ORIENT

Photo coupler

Product Data Sheet

Name: OR-M61L

Customer: ________________

Date: ________________

SHENZHEN ORIENT COMPONENTS CO ., LTD

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1. Features

(1) Compliance Halogens Free (Br < 900ppm, Cl < 900ppm, Br+Cl<1500ppm)
(2) Inverter logic type (Totem pole output)
(3) Supply voltage: 2.7 to 5.5 V
(4) Data transfer rate: 15 MBd (typ.) (NRZ)
(5) Threshold input current: 1.3 mA (max) (Ta = 105℃);1.6 mA (max) (Ta = 125℃)
(6) Supply current: 1.0 mA (max)
(7) Common-mode transient immunity: ±20 kV/μs (min)
(8) Isolation voltage: 3750 Vrms (min)
(9) Operating temperature: -40 to 125
(10) Safety approval
    UL approved(No.E323844)
    VDE approved(No.40029733)
    CQC approved (No.CQC19001231256)
(11) In compliance with RoHS, REACH standards
(12) MSL Class I

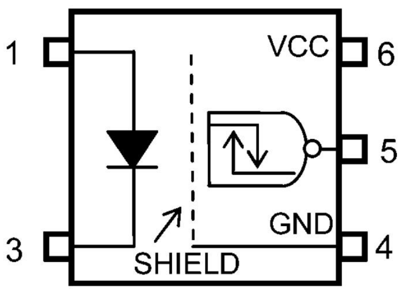
2. Instructions

The OR-M61L consists of a high-output GaAlAs light-emitting diode coupled with integrated high gain, high-speed photo detectors. It is housed in the SO6 package.This photo coupler guarantees operation at up to 125℃ and on supplies from 2.7 V to 5.5 V. Since M61L has guaranteed 1 mA low supply current (ICCL/ICCH), and 1.6 mA (Ta = 125℃) low threshold input current(IFHL), it contributes to energy saving of devices. It can drive directly from a microcomputer for a low input current.The M61L has an internal Faraday shield that provides a guaranteed common-mode transient immunity of ±20 kV/μs.

3. Application Range

- Factory Networking
- High-Speed Digital Interfacing for Instrumentation and ControlDevices
- I/O Interface Boards

4. Functional Diagram



1. Anode
3.Cathode
4.GND
5.VO (Output)
6.VCC

Input	LED	Output
H	ON	L
L	OFF	H

Note: A 0.1-μF bypass capacitor must be connected between pin 6 and pin 4

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

Parameter		Symbol	Rated Value	Unit
Input	Average Forward Input Current	I_F	50	mA
	Peak transient input forward current	I_{FPT}	1	A
	Reverse Input Voltage	V_R	5	V
	Power Dissipation	P_I	20	mW
Output	Output Collector Current	I_O	10	mA
	Output Collector Voltage	V_O	6	V
	Output Collector Power Dissipation	P_O	20	mW
	Supply Voltage	V_{CC}	6	V
	Insulation Voltage	V_{iso}	3750	Vrms
	Working Temperature	T_{opr}	-40～+ 125	℃
	Storage Temperature	T_{stg}	-55～+ 125	
*2	Soldering Temperature	T_{sol}	260	

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Pulse width (PW) ≤ 1 ms, duty = 50 %

Note 2: Pulse width (PW) ≤ 1 μs, 300 pps

Note 3: This device is considered as a two-terminal device: Pins 1 and 3 are shorted together, and pins 4, 5 and 6 are shorted together.

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	4000	Ω
Fan Out (at RL=1kΩ per channel)	N	—	5	TTL Loads

Note: The recommended operating conditions are given as a design guide necessary to obtain the intended performance of the device. Each parameter is an independent value. When creating a system design using this device, the electrical characteristics specified in this datasheet should also be considered.

Note: A ceramic capacitor (0.1 μF) should be connected between pin 6 and pin 4 to stabilize the operation of a high-gain linear amplifier. Otherwise, this photocoupler may not switch properly. The bypass capacitor should be placed within 1 cm of each pin.

Note 1: The rise and fall times of the input on-current should be less than 0.5 μs. Note 2: Denotes the operating range, not the recommended operating condition.

7. Opto-Electronic Characteristics

Parameter		Symbol	Min	Typ	Max	Unit	Condition
Input	Forward Voltage	V_F	1.0	1.38	1.7	V	I_F= 2mA T_A=25°C
	Temperature Coefficient OF Forward Voltage	$\Delta V_F/\Delta T$	—	-1.8	—	mV/°C	I_F= 2mA
	Reverse Voltage	BV_R	5	—	—	V	I_R = 10µA
	Input Capacitance	C_{IN}	—	20	—	pF	f = 1MHz, VF = 0V
Detector	High Level Supply Current	I_{CCH}	—	5.3	6	mA	V_{CC}=5V
	Low Level Supply Current	I_{CCL}	—	5.3	6	mA	V_{CC}= 5V
	Threshold input current (H/L)	I_{FHL}	—	0.5	1.3	mA	I_O=3.2mA, V_O<0.4V, T_a=-40 to 105°C
			—	0.5	1.6		I_O=3.2mA, V_O<0.4V, T_a=-40 to 125°C
	High-level output voltage	V_{OH}	3.2	3.28	—	V	I_O=-20µA,V_F=0.8V, V_{CC}=3.3 V
			4.9	4.98	—		I_O=-20µA, V_F=0.8 V, V_{CC}=5V
			2.3	3.13	—		I_O=-3.2mA, V_F= 0.8V,V_{CC}=3.3V
			4.0	4.84	—		I_O=-3.2mA, V_F=0.8V, V_{CC}=5V
	Low Level Output Voltage	V_{OL}	—	—	0.1	V	I_F=2mA, I_O=20µA
			—	0.15	0.4		I_F=2mA,I_O=3.2mA

Note: All typical values are at VCC = 5 V, Ta = 25℃, unless otherwise noted.

8. Switching Characteristics

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

Parameter	Symbol	Min	Typ.	Max	Unit	Test Condition
Propagation delay time (H/L)	t_{PHL}	—	25	80	ns	IF = 0 → 2 mA, RT = 1.68 kΩ, CL = 15 pF
Propagation delay time (L/H)	t_{PLH}	—	34	80		IF = 2 → 0 mA, RT = 1.68 kΩ, CL = 15 pF
Pulse width distortion	$\|t_{PHL}-t_{PLH}\|$	—	10	25		IF = 2 mA, RT = 1.68 kΩ, CL = 15 pF
Propagation delay skew (device to device)	tpsk	-30	—	30		IF = 2 mA, RT = 1.68 kΩ, CL = 15 pF
Fall time	tf	—	3	—		IF = 0 → 2 mA, RT = 1.68 kΩ, CL = 15 pF
Rise time	tr	—	3	—		IF = 2 → 0 mA, RT = 1.68 kΩ, CL = 15 pF
Common-mode transient immunity at output high	CMH	±20	±25	—	kV/μs	VCM = 1000 Vp-p, IF = 0 mA, VCC = 3.3 V / 5 V, Ta = 25℃, RT = 1.68 kΩ
Common-mode transient immunity at output low	CML	±20	±25	—		VCM = 1000 Vp-p, IF = 2 mA, VCC = 3.3 V / 5 V, Ta = 25 ℃, RT = 1.68 kΩ

Note: All typical values are at Ta = 25 ℃.

Note 1: f = 5 MHz, duty = 50 %, input current tr = tf = 5 ns, CL is approximately 15 pF which includes probe and stray wiring capacitance.

Note 2: The propagation delay skew, tpsk, is equal to the magnitude of the worst-case difference in tpHL and/or tpLH that will be seen between units at the same given conditions (supply voltage, input current, temperature, etc).

Note 3: RT = R1 + R2 = 1.68 kΩ

Recommendation input resistance conditions : R1 = R2 = 840 Ω

9. Order Information

Part Number

OR-M61L-W-Y-Z

Note

M61L = Part number.

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

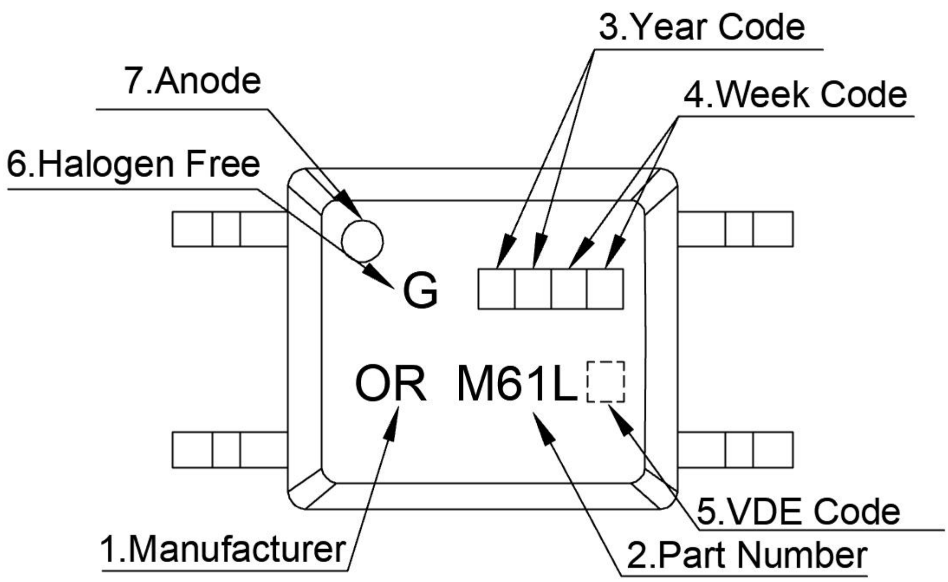
Y = ‘V’ code for VDE safety (This options is not necessary).

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

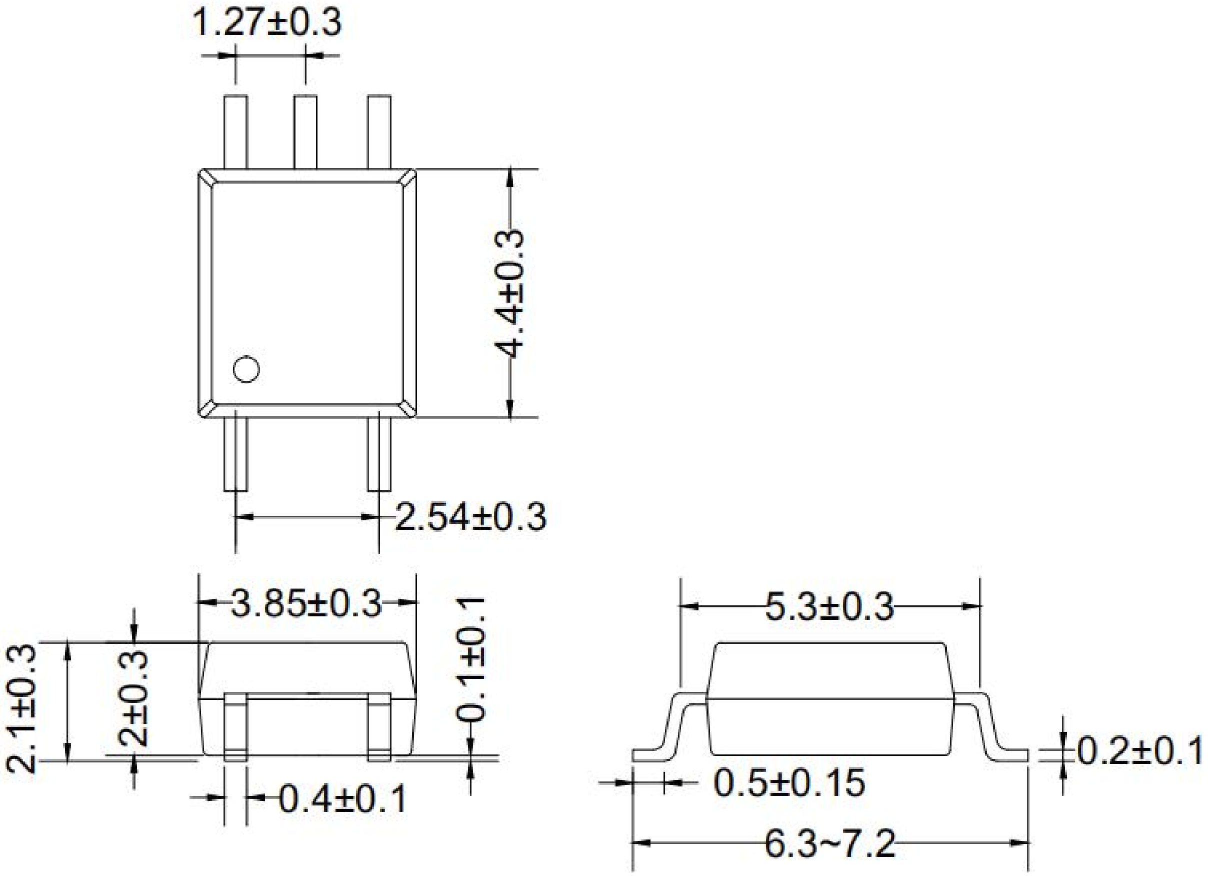
10. Naming Rule



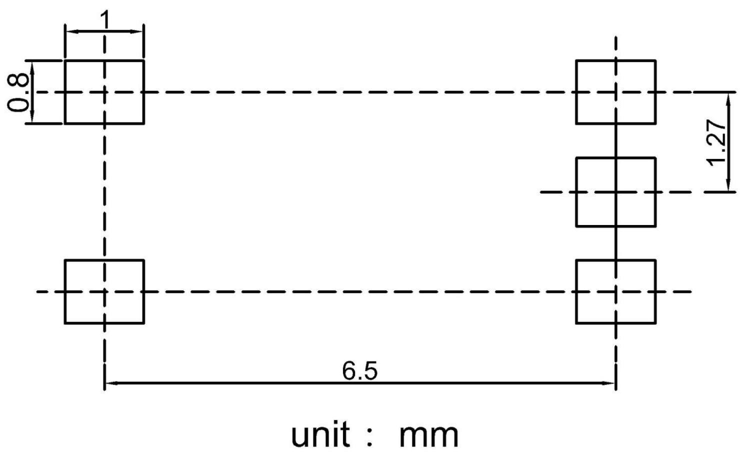
1. Manufacturer : ORIENT.
2. Part Number : M61L.
3. Year Code ☐☐ ： '21' means '2021' and so on.
4. Week Code ☐☐ ： 01 means the first week, 02 means the second week and so on.
5. VDE Code ⬚ . (Optional)
6. HF Code ‘G’: Halogen Free.
7. Anode.

* VDE Code can be selected.

11. Outer Dimension

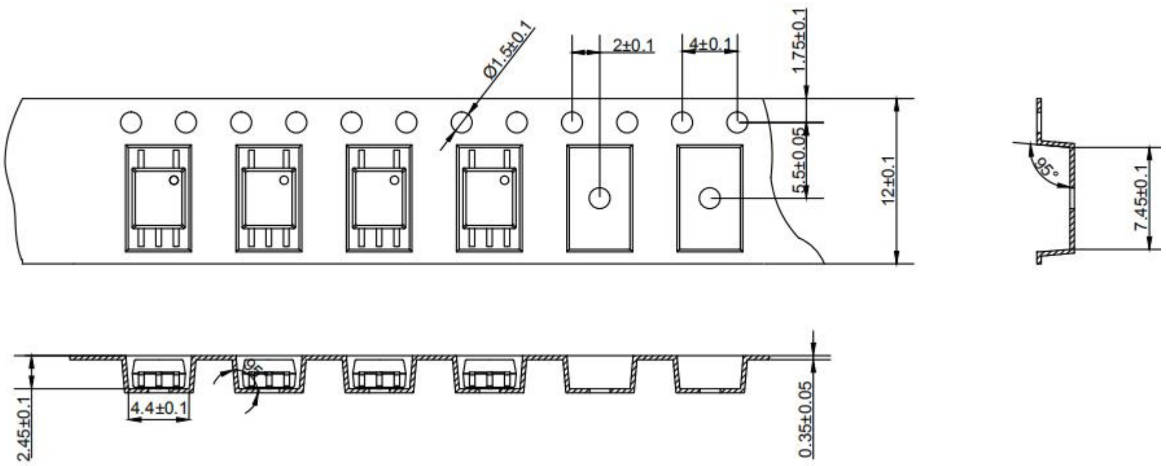


12. Recommended Foot Print Patterns (Mount Pad)

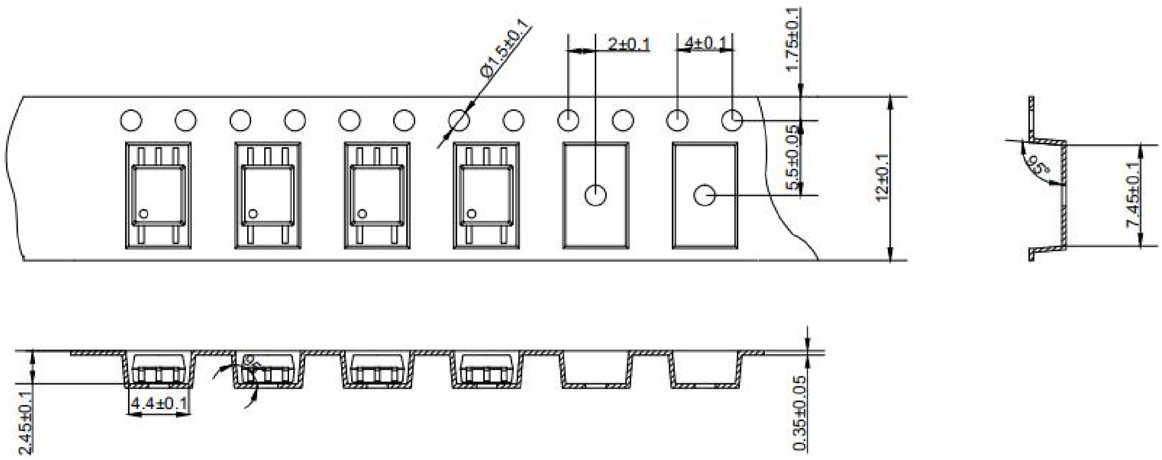


13. Taping Dimensions

（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）

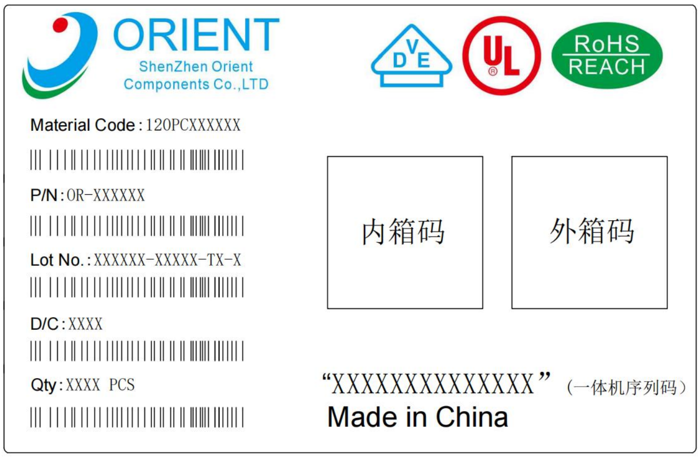
Encapsulation type	TP/TP1
amount （pcs）	3000

14. Package Dimension

(1) package dimension

Packing Information	
Packing 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. 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.

15. Reliability Test

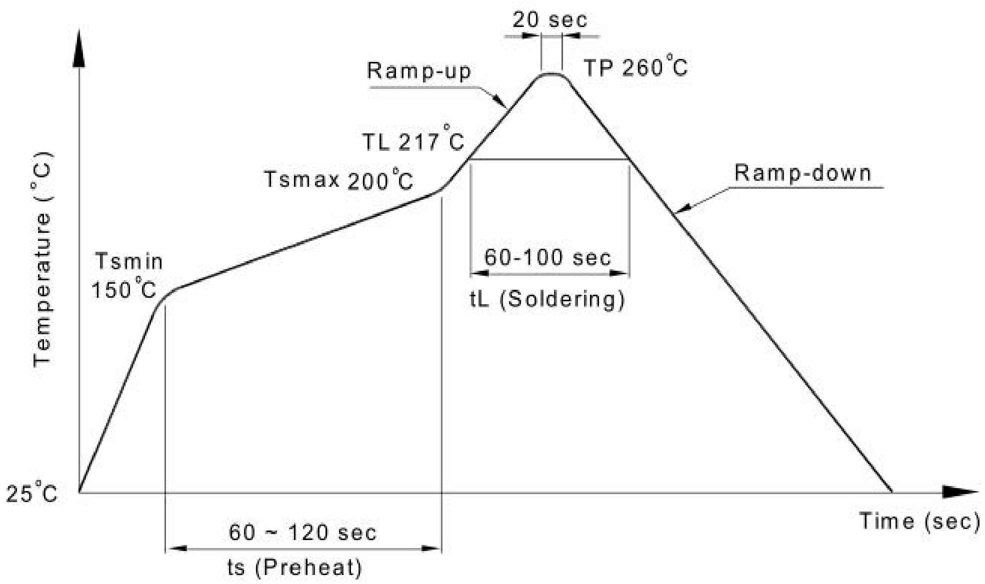
NO.	ITEMS	Reliability Testing				
		QTY. (Pcs)	Condition	Process	Device	Standard
1	**RSH** 耐焊接热	22	260±5℃	5s/3 次	锡炉	JESD22-A106
2	**HTSL** 高温存储	77	125℃	168 hrs 500 hrs 1000 hrs	高温烤箱测试仪	JESD22-A103
3	**LTSL** 低温存储	77	-40℃	168 hrs 500 hrs 1000 hrs	低温箱测试仪	JESD22-A119
4	**TC** 温度循环	77	H:125℃ 15min ∫5min 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

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.

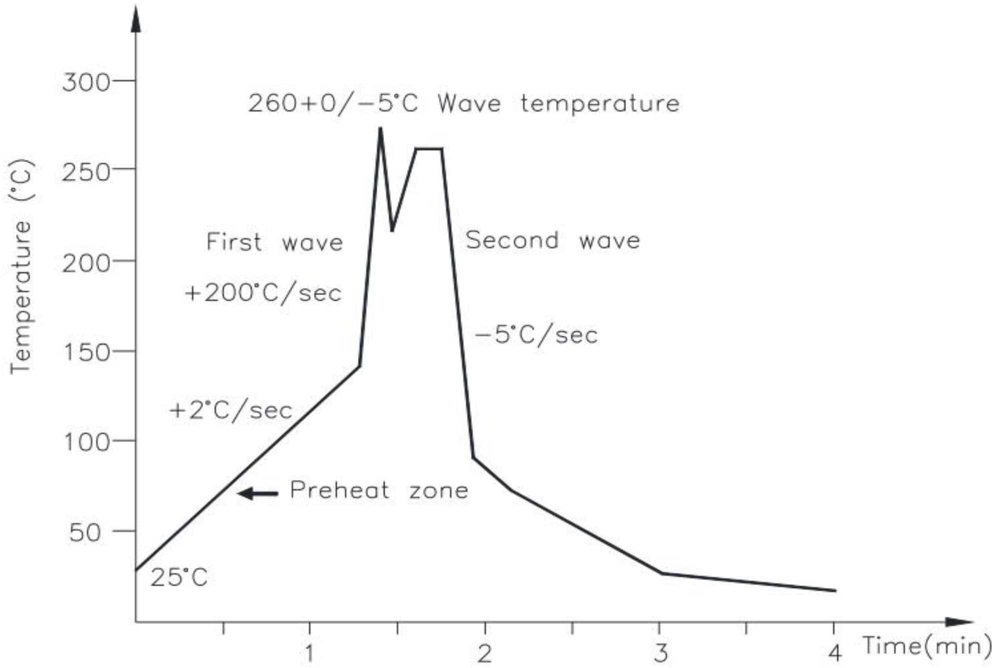
Profile item	Conditions
Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts)	150˚C 200˚C 90±30 sec
Soldering zone - Temperature (TL) - Time (t L)	217˚C 60 sec
Peak Temperature	260˚C
Peak Temperature time	20 sec
Ramp-up rate	3˚C / sec max.
Ramp-down rate from peak temperature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



（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

17. Switching time test circuit

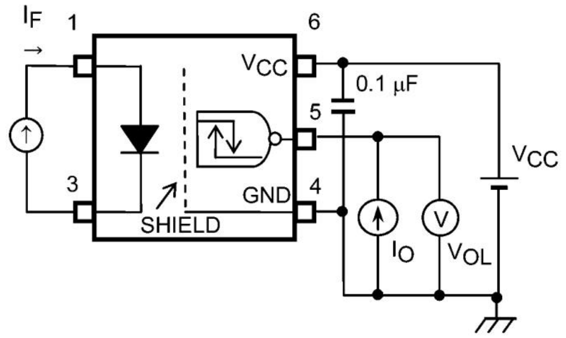


Fig. 17.1 VOL Test Circuit

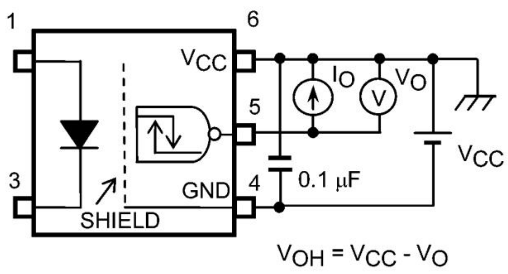


Fig. 17.2 VOH Test Circuit

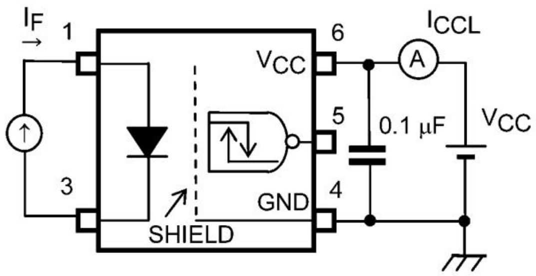


Fig. 17.3 ICCL Test Circuit

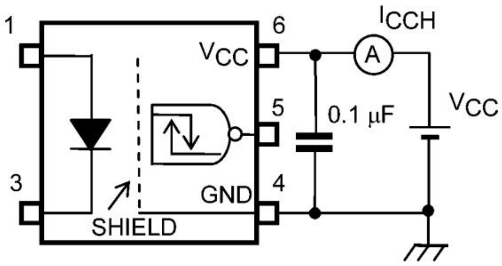
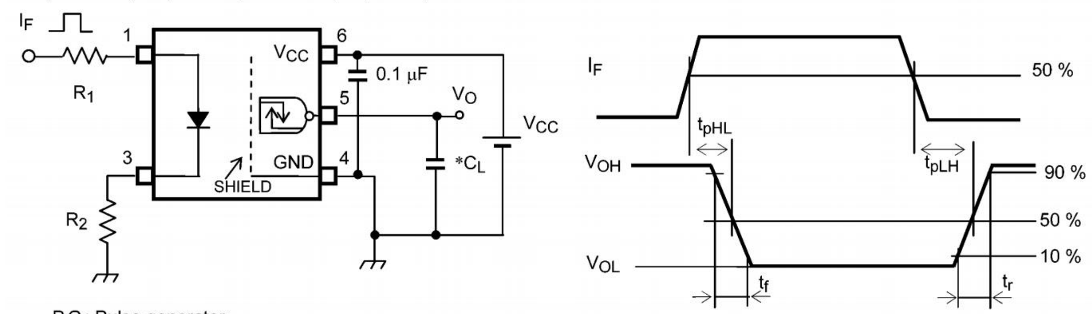


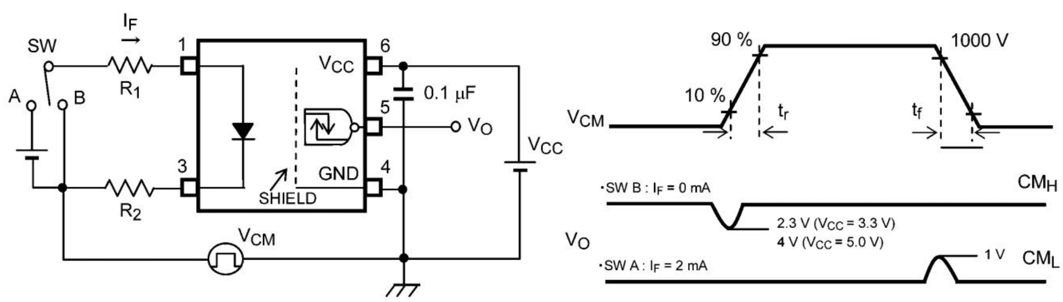
Fig. 17.4 ICCH Test Circuit

I_F = 2 mA (P.G.)
(f = 5 MHz, duty = 50 %, less than $t_r = t_f$ = 5 ns)



P.G.: Pulse generator
*C_L is approximately 15 pF which includes probe and stray wiring capacitance.
$R_T = R_1 + R_2$

Fig. 17.5 Switching Time Test Circuit and Waveform



$R_T = R_1 + R_2$

$$CM_H = \frac{800\,(V)}{t_f\,(\mu s)} \qquad CM_L = \frac{800\,(V)}{t_r\,(\mu s)}$$

Fig. 12.1.6 Common-Mode Transient Immunity and Waveform

18. Characteristics Curve

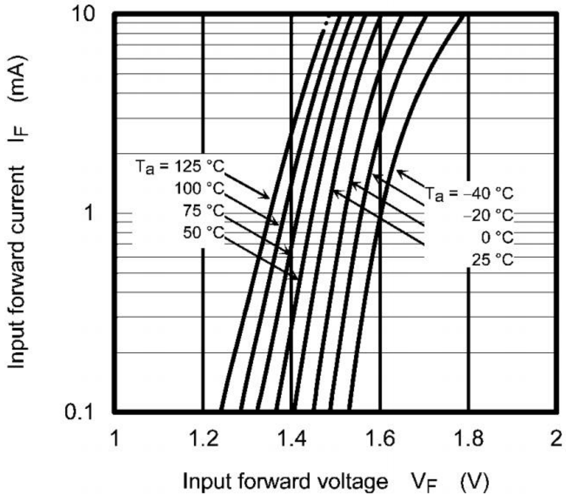


Fig. 18.1 I_F - V_F

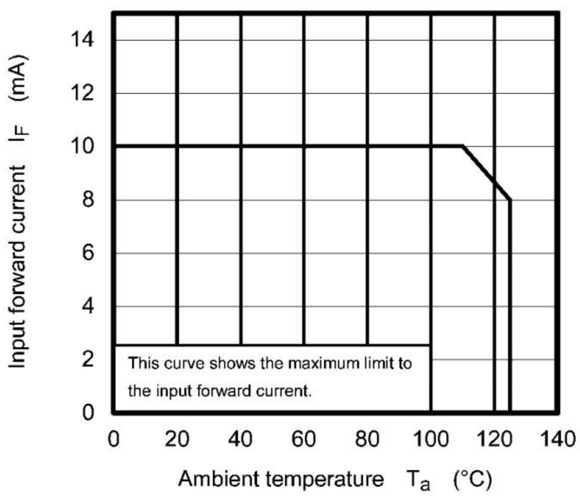


Fig. 18.2 I_F - T_a

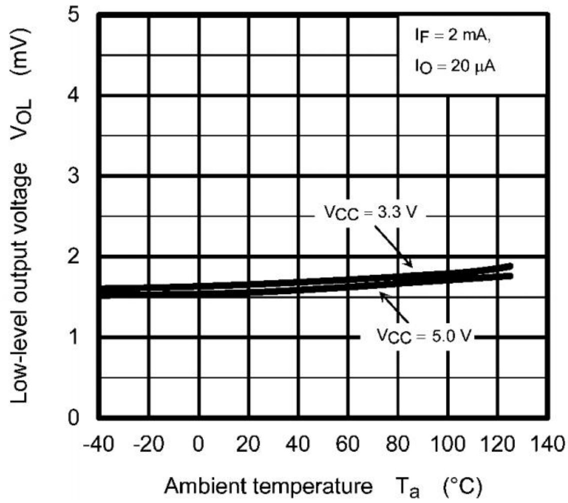


Fig. 18.3 V_{OL} - T_a

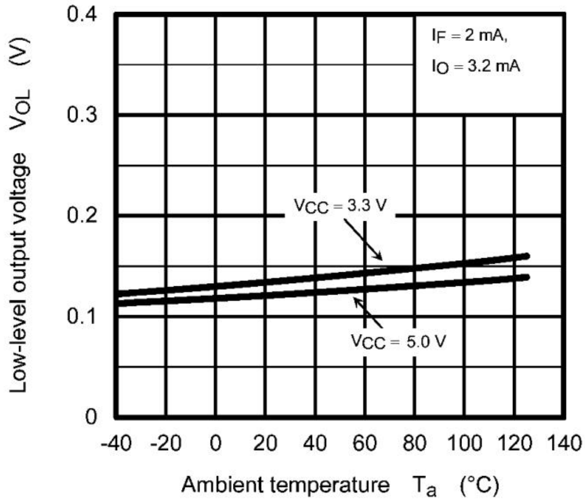


Fig. 18.4 V_{OL} - T_a

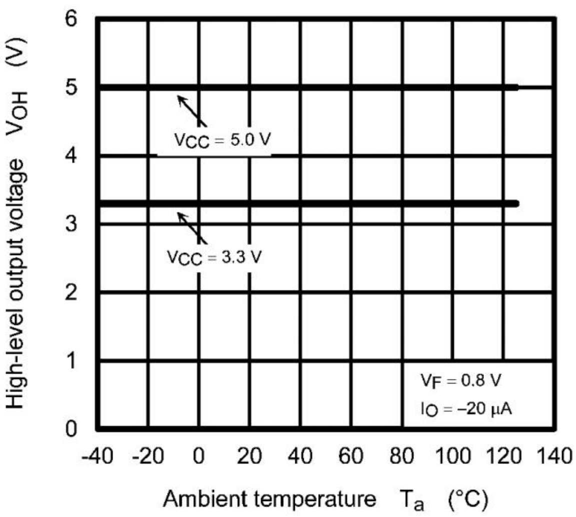


Fig. 18.5 V_{OH} - T_a

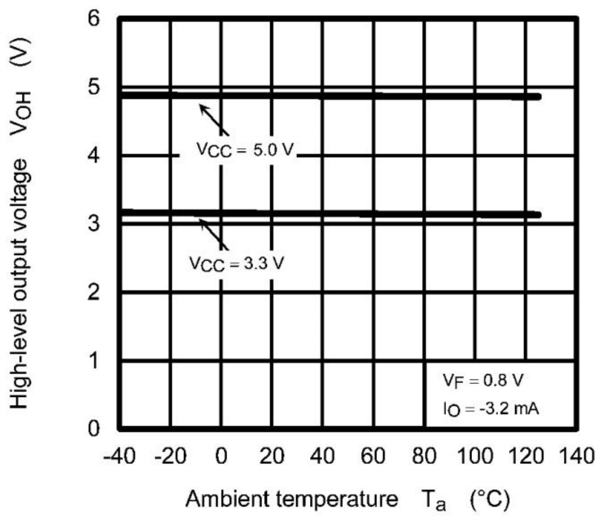


Fig. 18.6 V_{OH} - T_a

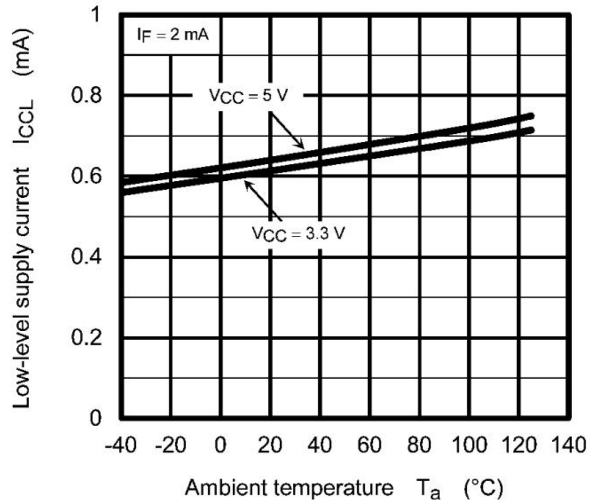


Fig. 18.7 I_{CCL} - T_a

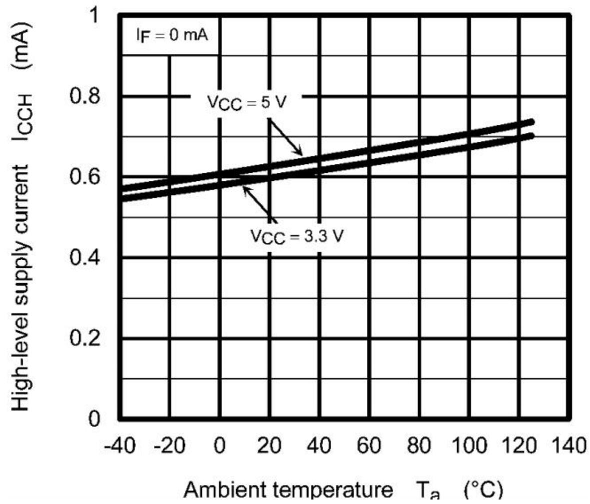


Fig. 18.8 I_{CCH} - T_a

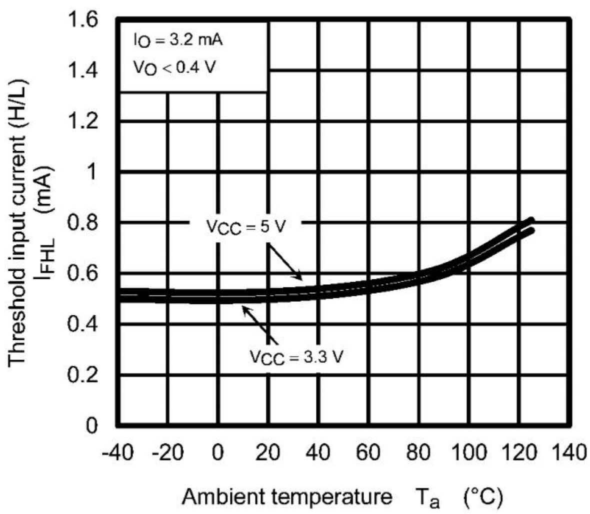


Fig. 18.9 I_{FHL} - T_a

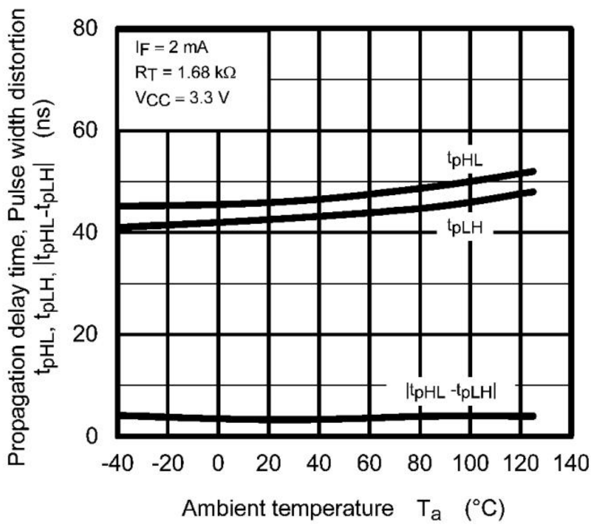


Fig. 18.10 t_{pHL}, t_{pLH}, $|t_{pHL}-t_{pLH}|$ - T_a

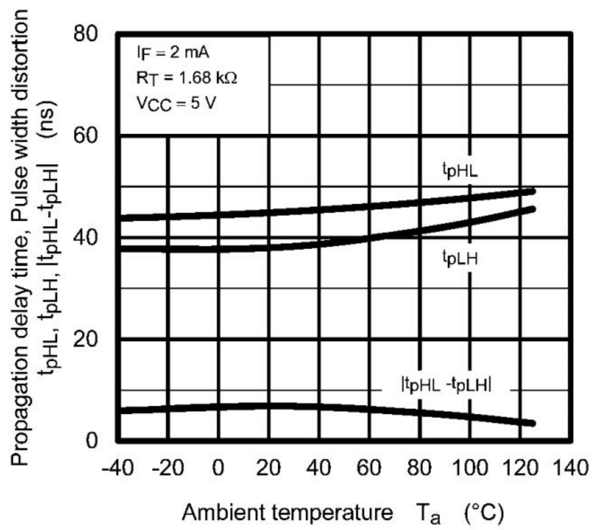


Fig. 18.11 t_{pHL}, t_{pLH}, $|t_{pHL}-t_{pLH}|$ - T_a

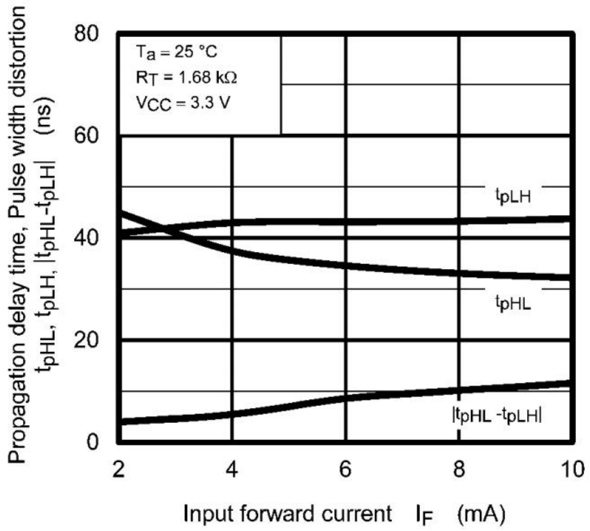


Fig. 18.12 t_{pHL}, t_{pLH}, $|t_{pHL}-t_{pLH}|$ - I_F

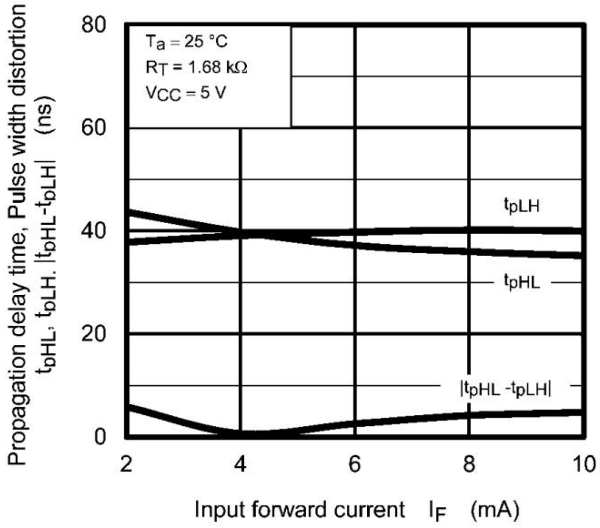


Fig. 18.13 t_{pHL}, t_{pLH}, $|t_{pHL}-t_{pLH}|$ - I_F