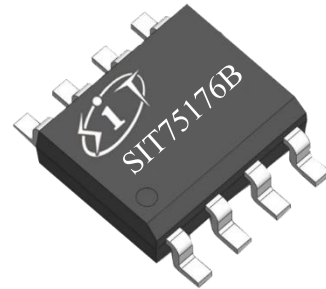


FEATURES

- 3.0V~5.5V power supply range, half-duplex
- Bus port ESD protection: HBM up to 15kV
- Bus fault tolerance up to $\pm 15V$
- Driver short-circuit output protection
- Low power off function
- Receiver open-circuit failure protection
- Strong anti-noise ability
- Integrated transient voltage suppression function
- Data transmission up to 10Mbps in an electric noise environment

PRODUCT APPEARANCE



Provide green and environmentally friendly lead-free package

DESCRIPTION

SIT75176B is a RS-485 transceiver with 3.0V~5.5V power supply, bus port ESD protection HBM up to 15kV, bus voltage range up to $\pm 15V$, half duplex, low power consumption, and fully meet the requirements of TIA/EIA-485 standard, allowing up to 32 nodes to connect to the bus at the same time.

SIT75176B 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. It can realize error-free data transmission up to 10Mbps.

SIT75176B has a working voltage range of 3.0~5.5V, and has the functions of fail-safe, current-limiting protection, over-voltage protection and other functions.

PIN CONFIGURATION

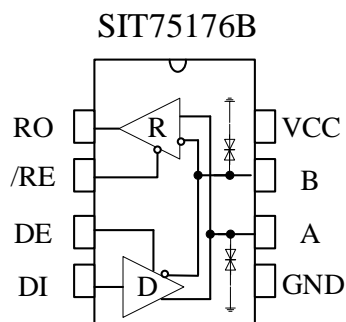


Fig 1 SIT75176B pin configuration

PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	RO	Receiver Output. When /RE is low and if $A - B \geq 200\text{mV}$, RO will be high; if $A - B \leq -200\text{mV}$, 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 Port Voltage	/RE, DE, DI	-0.3~VCC+0.5	V
Bus Port Input Voltage	A, B	-15~+15	V
Receiver Output Voltage	RO	-0.3~VCC+0.5	V
Operating Temperature Ranges	T _A	-40~125	°C
Storage Temperature Range	T _{stg}	-60~150	°C
Lead Temperature		300	°C

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}		2.5		5.5	V
Differential Driver Output	V_{OD2}	Fig 2, $R_L=54\Omega$, $V_{CC}=3.3V$	1.5	1.8	VCC	V
		Fig 2, $R_L=54\Omega$, $V_{CC}=5V$	1.5	3	VCC	
Change in Magnitude of Output Voltage (NOTE1)	ΔV_{OD}	Fig 2, $R_L=54\Omega$			0.2	V
Common-Mode Output Voltage	V_{OC}	Fig 2, $R_L=54\Omega$			3	V
Change in Magnitude of Common-Mode Output Voltage (NOTE1)	ΔV_{OC}	Fig 2, $R_L=54\Omega$			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			250	mA
Output Short-circuit Current, Short-circuit to Low	I_{OSD2}	short-circuit to -7V~0V	-250			mA

(Unless otherwise stated, $Temp=T_{MIN}\sim T_{MAX}$, typically $V_{CC}=+5V$, $Temp=25^{\circ}C$).

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=0V, $V_{CC}=0$ or 5V, $V_{IN}=12V$		500	1000	μA

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Input Current (A, B)	I_{IN2}	DE=0V, VCC=0 or 5V $V_{IN}=-7V$	-800	-300		μA
Positive Input Threshold Voltage	V_{IT+}	$-7V \leq V_{CM} \leq 12V$			200	mV
Reverse Input Threshold Voltage	V_{IT-}	$-7V \leq V_{CM} \leq 12V$	-200			mV
Input Hysteresis Voltage	V_{hys}	$-7V \leq V_{CM} \leq 12V$	10	30		mV
Receiver Output High Voltage	V_{OH}	$I_{OUT}=-2.5mA$, $V_{ID}=+200mV$	VCC-1.5			V
Receiver Output Low Voltage	V_{OL}	$I_{OUT}=+2.5mA$, $V_{ID}=-200mV$			0.4	V
Three-State Output Current at Receiver	I_{OZR}	$0.4V < V_O < 2.4V$			± 1	μA
Receiver Input Resistance	R_{IN}	$-7V \leq V_{CM} \leq 12V$	12			k Ω
Receiver Short-Circuit Output Current	I_{OSR}	$0V \leq V_O \leq VCC$	± 8		± 90	mA

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

SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC1}	/RE=DE=0V, VCC=3.3V		240	650	μA
		/RE=DE=0V VCC=5V		270	750	μA
	I_{CC2}	/RE=DE=VCC, VCC=3.3V		360	650	μA
		/RE=DE=VCC, VCC=5V		400	750	μA
Shutdown Current	I_{SHDN}	/RE=VCC, DE=0V, VCC=3.3V		0.2	10	μA
		/RE=VCC, DE=0V, VCC=5V		0.2	10	μA

DRIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Driver Differential Output Delay	t_{DD}	$R_L=60\Omega$, $C_L=100pF$, Fig 3 , Fig 4		15	22	ns
Driver Differential Output Transition Time	t_{TD}			20	30	ns
Driver Enable to Output High	t_{PZH}	$R_L=110\Omega$, Fig 5 , Fig 6		25	120	ns
Driver Enable to Output Low	t_{PZL}			25	60	ns
Driver Disable Time from Low	t_{PLZ}	$R_L=110\Omega$, Fig 5 , Fig 6		20	30	ns
Driver Disable Time from High	t_{PHZ}			25	250	ns

RECEIVER SWITCHING CHARACTERISTICS

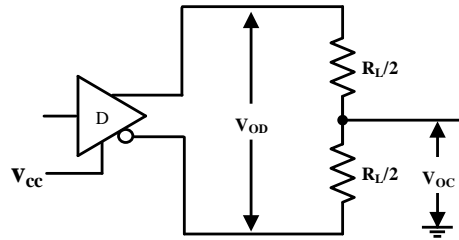
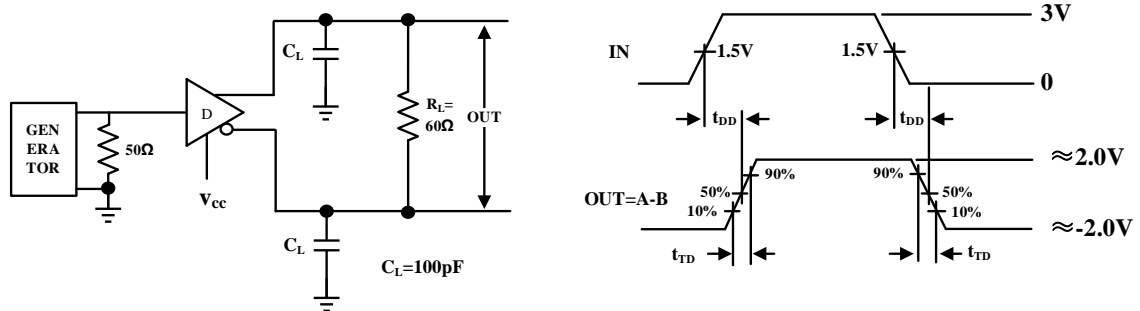
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Receiver Input to Output from Low to High	t_{RPLH}	$C_L=15pF$ Fig 7 , Fig 8		25	35	ns
Receiver Input to Output from High to Low	t_{RPHL}			25	35	ns
Receiver Enable to Output Low	t_{RPZL}	$C_L=15pF$ Fig 7 , Fig 8		15	20	ns
Receiver Enable to Output high	t_{RPZH}	$C_L=15pF$ Fig 7 , Fig 8		15	20	ns
Receiver Disable Time from Low	t_{RPLZ}	$C_L=15pF$ Fig 7 , Fig 8		15	25	ns
Receiver Disable Time from high	t_{RPHZ}	$C_L=15pF$ Fig 7 , Fig 8		20	35	ns

FUNCTION TABLE
Driver Function

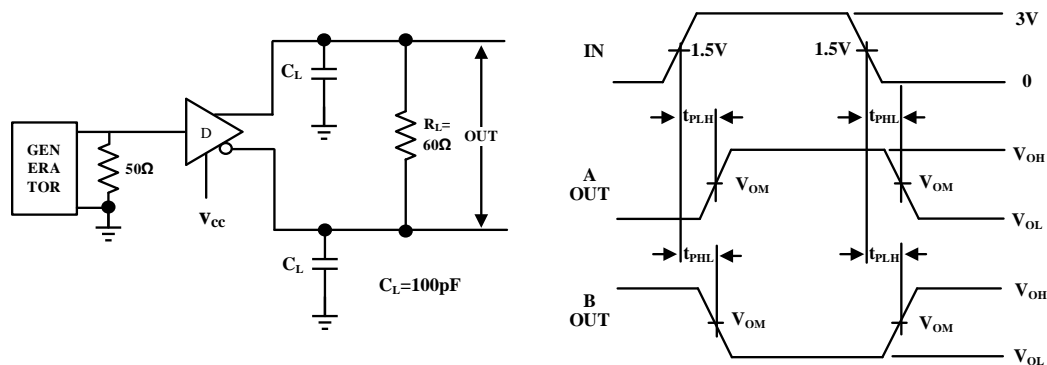
CONTROL		INPUT	OUTPUT	
/RE	DE	DI	A	B
X	1	1	H	L
X	1	0	L	H
0	0	X	Z	Z
1	0	X	Z(shutdown)	
X=irrelevant; Z=high impedance.				

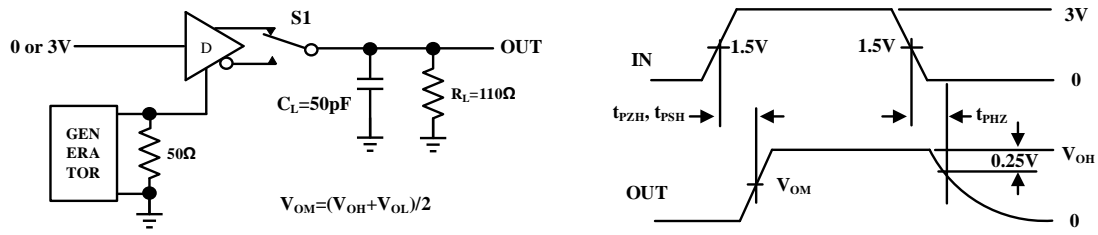
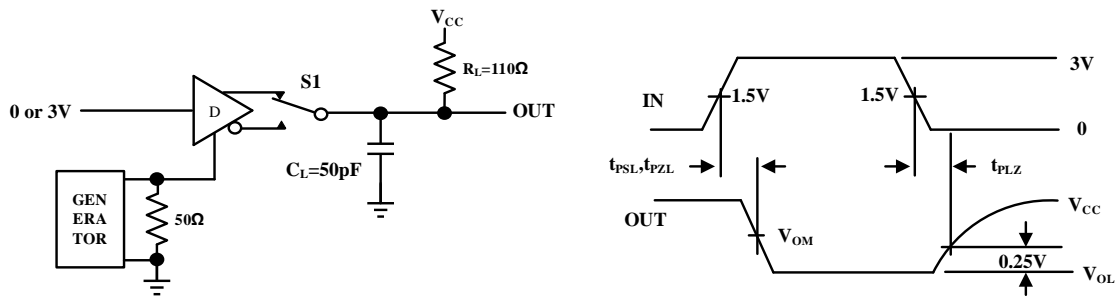
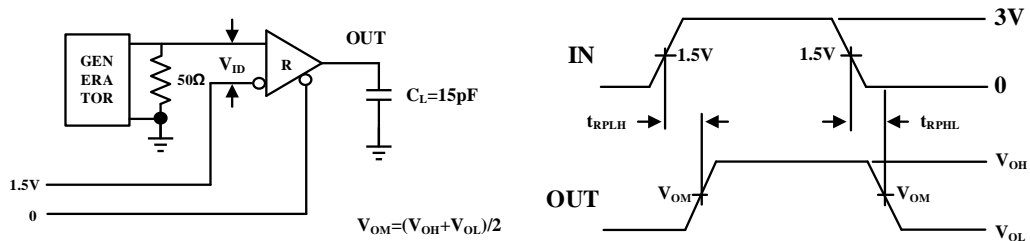
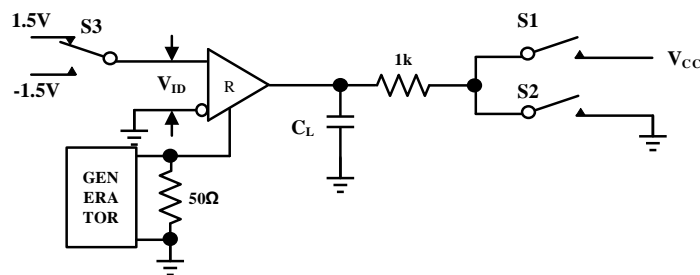
Receiver Function

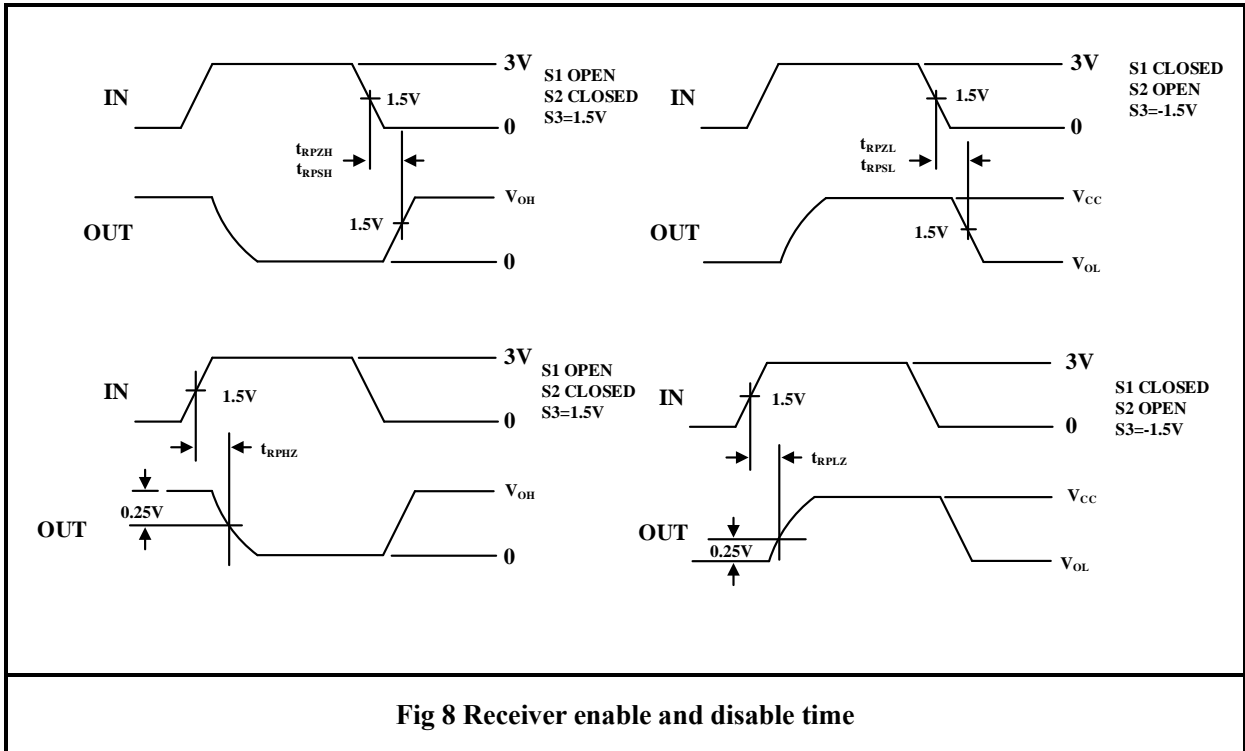
CONTROL		INPUT	OUTPUT
/RE	DE	A-B	RO
0	X	$\geq 200\text{mV}$	H
0	X	$\leq -200\text{mV}$	L
0	X	Open/short circuit	H
1	X	X	Z
X=irrelevant; Z=high impedance.			

TEST CIRCUIT

Fig 2 Driver DC test load


CL includes probe and stray capacitance (the same below).

Fig 3 Differential delay and transmit time of driver

Fig 4 Drive propagation delay


Fig 5 Drive enable and disable time

Fig 6 Drive enable and disable time

Fig 7 Receiver propagation delay test circuit



Fig 8 Receiver enable and disable time

ADDITIONAL DESCRIPTION
1 Sketch

SIT75176B is a 3.0V~5.5V power supply, bus port contact discharge capacity up to 15KV, bus DC voltage up to $\pm 15V$, for RS-485/RS-422 communication half-duplex high-speed transceiver, including a driver and receiver. With failure safety, over voltage protection, over current protection function. SIT75176B achieves error-free data transmission up to 10Mbps and allows up to 32 transceivers to be connected to the same bus.

2 Driver output protection

Over-current and over voltage protection mechanisms are used to avoid excessive output current and power consumption caused by faults or bus collisions, providing a quick short-circuit protection over the entire common mode voltage range (reference to typical operating characteristics).

3 Typical applications

3.1 Bus Networking: SIT75176B RS485 transceiver is designed for bidirectional data communication on multi-point bus transmission line. [Fig 9](#) 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.

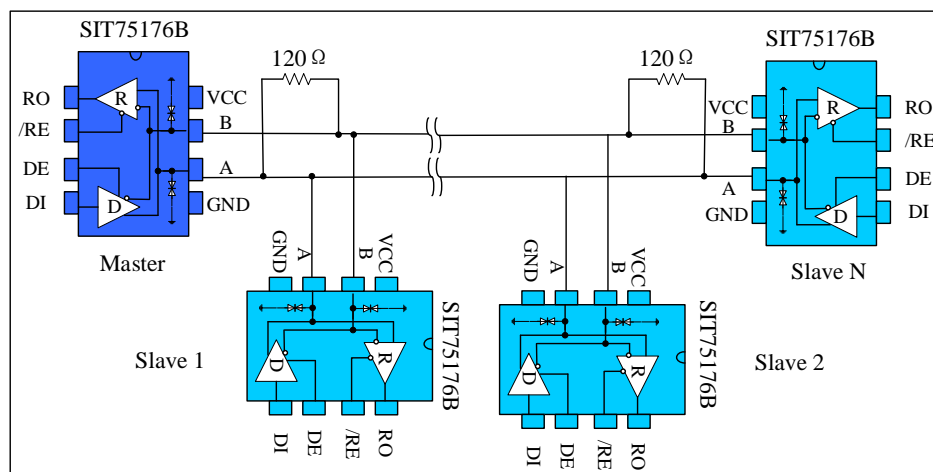


Fig 9 Bus type RS485 half-duplex communication network

3.2 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 10](#), and the hand-held mode is no branches. This wiring mode has the advantages of small signal reflection and high communication success rate.

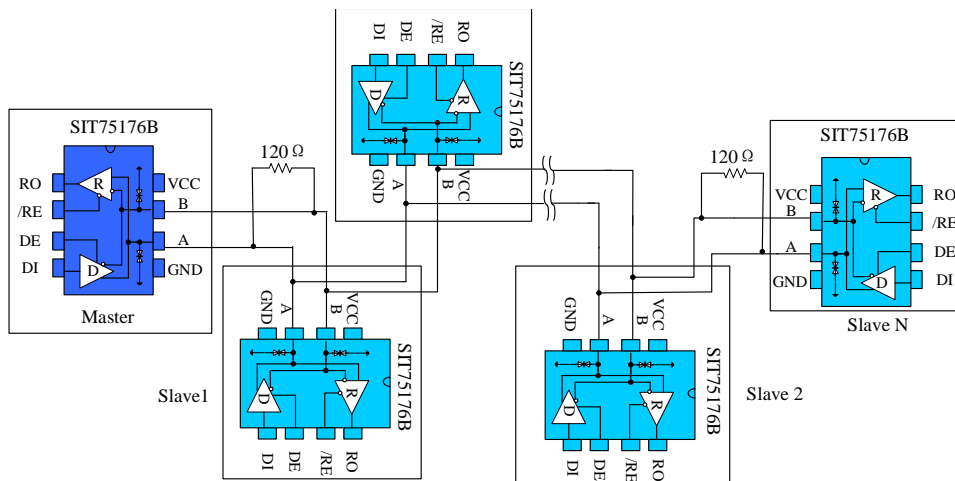


Fig 10 Hand in hand RS485 half-duplex communication network

3.3 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 11](#) 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 A, B with pull-up or pull-down resistor to power and ground respectively, connecting TVS between A & B, A or B port connecting thermistor.

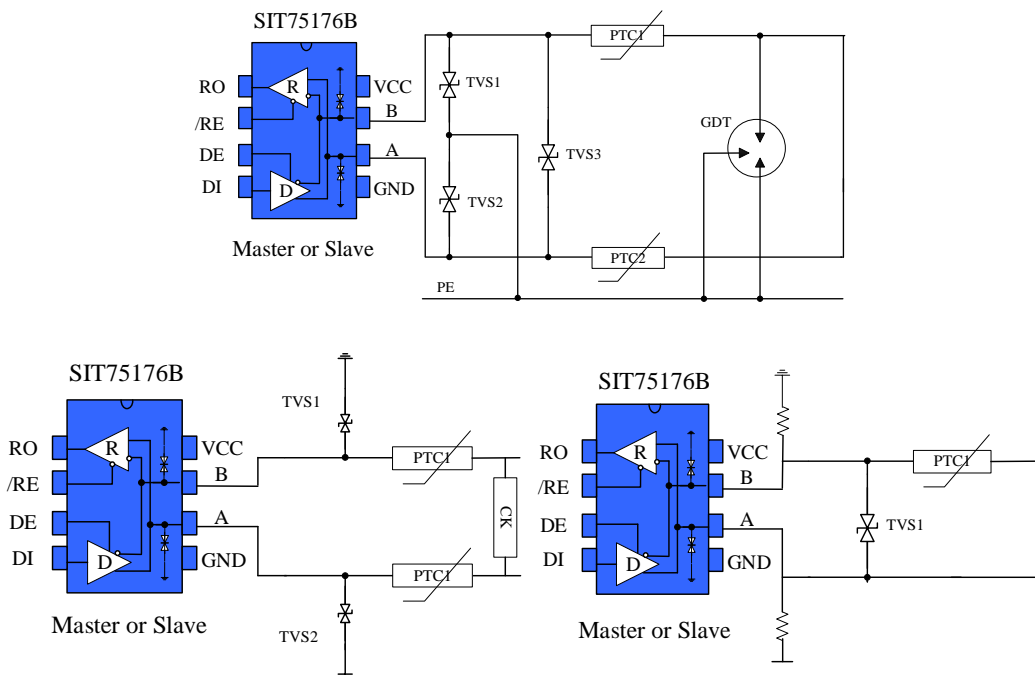
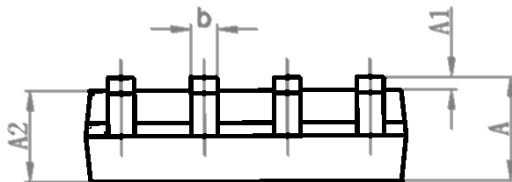
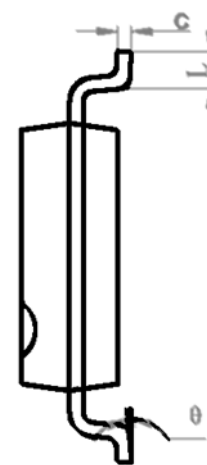
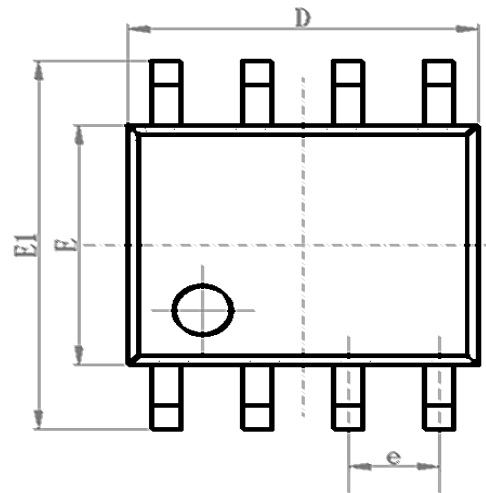


Fig 11 Port protection scheme

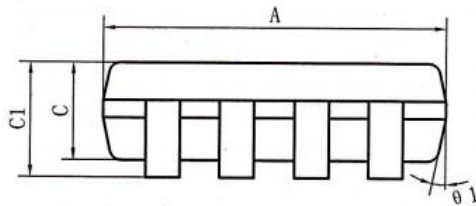
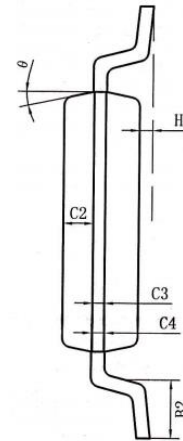
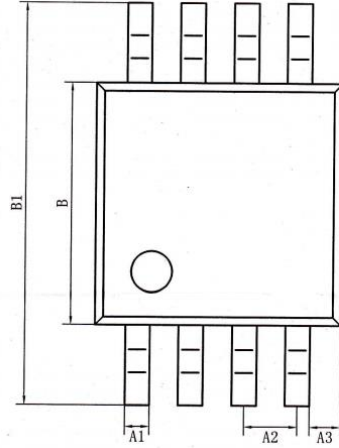
SOP8 DIMENSIONS
PACKAGE SIZE

SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	1.40	-	1.80
A1	0.10	-	0.25
A2	1.30	1.40	1.50
b	0.38	-	0.51
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e		1.27BSC	
L	0.40	0.60	0.80
c	0.20	-	0.25
θ	0°	-	8°



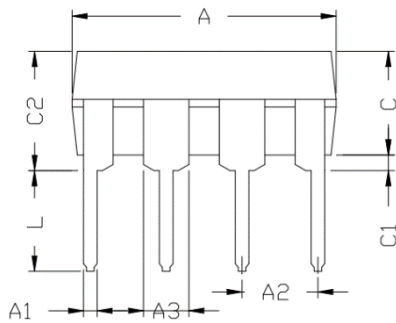
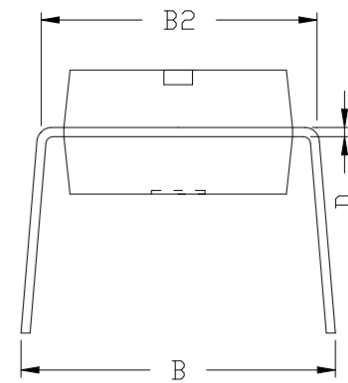
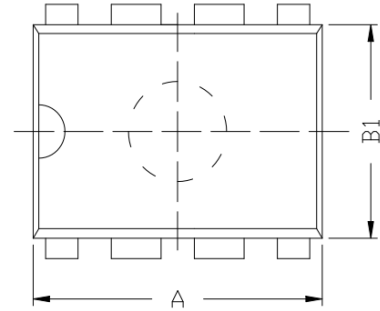
MSOP8/8μMAX/VSSOP8 DIMENSIONS
PACKAGE SIZE

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		



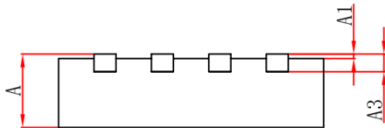
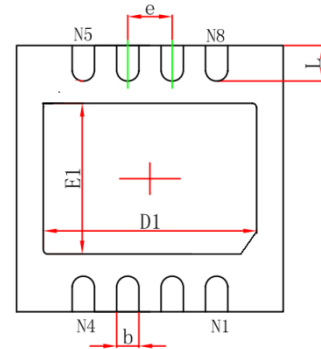
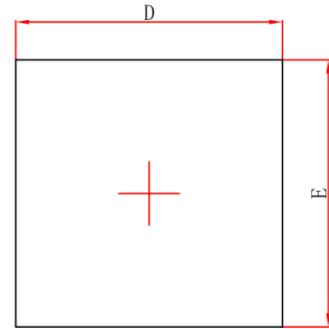
DIP8 DIMENSIONS
PACKAGE SIZE

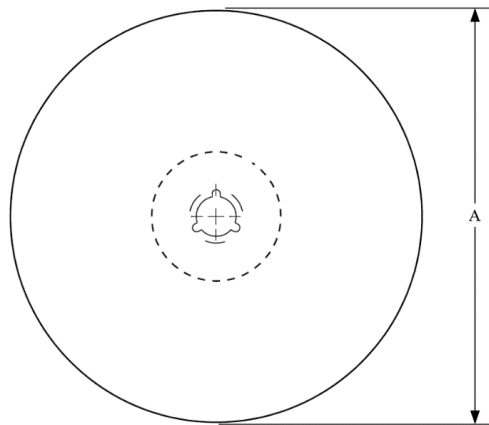
SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	9.00	9.20	9.40
A1	0.33	0.45	0.51
A2	2.54TYP		
A3	1.525TYP		
B	8.40	8.70	9.10
B1	6.20	6.40	6.60
B2	7.32	7.62	7.92
C	3.20	3.40	3.60
C1	0.50	0.60	0.80
C2	3.71	4.00	4.31
D	0.20	0.28	0.36
L	3.00	3.30	3.60



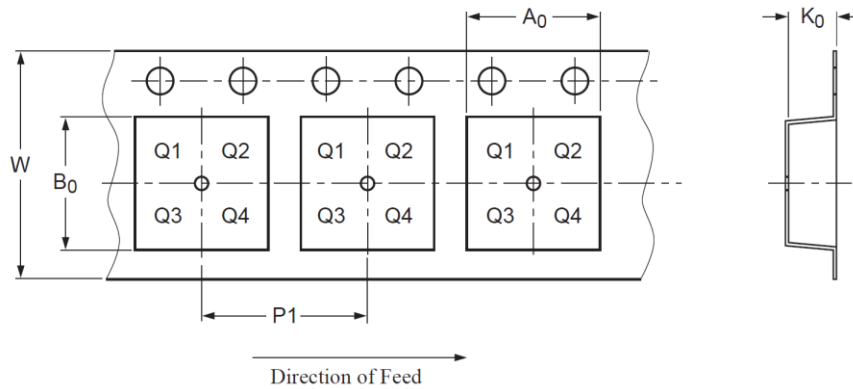
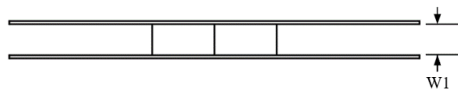
DFN3*3-8 DIMENSIONS
PACKAGE SIZE

SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	0.70		0.80
A1	0.00	0.02	0.05
A3	0.203 REF		
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D1	2.35	2.45	2.55
E1	1.55	1.65	1.75
b	0.2	0.25	0.33
e	0.65 TYP		
L	0.35		0.45



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



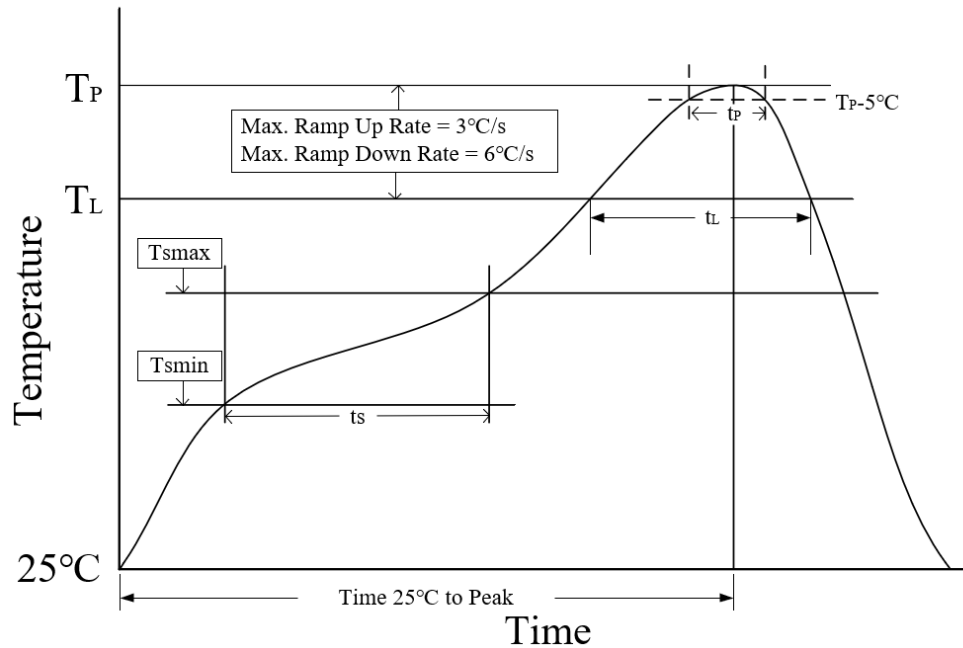
PIN1 is in quadrant 1

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}
DFN3*3-8	330	12.5±0.20	3.30±0.10	3.30±0.10	1.10±0.1	8.00±0.10	12.00 ^{+0.30} _{-0.10}

ORDERING INFORMATION

TYPE NUMBER	PACKAGE	PACKING
SIT75176BDR	SOP8	Tape and reel
SIT75176BDGK	MSOP8/VSSOP8/8 μ MAX	Tape and reel
SIT75176BP	DIP8	Tube
SIT75176BTK	DFN3*3-8, Small outline, no leads.	Tape and reel

SOP8 and MSOP8/VSSOP8/8 μ MAX is packed with 2500 pieces/disc in braided packaging. DIP8 is packed with 50 pieces/tube in tubed packaging. Leadless DFN3*3-8 is packed with 5000 pieces/disc in braided packaging.

REFLOW SOLDERING


Parameter	Lead-free soldering conditions
Ave ramp up rate (T_L to T_P)	3°C/second max
Preheat time t_s ($T_{smin}=150^\circ\text{C}$ to $T_{smax}=200^\circ\text{C}$)	60-120 seconds
Melting time t_L ($T_L=217^\circ\text{C}$)	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.	February 2023