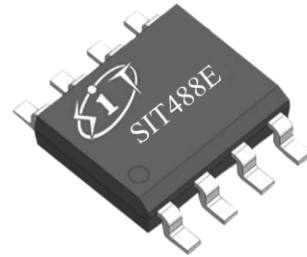


FEATURES

- 5V power supply, full-duplex
- 1/8 unit loads, allow up to 256 transceivers on the bus
- Driver short-circuit protection
- Receiver open-circuit failure protection
- Strong anti-noise ability
- Integrated transient voltage suppression
- Data transmission rate up to 1Mbps in the electrical noise environment
- A, B ports protection: HBM±16kV

PRODUCT APPEARANCE



Provide environmentally friendly lead-free package

DESCRIPTION

SIT488E is a 5V power supply, full-duplex, low power RS485 transceiver which is fully compliant with the TIA/EIA-485 standard.

SIT488E includes a driver and a receiver, both of which can transmit signals independently. SIT488E has 1/8 load and allows 256 transceivers to be connected to the same communication bus. It can achieve error-free transfer up to 1Mbps.

SIT488E has a working voltage range of 4.5~5.5V, and has the functions of fail-safe, current-limiting protection, over-voltage protection, etc.

SIT488E has excellent ESD discharge capability, HBM reaches ± 16kV.

PIN CONFIGURATION

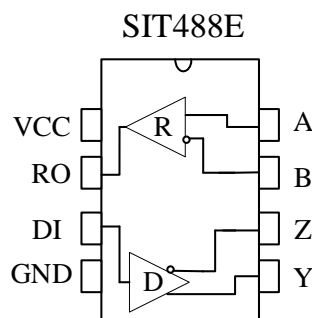


Fig 1 SIT488E pin configuration

PIN DESCRIPTION

Pin	Symbol	Description
1	VCC	Power supply, $4.5V \leq VCC \leq 5.5V$.
2	RO	Receiver data output. If $A-B \geq -50mV$, RO will be high; if $A-B \leq -200mV$, RO will be low.
3	DI	Driver Input. 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.
4	GND	Ground.
5	Y	Non-inverting Driver Output.
6	Z	Inverting Driver Output.
7	B	Inverting Receiver Input.
8	A	Non-inverting Receiver Input.

LIMITING VALUES

Parameter	Symbol	Range	Unit
Supply voltage	VCC	+7	V
Control input voltage	DI	-0.3~VCC+0.3	V
Bus side input voltage	A, B	-8~13	V
Receiver output voltage	RO	-0.3~VCC+0.3	V
Operating temperature	T _A	-40~125	°C
Storage temperature	T _{stg}	-60~150	°C
Welding temperature		300	°C
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.

DC ELECTRICAL CHARACTERISTICS OF DRIVER

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Differential output voltage (no load)	V_{OD1}			5		V
Differential output voltage	V_{OD2}	Fig 2, $R_L=54\Omega$	1.5		VCC	V
		Fig 2, $R_L=100\Omega$	2		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 voltage (NOTE1)	ΔV_{OC}	Fig 2, $R_L=54\Omega$			0.2	V
HIGH-level input voltage	V_{IH}	DE, DI, /RE	2.0			V
LOW-level input voltage	V_{IL}	DE, DI, /RE			0.8	V
Logic input current	I_{IN1}	DE, DI, /RE	-2		2	μA
Short-circuit output current, short to HIGH	I_{OSD1}	Short to 0V~12V	35		250	mA
Short-circuit output current, short to LOW	I_{OSD2}	Short to -7V~0V	-250		-35	mA

(Unless otherwise stated, $V_{CC}=5V\pm 10\%$, $T_A=-40^\circ C\sim 125^\circ C$, all typical values measured at $V_{CC}=+5V$, $T_A=25^\circ C$.)

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

DC ELECTRICAL CHARACTERISTICS OF RECEIVER

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Input current (A, B)	I_{IN2}	$V_{CC}=0$ or 5V, $V_{IN}=12V$			125	μA
		$V_{CC}=0$ or 5V, $V_{IN}=-7V$	-100			μA
Positive-going input threshold voltage	V_{IT+}	$-7V\leq V_{CM}\leq 12V$			-50	mV

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Negative-going input threshold voltage	V_{IT-}	$-7V \leq V_{CM} \leq 12V$	-200			mV
Receiver input hysteresis voltage	V_{hys}	$-7V \leq V_{CM} \leq 12V$	10	30		mV
HIGH-level output voltage	V_{OH}	$I_{OUT} = -4mA$, $V_{ID} = +200mV$	$V_{CC} - 1.5$			V
LOW-level output voltage	V_{OL}	$I_{OUT} = +4mA$, $V_{ID} = -200mV$			0.4	V
Three-state leakage current	I_{OZR}	$0.4V < V_O < 2.4V$			± 1	μA
Receiver input resistance	R_{IN}	$-7V \leq V_{CM} \leq 12V$	96			k Ω
Receiver output short-circuit	I_{OSR}	$0V \leq V_O \leq V_{CC}$	± 7		± 95	mA

(Unless otherwise stated, $V_{CC} = 5V \pm 10\%$, $T_A = -40^\circ C \sim 125^\circ C$, all typical values measured at $V_{CC} = +5V$, $T_A = 25^\circ C$.)

SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply current	I_{CC}	DI=0 or VCC		250	400	μA

ESD

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
A, B, Y, Z		Human body model (HBM)		± 16		kV
Other ports		Human body model (HBM)		± 6		kV

SWITCHING CHARACTERISTICS OF DRIVER

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Driver Propagation Delay from Low to High	t_{DPLH}	$R_{DIFF} = 54\Omega$, $C_L = 100pF$ Fig 3 & Fig 4		100	150	ns
Drive Propagation Delay from High to Low	t_{DPLH}			100	150	ns

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
$ t_{DPLH} - t_{DPHL} $	t_{SKEW1}	$R_{DIFF}=54\Omega$, $C_L=100pF$ Fig 3 & Fig 4			10	ns
Rising time/falling time	t_{DR}, t_{DF}			190	250	ns

RECEIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Receiver Input to Output from Low to High	t_{RPLH}	Fig 5 & Fig 6 $VID \geq 2.0V$; rising and falling time $VID \leq 15ns$	20	50	80	ns
Receiver Input to Output from High to Low	t_{RPHL}		20	50	80	ns
$ t_{RPLH} - t_{RPHL} $	t_{SKEW2}			5	15	ns

FUNCTION TABLE

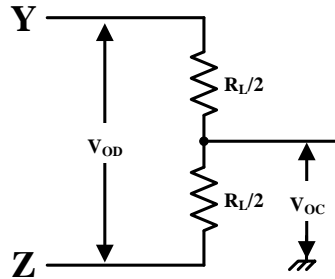
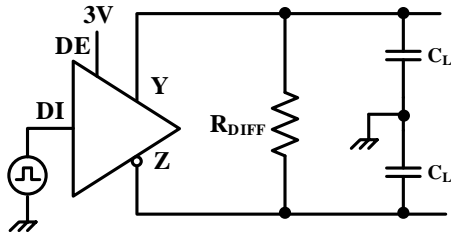
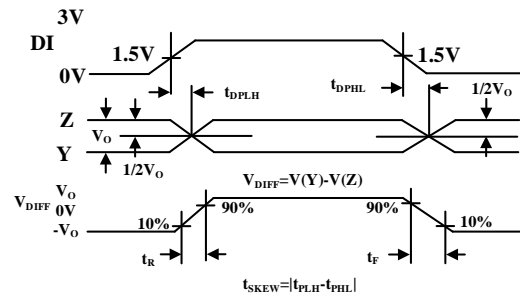
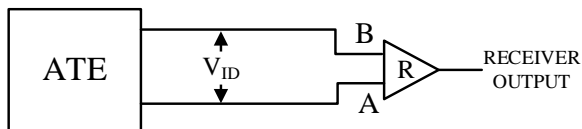
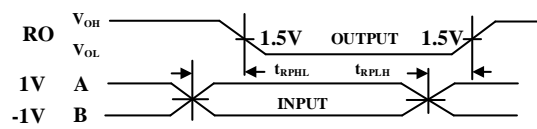
Driver Function

INPUT	OUTPUT	
DI	Y	Z
1	H	L
0	L	H
X	Z	Z
X	Z (Shutdown)	

Receiver Function

INPUT	OUTPUT
A-B	RO
$\geq -50mV$	H
$\leq -200mV$	L
Open/short circuit	H
$\leq -50mV$ & $\geq -200mV$?

Note: X: any level; Z: high impedance; ?: uncertain.

TEST CIRCUIT

Fig 2 Driver DC test load

Fig 3 Driver timing test circuit

Fig 4 Driver propagation delay

Fig 5 Driver enable/disable timing test circuit

Fig 6 Driver enable/disable timing

ADDITIONAL DESCRIPTION**1 Sketch**

SIT488E is a full-duplex high-speed transceiver, used for RS-485/RS-422 communication, including a driver and a receiver. It has the functions of fail-safe, over-voltage protection, over-current protection. SIT488E can achieve error-free data transmission up to 1Mbps.

2 Fail-safe

The SIT488E ensures a logic high output from the receiver when the receiver input is shorted or open circuit, or when all drivers are idle and connected to the terminated transmission line. This is achieved by setting the receiver input threshold to -50mV and -200mV respectively. If the difference receiver input voltage (A-B) \geq -50mV, RO is logic high; If voltage (A-B) \leq -200mV, RO is logic low. Depending on the receiver thresholds, the logic high with a minimum noise margin of 50mV can be realized. The -50mV to -200mV threshold voltage is compliant with the \pm 200mV EIA/TIA-485 standard.

3 Allowing up to 256 transceivers on the bus

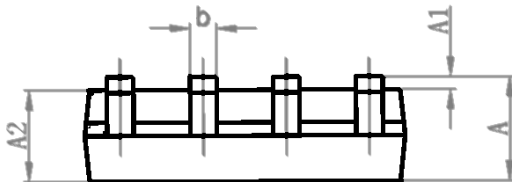
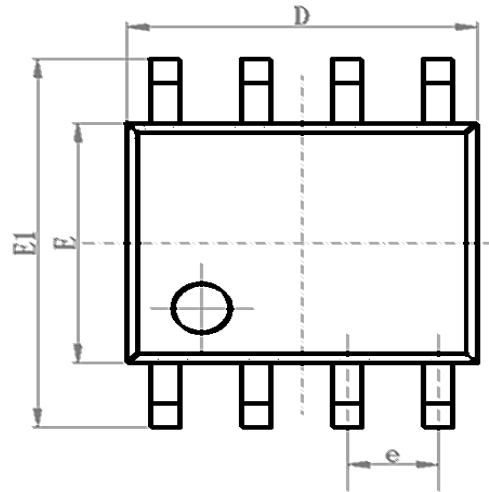
The input impedance of the standard RS485 receiver is 12k Ω (1 unit load), and the standard driver can drive up to 32 unit loads. The receiver of SIT488E transceiver has 1/8 unit load input impedance (96k Ω), which allows up to 256 transceivers to be connected on the same communication bus in parallel. 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

The overcurrent and overvoltage protection mechanism avoids excessive output current and power consumption caused by fault or bus conflict, and provides fast short-circuit protection over the entire common mode voltage range (refer to typical operating characteristics).

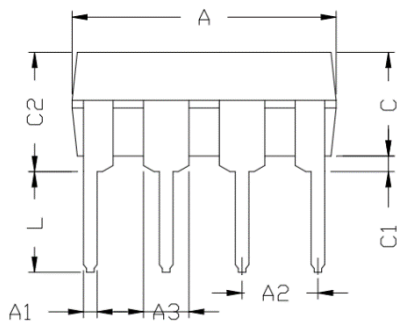
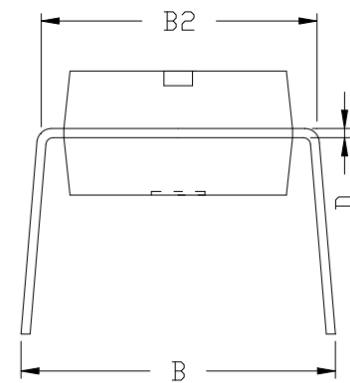
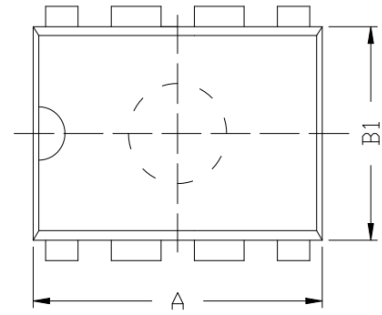
SOP8 DIMENSIONS
PACKAGE SIZE

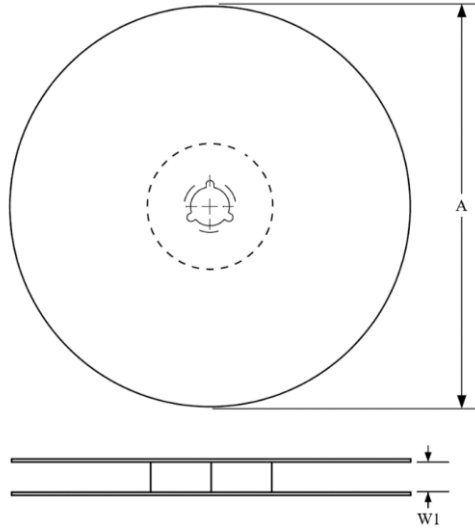
SYMBOL	MIN/mm	TYP/mm	MAX/mm
A	1.40	-	1.80
A1	0.10	-	0.25
A2	1.30	1.40	1.50
b	0.38	-	0.51
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e		1.27BSC	
L	0.40	0.60	0.80
c	0.20	-	0.25
θ	0°	-	8°



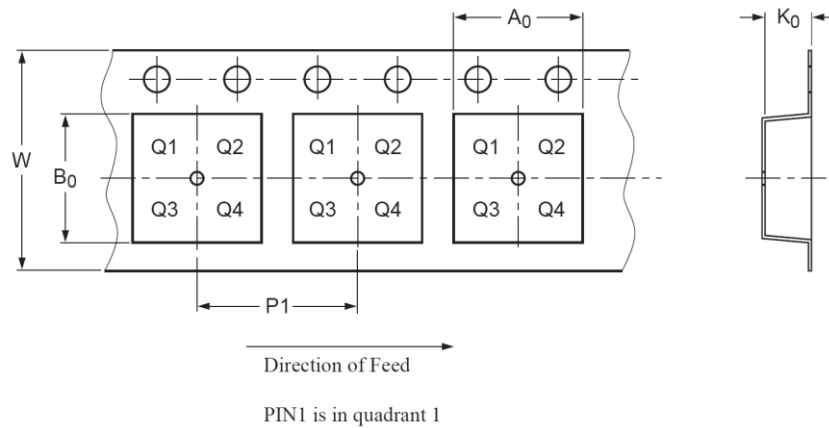
DIP8 DIMENSIONS
PACKAGE SIZE

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

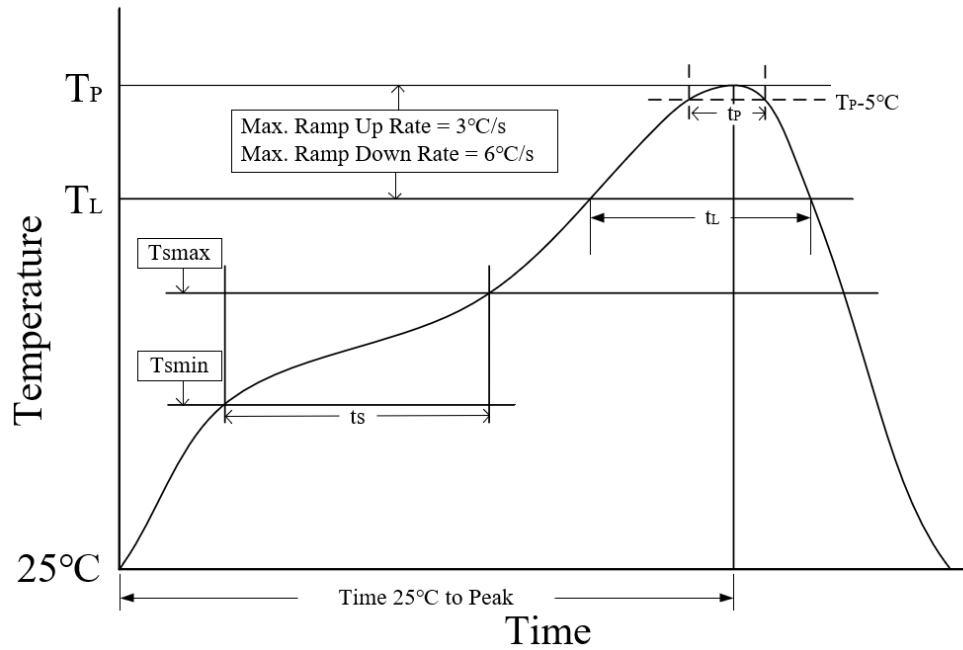


Package Type	Reel Diameter A (mm)	Tape Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)
SOP8	330	12.5±0.20	6.50±0.1	5.30±0.10	2.05±0.1	8.00±0.1	12.00±0.1

ORDERING INFORMATION

Type number	Package	Packing
SIT488EESA	SOP8	Tape and reel
SIT488EEPA	DIP8	Tube

SOP8 is packed with 2500 pieces/disc in braided packaging. DIP8 is packed with 50 pieces/tube in tube packaging.

REFLOW SOLDERING


Parameter	Lead-free soldering conditions
Ave ramp up rate (T_L to T_P)	$3^\circ C/second$ max
Preheat time t_s ($T_{smin}=150^\circ C$ to $T_{smax}=200^\circ C$)	60-120 seconds
Melting time t_L ($T_L=217^\circ C$)	60-150 seconds
Peak temp T_P	$260-265^\circ C$
$5^\circ C$ below peak temperature t_p	30 seconds
Ave cooling rate (T_P to T_L)	$6^\circ C/second$ max
Normal temperature $25^\circ C$ 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~V1.2	Product datasheet.	January 2021
V1.3	Updated SOP8 dimensions; Added important statement.	January 2022
V1.4	Updated operating temperature range; Added tape and reel information; Updated ordering information; Added reflow soldering information; Added revision history; Adjusted format.	September 2023
V1.5	Updated test circuit and test condition; Updated function table.	November 2023