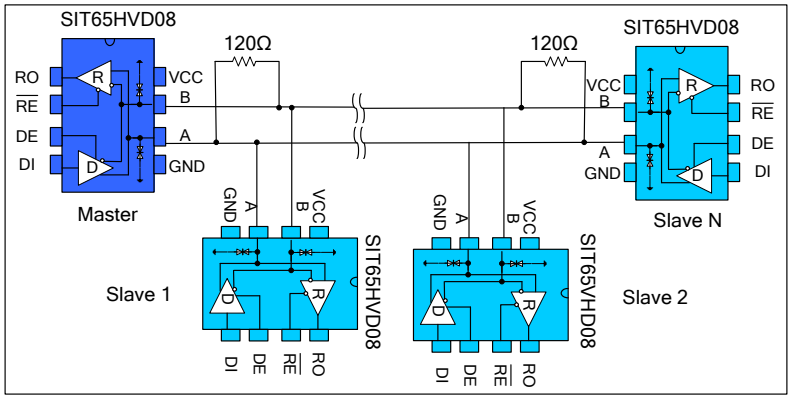


Fig.9 Backbone cable type RS485 communications network

4.2 **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 10. It' 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.

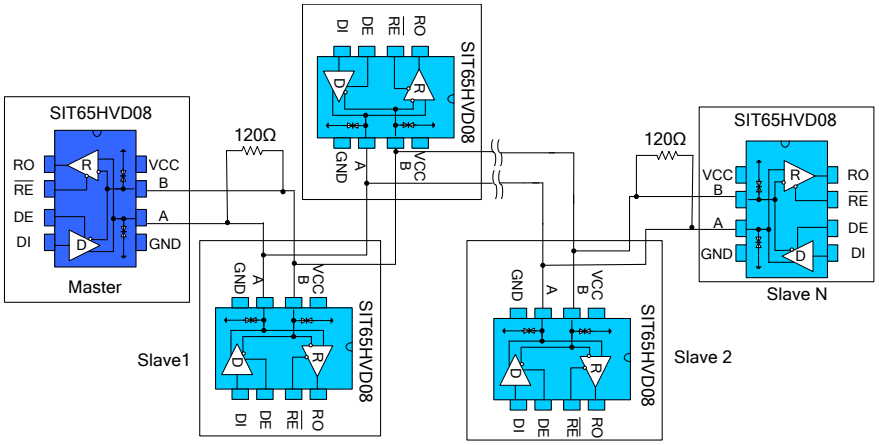


Fig.10 Daisy chain topology type RS485 communications network

4.3 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 11 demonstrates three general kinds of RS485 bus port protection configuration.

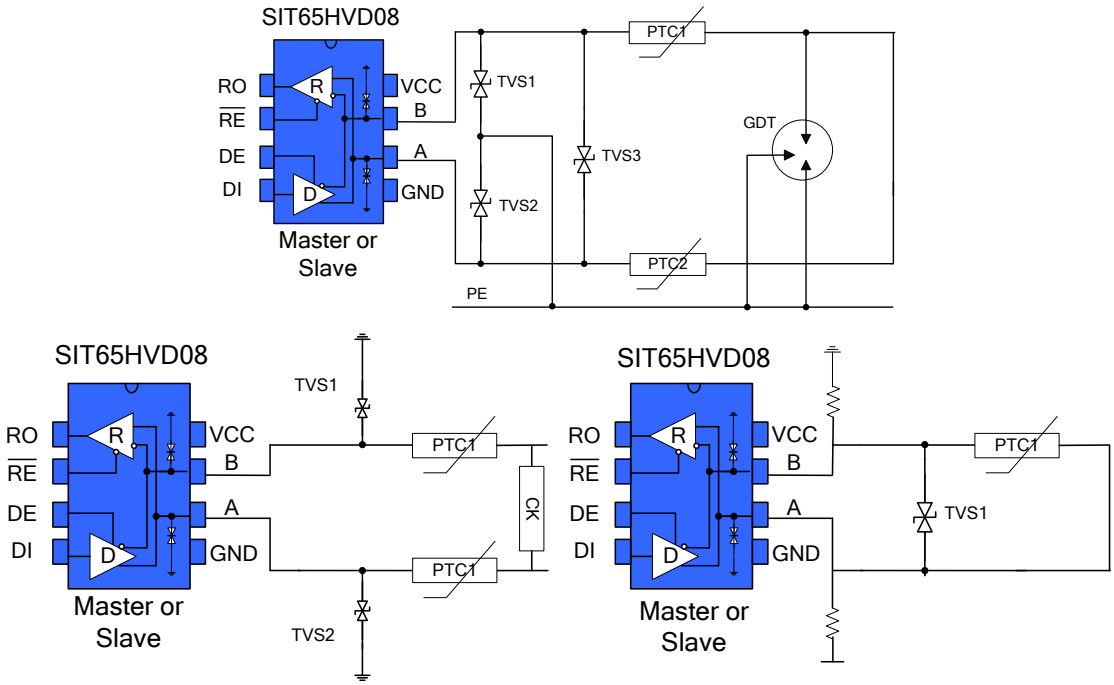
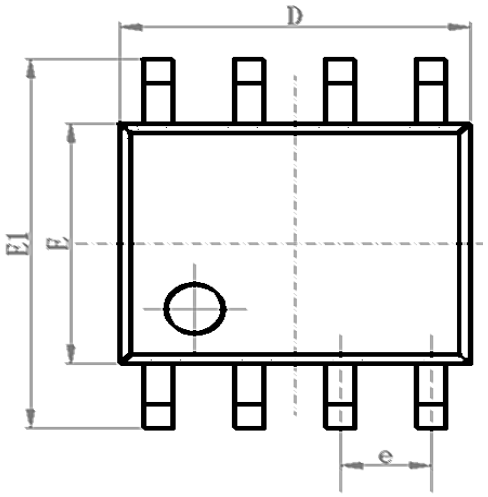


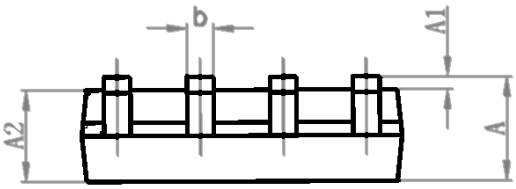
Fig11 RS485 bus ports Protection configuration

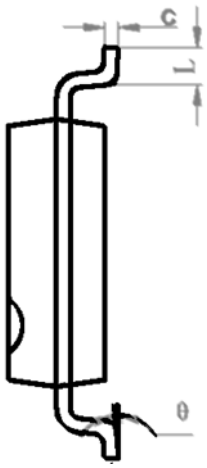
SOP8 PACKAGE OUTLINE

Package Dimensions

Symbol	Min/mm	Typ/mm	Max/mm
A	1.50	1.60	1.70
A1	0.1	0.15	0.2
A2	1.35	1.45	1.55
b	0.355	0.400	0.455
D	4.800	4.900	5.00
E	3.780	3.880	3.980
E1	5.800	6.000	6.200
e		1.270BSC	
L	0.40	0.60	0.80
c	0.153	0.203	0.253
θ	-2°	-4°	-6°



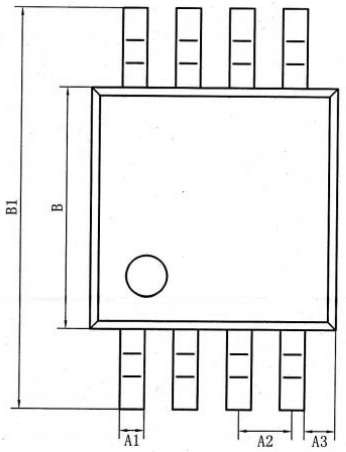


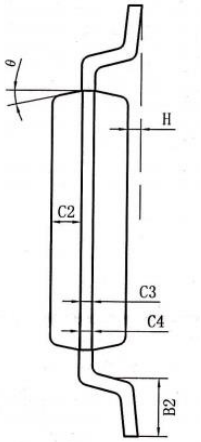


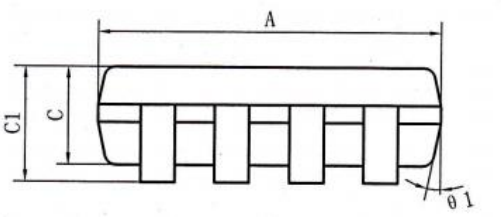
MSOP8 / 8μMAX / VSSOP8 PACKAGE OUTLINE

Package Dimensions

Symbol	Min/mm	Typ/mm	Max/mm
A	2.90	3.0	3.10
A1	0.28		0.35
A2	0.65TYP		
A3	0.375TYP		
B	2.90	3.0	3.10
B1	4.70		5.10
B2	0.45		0.75
C	0.75		0.95
C1			1.10
C2	0.328 TYP		
C3	0.152		
C4	0.15		0.23
H	0.00		0.09
θ	12 °TYP		



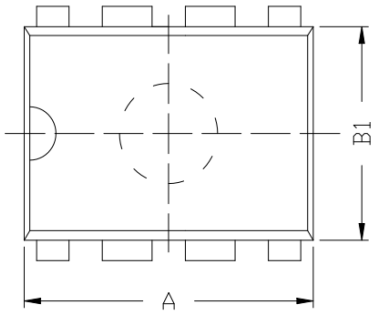


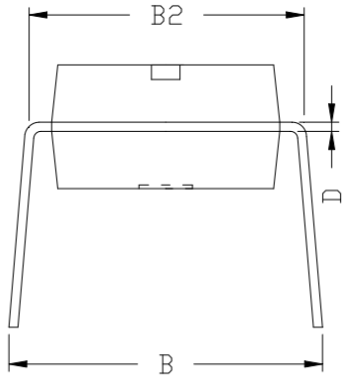


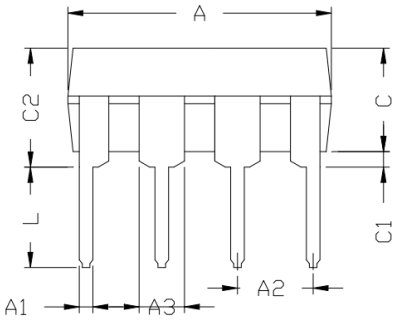
DIP8 PACKAGE OUTLINE

Package Dimensions

Symbol	Min/mm	Typ/mm	Max/mm
A	9.00	9.20	9.40
A1	0.33	0.45	0.51
A2	2.54TYP		
A3	1.525TYP		
B	8.40	8.70	9.10
B1	6.20	6.40	6.60
B2	7.32	7.62	7.92
C	3.20	3.40	3.60
C1	0.50	0.60	0.80
C2	3.71	4.00	4.31
D	0.20	0.28	0.36
L	3.00	3.30	3.60







Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
SIT65HVD08DR	-40℃~85℃	8 SO
SIT65HVD08DGK	-40℃~85℃	MSOP8/VSSOP8/8μMAX
SIT65HVD08P	-40℃~85℃	DIP8

Tape and Reel: Pack quantity is 2,500.

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