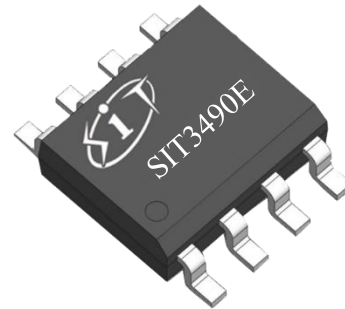


**FEATURES**

- 3.0V~5.5V supply, full-duplex
- 1/8 unit load, allow up to 256 transceivers on the bus
- Driver short-circuit output protection
- Strong anti-noise ability
- Integrated transient voltage suppression function
- The data transmission rate up to 14Mbps in electric noise environment
- ESD protection for RS-485 I/O pins  $\pm 15\text{kV}$ , HBM

**PRODUCT APPEARANCE**

Provide green and environmentally friendly lead-free package

**DESCRIPTION**

SIT3490E is a 3.0V~5.5V powered, full-duplex, low power dissipation RS-485 transceiver fully meeting the requirements of RS-485/RS-422 standard.

SIT3490E contains one driver and one receiver, both can transmit signals independently. The SIT3490E has a 1/8-unit-load. It allows up to 256 transceivers on the bus and error-free data transmission up to 14Mbps.

SIT3490E has a working voltage range of 3.0V~5.5V, with the functions of current-limiting protection, over-voltage protection, control port hot plug input, etc. SIT3490E has excellent ESD release capability, and HBM reaches  $\pm 15\text{kV}$ .

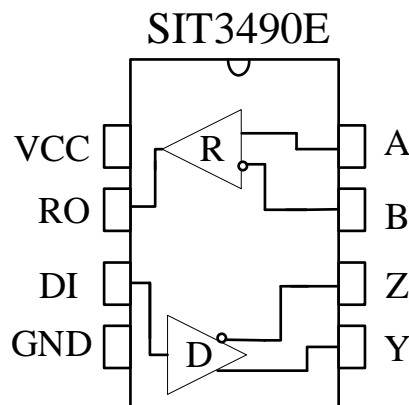
**PIN CONFIGURATION**

Fig 1 SIT3490E Pin Configuration

**PIN DESCRIPTION**

PIN	SYMBOL	DESCRIPTION
1	VCC	Positive Supply.
2	RO	Receiver Output. If $A-B \geq +200\text{mV}$ , RO will be high; If $A-B \leq -200\text{mV}$ , RO will be low.
3	DI	Driver Input. A low on DI forces output Y low and output Z high. A high on DI forces output Y high and output Z 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	VALUE	UNIT
Supply voltage	VCC	+7	V
Driver Input Voltage	DI	-0.3~VCC+0.3	V
Receiver Input Voltage	A, B	-8~13	V
Receiver Output Voltage	RO	-0.3~VCC+0.3	V
Ambient Temperature Ranges	$T_{\text{amb}}$	-40~125	°C
Storage Temperature Range	$T_{\text{stg}}$	-60~150	°C
Lead 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.

**DRIVER DC ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Differential Driver Output (No load)	$V_{OD1}$	$V_{CC}=5V$		5		V
Differential Driver Output	$V_{OD2}$	Fig 2, $R_L=54\Omega$	1.5		$V_{CC}$	V
		Fig 2, $R_L=100\Omega$	1.5		$V_{CC}$	
Change in Magnitude of Driver Differential Output Voltage (NOTE1)	$\Delta V_{OD}$	Fig 2, $R_L=54\Omega$			0.2	V
Driver Common-Mode Output Voltage	$V_{OC}$	Fig 2, $R_L=54\Omega$			3	V
Change in Magnitude of Common-Mode Output Voltage (NOTE1)	$\Delta V_{OC}$	Fig 2, $R_L=54\Omega$			0.2	V
Input High Voltage	$V_{IH}$	DI	2.0			V
Input Low Voltage	$V_{IL}$	DI			0.8	V
Logic Input Current	$I_{IN1}$	DI	-2		2	$\mu A$
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

(Unless otherwise noted,  $V_{CC}=3V\sim 5V$ ,  $-40^{\circ}C\leq T_{amb}\leq 125^{\circ}C$ , typical values are at  $V_{CC}=+3.3V$ ,  $T_{amb}=25^{\circ}C$ ).

NOTE1:  $\Delta V_{OD}$  and  $\Delta V_{OC}$  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)	$I_{IN2}$	$V_{CC}=0$ or 3.3V $V_{IN}=12V$			125	$\mu A$
		$V_{CC}=0$ or 3.3V $V_{IN}=-7V$	-100			$\mu A$
Positive input threshold voltage	$V_{IT+}$	$-7V\leq V_{CM}\leq 12V$			+200	mV



PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
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	$V_{OH}$	$I_{OUT} = -4mA$ , $V_{ID} = +200mV$	$V_{CC} - 1.5$			V
Receiver Output Low Voltage	$V_{OL}$	$I_{OUT} = +4mA$ , $V_{ID} = -200mV$			0.4	V
Three-State Output Current at Receiver	$I_{OZR}$	$0.4V < V_O < 2.4V$			$\pm 1$	$\mu A$
Receiver Input Resistance	$R_{IN}$	$-7V \leq V_{CM} \leq 12V$	96			k $\Omega$
Receiver Short-Circuit Output Current	$I_{OSR}$	$0V \leq V_O \leq V_{CC}$	$\pm 7$		$\pm 95$	mA

(Unless otherwise noted,  $V_{CC} = 3V \sim 5V$ ,  $-40^{\circ}C \leq T_{amb} \leq 125^{\circ}C$ , typical values are at  $V_{CC} = +3.3V$ ,  $T_{amb} = 25^{\circ}C$ ).

## SUPPLY CURRENT

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Supply Current	$I_{CC}$	DI=0 or VCC		240	400	$\mu A$

## ESD PROTECTION

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
A, B, Y, Z		HBM		$\pm 15$		kV
Other ports		HBM		$\pm 6$		kV

## DRIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Driver Propagation Delay, Low-to-High Level	$t_{PLH}$	$R_L = 54\Omega$ , $C_L = 100pF$ <a href="#">Fig 4</a>		15	35	ns
Driver Propagation Delay, High-to-Low Level	$t_{PHL}$	$R_L = 54\Omega$ , $C_L = 100pF$ <a href="#">Fig 4</a>		15	35	ns



PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
$ t_{PLH} - t_{PHL} $	$t_{SKEW1}$	$R_L=54\Omega$ , $C_L=100pF$ <a href="#">Fig 3</a> & <a href="#">Fig 4</a>		7	10	ns
Differential output delay / Transition time	$t_{DD}, t_{TD}$			10	25	ns

### RECEIVER SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Receiver Propagation Delay, Low-to-High Level	$t_{RPLH}$	<a href="#">Fig 5</a> $V_{ID} \geq 2.0V$ ; Rising and falling edge time $V_{ID} \leq 15ns$	20	60	90	ns
Receiver Propagation Delay, High-to-Low Level	$t_{RPHL}$		20	60	90	ns
$ t_{RPLH} - t_{RPHL} $	$t_{SKEW2}$			7	10	ns

### FUNCTION TABLE

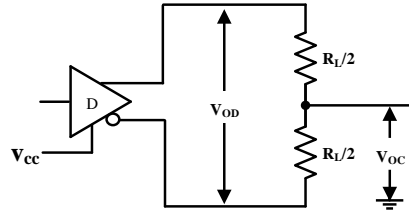
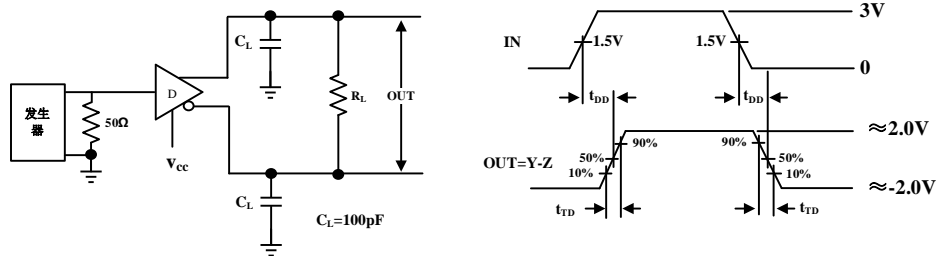
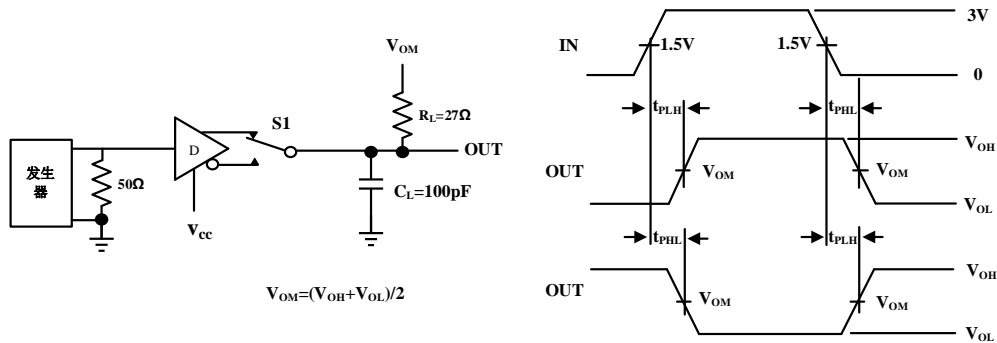
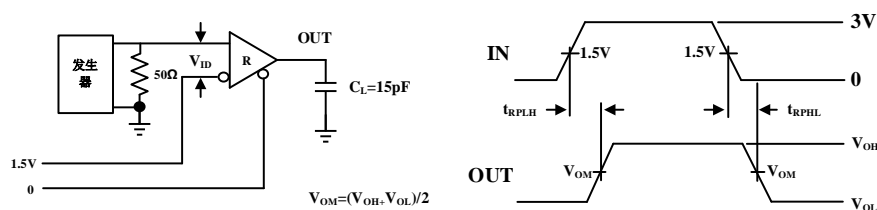
**Driver Function**

INPUT	OUTPUT	
	Y	Z
DI		
1	H	L
0	L	H
-	-	-
-	-	-

**Receiver Function**

INPUT	OUTPUT
A-B	RO
$\geq +200mV$	H
$\leq -200mV$	L
Open/Short	H
$\leq +200mV$ & $\geq -200mV$	?

(1) H=High level; L=Low level; ? = uncertain.

**TEST CIRCUIT**

**Fig 2 Driver DC test load**

**Fig 3 Driver differential output delay and transition times**

**Fig 4 Driver propagation times**

**Fig 5 Receiver propagation delay**



## ADDITIONAL DESCRIPTION

### 1 Sketch

SIT3490E is a full-duplex high-speed transceiver for RS-485/RS-422 communication, which includes a driver and a receiver. It has failure safety, over-voltage protection and over-current protection. SIT3490E realizes error-free data transmission up to 14Mbps.

### 2 Allowing up to 256 transceivers on the bus

The input impedance of the standard RS485 receiver is  $12k\Omega$  (1 unit load), and the standard driver can drive up to 32 unit loads. The receiver of SIT3490E transceiver has  $1/8$  unit load input impedance ( $96k\Omega$ ), 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.

### 3 Driver output protection

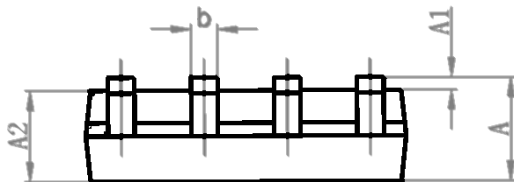
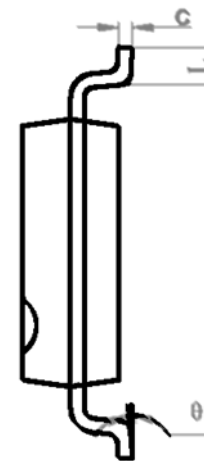
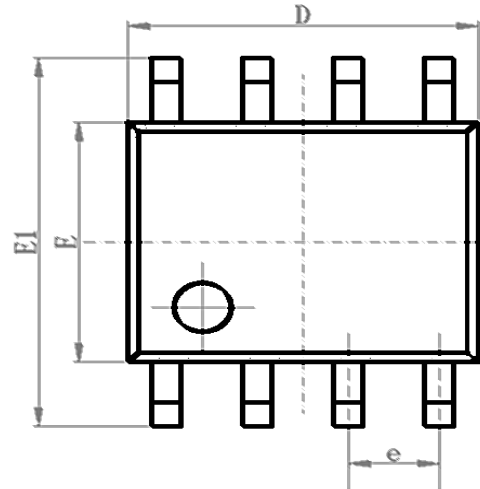
By means of over-current and over-voltage protection mechanism, it can prevent excessive output current and power dissipation caused by faults or by bus contention, and fast short-circuit protection can be provided in the whole common mode voltage range (refer to typical working characteristics).



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
$\theta$	0°	-	8°



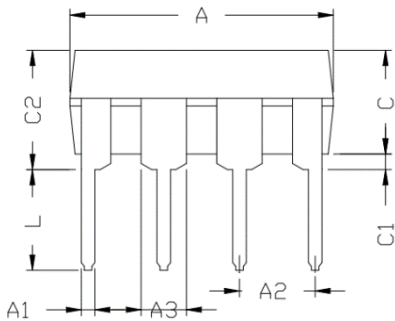
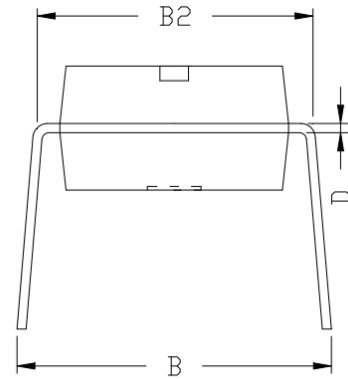
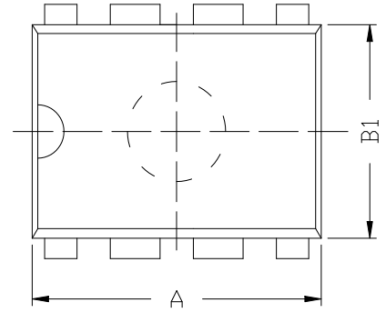




DIP8 DIMENSIONS

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

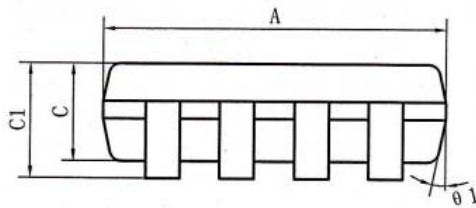
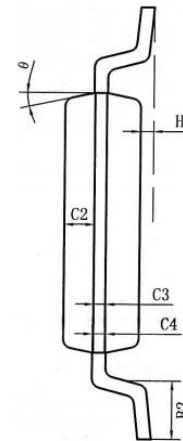
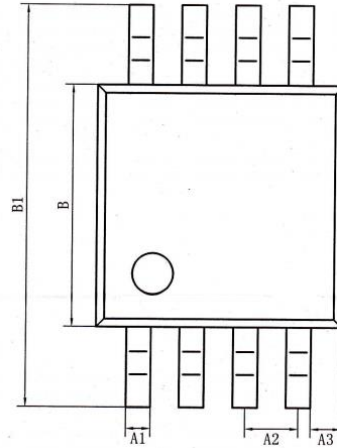




**MSOP8/8μMAX/VSSOP8 DIMENSIONS**

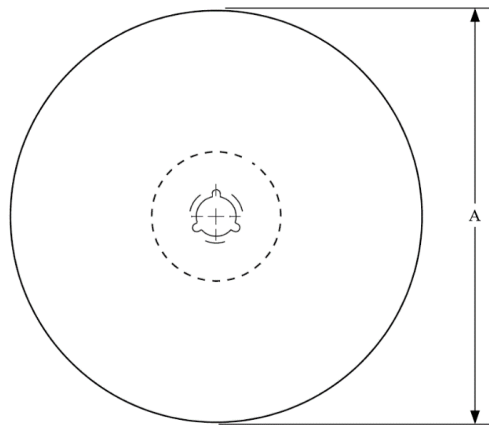
**PACKAGE SIZE**

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		

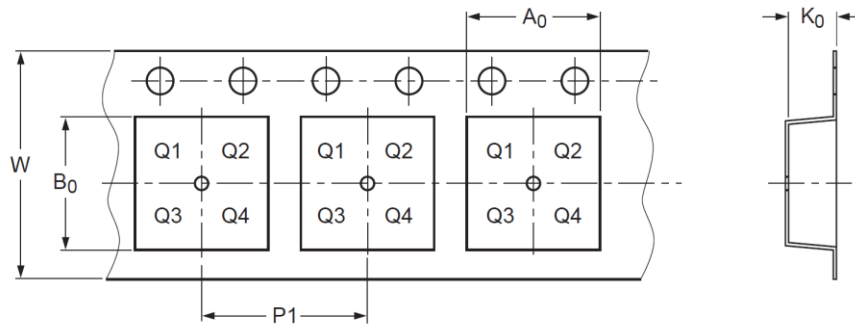
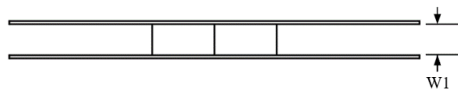




**TAPE AND REEL INFORMATION**



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



Direction of Feed →

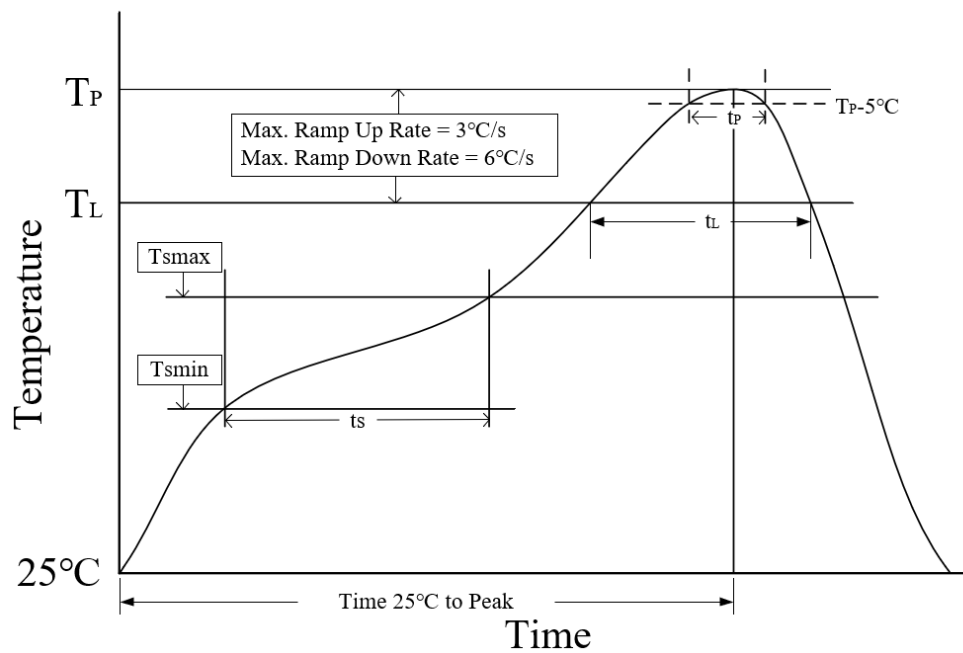
PIN1 is in quadrant 1

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 <sup>+0.30</sup> <sub>-0.10</sub>

**ORDERING INFORMATION**

TYPE NUMBER	PACKAGE	PACKING
SIT3490EESA	SOP8	Tape and reel
SIT3490EEPA	DIP8	Tube
SIT3490EEUA	MSOP8/VSSOP8/8μMAX	Tape and reel

Braided packing is 2500 pieces/disc. 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 $t_s$ ( $T_{smin}=150\text{ °C}$ to $T_{smax}=200\text{ °C}$ )	60-120 seconds
Melting time $t_L$ ( $T_L=217\text{ °C}$ )	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
V1.2	Initial version.	February 2020
V1.3	Modified operating temperature ranges.	March 2020
V1.4	Modified the max value of the positive input threshold voltage; Modified the minimum noise tolerance in the description of fail-safe; Added the information of MSOP8/8 $\mu$ MAX/VSSOP8 dimensions.	May 2020
V1.5	Modified the range of VCC; Modified the condition of RO being high; Modified the max value of the positive input threshold voltage; Deleted the description of the fail-safe.	July 2020
V1.6	Deleted “x” and “z” in the last row of driver function table.	August 2020
V1.7	Updated the max value of positive input threshold voltage.	September 2020
V1.8	Updated the package size of SOP8.	January 2022
V1.9	Updated DIP/MSOP8/8 $\mu$ MAX/VSSOP8 dimensions drawing; Updated ordering information; Added reflow soldering information.	November 2022
V1.10	Added the test condition of V <sub>OD1</sub> ; Updated the V <sub>OD2</sub> minimum of RL=100 $\Omega$ in the test condition; Updated test circuit; Added tape and reel information.	February 2023
V1.11	Updated description and symbol of operating temperature; Updated RL’s value related to Fig 2 in electrical characteristics table; Updated test description of electrical characteristics; Updated description of t <sub>DD</sub> and t <sub>TD</sub> ; Updated function table.	April 2023
V1.12	Updated ESD protection HBM for A, B, Y, Z ports is $\pm$ 15kV.	June 2023