



ORIENT

Photo coupler

Product Data Sheet

Part Number: OR-253X

Customer: _____

Date: _____

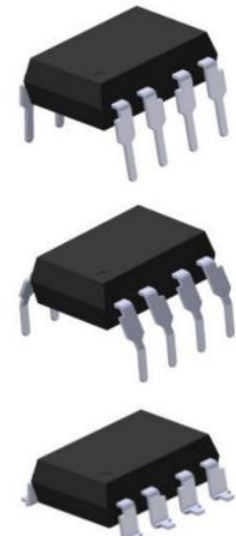
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1. Features

- (1) High speed 1 Mbit/s
- (2) 10kV/ps min. common mode transient immunity
- (3) Guaranteed performance from -40 to 100°C
- (4) Open collector output
- (5) High isolation voltage between input and output
- (6) $V_{iso}=5000\text{ V rms}$
- (7) Safety approval
 - UL approved (No.E323844)
 - VDE approved (No.40029733)
 - CQC approved (No.CQC19001231254)
- (8) In compliance with RoHS, REACH standards
- (9) MSL Class I



2. Instructions

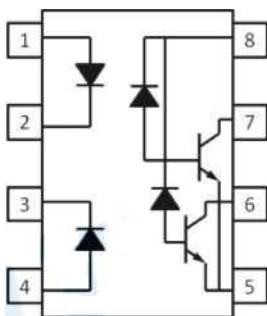
The OR-2530 and OR-2531 dual channel devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor. The devices are packaged in an 8-pin DIP package and available in wide-lead spacing and SMD option.

The photoelectric coupler operating temperature range: -40 °C ~ + 110 °C.

3. Application Range

- (1) Line receivers
- (2) Telecommunication equipments
- (3) Feedback loop in switch-mode power supplies
- (4) Home appliances
- (5) High speed logic ground isolation
- (6) Power transistor isolation in motor drives
- (7) Replacement for low speed phototransistor photo couplers

4. Functional Diagram



- Pin Configuration
- 1. Anode
 - 2. Cathode
 - 3. Cathode
 - 4. Anode
 - 5. Gnd
 - 6. Vout 2
 - 7. Vout 1
 - 8. Vcc

Truth table		
Input	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H
H	NC	L
L	NC	H

5. Absolute Maximum Ratings (Ta=25°C)*1

	Parameter	Symbol	Rating	Unit
INPUT	Forward Current	I_F	25	mA
	Peak forward Current (50% duty, 1ms P.W)	I_{FP}	50	mA
	Peak transient Current (1<lps P.W,300pps)	$I_{F(trans)}$	1	A
	Reverse Voltage	V_R	5	V
	Power Dissipation	P_I	45	mW
OUTPUT	Power Dissipation	P_O	35	mW
	Average Output Current	$I_{O(AVG)}$	8	mA
	Output Peak Output Current	$I_{O(PK)}$	16	mA
	Output Voltage	V_O	-0.5 to 20	V
	Supply Voltage	V_{CC}	-0.5 to 30	V
	Isolation Voltage *1	V_{ISO}	5000	V _{rms}
	Operating Temperature	T_{OPR}	-40~+100	°C
	Storage Temperature	T_{STG}	-40 ~ +125	°C
	Soldering Temperature *2	T_{SOL}	260	°C

Notes:

*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1,2, 3 & 4 are shorted together, and pins 5, 6, 7 & 8 are shorted together.

*2 For 10 seconds.

6. Electrical Characteristics (Ta=0 to 70°C unless specified otherwise)

Parameter		Symbol	Min	Typ	Max	Unit	Condition
Output	Forward Voltage	V_F	—	1.45	1.8	V	$I_F=16\text{mA}$, $T_A=25^\circ\text{C}$
	Reverse Voltage	V_R	5.0	—	—	V	$I_R=10\mu\text{A}$
	Temperature coefficient of Forward Voltage	$\Delta V_f/\Delta T_a$	—	-1.9	—	mV/°C	$I_R=16\text{mA}$
	Input Capacitance	C_{in}	—	60	—	pF	$V_F=0\text{V}$, $f=1\text{MHz}$
Transfer Characteristics	High Level Supply Current	I_{CCH}	—	0.01	1	μA	$I_F=0\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15\text{V}$, $T_A=25^\circ\text{C}$
			—	—	4		$I_F=0\text{mA}$, $V_O=\text{Open}$, $V_{CC}=15\text{V}$
	Low Level Supply Current	I_{CCL}	—	140	400	μA	$I_{F1}=I_{F2}=16\text{mA}$, $V_O=\text{OPEN}$, $V_{CC}=15\text{V}$
	High Level Output Current	I_{OH}	—	0.001	0.5	μA	$I_F=0\text{mA}$, $T_A=25^\circ\text{C}$ $V_O=V_{CC}=5.5\text{V}$
—			—	50	$I_F=0\text{mA}$, $T_A=25^\circ\text{C}$ $V_O=V_{CC}=15\text{V}$		

7. Transfer Characteristics (Ta=0 to 70°C unless specified otherwise)

Parameter		Symbol	Min.	Typ*	Max.	Unit	Conditions
Current Transfer Ratio	OR-2530	CTR	7	—	50	%	$I_F=16\text{mA}, V_O=0.4\text{V}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$ $I_F=16\text{mA}, V_O=0.5\text{V}, V_{CC}=4.5\text{V}$
	OR-2531		19	—	50		
	OR-2530		5	—	—		
	OR-2531		15	—	—		
Logic Low Output Voltage	OR-2530	V_{OL}	—	0.18	0.5	V	$I_F=16\text{mA}, I_O=1.1\text{mA}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$ $I_F=16\text{mA}, I_O=3\text{mA}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$ $I_F=16\text{mA}, I_O=0.8\text{mA}, V_{CC}=4.5\text{V}$ $I_F=16\text{mA}, I_O=2.4\text{mA}, V_{CC}=4.5\text{V}$
	OR-2531		—	0.25	0.5		
	OR-2530		—	—	0.5		
	OR-2531		—	—	0.5		

8. Switching Characteristics (At Ta = 25°C)

Parameter		Symbol	Min.	Typ*	Max.	Unit	Conditions
Propagation Delay Time to Logic Low	OR-2530	t_{PHL}	—	0.35	1.5	μs	$R_l=4.1\text{K}\Omega, T_a=25^\circ\text{C}$
			—	—	2.0		$R_l=4.1\text{K}\Omega$
	OR-2531		—	0.35	0.8		$R_l=1.9\text{K}\Omega, T_a=25^\circ\text{C}$
			—	—	1.0		$R_l=1.9\text{K}\Omega$
Propagation Delay Time to Logic High	OR-2530	t_{PLH}	—	0.5	1.5	μs	$R_l=4.1\text{K}\Omega, T_a=25^\circ\text{C}$
			—	—	2.0		$R_l=4.1\text{K}\Omega$
	OR-2531		—	0.3	0.8		$R_l=1.9\text{K}\Omega, T_a=25^\circ\text{C}$
			—	—	1.0		$R_l=1.9\text{K}\Omega$
Common Mode Transient Immunity at Logic High	OR-2530	CM_h	1,000	10,000	—	$\text{V}/\mu\text{s}$	$I_f=0\text{mA}, V_{cm}=10\text{V}_{P-P}, R_l=4.1\text{K}\Omega, T_a=25^\circ\text{C}$
	OR-2531		1,000	10,000	—		$I_f=0\text{mA}, V_{cm}=1000\text{V}_{P-P}, R_l=1.9\text{K}\Omega, T_a=25^\circ\text{C}$
Common Mode Transient Immunity at Logic Low	OR-2530	CM_l	1,000	10,000	—	$\text{V}/\mu\text{s}$	$I_f=16\text{mA}, V_{cm}=10\text{V}_{P-P}, R_l=4.1\text{K}\Omega, T_a=25^\circ\text{C}$
	OR-2531		1,000	10,000	—		$I_f=16\text{mA}, V_{cm}=1000\text{V}_{P-P}, R_l=1.9\text{K}\Omega, T_a=25^\circ\text{C}$

9. Order Information

Part Number

OR-253XU-Y-Z

Note

253X = Part Number ,2530 or 2531.

U = Lead form option (S, M or none)

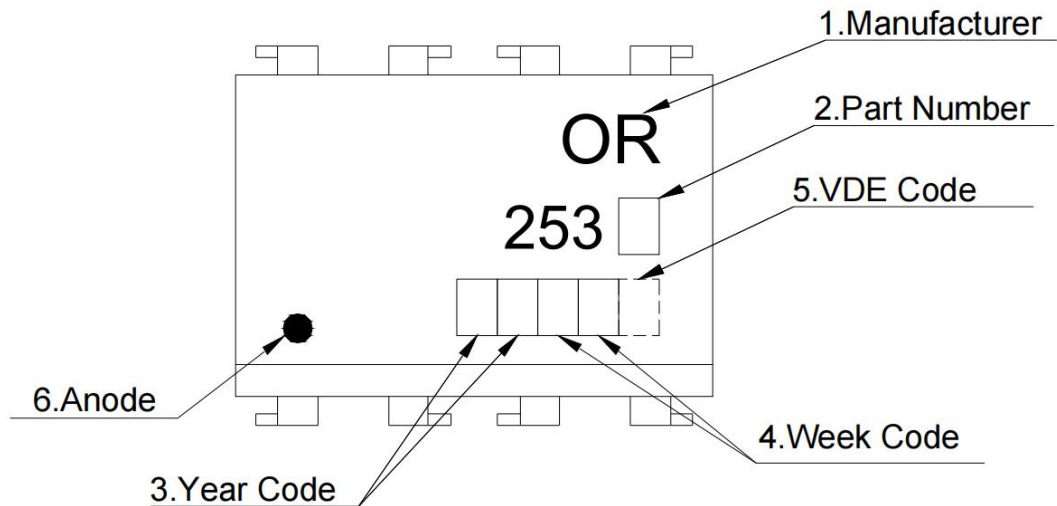
Y = Tape and reel option (TA,TA1 or none).

Z = 'V' code for VDE safety (This options is not necessary).

* VDE Code can be selected.

Option	Description	Packing quantity
None	Standard SMD Option	45 units per tube
M	Wide lead bend (0.4 inch spacing)	45 units per tube
TA	Surface mount lead form (low profile) + TA tape & reel option	1000 units per reel
TA1	Surface mount lead form (low profile) + TA1 tape & reel option	1000 units per reel

10. Naming Rule

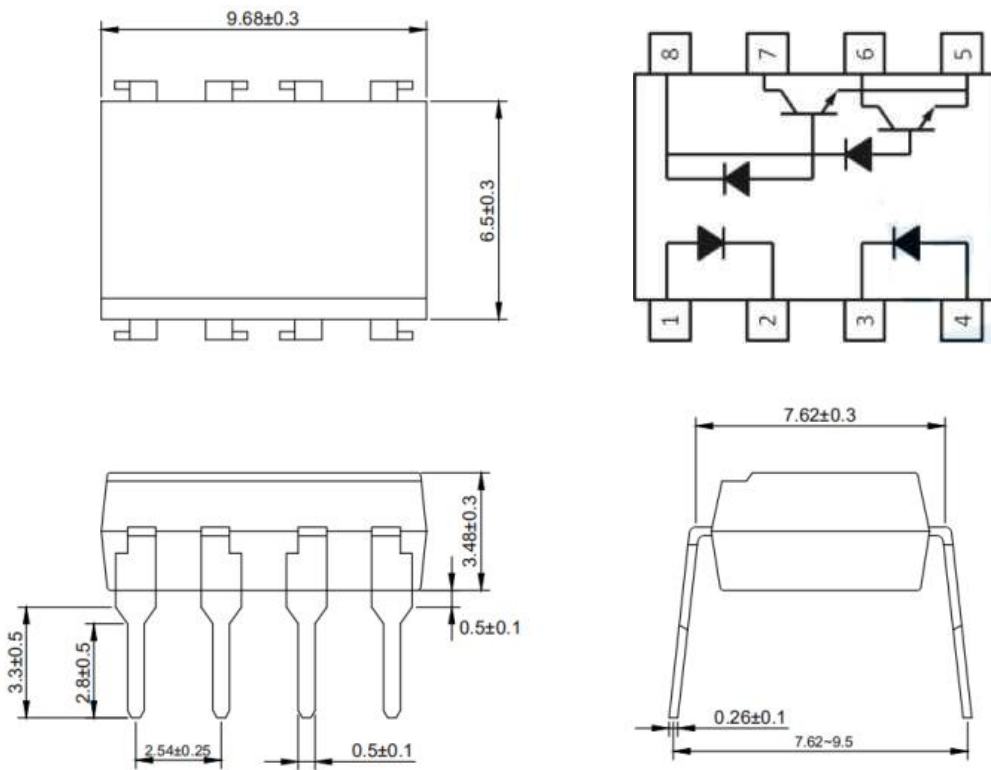


1. Manufacturer : ORIENT.
2. Part Number : 2530 or 2531.
3. Year Code : '21' means '2021' and so on.
4. Week Code : 01 means the first week, 02 means the second week and so on.
5. VDE Code . (Optional)
6. Anode.

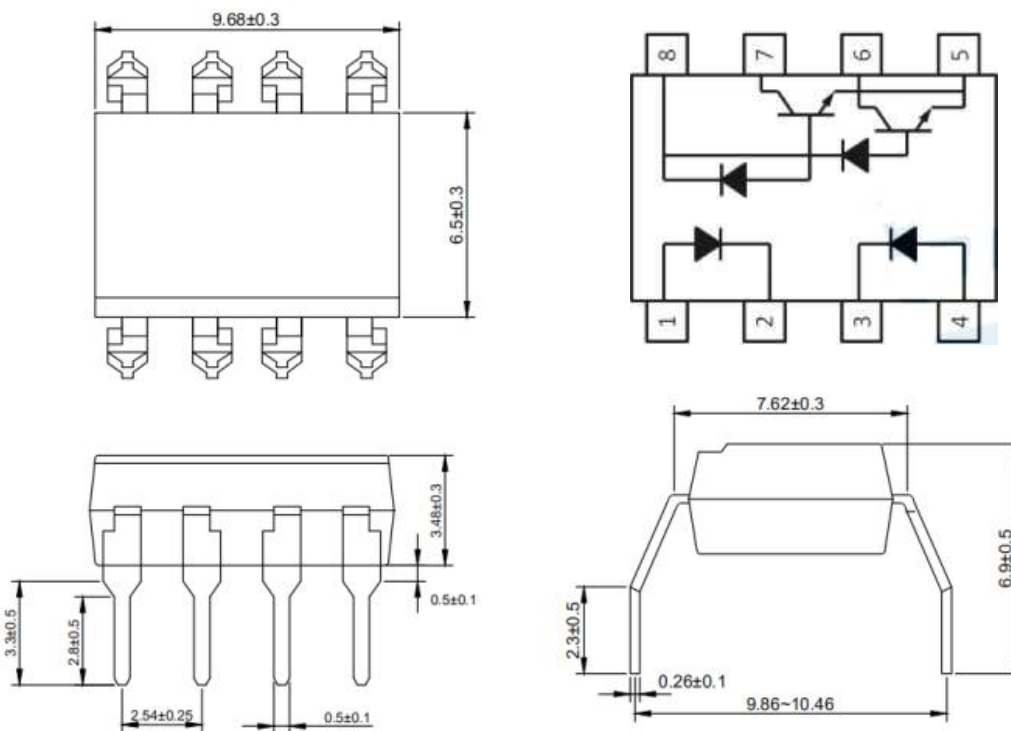
* VDE Mark can be selected.

11. Outer Dimension

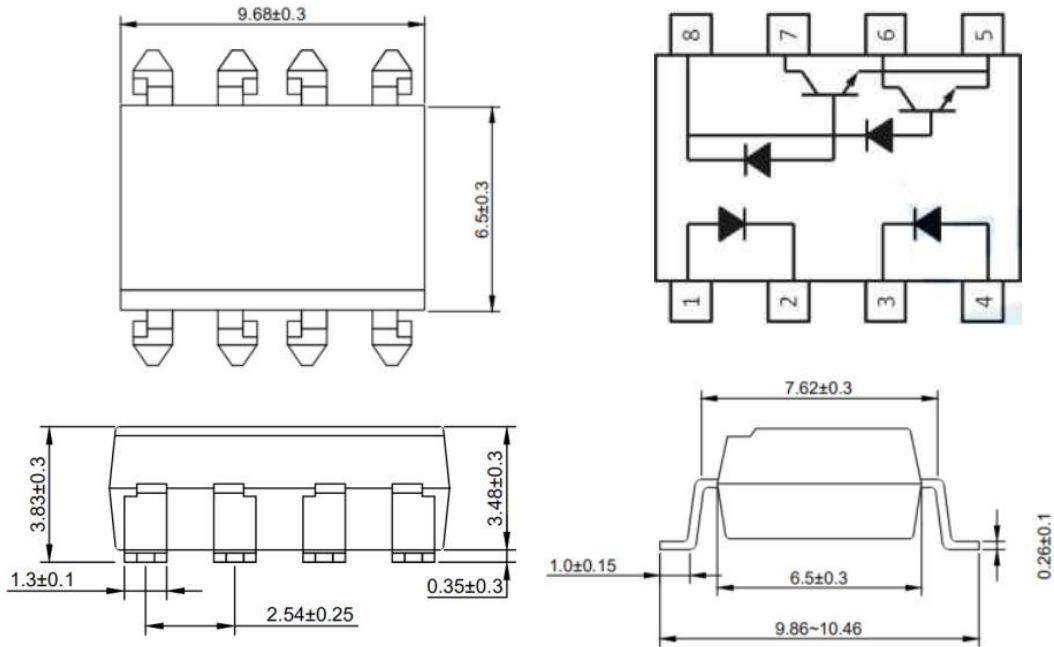
(1) OR-253X



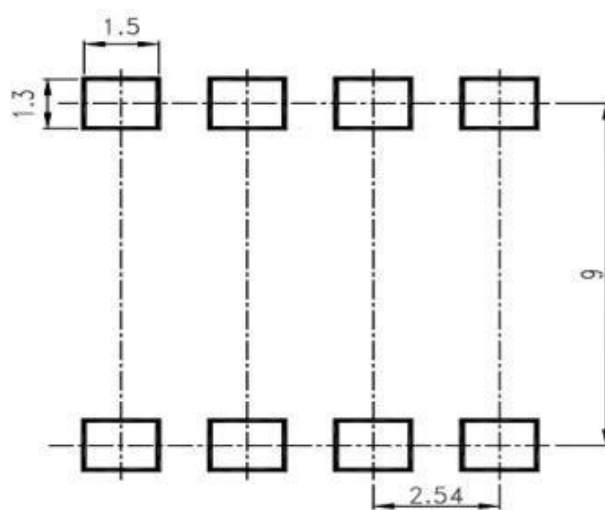
(2) OR-253XM



(3) OR-253XS



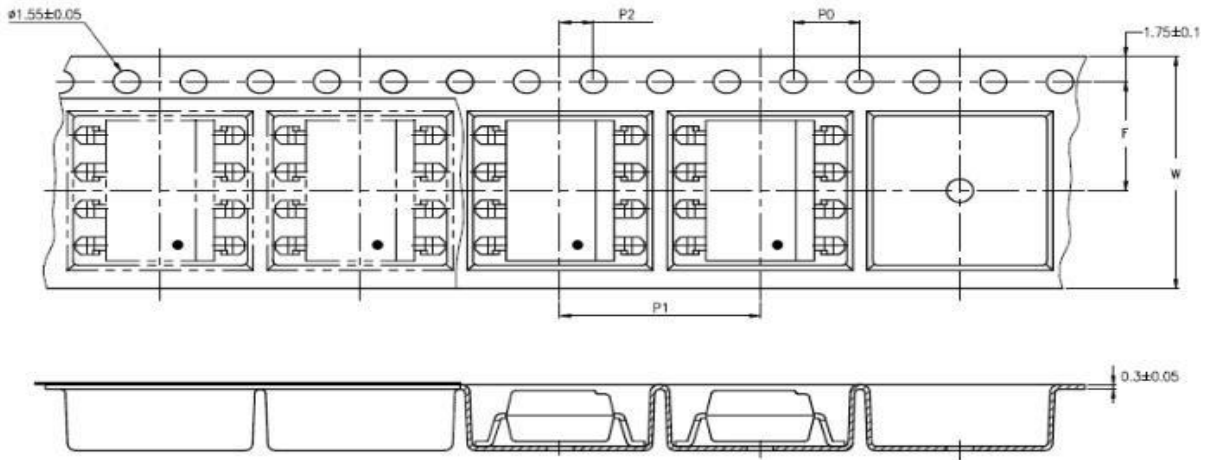
12、 Recommended Foot Print Patterns (Mount Pad)



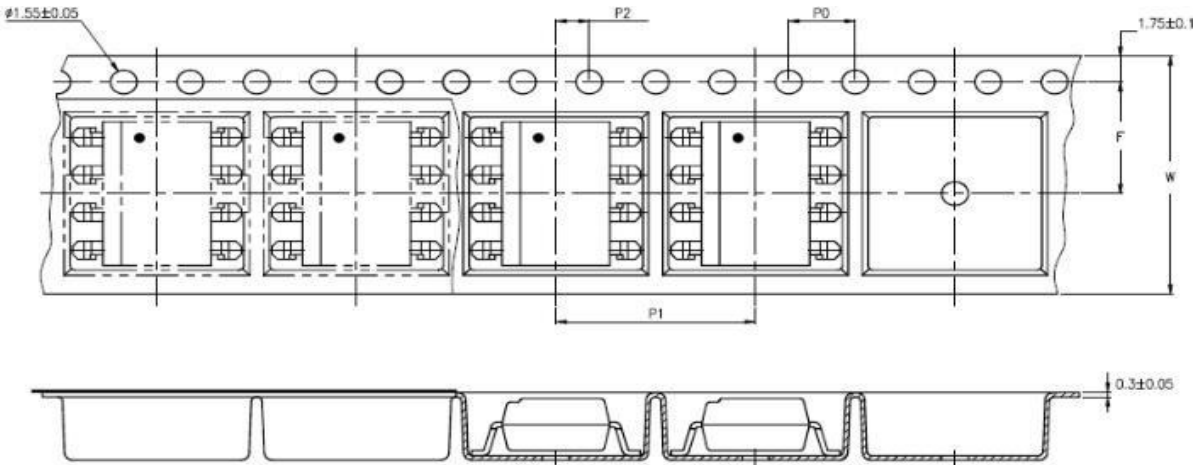
unit: mm

12. Taping Dimensions

(1) OR-253XS-TA



(2) OR-253XS-TA1



type	symbol	Size: mm (inches)
bandwidth	W	16±0.3 (0.63)
pitch	P0	4±0.1 (0.15)
pitch	F	7.5±0.1 (0.295)
	P2	2±0.1 (0.079)
interval	P1	12±0.1 (0.472)

Encapsulation type	TA/TA1
amount (pcs)	1000

13. Package Dimension

(1) package dimension


DIP Type






Packing Information	
Packing type	Tube
Qty per Tube	45pcs
Small box (Inner) Dimension	525*128*60mm
Large box (Outer) Dimension	545*290*335mm
The Amount per Inner Box	2,250pcs
The Amount per Outer Box	22,500pcs



SOP Type

Packing Information	
Packing type	Reel type
Tape Width	16mm
Qty per Reel	1,000pcs
Small box (inner) Dimension	345*345*58.5mm
Large box (Outer) Dimension	620x360x360mm
Max qty per small box	2,000pcs
Max qty per large box	20,000pcs

(2)Packing Label Sample



Material Code : 120PCXXXXXX

P/N : OR-XXXXXX

Lot No. : XXXXXX-XXXX-TX-X

D/C : XXXX

Qty : XXXX PCS


内箱码

外箱码

“XXXXXXXXXXXXXXXX” (一体机序列码)

Made in China

Note:

1. Material Code :Product ID.
2. P/N :Contents with "Order Information" in the specification.
3. Lot No. :Product data.
4. D/C :Product weeks.
5. Quantity :Packaging quantity.

14. Reliability Test

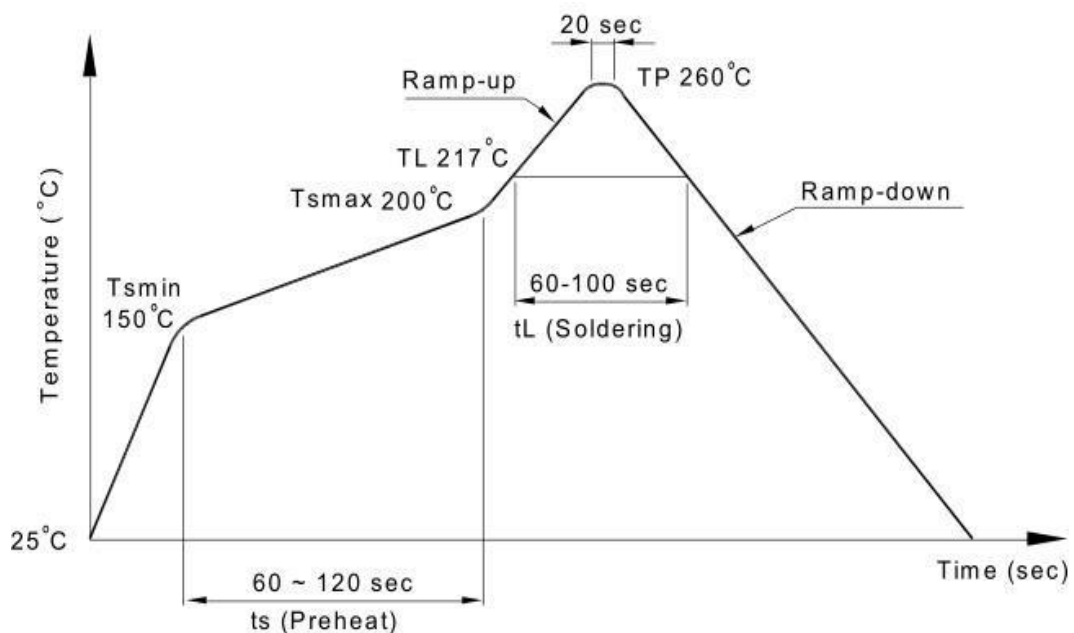
NO.	ITEMS	Reliability Testing				
		QTY. (Pcs)	Condition	Process	Device	Standard
1	RSH 耐焊接热	22	260±5°C	5s/3 次	锡炉	JESD22-A106
2	HTSL 高温存储	77	125°C	168 hrs	高温烤箱 测试仪	JESD22-A103
				500 hrs		
				1000 hrs		
3	LTSL 低温存储	77	-40°C	168 hrs	低温箱 测试仪	JESD22-A119
				500 hrs		
				1000 hrs		
4	TC 温度循环	77	H:125°C 15min ↓5min L:-55°C 15min	300 cycle	冷热冲击 机	JESD22-A104
5	TS 温度冲击	77	H:100°C 5min ↓15s L:-40°C 5min	300 cycle	冷热冲击 机	JESD22-A106
6	HTOL 高温操作	77	100°C IF=10mA Vcc=5V	168 hrs	高温烤箱 测试仪、 老化电路 板	JESD22-A108
				500 hrs		
				1000 hrs		
7	ESD- HBM 人体模式	22	≥8KV 1Cycle	1次	ESD静电 测试仪	JESD22-A114
8	SD 可焊性	22	Pb-free 245±5°C	5s/1次	锡炉	JESD22-B102
9	HTHB 温湿寿命 试验	77	85°C,85%RH IF=10mA,Vcc=5V	168 hrs	恒温恒湿 机, 测试 仪	JESD22-A101
				500 hrs		
				1000 hrs		
10	Autoclave 压力锅	77	Ta=121 °C,100%RH,2atm	96hrs	压力锅	JESD22-A102

15. Temperature Profile Of Soldering

(1) IR Reflow soldering (JEDEC-STD-020C compliant)

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

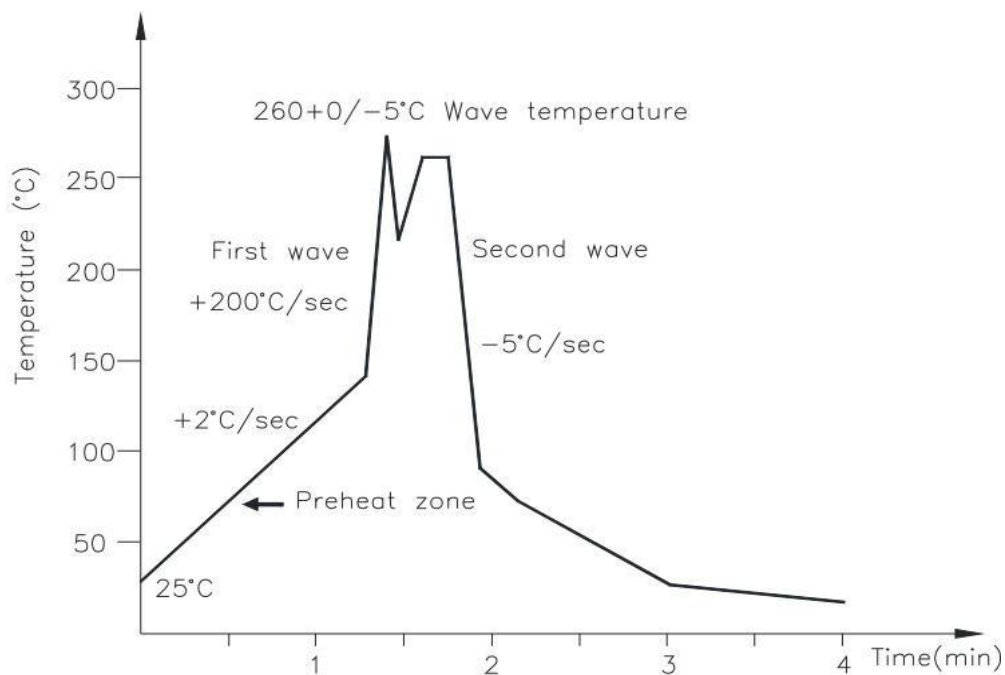
Profile item	Conditions
Preheat	
- Temperature Min (T Smin)	150°C
- Temperature Max (T Smax)	200°C
- Time (min to max) (ts)	90±30 sec
Soldering zone	
- Temperature (TL)	217°C
- Time (t L)	60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak temperature	3~6°C / sec
Reflow times	≤3



(2) Wave soldering (JEDEC22A111 compliant)

One-time welding is recommended under the temperature condition.

Temperature	260+0/-5°C
Time	10 sec
Preheat temperature	5 to 140°C
Preheat time	30 to 80 sec



(3) Hand soldering by soldering iron

Single lead welding is allowed in each process and one-time welding is recommended.

Temperature	380+0/-5°C
Time	3 sec max

16. Characteristics Curve

Fig.1 Forward Current vs. Forward Voltage

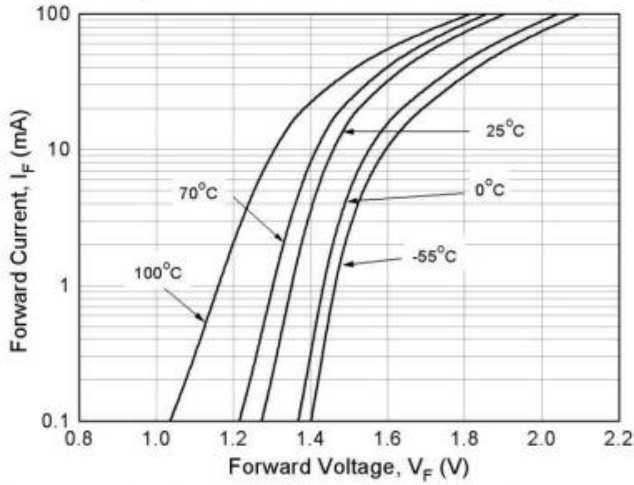


Fig.2 Normalized Current Transfer Ratio vs. Forward Current

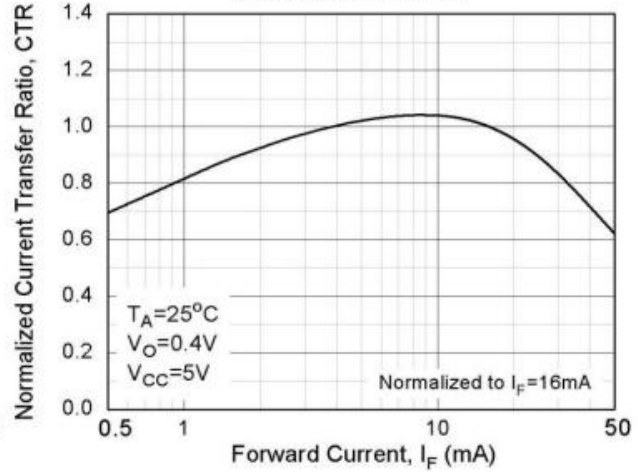


Fig.3 Normalized Current Transfer Ratio vs. Ambient Temperature

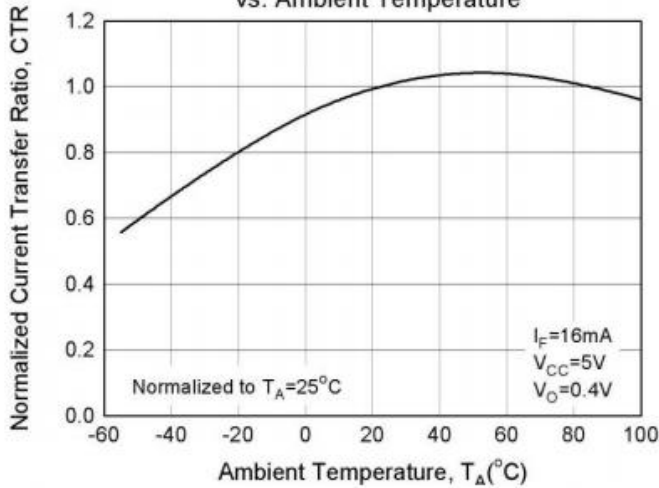


Fig.4 Output Current vs Output Voltage

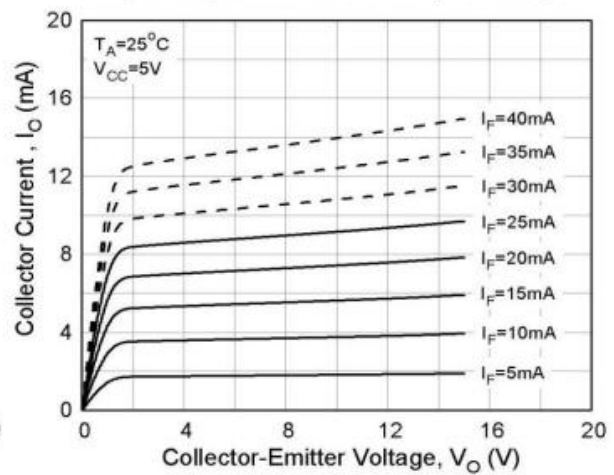


Fig.5 Logic High Output Current vs. Temperature

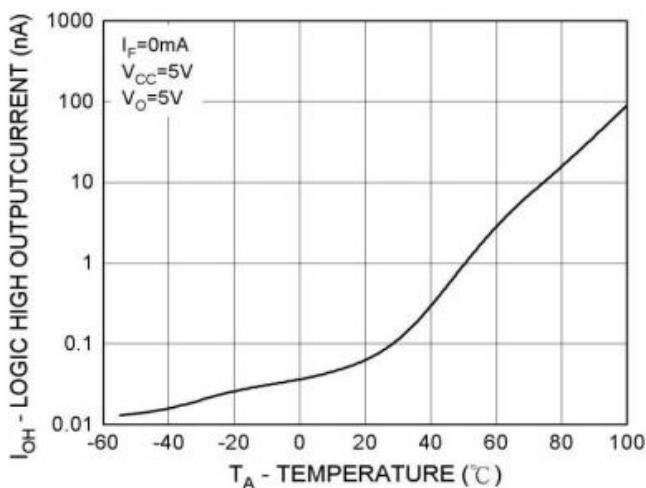


Fig.6 Propagation Delay vs. Load Resistance

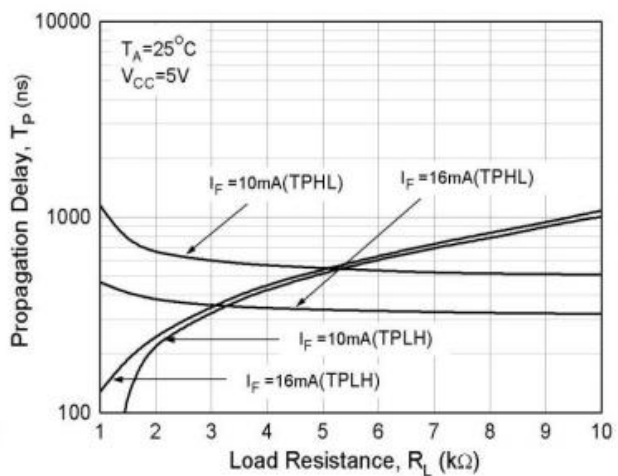


Fig. 8 Switching Time Test Circuit & Waveform

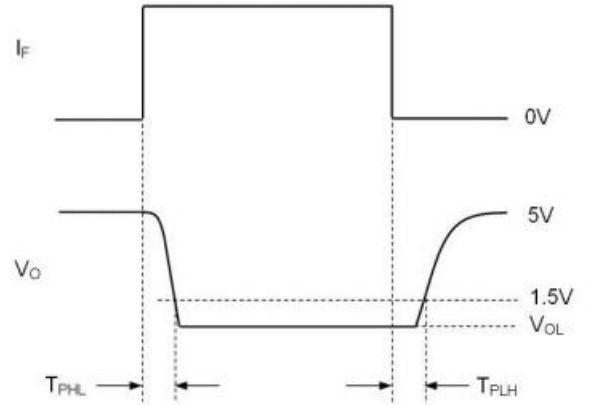
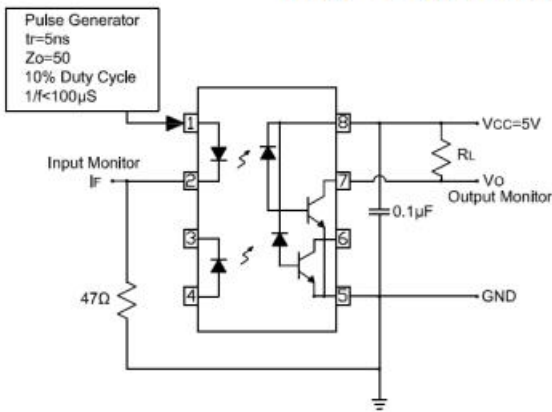


Fig. 9 Transient Immunity Test Circuit & Waveform

