Corel

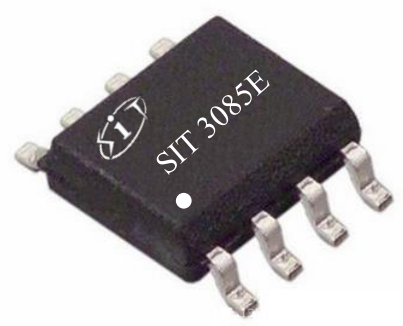
SIT3085E

High static protection 1M half-duplex RS485/RS422 transceiver

characteristic:

- 5V power supply, half-duplex;
- 1/8 unit load, allowing up to 256 devices to be connected to the bus;
- Driver short circuit output protection;
- Over temperature protection function;
- Low power consumption shutdown function;
- The RE and DE ports allow hot-plugging input
- Receiver open circuit failure protection;
- Strong anti-noise ability;
- Integrated transient voltage resistance function;
- The data transmission rate in the electrical noise environment can reach 1Mbps;
- A, B port protection: HBM±16KV; contact discharge ±16KV;

Product appearance:



Provide green, lead-free packaging

description

SIT3085E is a 5V powered, half-duplex, low-power RS-485 transceiver that fully meets the requirements of TIA/EIA-485 standards.

SIT3085E includes a driver and a receiver, both of which can be independently enabled or disabled. When both are disabled, the driver and receiver output high impedance states. SIT3085E has 1/8 load capacity, allowing 256 SIT3085E transceivers to be connected in parallel on the same communication bus. It supports error-free data transmission up to 1 Mbps.

SIT3085E The working voltage range is 4.5~5.5 V, with fail-safe (fail-safe), over temperature protection, current limiting protection, over voltage protection, hot plug-in input of control port and other functions.

SIT3085E It has excellent ESD release capability, HBM reaches ±16KV, and contact discharge meets IEC61000-4-2± 16KV.

Pin distribution diagram

SIT3085E

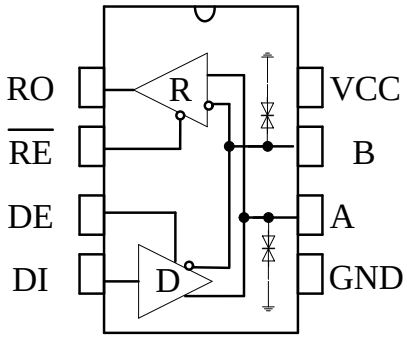


Figure 1 SIT3085E Pin distribution diagram

Absolute rating

Parameter	Symbol	Big or small	Unit
Supply voltage	VCC	+7	V
Control the port voltage	/RE，DE，DI	-0.3~VCC+0.3	V
Total input voltage on the bus	A、B	-7~13	V
Receiver output voltage	RO	-0.3~VCC+0.3	V
Operating temperature range		-40~85	℃
Storage working temperature range		-60~150	℃
Welding temperature range		300	℃
Continuous power consumption	SOP8	400	mW
	DIP8	700	mW

The maximum limit parameter value is the value beyond which the device may suffer irrecoverable damage. Under these conditions, it is not conducive to the normal operation of the device. Continuous operation of the device at the maximum allowable rating may affect the reliability of the device. All voltage reference points are ground.

Pin definition

Pin number	Pin name	Pin function
1	RO	Receiver output end. When /RE is low, if A-B>= -50mV, RO output is high; if A-B<= -200mV, RO output is low.
2	/RE	Receiver output enable control. When /RE is connected to low voltage, the receiver output is enabled and RO output is valid; when /RE is connected to high voltage, the receiver output is disabled and RO is in high resistance state; When the RE is connected to a high level and the DE is connected to a low level, the device enters a low-power shutdown mode.
3	DE	Driver output enable control. When DE is high and DE is low, the driver output is valid; when DE is high and DE is low, the device enters low-power shutdown mode.
4	DI	DI driver input. When DE is high, the low level on DI makes the in-phase terminal A of the driver output low and the out-of-phase terminal B of the driver output

		high; the high level on DI will make the in-phase terminal output high and the out-of-phase terminal output low.
5	GND	Landing
6	A	Receiver in-phase input and driver in-phase output
7	B	Receiver inverting input and driver inverting output
8	VCC	Power connection

DC electrical characteristics of the driver

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Driver differential output (non-loaded)	V_{OD1}			5		V
Drive differential output	V_{OD2}	Graph 2,RL=27Ω	1.5		VCC	V
		Graph 2,RL=50Ω	2		VCC	
Change in the amplitude of the output voltage (NOTE1)	ΔV_{OD}	Graph 2,RL=27Ω			0.2	V
Output common mode voltage	V_{OC}	Graph 2,RL=27Ω			3	V
Change in the amplitude of the common-mode output voltage (NOTE1)	ΔV_{OC}	Graph 2,RL=27Ω			0.2	V
High-level input	V_{IH}	DE, DI, /RE	2.0			V
Low level input	V_{IL}	DE, DI, /RE			0.8	V
Logic input current	I_{IN1}	DE, DI, /RE	-2		2	uA
The current at the output short circuit is high	I_{OSD1}	Short circuit to 0V~12V	35		250	mA
The current at the time of output short circuit is low	I_{OSD2}	Short circuit to-7V~0V	-250		-35	mA
Overtemperature shutdown threshold temperature				150		℃
Overtemperature shutdown hysteresis temperature				20		℃

(If no other description is given, VCC=5V±10%, Temp=TMIN~TMAX, the typical value is VCC=+5V and Temp = 25) NOTE1: VOD and VOC are the changes in the amplitude of VOD and VOC caused by the state change of input signal DI.

DC electrical characteristics of the receiver

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Input current (A, B)	I_{IN2}	DE = 0 V, VCC=0 or 5V VIN = 12 V			125	uA
		DE = 0 V, VCC=0 or 5V VIN = -7 V	-100			uA

Positive input threshold voltage	V_{IT+}	-7V≦V_{CM}≦12V			-50	mV
Reverse input threshold voltage	V_{IT-}	-7V≦V_{CM}≦12V	-200			mV
Input hysteresis voltage	V_{hys}	-7V≦V_{CM}≦12V	10	30		mV
High level output voltage	V_{OH}	I_{OUT} = −4mA, V_{ID} = +200 mV	VCC-1.5			V
Low level output voltage	V_{OL}	I_{OUT} = +4mA, V_{ID} = -200 mV			0.4	V
Three state input leakage current	I_{OZR}	0.4 V < V_O < 2.4 V			±1	uA
Input resistance at the receiver	R_{IN}	-7V≦V_{CM}≦12V	96			kΩ
Receiver short circuit current	I_{OSR}	0 V≤V_O≤VCC	±7		±95	mA

(If no other description is given, VCC=5V±10%, Temp=TMIN~TMAX, typical value is VCC=+5 V, Temp = 25)

supply current

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Supply current	I_{CC1}	/RE=0V or VCC, DE = 0 V		180	300	uA
	I_{CC2}	/RE=VCC, DE=VCC		150	300	uA
Shut off the current	I_{SHDN}	/RE=VCC, DE=0V		0.5	10	uA

ESD protect

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
A、B		Mannequin (HBM)		±16		KV
		Contact discharge		±16		KV
Other ports		Mannequin (HBM)		±6		KV

Driver switch characteristics

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Drive input to output propagation delay (low to high)	t_{DPLH}	RDIFF = 54 Ω, CL 1=CL2=100pF (see Figure 3 and Figure 4)		100	150	ns
Drive input to output propagation delay (high to low)	t_{DPHL}			100	150	ns
$\lvert t_{DPLH} - t_{DPHL} \rvert$	t_{SKEW1}				±10	ns
Rise time / fall time	t_{DR}, t_{DF}			190	250	ns
Enable to output high	t_{DZH}	CL = 100 pF, S 1 closed (see Fig. 5, 6)		70	160	ns
Enable to output low	t_{DZL}			70	160	ns
Input is low to the forbidden energy	t_{DLZ}	C_L = 15 pF, S2 closed (See Figures 5 and 6)		70	100	ns
Input high enough to disable energy	t_{DHZ}			70	100	ns
Under shutdown conditions, Enable to output high	$t_{DZH(SHDN)}$	CL = 15 pF, S2, closed (see Figures 5 and 6)		80	120	ns
Under shutdown conditions, Enable to output low	$t_{DZL(SHDN)}$	CL = 15 pF, S1, closed (see Figures 5 and 6)		80	120	ns

Receiver switch characteristics

Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
Acceptor The propagation delay from input to output increases from low to high	t_{RPLH}	See Figure 7 and Figure 8 VID 2.0V; rising and falling edge time VID 15ns		50	80	ns
Acceptor The input to output propagation delay goes from high to low	t_{RPHL}			50	80	ns
$\lvert t_{RPLH} - t_{RPHL} \rvert$	t_{SKEW2}			5	15	ns
Enable to output low time	t_{RZL}	C_L = 100 pF, S1 closed (See figures 9 and 10)		25	40	ns

Enable the high time to output	t_{RZH}	C_L = 100 pF, S2 closed (See figures 9 and 10)		25	40	ns
From low output to forbidden time	t_{RLZ}	C_L = 100 pF, S1 closed (See figures 9 and 10)		25	50	ns
From high output to forbidden time	t_{RHZ}	C_L= 100pF, S2 closed (See figures 9 and 10)		25	50	ns
In the off state Enable the high time to output	$t_{RZH(SHDN)}$	CL = 100 pF, S2 closed (See figures 9 and 10)			1000	ns
In the off state Enable to output low time	$t_{RZL(SHDN)}$	C_L = 100 pF, S1 closed (See figures 9 and 10)			1000	ns
Enter the shutdown state time	t_{SHDN}	NOTE2	50	200	600	ns

Note2: When/RE=1 and DE=0, the duration is less than 50ns, the device must not enter the shutdown state, and when it is greater than 600ns, the device must enter the shutdown state.

Function table

Send function table

Control		Import	Output	
/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: any level; Z: high resistance.				

Receive function table

Control		Import	Output
/RE	DE	A-B	RO
0	X	≥-50mV	H
0	X	≤-200mV	L
0	X	Open/ circuit	H
1	X	X	Z
X: any level; Z: high resistance.			

test circuit

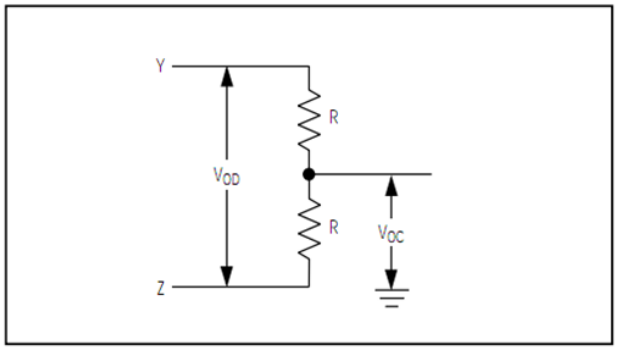


Figure 2 DC test load for the driver

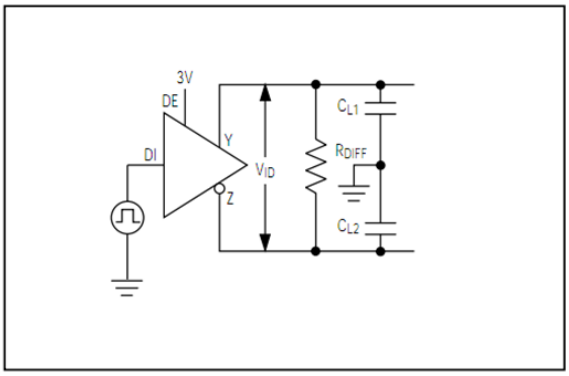


Figure 3 Driver timing test circuit

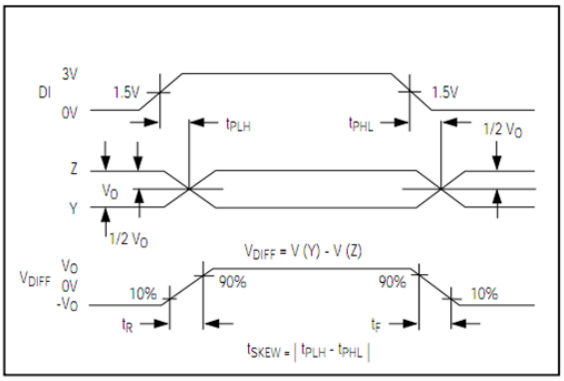


Figure 4 Driver propagation delay

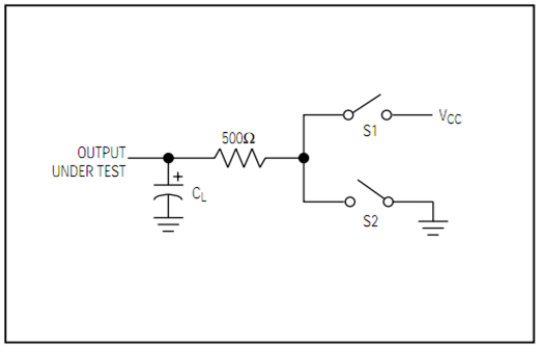


Figure 5 Driver enable/disable timing test circuit

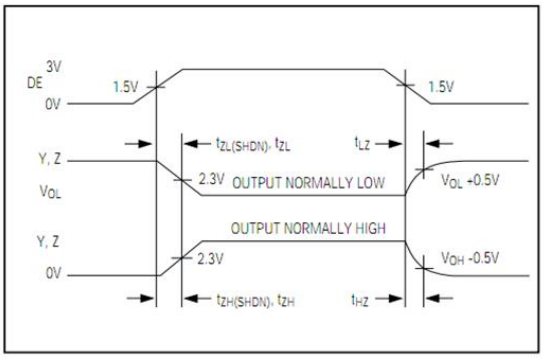


Figure 6 Driver enable/disable timing

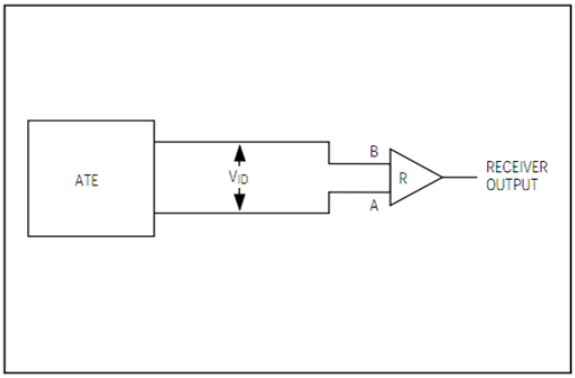


Figure 7 Receiver propagation delay test circuit

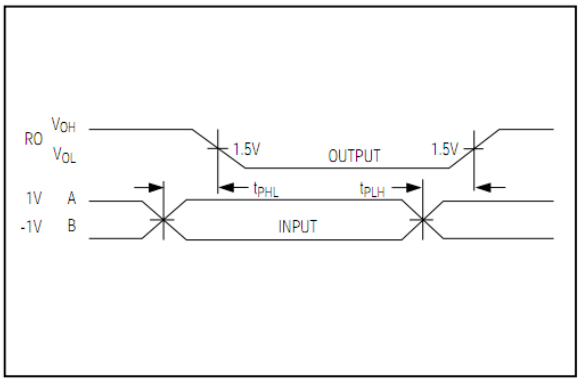


Figure 8 Receiver propagation delay sequence

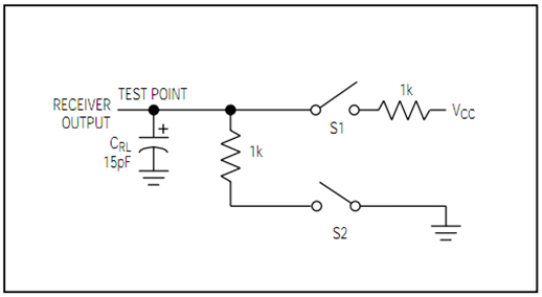


Figure 9 Receiver enable/disable timing test circuit

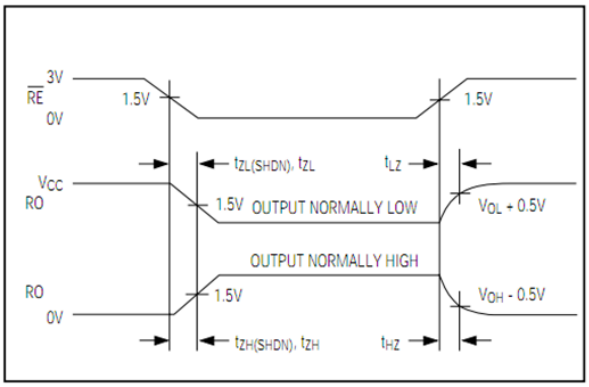


Figure 10 Receiver enable and disable timing

explain

1 resume

The SIT3085E is a half-duplex high-speed transceiver for RS-485/RS-422 communication, consisting of a driver and receiver. It has fail-safe, overvoltage protection, overcurrent protection, overheating protection functions, and allows/RE, DE port hot plug-in input. The SIT3085E achieves error-free data transmission up to 1Mbps.

2 Failure safety

When the receiver input is short-circuited or open-circuited, or when all drivers connected to the terminal matching transmission line are in an idle state (idle), SIT 3085E can ensure that the receiver output is at a logic high level. This is achieved by setting the receiver input thresholds to-50mV and-200mV, respectively. If the differential receiver input voltage (A-B) -50mV, RO is at a logic high level; if the voltage (A-B) -200mV, RO is at a logic low level. When all transmitters connected to the terminal matching bus are disabled, the differential input voltage of the receiver will be pulled to 0V through the termination resistor. Based on the receiver threshold, a logic high level with a minimum noise tolerance of 50mV can be achieved. The-50mV to-200mV threshold voltage complies with the EIA/TIA-485 standard for ±200 mV.

3 A total of 256 transceivers are connected to the wall

The standard RS485 receiver has an input impedance of 12kΩ (one unit load), and the standard driver can drive up to 32 unit loads. The SIT3085E transceiver's receiver has an input impedance of 1/8 unit load (96kΩ), allowing up to 256 transceivers to be connected in parallel on the same communication bus. These devices can be combined arbitrarily or with other RS485 transceivers, as long as the total load does not exceed 32 unit loads, they can all be connected on the same bus.

4 Driver output protection

To prevent excessive output current and high power consumption caused by faults or bus conflicts, two mechanisms are employed. First, overcurrent protection, which provides rapid short-circuit protection across the entire common-mode voltage range (refer to typical operating characteristics). Second, a thermal shutdown circuit that forces the driver output into a high-impedance state when the die temperature exceeds 150 .

5 Typical application

5.1 Bus topology networking: SIT3085E RS485 transceivers are designed for bidirectional data communication on multi-drop bus transmission lines. Figure 11 shows a typical network application circuit. These devices can also be used as linear repeaters for cable lengths exceeding 4000 feet. To reduce reflections, termination matching at both ends of the transmission line should be performed with their characteristic impedance, and branch connections outside the main trunk should be as short as possible.

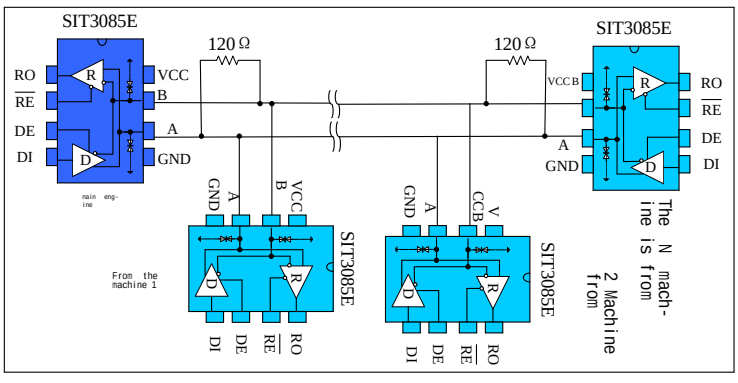


Figure 11 Bus type RS485 half-duplex communication network

5.2 Hand-in-hand networking: Also known as the daisy chain topology, it is the standard and specification for RS485 bus cabling, recommended by organizations such as TIA for RS485 bus topology. The wiring method involves forming a hand-in-hand connection between the master control device and multiple slave devices, as shown in Figure 12. This method does not leave any branches, which is what defines a hand-in-hand connection. This wiring method has advantages such as minimal signal reflection and high communication success rates.

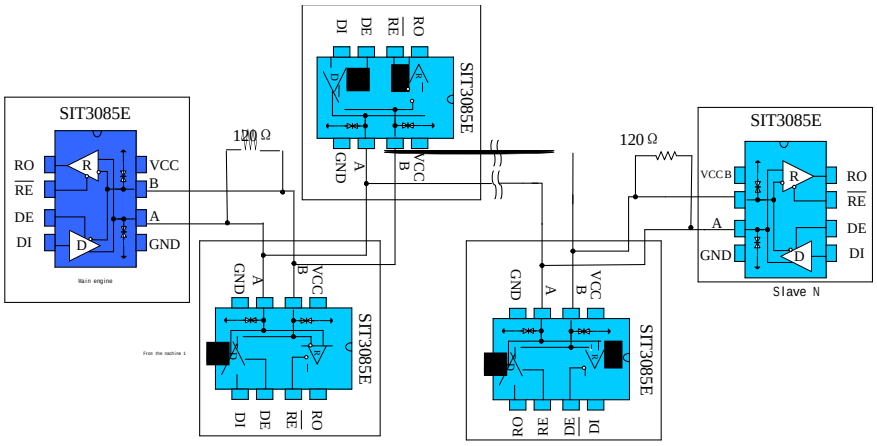


Figure 12 Hand-in-hand RS485 half-duplex communication network

5.3 Total Bus Port Protection: In harsh environments, RS485 communication ports are typically equipped with additional protections such as electrostatic protection and surge protection against lightning strikes. They may even require solutions to prevent the connection of 380V mains power to avoid damage to smart meters and industrial control hosts. Figure 13 shows three common RS485 bus port protection schemes. The first scheme involves paralleling TVS devices between the AB ports to ground, paralleling TVS devices between the AB ports, and connecting thermal resistors in series with the AB ports, then paralleling gas discharge tubes to ground to form a three-level protection scheme. The second scheme involves paralleling TVS devices between the AB ports to ground, connecting thermal resistors in series between the AB ports, and paralleling varistors between the AB ports to form a three-level protection scheme. The third scheme involves connecting pull-up resistors between the AB ports to power and ground, connecting TVS devices between the AB ports, and connecting thermal resistors to one of the A or B ports.

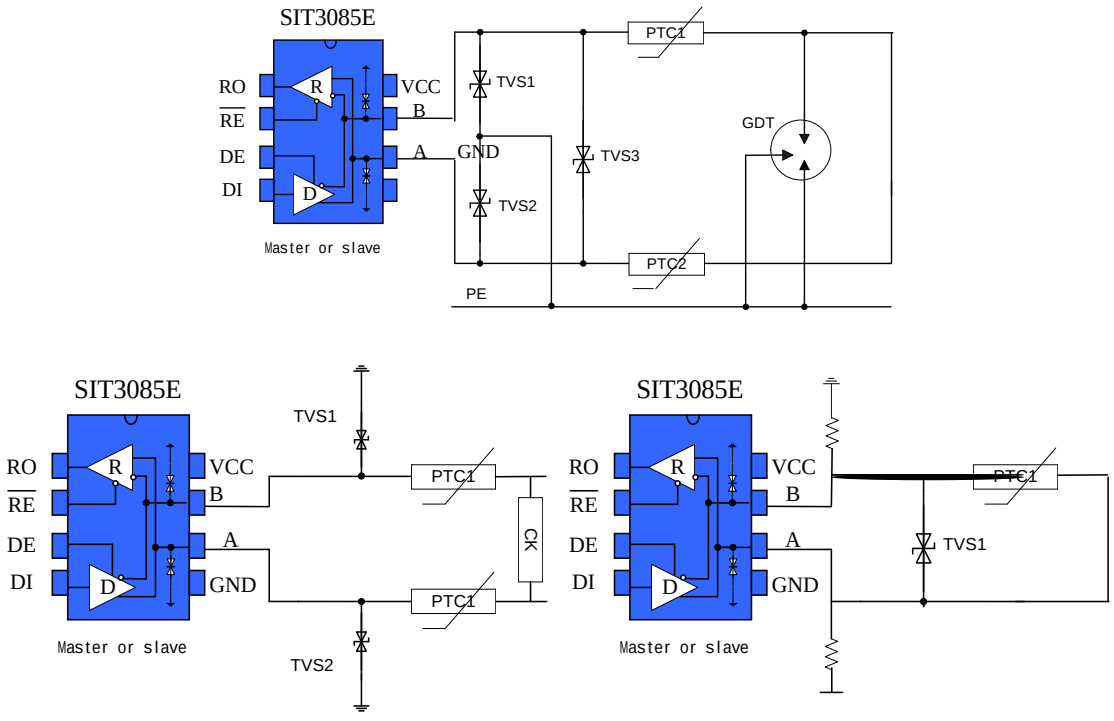
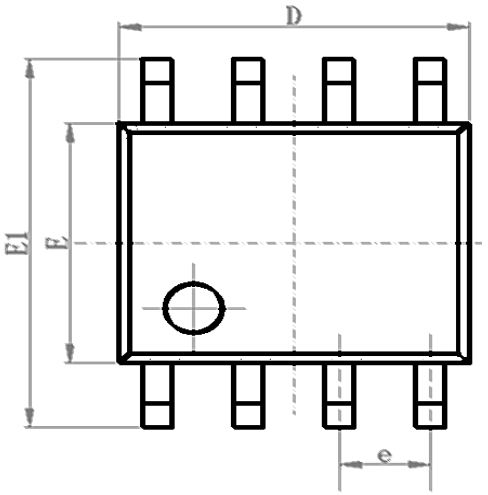


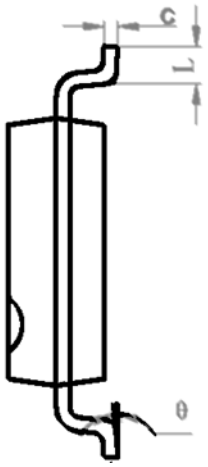
Figure 13 Port protection scheme

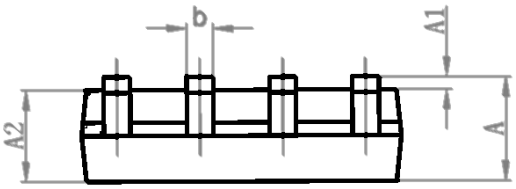
SOP8, external dimensions

Package size

Symbol	Least value / mm	Representative value / mm	Crest value / 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 °



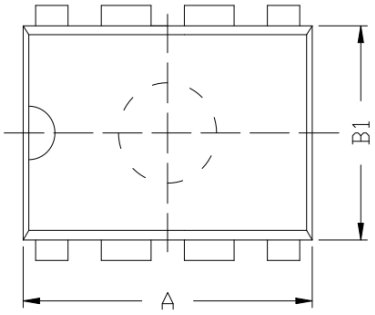


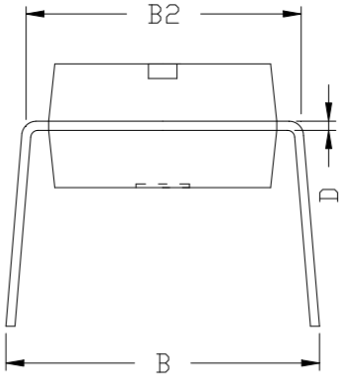


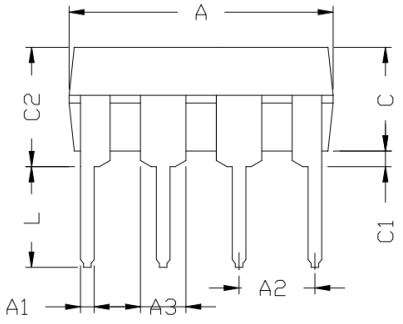
DIP8, external dimensions

Package size

Symbol	Least value / mm	Representative value / mm	Crest value / 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







Order information

Order code	Temperature	Package
SIT3085EESA	-40℃~85℃	8 SO
SIT3085EEPA	-40℃~85℃	DIP8

The tape packaging is 2500 beads per disc