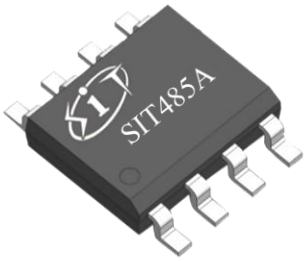
FEATURES

- 5V power supply, half-duplex
- Allow up to 32 transceivers on the bus
- Short-circuit protection
- Thermal shutdown protection
- True fail-safe receiver
- Excellent noise immunity
- Integrated transient voltage suppression
- 2.5Mbps in electrically noisy environments
- Available in SOP8 and DIP8 packages

PRODUCT APPEARANCE



Provide environmentally friendly lead-free package

DESCRIPTION

The SIT485A is a 5V power supply, half-duplex, low power, RS485 transceiver that is fully compliant with the TIA/EIA-485 standard.

The SIT485A includes a driver and a receiver and allows up to 32 transceivers on the bus. It also allows error-free data transmission up to 2.5Mbps.

The SIT485A operates under the supply voltage of 4.5V~5.5V. It is a true fail-safe transceiver and also has the function of thermal shutdown protection, current limiting protection, overvoltage protection and hot-swap input control functions.

PIN CONFIGURATION

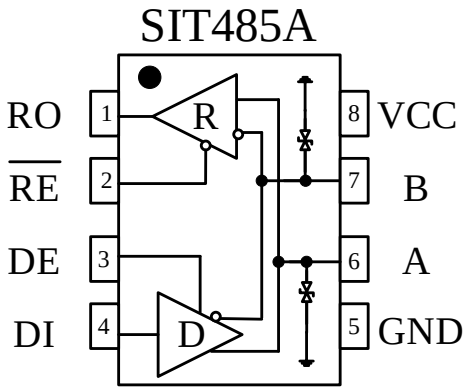


Fig 1 SIT485A pin configuration diagram

PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	RO	Receiver data output. When enabled, if A-B≥200 mV, then RO=high. If A-B≤-200 mV, then RO=low.
2	/RE	Receiver output enable. Drive /RE low to enable RO; RO is high impedance when /RE is high.
3	DE	Driver output enable. Drive DE high to enable driver outputs. These outputs are high impedance when DE is low.
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.
6	A	No inverting receiver input A/driver output A.
7	B	Inverting receiver input B/driver output B.
8	VCC	Supply voltage.

LIMITING VALUES

PARAMETER	SYMBOL	RANGE	UNIT
Supply voltage	VCC	+7	V
Control input voltage	/RE, DE, DI	-0.3~VCC+0.3	V
Bus side input voltage	A, B	-7~13	V
Receiver output voltage	RO	-0.3~VCC+0.3	V
Operating temperature	T_A	-40~85	℃
Storage temperature	T_{stg}	-60~150	℃
Welding temperature		300	℃
Continuous power dissipation	SOP8	400	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 driver output voltage (no load)	V_{OD1}			5		V
Differential driver output voltage	V_{OD2}	Fig 2, R_L=27Ω	1.5		VCC	V
		Fig 2, R_L=50Ω	2		VCC	
Change in magnitude of output voltage (NOTE1)	ΔV_{OD}	Fig 2, R_L=27Ω or 50Ω			0.2	V
Driver common-mode output voltage	V_{OC}	Fig 2, R_L=27Ω or 50Ω			3	V
Change in magnitude of common-mode voltage (NOTE1)	ΔV_{OC}	Fig 2, R_L=27Ω or 50Ω			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
Thermal-shutdown threshold temperature				150		℃
Thermal-shutdown hysteresis temperature				20		℃

(Unless otherwise stated, V_{CC}=5V±10%, Temp=T_{MIN}~T_{MAX}, typically V_{CC}=+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.

DC ELECTRICAL CHARACTERISTICS OF RECEIVER

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Input current (A, B)	I_{IN2}	DE=0V, VCC=0 or 5V, V_{IN}=12V			1000	μA
		DE=0V, VCC=0 or 5V, V_{IN}=-7V	-800			μA
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 voltage	V_{hys}	-7V≤V_{CM}≤12V		60		mV
HIGH-level output voltage	V_{OH}	I_{OUT}=−4mA, V_{ID}=+200 mV	3.5			V
LOW-level output 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	12			kΩ
Receiver output short-circuit	I_{OSR}	0V≤V_O≤VCC	±7		±95	mA

(Unless otherwise stated, V_{CC}=5V±10%, Temp=T_{MIN}~T_{MAX}, typically V_{CC}=+5V, Temp=25°C.)

SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply current	I_{CC1}	/RE=0V or VCC, DE=0V		350	500	μA
	I_{CC2}	/RE=VCC, DE=VCC		450	900	μA

SWITCHING CHARACTERISTICS OF DRIVER

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Driver propagation delay time, Low-to-High level	t_{DPLH}	R_{DIFF}=54 Ω, C_L=100pF (Fig 3, Fig 4)	10	30	70	ns
Driver propagation delay time, High-to-Low level	t_{DPHL}		10	30	70	ns
$\|t_{DPLH}- t_{DPHL}\|$	t_{SKEW1}			5	±10	ns
Driver enable to output High	t_{DZH}	C_L=100 pF, S2 closed (Fig 5, Fig 6)		40	75	ns
Driver enable to output Low	t_{DZL}	C_L=100 pF, S1 closed (Fig 5, Fig 6)		40	75	ns
Driver disable time from Low	t_{DLZ}	C_L=15 pF, S1 closed (Fig 5, Fig 6)		40	75	ns
Driver disable time from High	t_{DHZ}	C_L=15 pF, S2 closed (Fig 5, Fig 6)		40	75	ns

SWITCHING CHARACTERISTICS OF RECEIVER

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Receiver enable to output Low	t_{RZL}	C_L=100pF, S1 closed, (Fig 7, Fig 8)		25	50	ns
Receiver enable to output High	t_{RZH}	C_L=100pF, S2 closed, (Fig 7, Fig 8)		25	50	ns
Receiver disable time from Low	t_{RLZ}	C_L=15pF, S1 closed, (Fig 7, Fig 8)		25	50	ns
Receiver disable time from High	t_{RHZ}	C_L=15pF, S2 closed, (Fig 7, Fig 8)		25	50	ns

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	
X: at any level; 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: at any level; Z: high impedance.			

TEST CIRCUIT

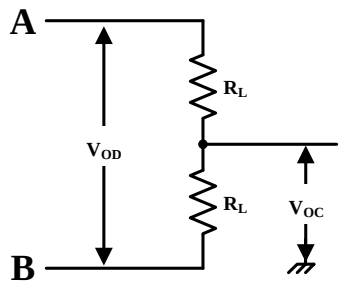


Fig 2 Driver DC test load

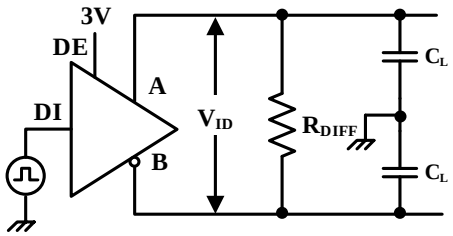


Fig 3 Driver time test circuit

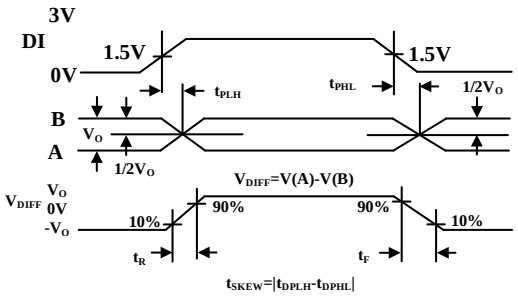


Fig 4 Driver propagation time

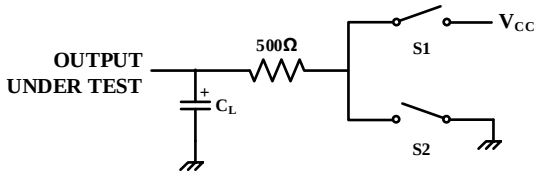


Fig 5 Driver enable and disable time test circuit

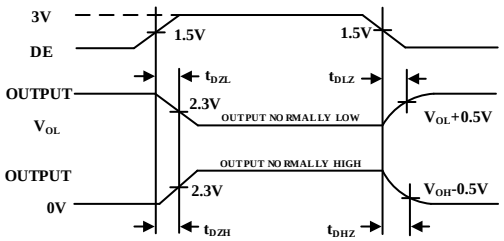


Fig 6 Driver enable and disable time

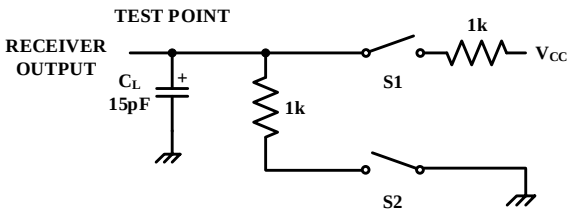


Fig 7 Receiver enable and disable times test circuit

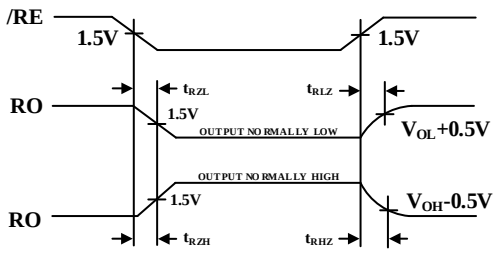


Fig 8 Receiver enable and disable time

ADDITIONAL DESCRIPTION

1 Sketch

The SIT485A is a half-duplex high-speed transceiver for RS485/RS422 communications and contains a driver and receiver. It supports fail-safe, over voltage protection, over current protection and overtemperature protection functions. It also allows error-free data transmission up to 2.5Mbps.

2 Receiver threshold voltage

If the input voltage of differential receiver $V_{(A-B)}$ is more than or equal to +200mV, RO is logic high level. If $V_{(A-B)}$ is less than or equal to -200mV, RO indicates the logic low level. A logic high level with a minimum noise tolerance of 60mV can be achieved depending on the receiver threshold.

3 Connecting 32 transceivers on one bus

The standard RS485 receiver has an input impedance of 12kΩ (1 unit load), and the standard driver can drive up to 32 unit loads. The receiver of the SIT485A transceiver has one input impedance per unit load (12kΩ), allowing up to 32 transceivers to be connected in parallel to the same communication bus. These devices can be arbitrarily combined, or combined with other RS485 transceivers, as long as the total load does not exceed 32 unit loads, can be attached to the same bus.

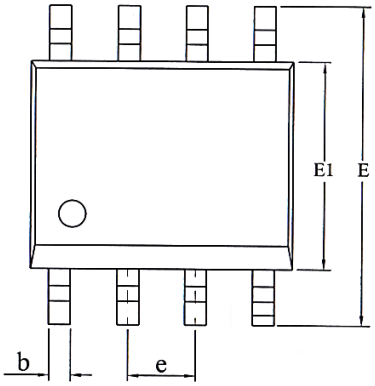
4 Driver output protection

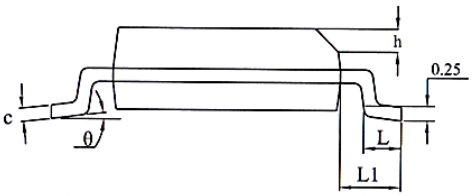
Two mechanisms are used to avoid excessive output current and power consumption caused by fault or bus collision. First, over-current protection, throughout the common-mode voltage range (reference typical operating characteristics) provides a quick short-circuit protection. Second, the thermal shutdown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

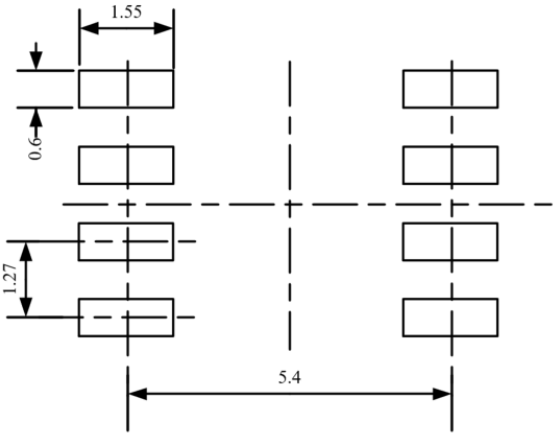
SOP8 DIMENSSIONS

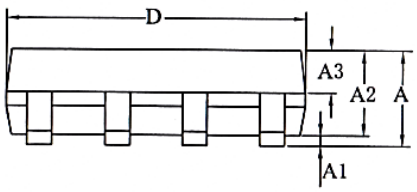
PACKAGE SIZE

SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	1.40	-	1.80
A1	0.10	-	0.25
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.38	-	0.51
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	-	0.50
L	0.40	0.60	0.80
L1	1.05REF		
c	0.20	-	0.25
θ	0°	-	8°







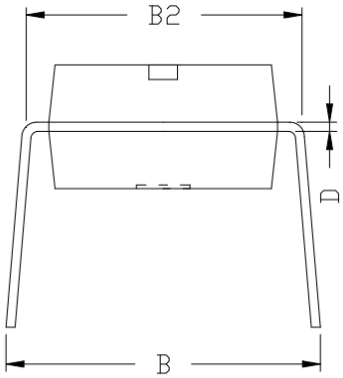


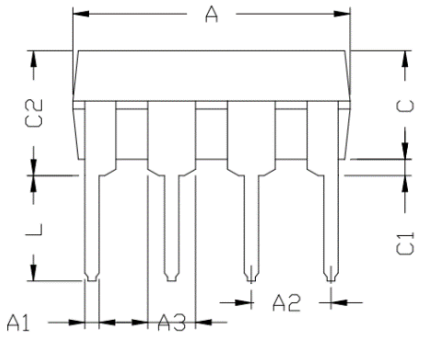
LAND PATTERN EXAMPLE (Unit: mm)

DIP8 DIMENSSIONS

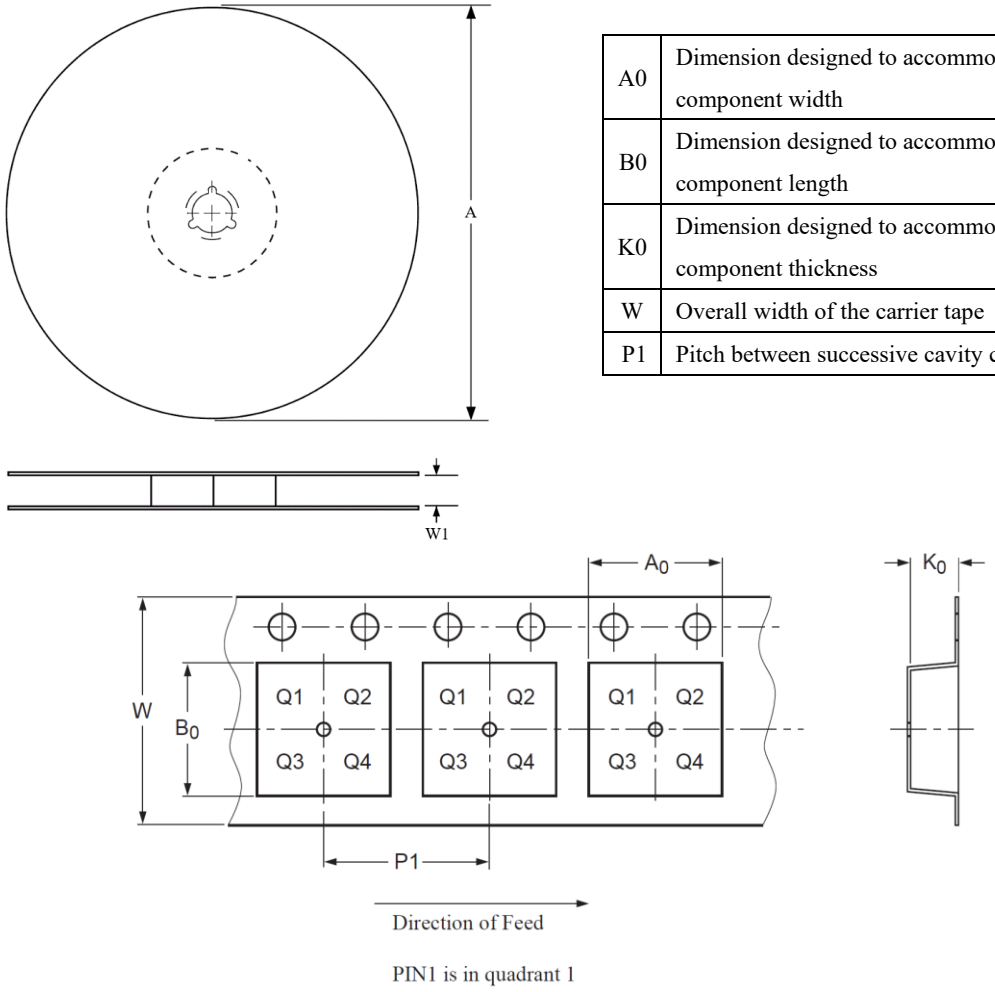
PACKAGE SIZE

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

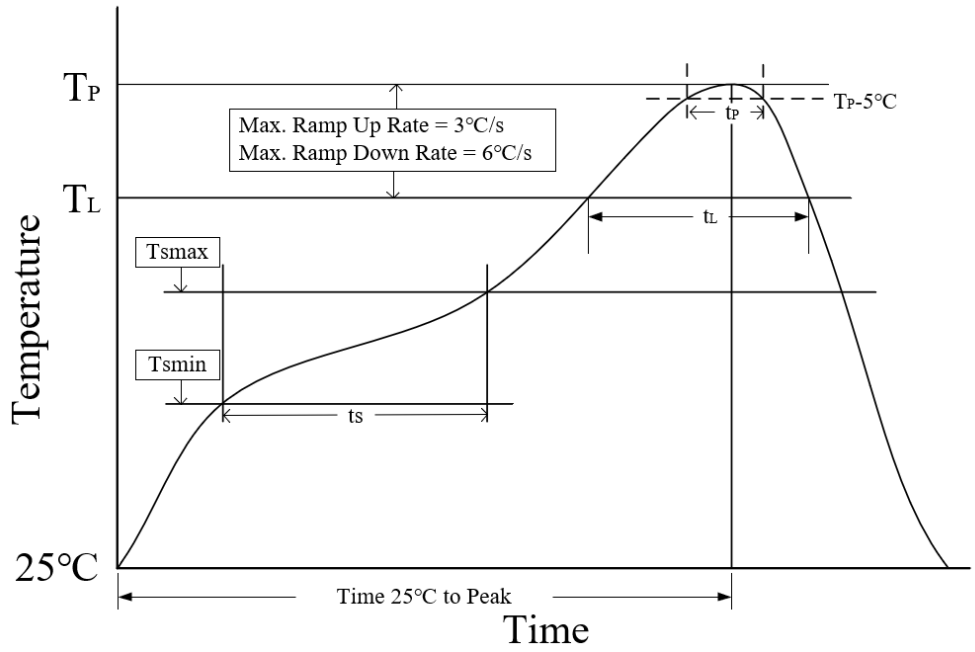
Package Type	Reel Diameter A (mm)	Tape width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)
SOP8	330±2	12.4±0.40	6.50±0.1	5.30±0.10	2.05±0.1	8.00±0.1	12.00±0.1

ORDERING INFORMATION

TYPE NUMBER	PACKAGE	PACKING
SIT485AESA	SOP8	Tape and reel
SIT485AEPA	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°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.

VERSION HISTORY

Version number	Data sheet status	Revision Date
V1.0	Initial version.	October 2022
V1.1	Added ΔV_{OD}, V_{OC} and ΔV_{OC} test conditions: R_L=50Ω; Modified ICC1 and ICC2 parameters; Modified t_{DZH} and t_{DLZ} test condition; Added t_{RLZ} and t_{RHZ} parameters; Updated all test circuit diagrams and sequence diagrams.	November 2022