ORIENT

Photo coupler

Product Data Sheet

Name: OR-M6XX

Customer: _____

Date: _____

SHENZHEN ORIENT COMPONENTS CO ., LTD

Block A 3rd Floor No.4 Building,Tian'an Cyber Park,Huangge Rd,LongGang Dist,Shenzhen,GD

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1. Features

(1) Compliance Halogens Free (Br < 900ppm, Cl < 900ppm, Br+Cl <1500ppm)
(2) 3.3V / 5V supply voltage
(3) low power consumption
(4) high speed: 10MBd(typical)
(5) VCM=1000V, and the lowest common mode inhibition (CMR) is 10 kV/μs
(6) when - 40 ℃ ~ + 85 ℃ temperature of ac and dc performance
(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

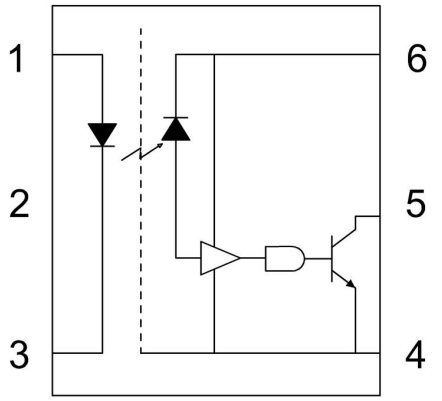
2. Instructions

OR-M6XX is made up of an efficient AlGaAs light-emitting diode and high-speed optical detector. This design provides good ac and dc isolation between the input and output ends of the photoelectric coupler. The output characteristic of the photodetector is a collector open circuit schottky clamp transistor. The photoelectric coupler operating temperature range: - 40 ℃ ~ + 85 ℃.

3. Application Range

(1)Ground loop elimination
(2)LSTTL to TTL, LSTTL or 5 volt CMOS
(3)Line receiver, data transmission
(4)Data multiplexing
(5)Switching power supplies
(6)Pulse transformer replacement
(7)Computer peripheral interface

4. Functional Diagram



1.Anode
2.NC
3.Cathode
4.GND
5.Output
6.Vcc

Truth table

Input（LED）	Output
ON	L
OFF	H

0.1 capacitor F bypass capacitance needs to be connected between A Pin4 and Pin6

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

Parameter		Symbol	Rated Value	Unit
Input	Average Forward Input Current	I_F	50	mA
	Reverse Input Voltage	V_R	5	V
	Power Dissipation	P_I	40	mV
Output	Output Collector Current	I_O	50	mA
	Output Collector Voltage	V_O	7	V
	Output Collector Power Dissipation	P_O	85	mW
Supply Voltage		V_{CC}	7	V
Insulation Voltage		V_{iso}	3750	Vrms
Working Temperature		T_{opr}	-40 ～ + 85	℃
Storage Temperature		T_{stg}	-55～ + 125	
*2	Soldering Temperature	T_{sol}	260	

*1. Room temperature = 25 ℃. Exceeding the maximum absolute rating can permanently damage the device. Working long hours at the maximum absolute rating can affect reliability.

*2. soldering time is 10 seconds.

6. Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A	-40	85	℃
Supply Voltage	V_{CC}	2.7	3.6	V
		4.5	5.5	
Low Level Input Current	I_{FL}	0	250	μA
High Level Input Current	I_{FH}	5	15	mA
Output Pull-up Resistor	R_L	330	4k	Ω
Fan Out (at RL=1kΩ per channel)	N	—	5	TTL Loads

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7. Opto-Electronic Characteristics

Parameter		Symbol	Min	Typ	Max	Unit	Condition
Input	Forward Voltage	V_F	—	1.38	1.8	V	I_F= 10mA T_A=25°C
	Temperature Coefficient OF Forward Voltage	$\Delta V_F/\Delta T$	—	-1.6	—	mV/°C	I_F= 10mA
	Reverse Voltage	BV_R	5	—	—	V	I_R = 10μA
	Input Threshold Current	I_{TH}	—	1.5	5	mA	V_E=2V,V_{CC}=3.3V V_O=0.6V I_{OL} (sinking) =13mA
	Input Capacitance	C_{IN}	—	34	—	pF	f = 1MHz, VF = 0V
Detector	High Level Supply Current	I_{CCH}	—	3.8	7	mA	V_{CC}=3.3V,I_F=0mA
	Low Level Supply Current	I_{CCL}	—	5.8	10	mA	V_{CC}= 3.3V,I_F=10mA
	High Level Output Current	I_{OH}	—	5	100	μA	V_{CC}=3.3V, V_O=3.2V,I_F=250μA
	Low Level Output Voltage	V_{OL}	—	0.3	0.6	V	V_{CC}=3.3V, I_F=5mA, I_{OL} (sinking) = 13mA

Recommended temperature range (T_A= -40°C—+85°C,2.7V≤V_{CC}≤3.6 V),I_F= 7.5mA Unless otherwise stated. Typical valuesT_A=25°C,V_{CC} = 3.3 V.

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Parameter		Symbol	Min	Typ	Max	Unit	Condition
Input	Forward Voltage	V_F	—	1.38	1.8	V	I_F= 10mA T_A=25°C
	Temperature Coefficient OF Forward Voltage	$\Delta V_F/\Delta T$	—	-1.6	—	mV/°C	I_F= 10mA
	Reverse Voltage	BV_R	5	—	—	V	I_R = 10μA
	Input Threshold Current	I_{TH}	—	1.5	5	mA	V_{CC}=5.5V,V_O=0.6V I_{OL}>13mA
	Input Capacitance	C_{IN}	—	34	—	pF	f = 1MHz, V_F = 0V
Detector	High Level Supply Current	I_{CCH}	—	6	10	mA	V_{CC}=5.5V,I_F=0mA
	Low Level Supply Current	I_{CCL}	—	8	13	mA	V_{CC}= 5.5V,I_F=10mA
	High Level Output Current	I_{OH}	—	3	100	μA	V_{CC}=5.5V, V_O=5.5V,I_F=250μA
	Low Level Output Voltage	V_{OL}	—	0.4	0.6	V	V_{CC}=5.5V, I_F=5mA, I_{OL} (sinking) = 13mA

Recommended temperature range(T_A= -40℃—+85℃,4.5V≤V_{CC}≤5.5V),I_F= 7.5mA Unless otherwise stated. Typical values T_A=25℃,V_{CC} = 5.0V.

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8. Switching Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Propagation delay time to output High level	t_{PLH}	—	60	90	ns	R_L=350Ω C_L=15pF
Propagation delay time to output Low level	t_{PHL}	—	25	75	ns	
Pulse Width Distortion	$\|t_{PLH}-t_{PHL}\|$	—	35	45	ns	
Output Rise Time (10 to 90%)	t_r	—	27	—	ns	
Output Fall Time (90 to 10%)	t_f	—	6.6	—	ns	
Propagation Delay Skew	t_{PSK}	—	—	40	ns	

Recommended temperature range (T_A= -40℃—+85℃,2.7V≤V_{CC}≤3.6 V),I_F= 7.5mA Unless otherwise stated. Typical values T_A=25℃,V_{CC}= 3.3 V。

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Propagation delay time to output High level	t_{PLH}	—	45	75	ns	R_L=50Ω, C_L=15pF, T_A=25℃
		—	—	100		
Propagation delay time to output Low level	t_{PHL}	—	25	75	ns	R_L=350Ω , C_L=15pF, T_A=25℃
		—	—	100		
Pulse Width Distortion	$\|t_{PLH}-t_{PHL}\|$	—	10	35	ns	R_L=350Ω, C_L=15pF
Output Rise Time (10 to 90%)	tr	—	22	—	ns	
Output Fall Time (90 to 10%)	t_f	—	6.9	—	ns	
Propagation Delay Skew	t_{PSK}	—	—	40	ns	

Recommended temperature range (T_A= -40℃—+85℃,4.5V≤V_{CC}≤5.5V),I_F= 7.5mA Unless otherwise stated. Typical values T_A=25℃,V_{CC}= 5.0 V。

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Parameter	Symbol	Part Number	Min	Typ	Max	Unit	Condition
Logic High Common Mode Transient Immunity	$\|CM_H\|$	M600	—	—	—	V/μs	I_F = 7.5mA , V_{OH}=2.0V, R_L=350Ω, T_A=25°C V_{CM}=10Vp-p
		M601	5000	—	—		I_F = 7.5mA , V_{OH}=2.0V, R_L=350Ω, T_A=25°C V_{CM}=50Vp-p
		M611	20000	—	—		I_F = 7.5mA , V_{OH}=2.0V, R_L=350Ω, T_A=25°C V_{CM}=1000Vp-p
Logic Low Common Mode Transient Immunity	$\|CM_L\|$	M600	—	—	—	V/μs	I_F = 0mA , V_{OL}=0.8V, R_L=350Ω, T_A=25°C V_{CM}=10Vp-p
		M601	5000	—	—		I_F = 0mA , V_{OL}=0.8V, R_L=350Ω, T_A=25°C V_{CM}=50Vp-p
		M611	20000	—	—		I_F = 0mA , V_{OL}=0.8V, R_L=350Ω, T_A=25°C V_{CM}=1000Vp-p

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Input-Output Insulation Leakage Current	II-O	—	—	1	μA	45% RH,t=5s, VI-O = 3kV DC,TA =25 C
Withstand Insulation Test Voltage	VISO	3750	—	—	VRMS	RH ≤ 50%, t =1min,TA=25°C
Input-Output Resistance	RI-O	—	10^{12}	—	Ω	VI-O = 500V DC
Input-Output Capacitance	CI-O	—	1	—	p	f = 1MHz, TA = 25 C

Recommended temperature range (T_A=40°C-85°C) Unless otherwise stated. Typical values T_A=25°C.

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9. Order Information

Part Number

OR-M6XX-W-Y-Z

Note

XX = Type code. (‘00’, ‘01’, ‘11’)

W = Tape and reel option. (TP or TP1).

Y = ‘V’ code for VDE safety (This options is not necessary).

Z = ‘G’ code for Halogen free.

* VDE Code can be selected.

Option	Description	Packing quantity
TP	Surface mount lead form (low profile) + TP tape & reel option	3000 units per reel
TP1	Surface mount lead form (low profile) + TP1 tape & reel option	3000 units per reel

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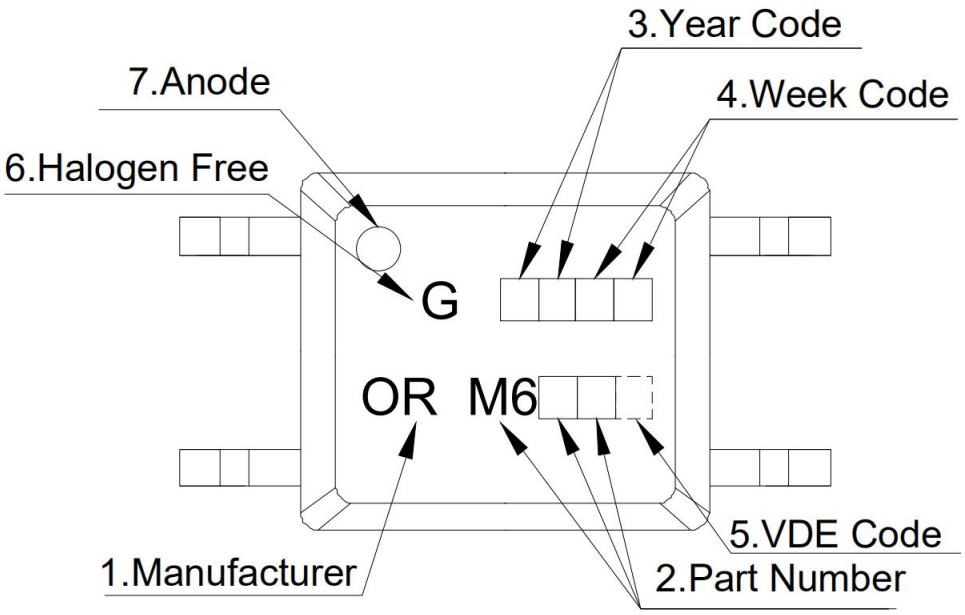
10. Naming Rule



1. Manufacturer : ORIENT.
2. Part Number : M600, M601 or M611.
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 □.
6. HF Code 'G': Halogen Free.
7. Anode.

* VDE Code can be selected.

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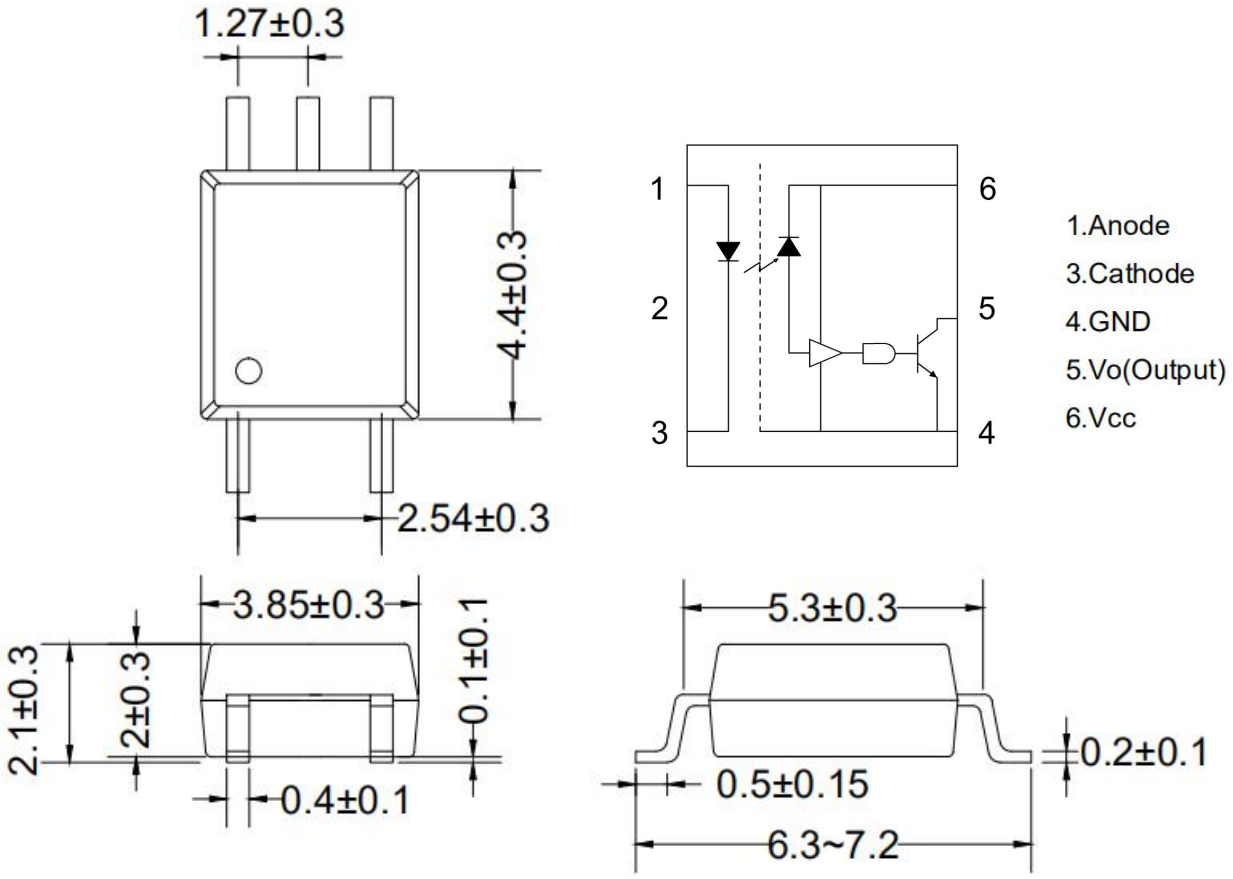
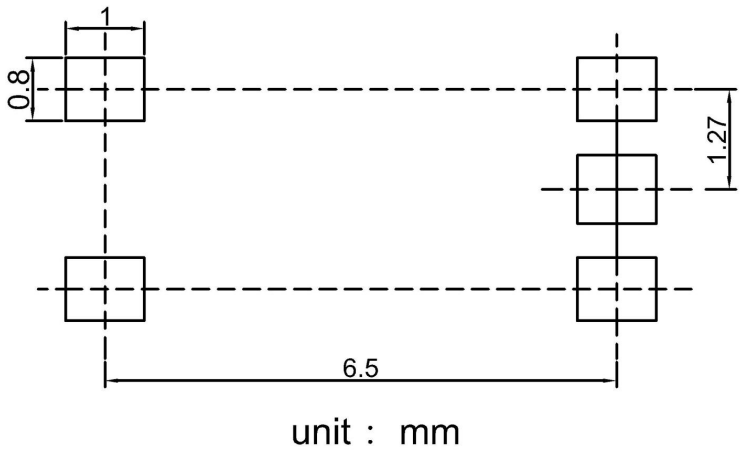
11. Outer Dimension



12. Recommended Foot Print Patterns (Mount Pad)



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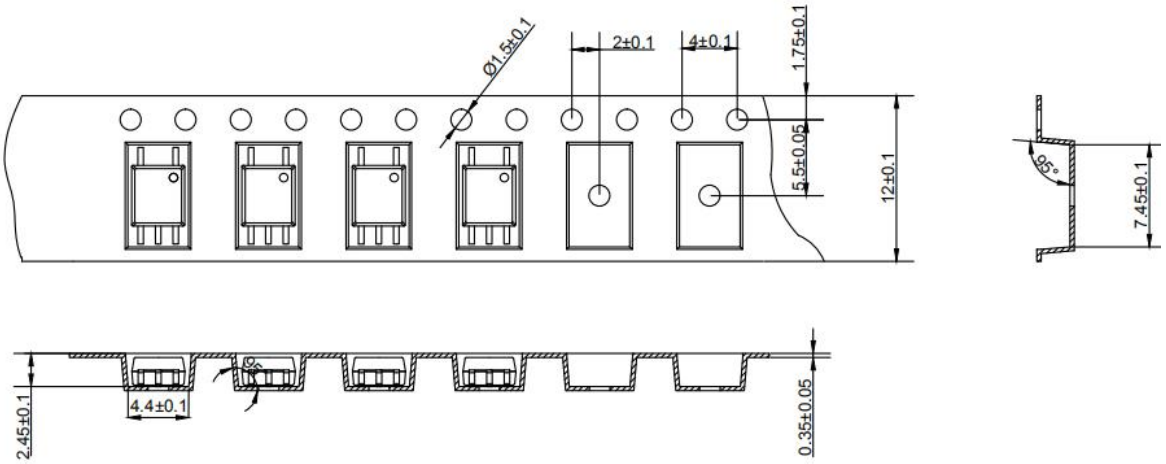
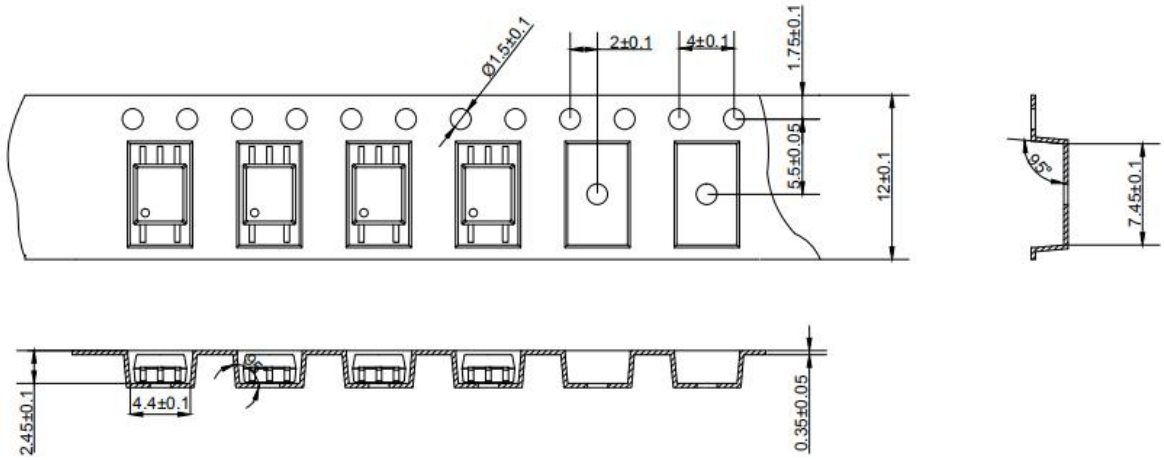
13. Taping Dimensions

（1）OR-M6XX-TP



（2）OR-M6XX-TP1



Description	Symbol	Dimension in mm(inch)
Tape wide	W	12±0.3（0.472）
Pitch of sprocket holes	P0	4±0.1（0.157）
Distance of compartment	F	5.5±0.1（0.217）
	P2	2±0.1（0.079）
Distance of compartment to compartment	P1	8±0.1（0.315）

Encapsulation type	TP/TP1
amount （pcs）	3000

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14. Package Dimension

(1) package dimension

Packing Information	
Packing type	Reel type
Tape Width	12mm
Qty per Reel	3,000pcs
Small box (inner) Dimension	345*345*45mm
Large box (Outer) Dimension	480x360x360mm
Max qty per small box	6,000pcs
Max qty per large box	60,000pcs

(2)Packing Label Sample

Note:

1. P/N :Contents with "Order Information" in the specification.
2. LOT NO : The production lot.
3. BATCH : The Electrical rank.
4. Quantity :Packaging quantity.
5. Product Data :Date of manufacture.

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15. Reliability Test

NO.	ITEMS	Reliability Testing				
		QTY. (Pcs)	Condition	Process	Device	Standard
1	RSH 耐焊接热	22	260±5℃	5s/3 次	锡炉	JESD22-A106
2	HTSL 高温存储	77	125℃	168 hrs 500 hrs 1000 hrs	高温烤箱 测试仪	JESD22-A103
3	LTSL 低温存储	77	-40℃	168 hrs 500 hrs 1000 hrs	低温箱 测试仪	JESD22-A119
4	TC 温度循环	77	H:125℃ 15min ∫5min L:-55℃ 15min	300 cycle	冷热冲击机	JESD22-A104
5	TS 温度冲击	77	H:100℃ 5min ∫15s L:-40℃ 5min	300 cycle	冷热冲击机	JESD22-A106
6	HTOL 高温操作	77	100℃ IF=10mA Vcc=5V	168 hrs 500 hrs 1000 hrs	高温烤箱 测试仪、 老化电路板	JESD22-A108
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℃	5s/1 次	锡炉	JESD22-B102
9	HTHB 温湿寿命试验	77	85℃,85%RH IF=10mA,Vcc=5V	168 hrs 500 hrs 1000 hrs	恒温恒湿机，测试仪	JESD22-A101
10	Autoclave 压力锅	77	Ta=121 ℃,100%RH,2atm	96hrs	压力锅	JESD22-A102

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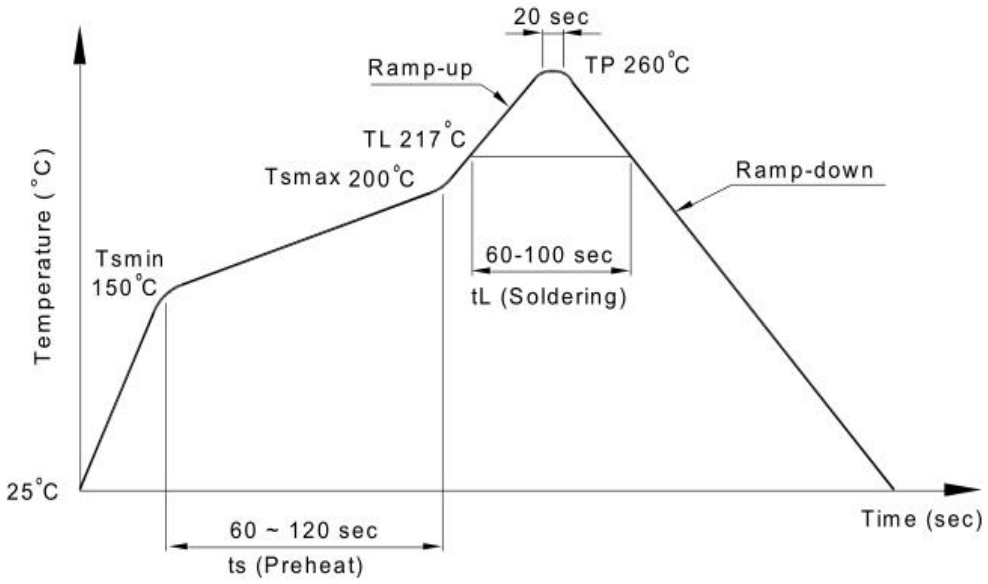
16. Temperature Profile Of Soldering

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

Note: one solder backflow is recommended under the conditions described below in the temperature and time profile. Do not weld more than three times.

Profile item	Conditions
Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts)	150˚C 200˚C 90±30 sec
Soldering zone - Temperature (TL) - Time (t L)	217˚C 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



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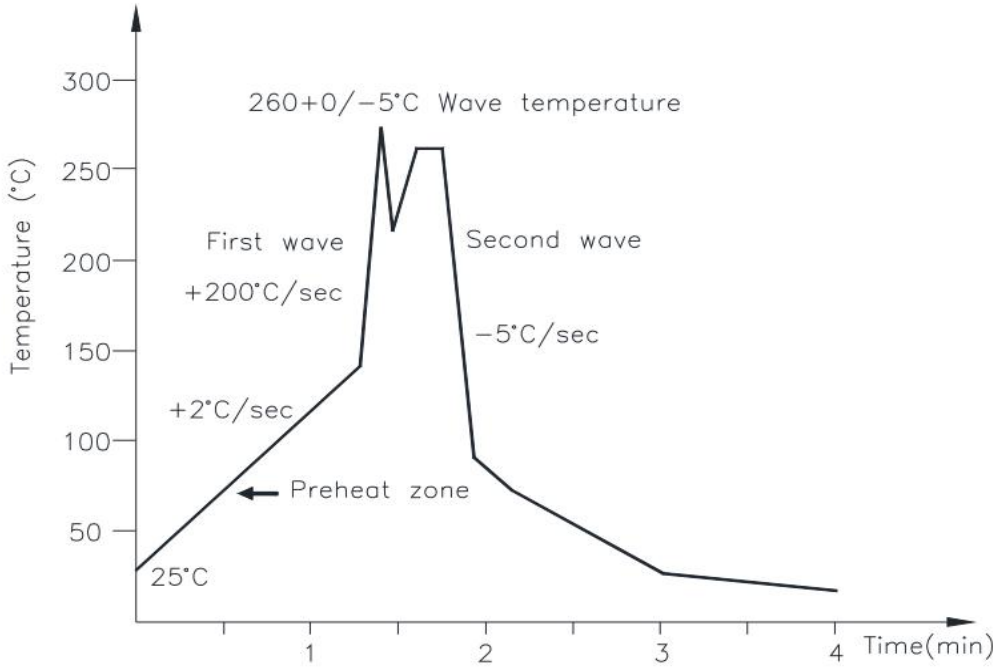
（2） Wave soldering (JEDEC22A111 compliant)

One-time welding is recommended under the temperature condition.

Temperature Time	260+0/-5˚C 10 sec
Preheat temperature Preheat time	5 to 140˚C 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 Time	380+0/-5˚C 3 sec max

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17. Switching time test circuit

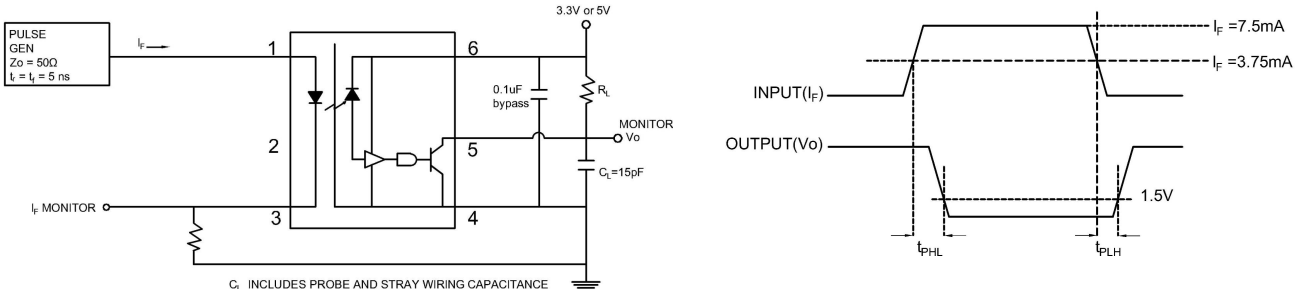

Figure 1：Test Circuit for T_{PHL} and T_{PLH}

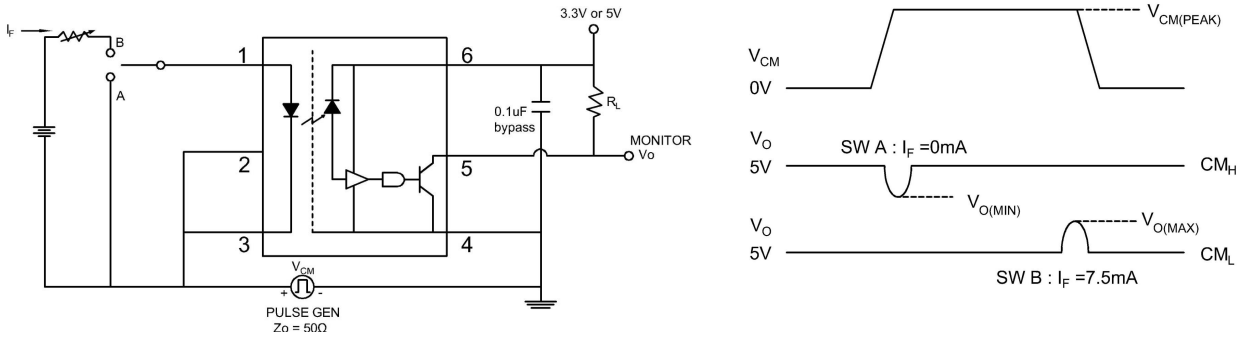

Figure 2：Single Channel Test Circuit for Common Mode Transient Immunity

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18. Characteristics Curve

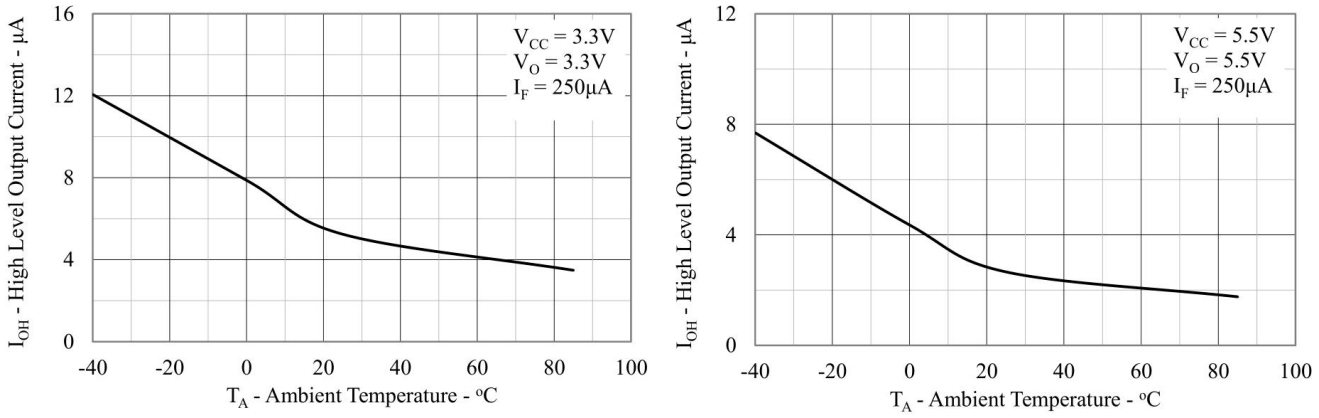

Figure 3: Typical high level output current vs. temperature.

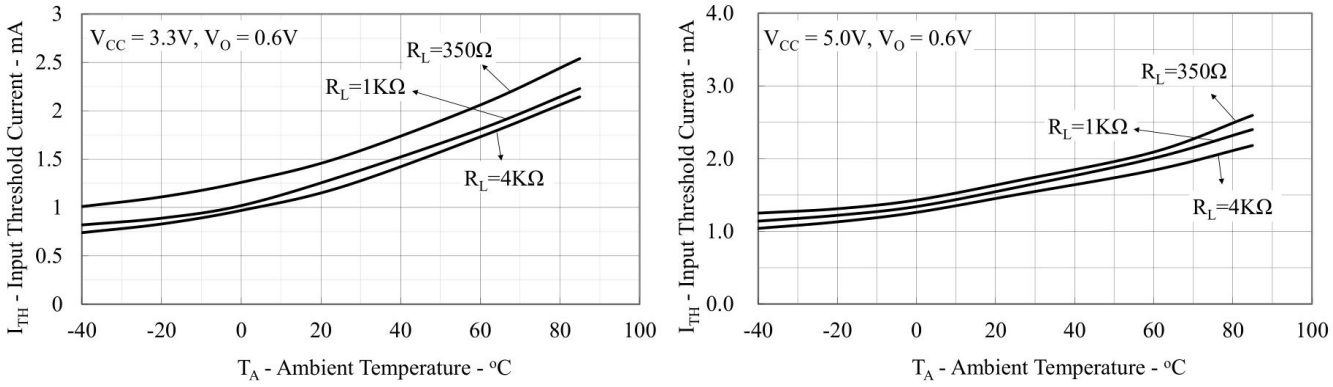

Figure 4: Typical Input Diode Threshold Current vs. Ambient Temperature

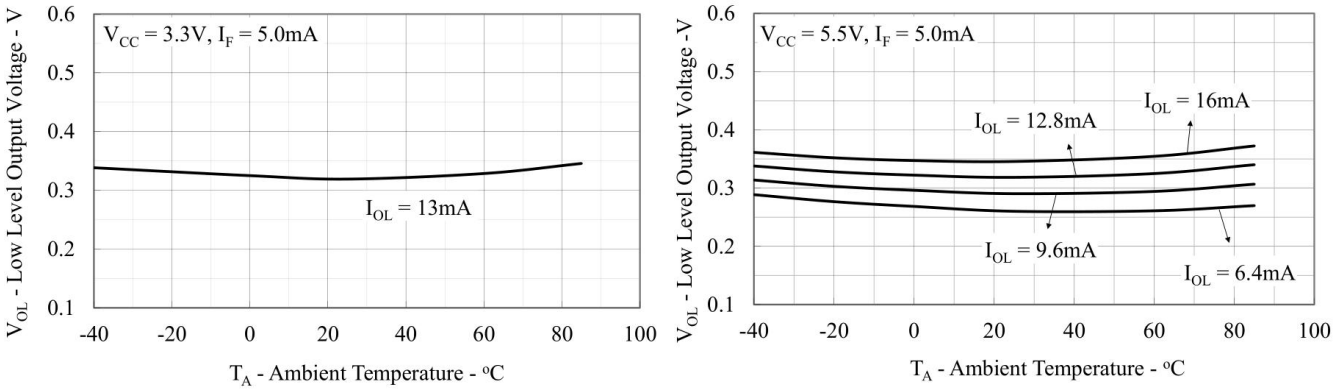

Figure 5: Typical Low Level Output Voltage vs. Ambient Temperature

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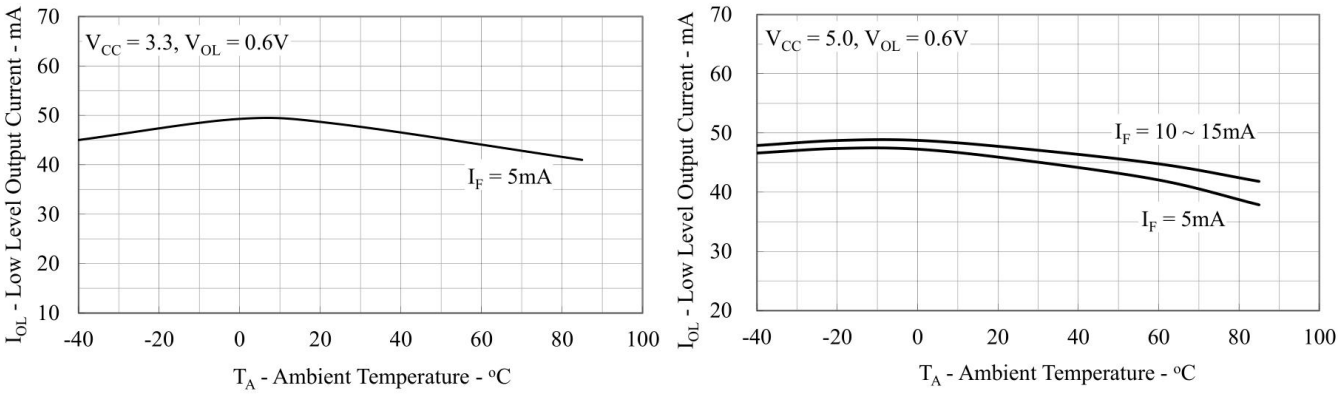

Figure 6: Typical Low Level Output Current vs. Ambient Temperature

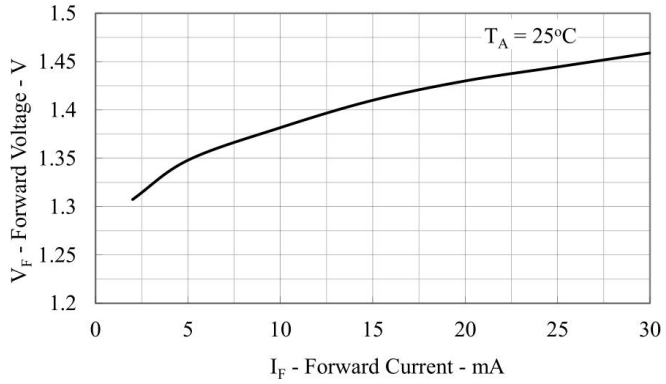

Figure 7: Typical Input Diode Forward Characteristics

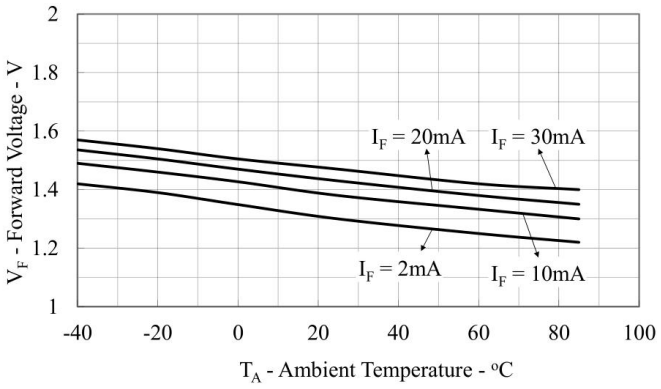

Figure 8: Typical Input Diode Forward Voltage vs. Ambient Temperature

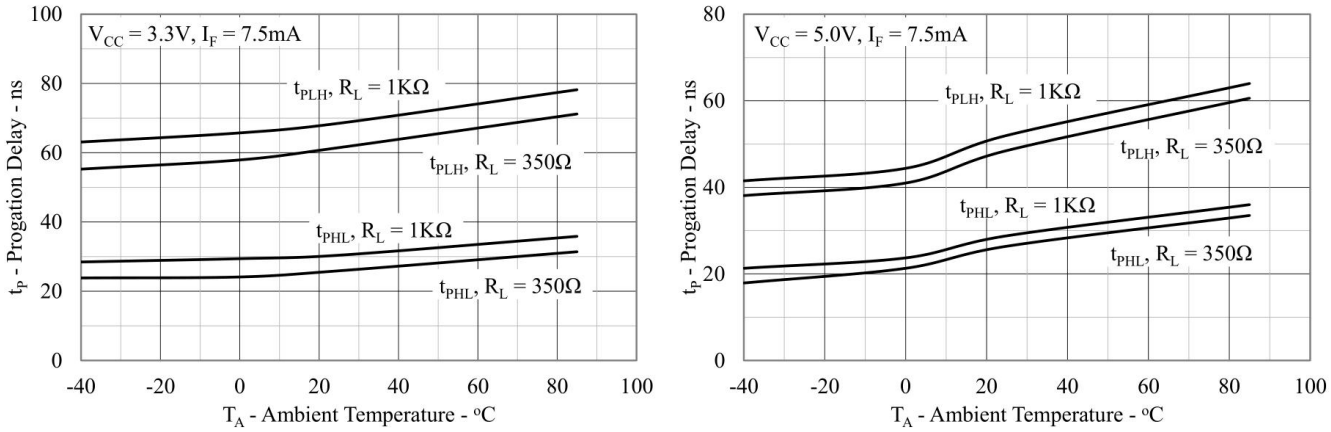

Figure 9: Typical Propagation Delay vs. Ambient Temperature

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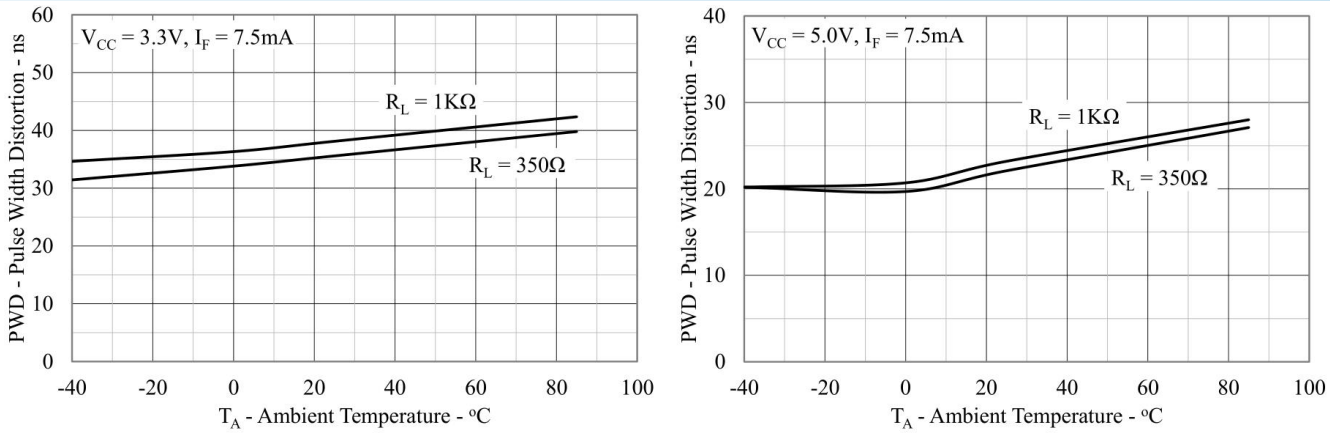

Figure 10: Typical Pulse Width Distortion vs. Ambient

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