



ORIENT

Photo coupler

Product Data Sheet

Name: OR-M6XX

Customer: _____

Date: _____

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1. Features

- (1) 3.3v / 5V supply voltage
- (2) low power consumption
- (3) high speed: 10MBd(typical)
- (4) VCM=1000V, and the lowest common mode inhibition (CMR) is 10 kv/μs
- (5) when - 40 °C ~ + 85 °C temperature of ac and dc performance
- (6) In compliance with RoHS, REACH standards
- (7) MSL Class I



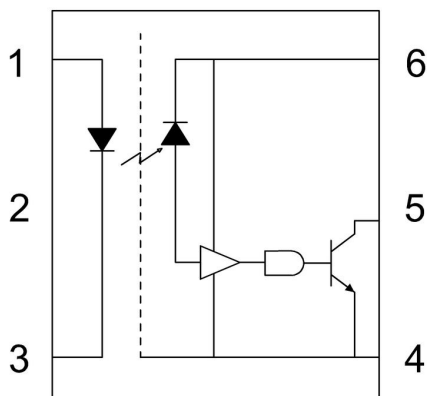
2. Instructions

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 °C ~ + 85 °C.

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

5. Absolute Maximum Ratings (Ta=25°C)*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	mW
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	V _{rms}
Working Temperature		T _{opr}	-40 ~ +85	°C
Storage Temperature		T _{stg}	-55 ~ +125	
*2	Soldering Temperature	T _{sol}	260	

*1. Room temperature = 25 °C. 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	°C
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 R _L =1kΩ per channel)	N	—	5	TTL Loads

7. Opto-electronic Characteristics

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

Recommended temperature range ($T_A = -40^\circ\text{C} \sim +85^\circ\text{C}$, $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$), $I_F = 7.5\text{mA}$ Unless otherwise stated. Typical values $T_A = 25^\circ\text{C}$, $V_{CC} = 3.3\text{V}$.

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

Recommended temperature range ($T_A = -40^\circ\text{C} \text{---} +85^\circ\text{C}, 4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$), $I_F = 7.5\text{mA}$ Unless otherwise stated. Typical values $T_A = 25^\circ\text{C}, V_{CC} = 5.0\text{V}$.

8. Switching Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Propagation delay time to output High level	t_{PLH}	$R_L=350\Omega$ $C_L=15pF$	—	60	90	ns
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 ($T_A = -40^\circ\text{C} \text{---} +85^\circ\text{C}$, $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$), $I_F = 7.5\text{mA}$ Unless otherwise stated. Typical values $T_A = 25^\circ\text{C}$, $V_{CC} = 3.3\text{V}$.

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

Recommended temperature range ($T_A = -40^\circ\text{C} \text{---} +85^\circ\text{C}$, $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$), $I_F = 7.5\text{mA}$ Unless otherwise stated. Typical values $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$.

Parameter	Symbol	Device Part Number	Condition	Min	Typ	Max	Unit
Logic High Common Mode Transient Immunity	CM _H	M600	I _F = 7.5mA, V _{OH} =2.0V, R _L =350Ω, T _A =25°C V _{CM} =10Vp-p	—	—	—	V/μs
		M601	I _F = 7.5mA, V _{OH} =2.0V, R _L =350Ω, T _A =25°C V _{CM} =50Vp-p	5000	—	—	
		M611	I _F = 7.5mA, V _{OH} =2.0V, R _L =350Ω, T _A =25°C V _{CM} =1000Vp-p	20000	—	—	
Logic Low Common Mode Transient Immunity	CM _L	M600	I _F = 0mA, V _{OL} =0.8V, R _L =350Ω, T _A =25°C V _{CM} =10Vp-p	—	—	—	V/μs
		M601	I _F = 0mA, V _{OL} =0.8V, R _L =350Ω, T _A =25°C V _{CM} =50Vp-p	5000	—	—	
		M611	I _F = 0mA, V _{OL} =0.8V, R _L =350Ω, T _A =25°C V _{CM} =1000Vp-p	20000	—	—	

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

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



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).

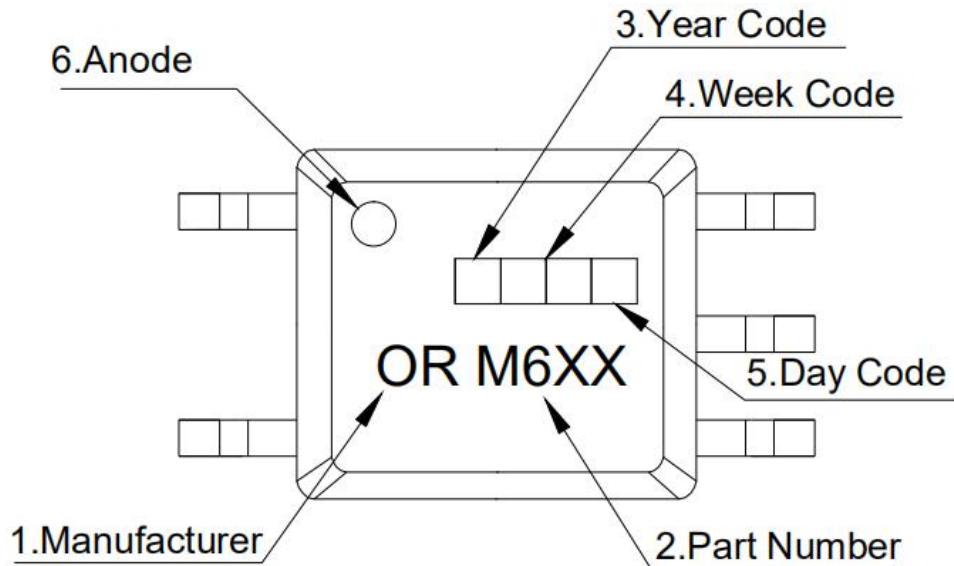
Y = 'V' code for VDE safety (This options is not necessary).

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

10. Naming Rule



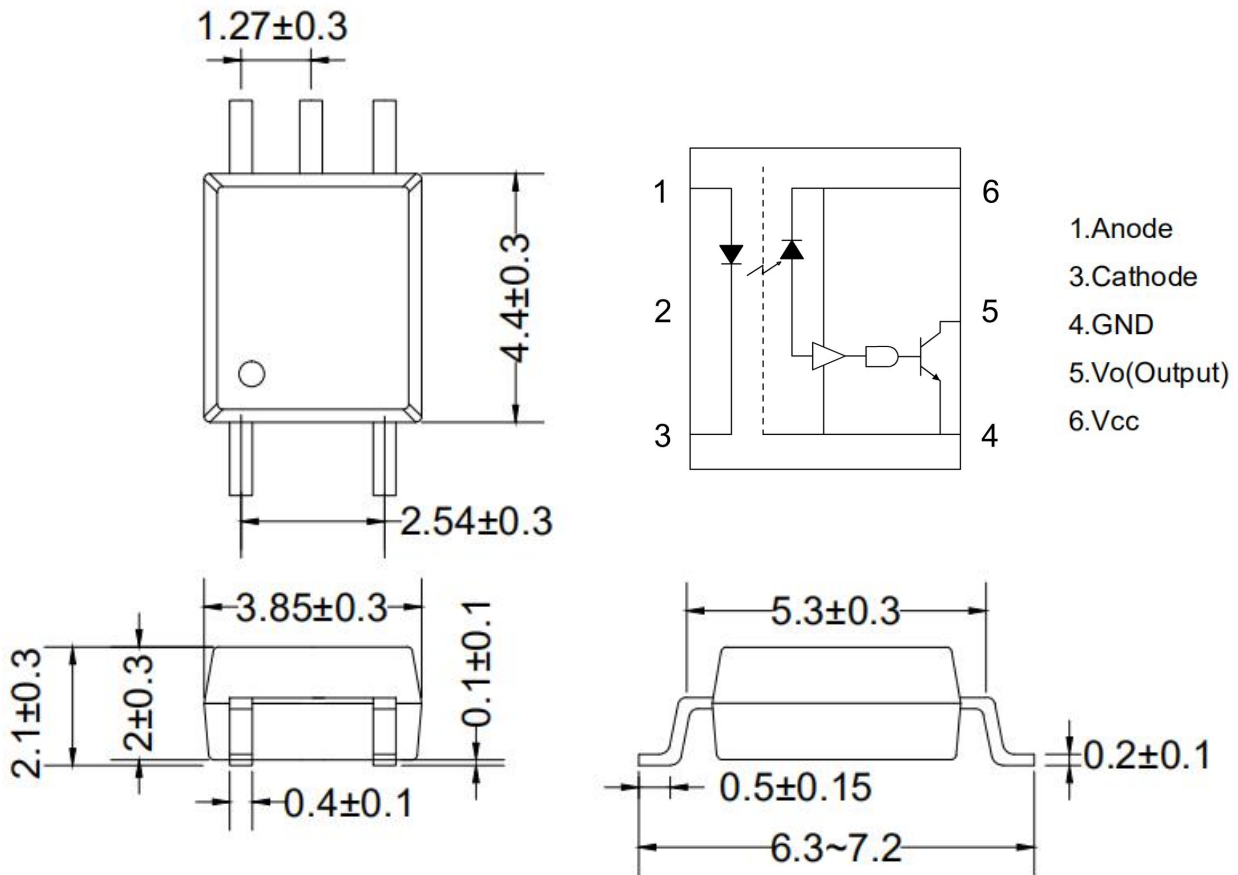
NOTE:

- (1) ORIENT
- (2) Part Number: 'M6XX' representing Type M600、M601 or M611.
- (3) Year Code: '9' means '2019'.
- (4) Week Code: '01' represents the first week, '02' represents the second week.
- (5) Day Code: 'A to F' means 'Monday to Sunday'
- (6) Anode.

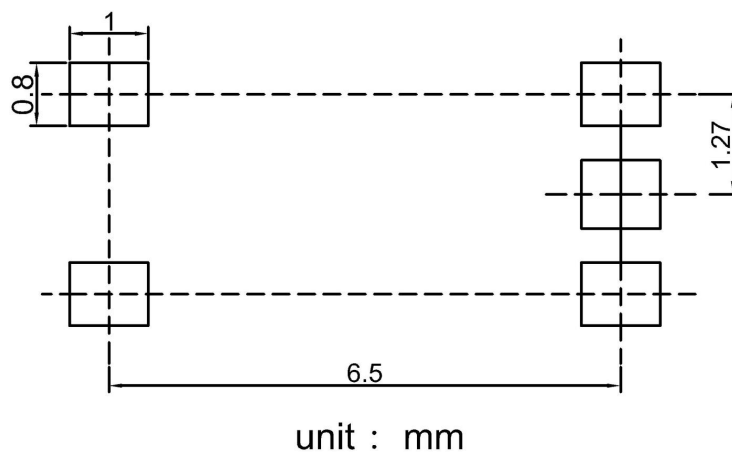
* Halogen Free Mark can be selected.

* VDE Mark can be selected.

11. Outer Dimension

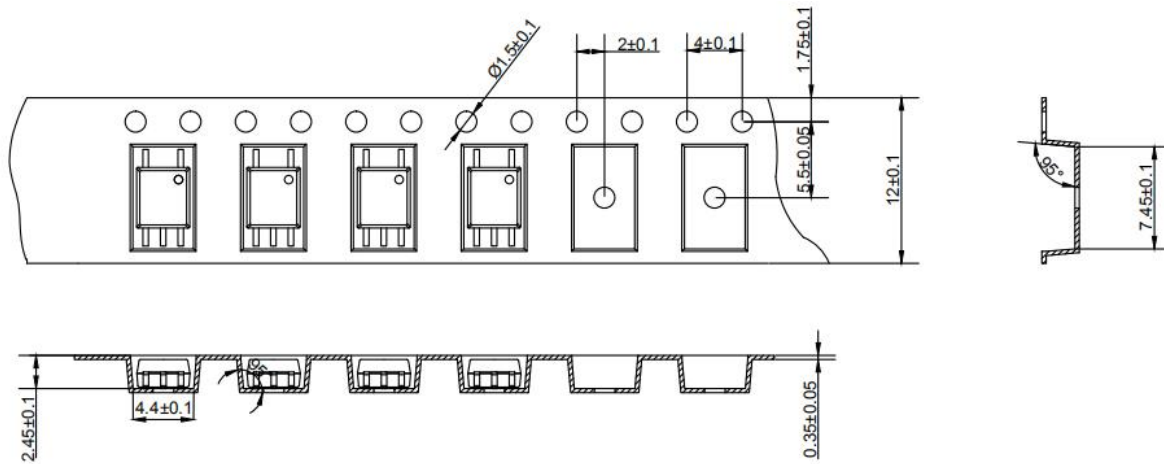


12. Recommended Foot Print Patterns (Mount Pad)

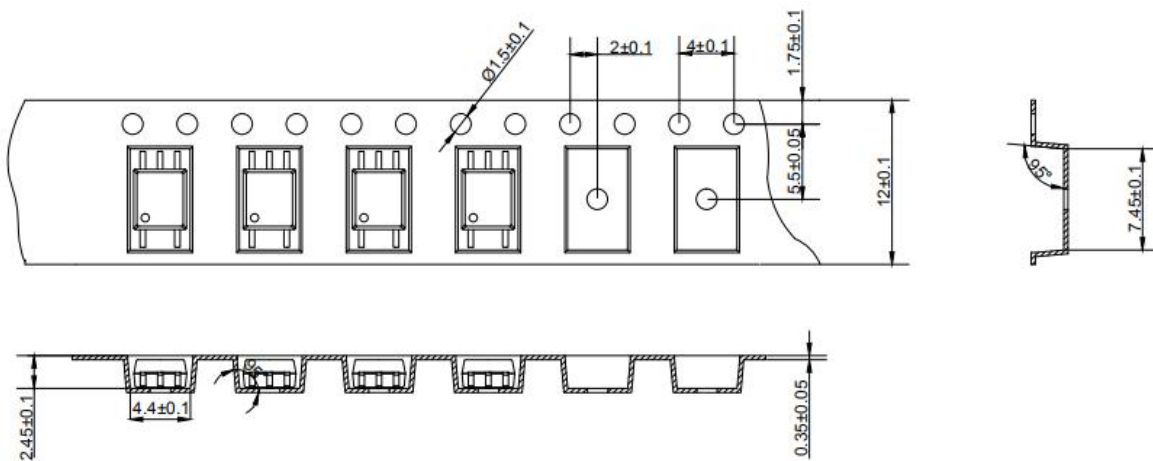


13. Taping Dimensions

(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

14. Package Dimension

(1) package dimension

Packing Information

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

(2) Packing Label Sample



- 1.MTL NO:Contents with "Order Information" in the specification.
- 2.LOT NO:The production cycle of the product.
- 3.BATCH:The CTR RANK of the product.
- 4.Quantity:Product packaging quantity.
- 5.Product Data: The data when product be made.

15. Reliability Test

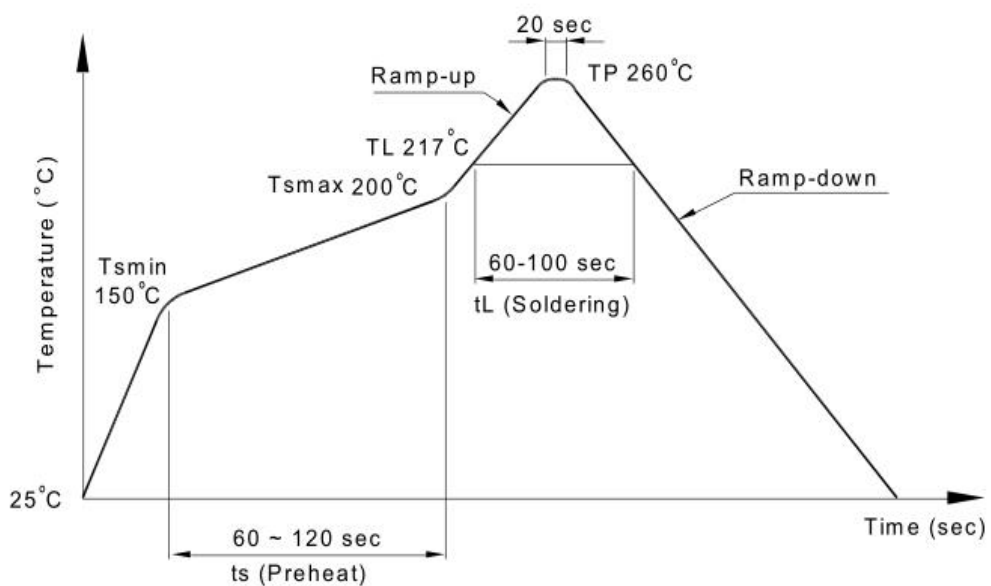
NO.	Item	Condition	Quantity	Cycle	Reference Standards
1	RSH, Resistance to Solder Heat	260±5°C,20s/cycle	22	3 cycles	JESC22A-106
2	SD, Solderability	260±5°C, 10s/cycle	22	1 cycle	JESD22-B102
3	TC, Temperature Cycle	H: 125°C 15min ∫ 5min L: -55°C 15min	77	300cycles	JESC22A-104
4	TS, Thermal Shock	H:100°C 5min ∫ 15s L:-10°C 5min	77	300cysles	JESC22A-106
5	LTSL, Low Temperature Storage	T:-55°C	77	1000h	JESD22-A119
6	HTSL, High Temperature Storage	T:125°C	77	1000h	JESC22A-103
7	THB, High Temperature High Humidity	T:85°C RH: 85%	77	1000h	JESC22A-101
8	HTOL DC Operating Life	T: 110°C IF=10mA VCC=5V	77	1000h	MIL-STD-750 Method 1037
9	ESD-HBM Human Body Model ESD	Ta=25° C, Reference JESD22-A114	6	1 cycle	JESD22-A114

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.

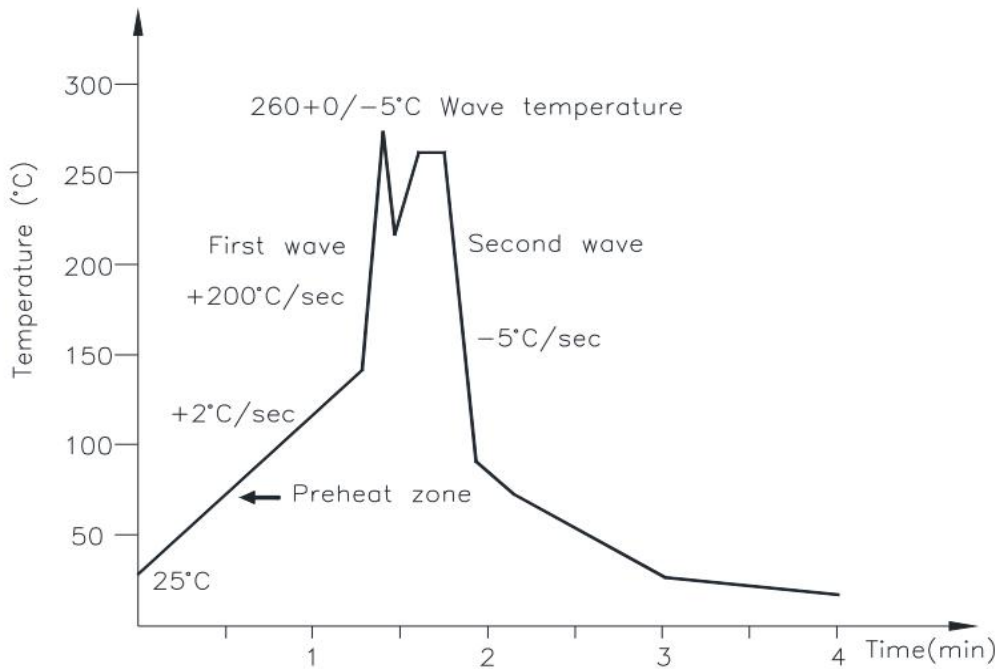
Profile item	Conditions
Preheat	
- Temperature Min (T Smin)	150°C
- Temperature Max (T Smax)	200°C
- Time (min to max) (ts)	90±30 sec
Soldering zone	
- Temperature (TL)	217°C
- Time (t L)	60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak temperature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

17. Switching time test circuit

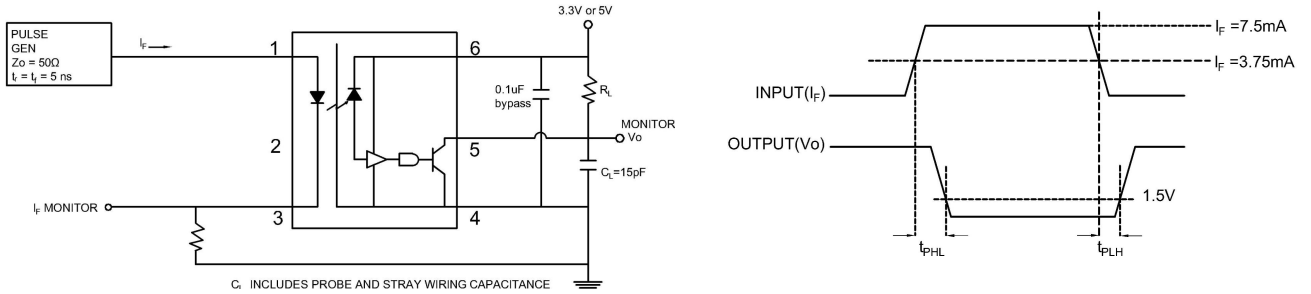


Figure 1: Test Circuit for T_{PHL} and T_{PLH}

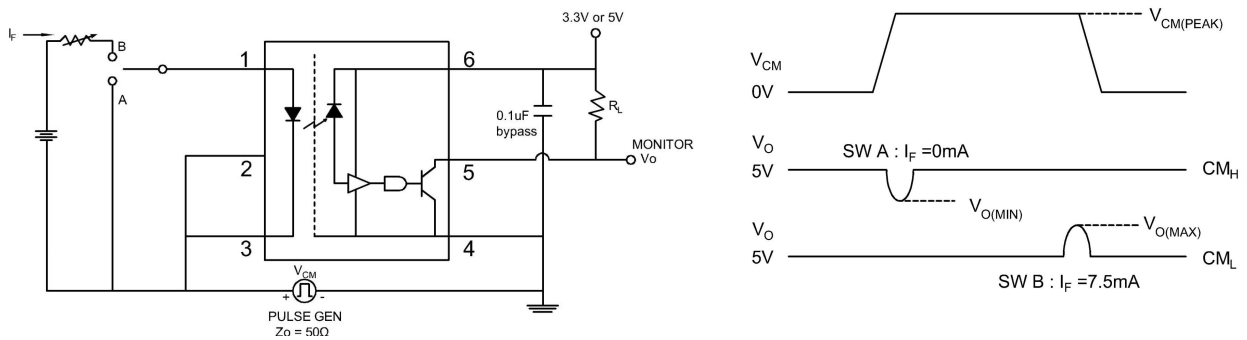


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

18. Characteristics Curve

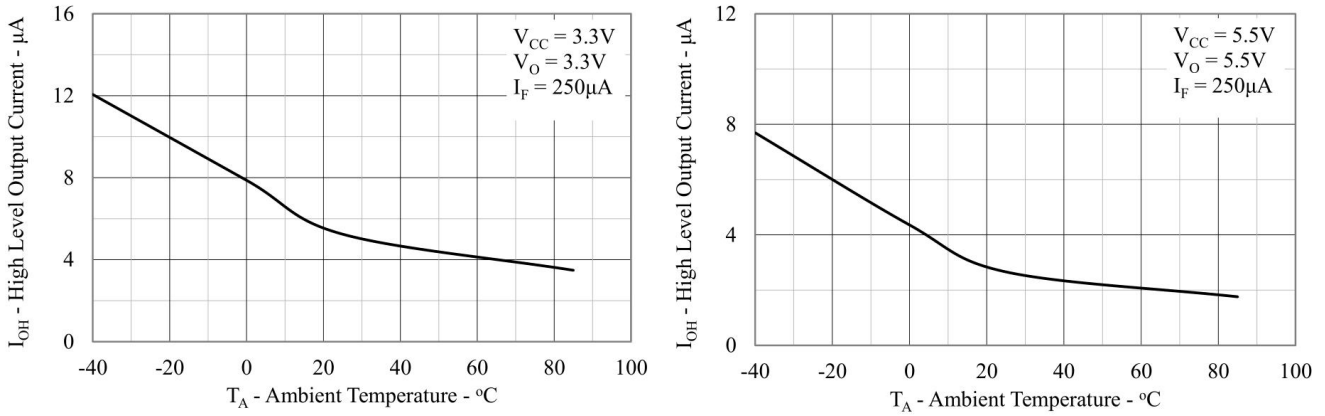


Figure 3: Typical high level output current vs. temperature.

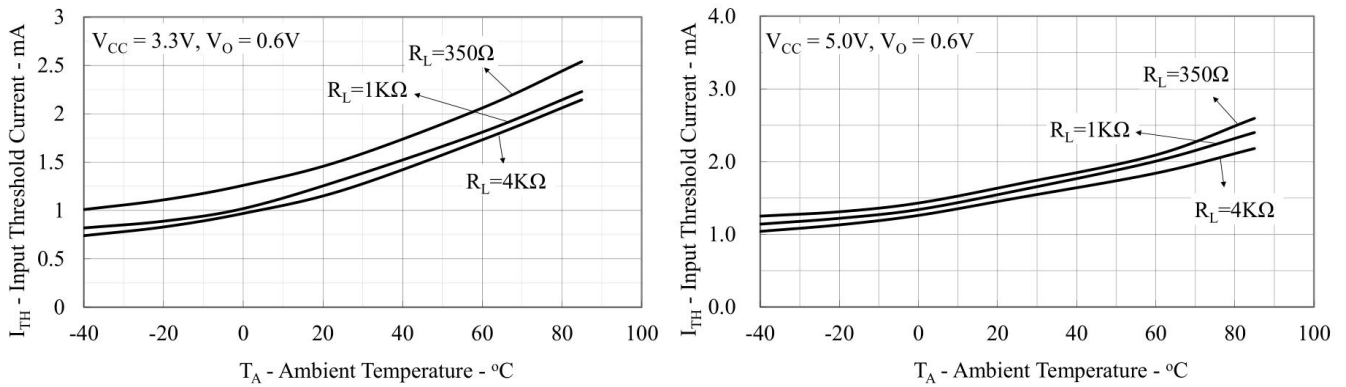


Figure 4: Typical Input Diode Threshold Current vs. Ambient Temperature

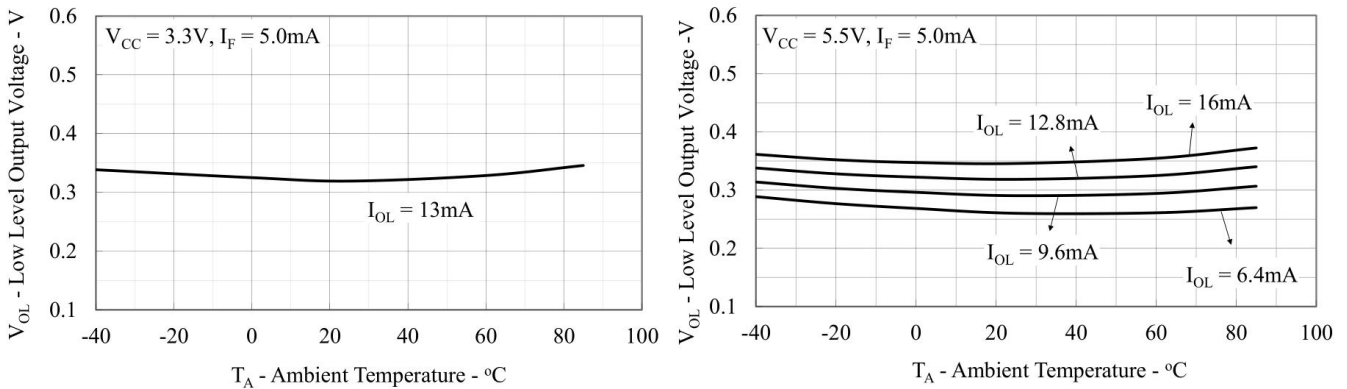


Figure 5: Typical Low Level Output Voltage vs. Ambient Temperature

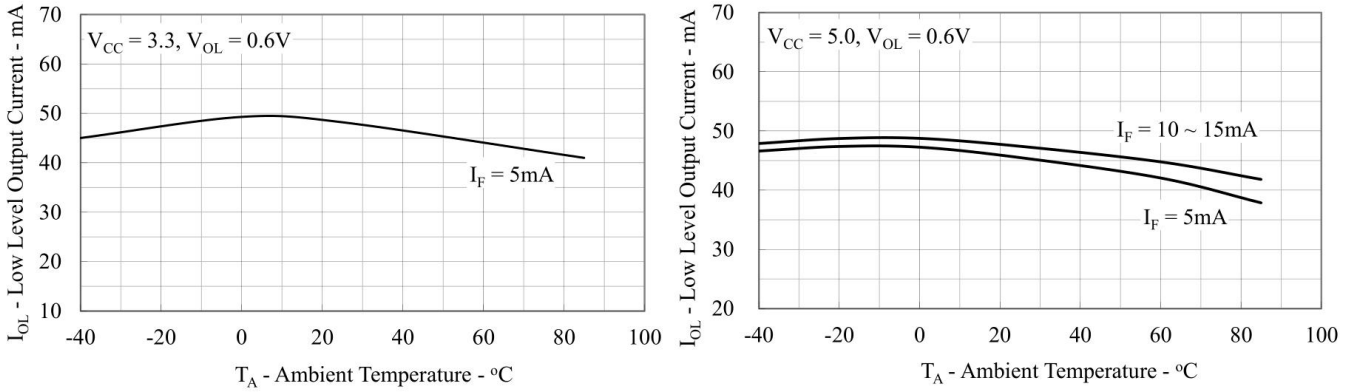


Figure 6: Typical Low Level Output Current vs. Ambient Temperature

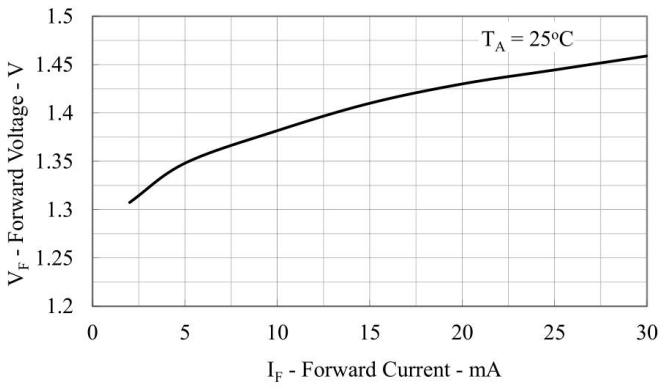


Figure 7: Typical Input Diode Forward Characteristics

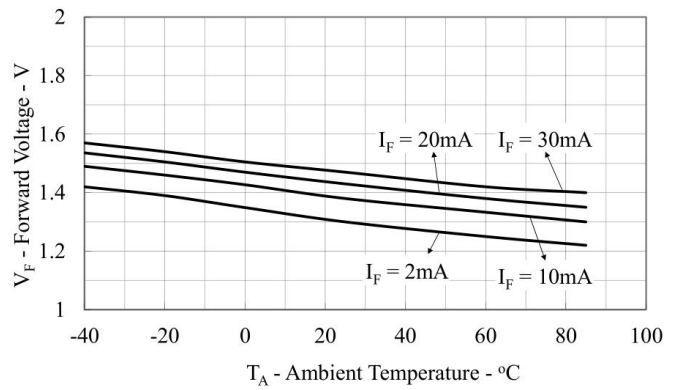


Figure 8: Typical Input Diode Forward Voltage vs. Ambient Temperature

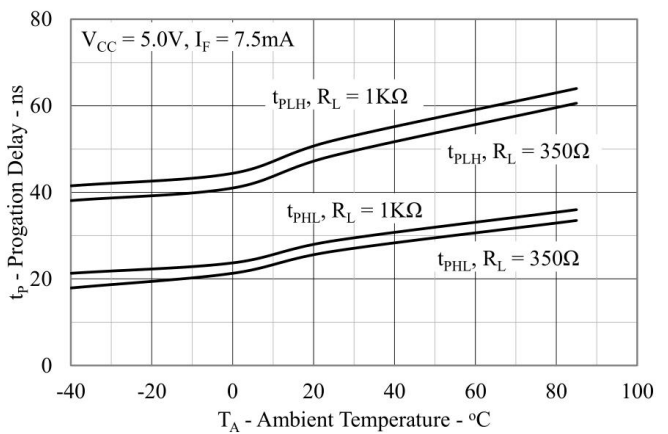
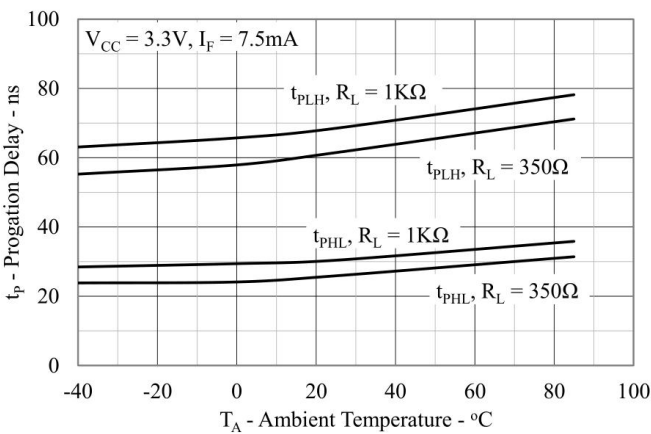


Figure 9: Typical Propagation Delay vs. Ambient Temperature

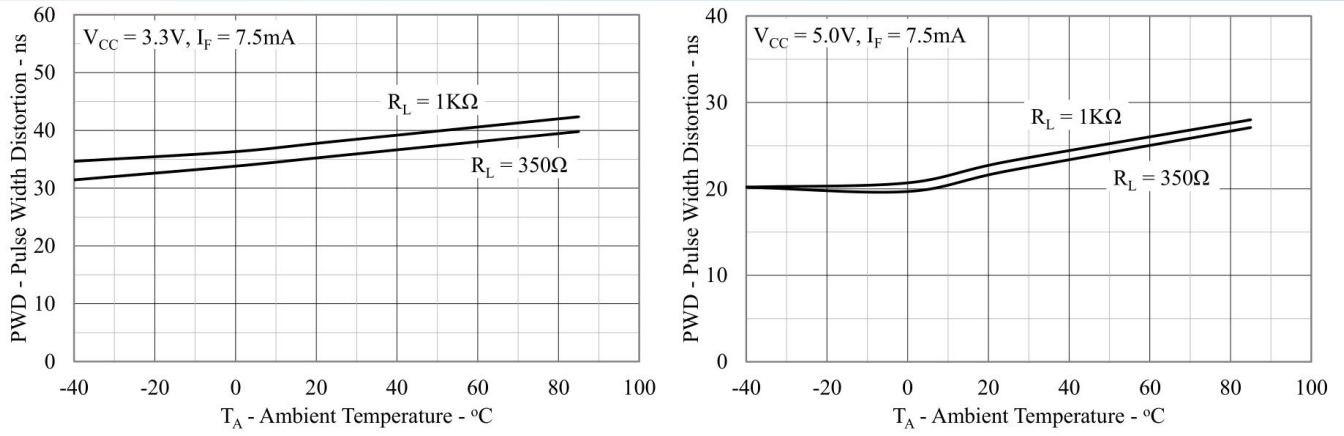


Figure 10: Typical Pulse Width Distortion vs. Ambient