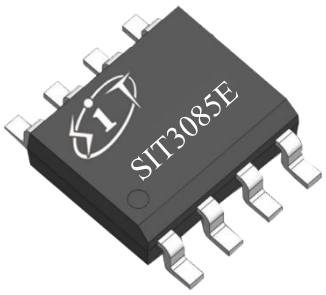
FEATURES

- 5V power supply, half-duplex
- 1/8 unit load, allow Up to 256 transceivers on the bus
- Driver short-circuit output protection
- Overtemperature Protection
- Low Power Off Function
- /RE, DE ports allow hot-swap inputs
- Receiver Open-Circuit Failure Protection
- Strong Anti-Noise Ability
- Integrated Transient Voltage Suppression Function
- Data transmission up to 1Mbps in an electric noise environment
- A, B port protection: HBM 16kV; contact discharge 16kV

PRODUCT APPEARANCE



Provide green and environmentally friendly lead-free package

DESCRIPTION

SIT3085E is a RS-485 transceiver with 5V power supply, half duplex, low power consumption, and fully meet the requirements of TIA / EIA-485 standard.

SIT3085E includes a driver and a receiver, both of which can be enabled and closed independently. When both are disabled, both the driver and the receiver output are high resistance state. SIT3085E has 1/8 load, which allows 256 SIT3085E transceivers to be connected to the same communication bus. It can realize error-free data transmission up to 1Mbps.

SIT3085E has a working voltage range of 4.5~5.5V, and has the functions of fail-safe, overtemperature protection, current-limiting protection, over-voltage protection and hot-swap input control functions.

SIT3085E has excellent ESD release ability, HBM up to ±16KV, contact discharge ±16kV that meet IEC61000-4-2

PIN CONFIGURATION

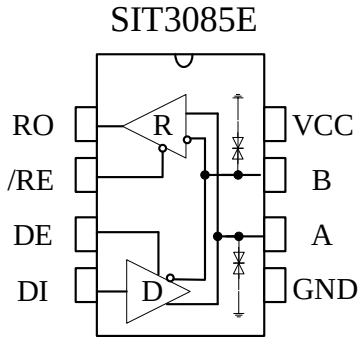


Figure 1 SIT3085E Pin Configuration

PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	RO	Receiver Output. When /RE is low and if A - B≥-50mV, RO will be high; if A - B≤-200mV, RO will be low.
2	/RE	Receiver Output Enable. Drive /RE low to enable RO; RO is high impedance when /RE is high. Drive /RE high and DE low to enter low-power shutdown mode.
3	DE	Driver Output Enable. Drive DE high to enable driver outputs. These outputs are high impedance when DE is low. Drive /RE high and DE low to enter low-power shutdown mode.
4	DI	Driver Input. With DE high, a low on DI forces non-inverting output low and inverting output high. Similarly, a high on DI forces non-inverting output high and inverting output low.
5	GND	Ground.
6	A	non-inverting Receiver Input and non-inverting Driver Output.
7	B	Inverting Receiver Input and Inverting Driver Output
8	VCC	Positive Supply.

LIMITING VALUES

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	VCC	+7	V
Control Input Voltage	/RE, DE, DI	-0.3~VCC+0.3	V
Receiver Input Voltage	A, B	-7~+13	V
Receiver Output Voltage	RO	-0.3~VCC+0.3	V
Operating Temperature Ranges	T_A	-40~85	℃
Storage Temperature Range	T_{stg}	-60~150	℃
Lead Temperature		300	℃
Continuous Power Dissipation	SOP8	400	mW
	DIP8	700	mW

The maximum limit parameters mean that exceeding these values may cause irreversible damage to the device. Under these conditions, it is not conducive to the normal operation of the device. The continuous operation of the device at the maximum allowable rating may affect the reliability of the device. The reference point for all voltages is ground.

DRIVER DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Differential Driver Output (no load)	V_{OD1}			5		V
Differential Driver Output	V_{OD2}	Fig 2, RL = 27 Ω	1.5		VCC	V
		Fig 2, RL = 50 Ω	2		VCC	
Change in Magnitude of Output Voltage (NOTE1)	ΔV_{OD}	Figu 2, RL = 27 Ω			0.2	V
Common-Mode Output Voltage	V_{OC}	Fig 2, RL = 27 Ω			3	V
Change in Magnitude of Common-Mode Output Voltage (NOTE1)	ΔV_{OC}	Fig 2, RL = 27 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
Logic Input Current	I_{IN1}	DE, DI, /RE	-2		2	μA
Output Short-circuit Current, Short-circuit to High	I_{OSD1}	short-circuit to 0V~12V	35		250	mA
Output Short-circuit Current, Short-circuit to Low	I_{OSD2}	short-circuit to -7V~0V	-250		-35	mA
Thermal-shutdown threshold temperature				150		℃
Thermal-shutdown hysteresis temperature				20		℃

(Unless otherwise stated, Temp=T_{MIN}~T_{MAX}, typically VCC=+5V, Temp=25℃).

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

RECEIVER DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Input Current (A, B)	I_{IN2}	DE = 0 V, VCC=0 or 5V V_{IN} = 12 V			125	μA
Input Current (A, B)	I_{IN2}	DE = 0 V, VCC=0 or 5V V_{IN} = -7 V	-100			μA
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
Receiver Output High Voltage	V_{OH}	I_{OUT} = -4mA, V_{ID} = +200 mV	VCC-1.5			V
Receiver Output Low Voltage	V_{OL}	I_{OUT} = +4mA, V_{ID} = -200 mV			0.4	V
Three-State Output Current at Receiver	I_{OZR}	0.4V<V_O<2.4V			±1	μA
Receiver Input Resistance	R_{IN}	-7V≤V_{CM}≤12V	96			kΩ
Receiver Short-Circuit Output Current	I_{OSR}	0 V≤V_O≤VCC	±7		±95	mA

(Unless otherwise stated, Temp=T_{MIN}~T_{MAX}, typically VCC=+5V, Temp=25℃).

SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC1}	/RE=0V 或 VCC DE = 0 V		180	300	μA
	I_{CC2}	/RE= VCC, DE = VCC		150	300	μA
Shutdown Current	I_{SHDN}	/RE=VCC, DE=0V		0.5	10	μA

ESD PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
A, B		HBM		±16		kV
		contact discharge		±16		kV
Other ports		HBM		± 6		kV

DRIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Driver propagation delay time, Low-to-High level	t_{DPLH}	R_{DIFF} = 54Ω, C_{L1} = C_{L2}=100pF, Fig 3 & Fig 4		100	150	ns
Driver propagation delay time, High-to-Low level	t_{DPHL}			100	150	ns
|tDPLH- tDPHL|	t_{SKEW1}				±10	ns
Rising time/Falling time	t_{DR}, t_{DF}			190	250	ns
Driver Enable to Output High	t_{DZH}	C_L = 100pF, S1 closed Fig 5 & Fig 6		70	160	ns
Driver Enable to Output Low	t_{DZL}			70	160	ns
Driver Disable Time from Low	t_{DLZ}	C_L = 15pF, S2 closed Fig 5 & Fig 6		70	100	ns
Driver Disable Time from High	t_{DHZ}			70	100	ns
In Shutdown mode, Enable to Output High	$t_{DZH(SHDN)}$	C_L = 15pF, S2 closed Fig 5 & Fig 6		80	120	ns
In Shutdown mode, Enable to Output Low	$t_{DZL(SHDN)}$	C_L = 15pF, S1 closed Fig 5 & Fig 6		80	120	ns

RECEIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Receiver input to output propagation delay time from Low to High	t_{RPLH}	Fig 7 & Fig 8 VID≥2.0V; Rising and falling edge time VID≤15ns		50	80	ns
Receiver propagation delay time from High to Low	t_{RPHL}			50	80	ns
$\|t_{RPLH} - t_{RPHL}\|$	t_{SKEW2}			5	15	ns
Receiver Enable to Output Low	t_{RZL}	C_L=100pF, S1 closed Fig 9 & Fig 10		25	40	ns
Receiver Enable to Output high	t_{RZH}	C_L=100pF, S2 closed Fig 9 & Fig 10		25	40	ns
Receiver Disable Time from Low	t_{RLZ}	C_L=100pF S1 closed Fig 9 & Fig 10		25	50	ns
Receiver Disable Time from high	t_{RHZ}	C_L=100pF S2 closed Fig 9 & Fig 10		25	50	ns
In Shutdown Mode, Enable to Output High	$t_{RZH(SHDN)}$	C_L=100pF S2 closed Fig 9 & Fig 10			1000	ns
In Shutdown Mode, Enable to Output Low	$t_{RZL(SHDN)}$	C_L=100pF S1 closed Fig 9 & Fig 10			1000	ns
Time to Shutdown	t_{SHDN}	NOTE2	50	200	600	ns

NOTE2: If the enable inputs are RE=high and DE=low for less than 50ns, the device is guaranteed not to enter shutdown. If the enable inputs are in this state for at least 300ns, the device is guaranteed to have entered shutdown.

FUNCTION TABLE

Driver Function

CONTROL		INPUT	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=irrelevant; Z=high impedance.				

Receiver Function

CONTROL		INPUT	OUTPUT
/RE	DE	A-B	RO
0	X	≥-50mV	H
0	X	≤-200mV	L
0	X	Open/short circuit	H
1	X	X	Z
X=irrelevant; Z=high impedance.			

TEST CIRCUIT

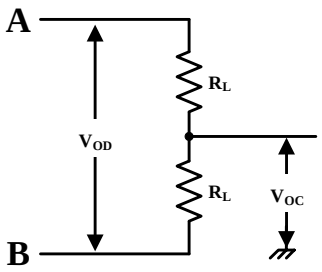


Fig 2 Driver DC test load

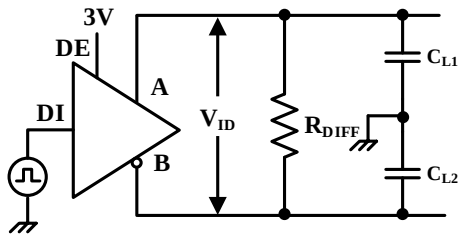


Fig 3 Driver time test circuit

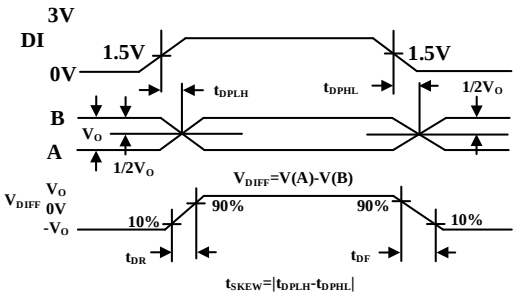


Fig 4 Driver propagation time

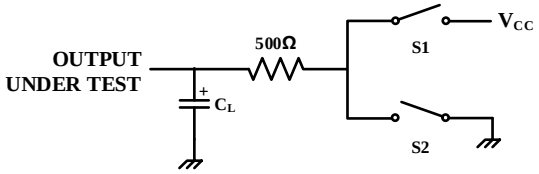


Fig 5 Driver enable and disable time test circuit

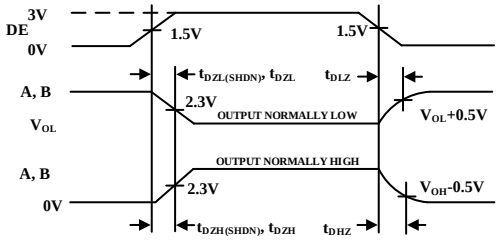


Fig 6 Driver enable and disable time

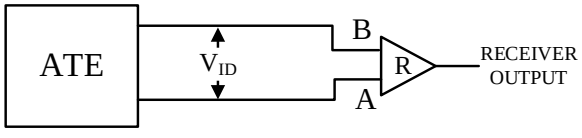


Fig 7 Receiver propagation delay test circuit

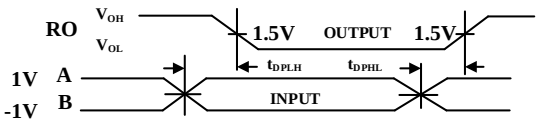


Fig 8 Receiver propagates delay time

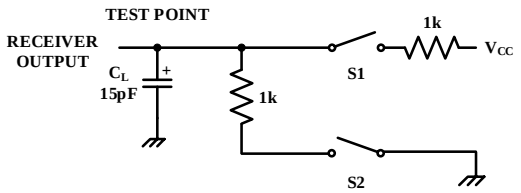


Fig 9 Receiver enable and disable times test circuit

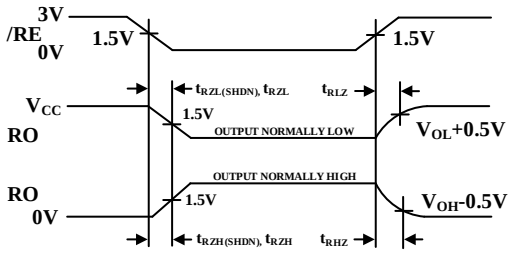


Fig 10 Receiver enable and disable time

ADDITIONAL DESCRIPTION

1 Sketch

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

2 Fail-safe

SIT3085E ensures that the receiver output logic is high, when the receiver input is short-circuited or open-circuited, or all drivers attached to the terminal matching transmission line are disabled (idle). This is achieved by setting the receiver input thresholds to -50mV and -200mV, respectively. If the differential receiver input voltage $V_{(A-B)}$≥-50mV, RO is logic high level; If $V_{(A-B)}$≤-200mV, RO is the logic low level. When all transmitters attached to the terminal matching bus are disabled, the receiver differential input voltage will be pulled to 0V through the terminal resistor. Depending on the receiver threshold, a logic high level with a minimum noise tolerance of 50mV can be achieved. -50mV to -200mV threshold voltage is in accordance with the EIA/TIA-485 standard of ±200mV.

3 Allowing up to 256 transceivers on the bus

The input impedance of the standard RS485 receiver is 12kΩ (1 unit load), and the standard driver can drive up to 32 unit loads. The receiver of SIT3085E transceiver has 1/8 unit load input impedance (96kΩ), which allows up to 256 transceivers to be connected on the same communication bus in parallel. These devices can be combined arbitrarily or with other RS485 transceivers. Any combination of these devices and/or other RS-485 transceivers with a total of 32 unit loads or less can be connected to the line.

4 Driver output protection

Two mechanisms are used to avoid excessive output current and power consumption caused by fault or bus collision. First, over-current protection, throughout the common-mode voltage range (reference typical operating characteristics) provides a quick short-circuit protection. Second, the thermal shutdown circuit forces the driver output into a high impedance state when the die temperature exceeds 150℃.

5 Typical applications

5.1 Bus Networking: SIT3085E RS485 transceiver is designed for bidirectional data communication on multi-point bus transmission line. Fig 11 shows a typical network application circuit. These devices can also be used as linear repeaters with cables longer than 4000 feet. In order to reduce reflection, terminal matching should be carried out at both ends of the transmission line with its characteristic impedance, and the length of branch lines outside the main line should be as short as possible.

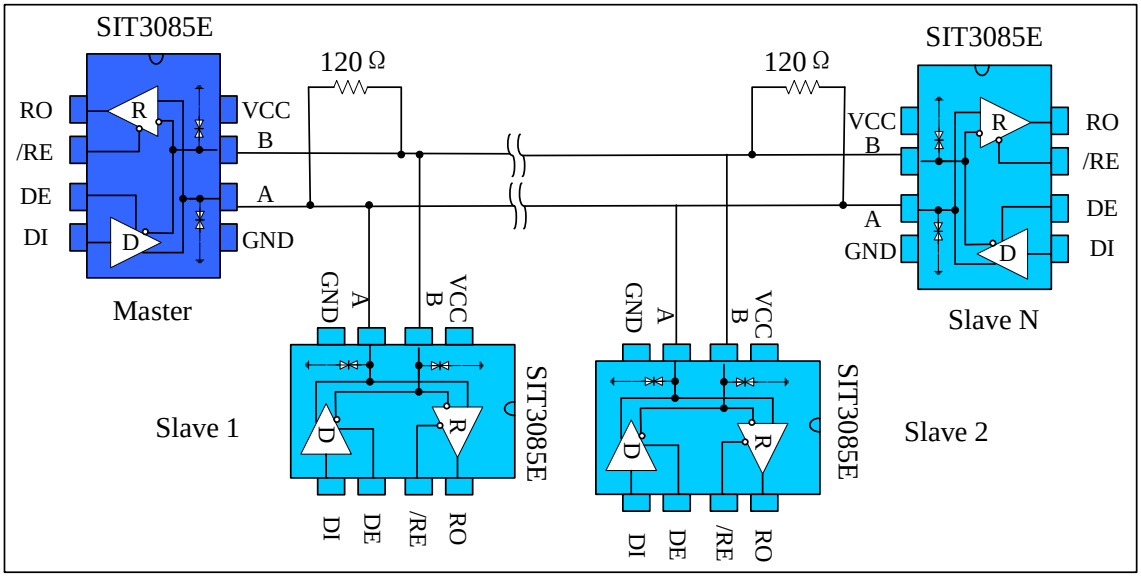


Fig 11 Bus type RS485 half-duplex communication network

5.2 Hand in hand Networking: also known as daisy chain topology, is the standard and specification of RS485 bus wiring, and is the RS485 bus topology recommended by TIA and other organizations. The wiring mode is that the main control equipment and a plurality of slave control equipment form a hand-held connection mode, as shown in Fig 12, and the hand-held mode is no branches. This wiring mode has the advantages of small signal reflection and high communication success rate.

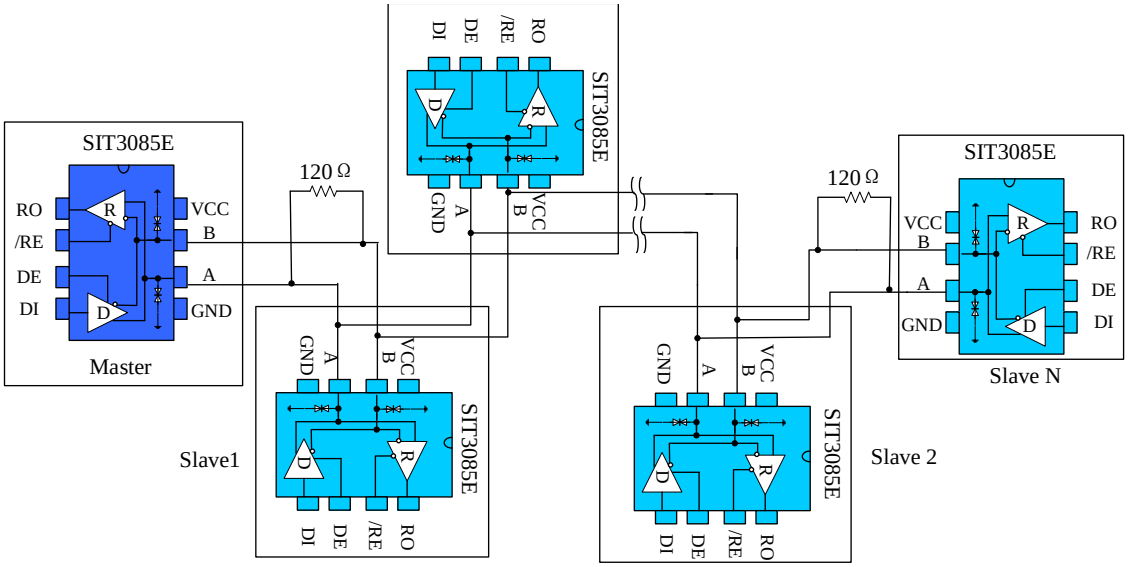


Fig12 Hand in hand RS485 half-duplex communication network

5.3 Bus port protection: in severe environment, RS485 communication port is usually provided with electrostatic protection, lightning surge protection and other additional protection, and even the plan to prevent 380V market electricity access is needed to avoid the damage of intelligent instrument and industrial control host. Fig 13 shows three common RS485 bus port protection schemes. The first is the scheme of three-level protection by connecting TVS devices in parallel with A,B port to the protective

ground, TVS devices in parallel with A,B port, thermistor in series with A,B port, gas discharge tube in parallel to the protective ground; the second is the scheme of three-level protection by connecting TVS in parallel with A,B port to the ground, thermistor in series with A,B port, and varistor in parallel with A,B port; the third is the scheme of three-level protection by connecting AB with pull-up or pull-down resistor to power and ground respectively, connecting TVS between A & B, A or B port connecting thermistor.

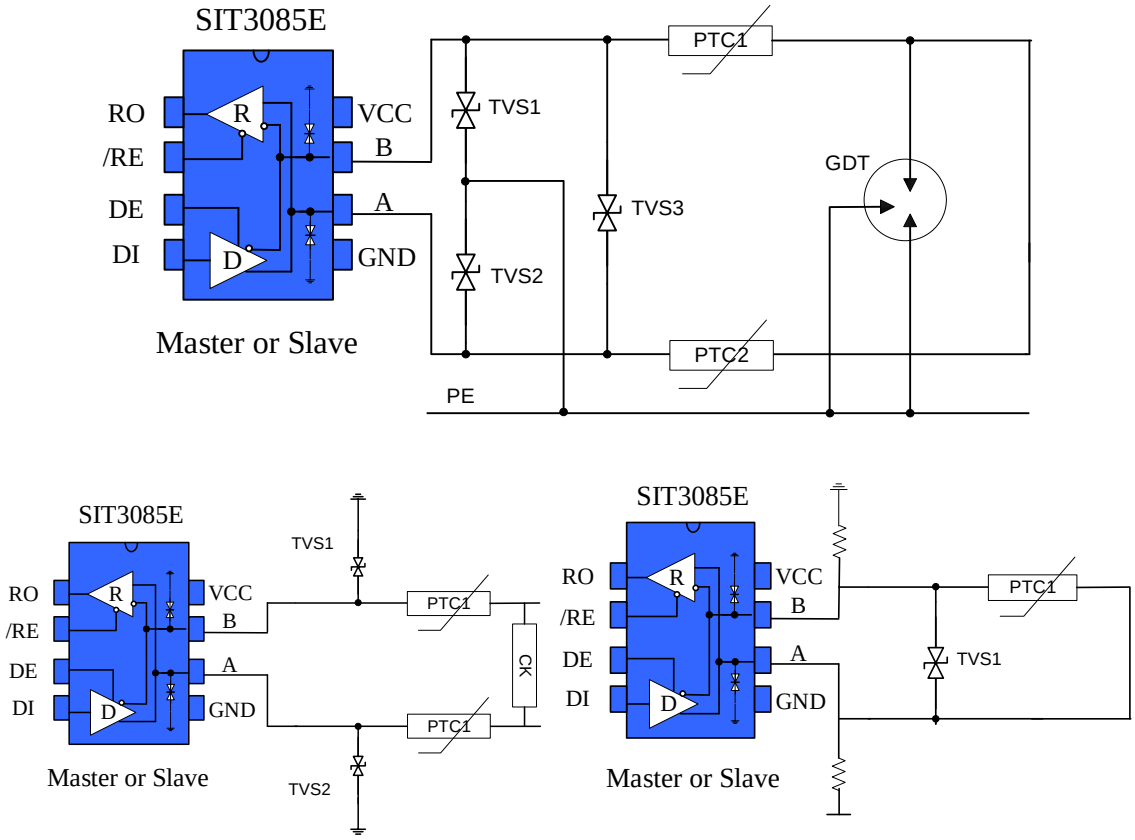
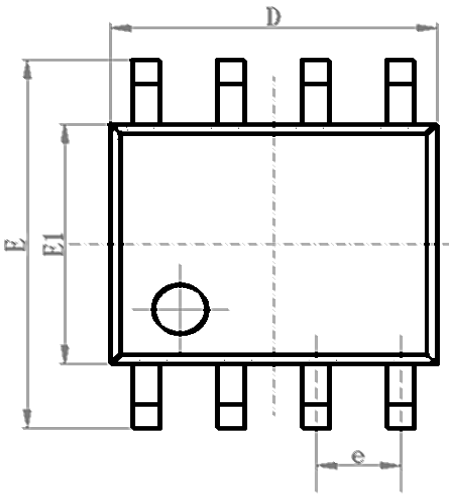


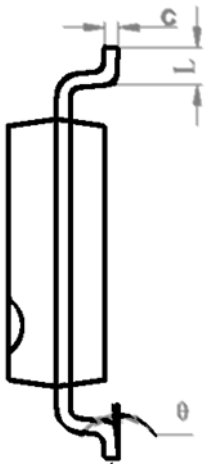
Fig 13 Port protection scheme

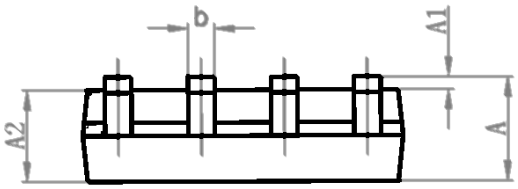
SOP8 DIMENSIONS

PACKAGE SIZE

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	5.000
E	3.780	3.880	3.980
E1	5.800	6.000	6.200
e		1.27BSC	
L	0.40	0.60	0.80
c	0.153	0.203	0.253
θ	-2°	-4°	-6°



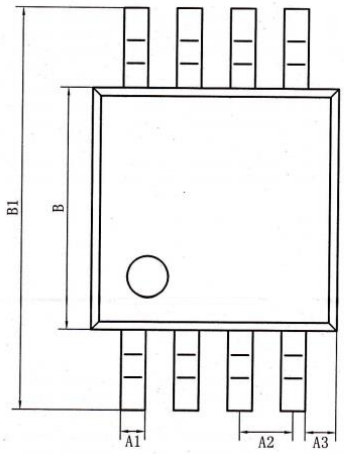


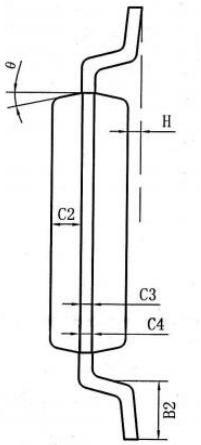


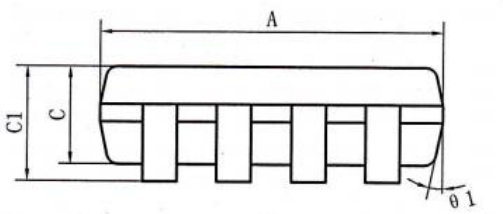
MSOP8/8μMAX/VSSOP8 DIMENSIONS

PACKAGE SIZE

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		



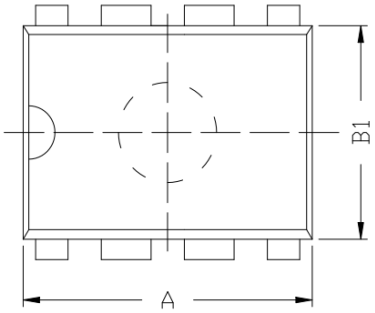


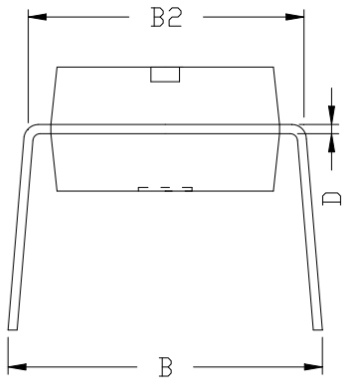


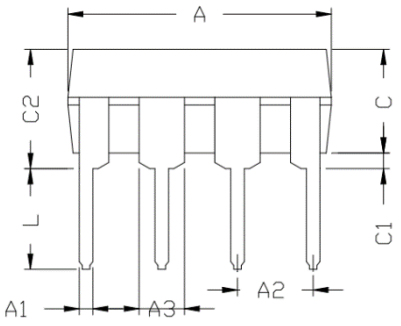
DIP8 DIMENSIONS

PACKAGE SIZE

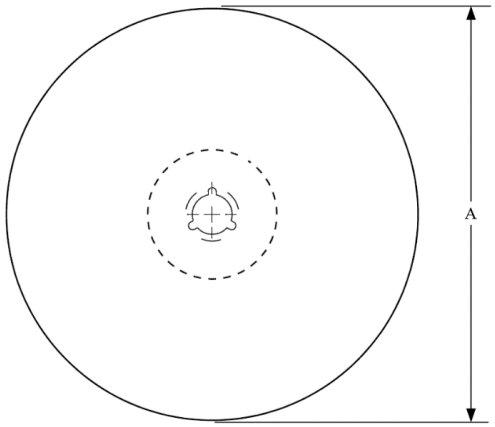
SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	9.00	9.20	9.40
A1	0.33	0.45	0.51
A2	2.54TYP		
A3	1.525TYP		
B	8.40	8.70	9.10
B1	6.20	6.40	6.60
B2	7.32	7.62	7.92
C	3.20	3.40	3.60
C1	0.50	0.60	0.80
C2	3.71	4.00	4.31
D	0.20	0.28	0.36
L	3.00	3.30	3.60



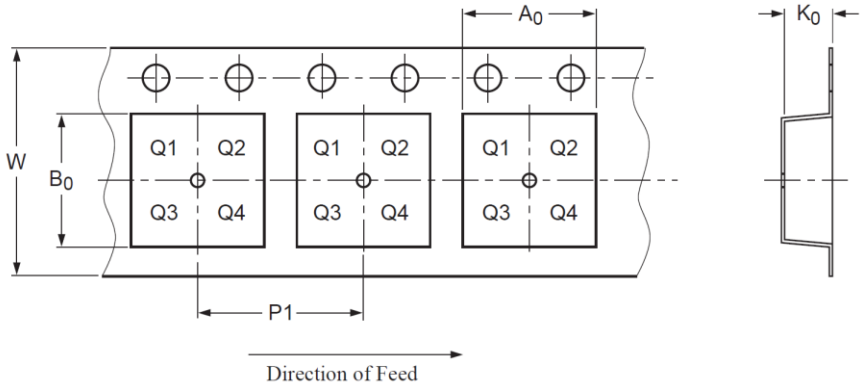




TAPE AND REEL INFORMATION



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers



PIN1 is in quadrant 1

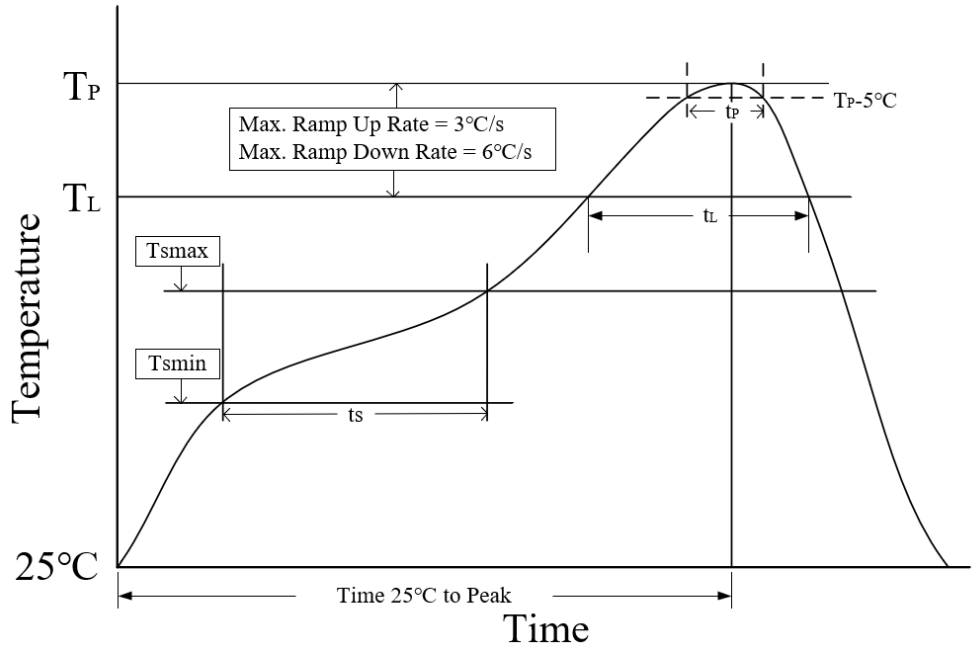
Package Type	Reel Diameter A (mm)	Tape width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)
SOP8	330	12.5±0.20	6.50±0.1	5.30±0.10	2.05±0.1	8.00±0.1	12.00±0.1
MSOP8	330	12.5±0.20	5.33±0.10	3.40±0.10	1.53±0.10	8.00±0.10	$12.00^{+0.30}_{-0.10}$

ORDERING INFORMATION

TYPE NUMBER	PACKAGE	PACKING
SIT3085EESA	SOP8	Tape and reel
SIT3085EEPA	DIP8	Tube
SIT3085EDGK	MSOP8/VSSOP8/8μMAX	Tape and reel

Tapered package is 2500 pcs/reel. DIP8 is packed with 50 pieces/tube in tubed packaging.

REFLOW SOLDERING



Parameter	Lead-free soldering conditions
Ave ramp up rate (T_L to T_P)	3°C/second max
Preheat time ts (T_{smin}=150°C to T_{smax}=200°C)	60-120 seconds
Melting time t_L (T_L=217°C)	60-150 seconds
Peak temp T_P	260-265°C
5°C below peak temperature t_P	30 seconds
Ave cooling rate (T_P to T_L)	6°C/second max
Normal temperature 25°C to peak temperature T_P time	8 minutes max

Important statement

SIT reserves the right to change the above-mentioned information without prior notice.

REVISION HISTORY

Version number	Data sheet status	Revision date
V1.0	Initial version.	January 2023