ORIENT

Photo coupler

Product Data Sheet

Part Number: OR-T350

Customer: _____

Date: _____

SHENZHEN ORIENT COMPONENTS CO ., LTD

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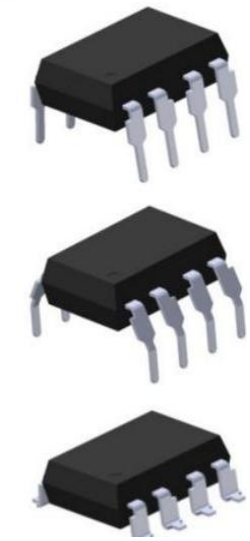
1. Features



(1) 2.5A Absolute Maximum Peak Output Current
(2) 15 kV/μs minimum Common Mode Rejection (CMR) at VCM = 1500 V
(3) 1.5 V maximum low level output voltage (VOL)
(4) ICC = 4 mA maximum supply current
(5) Under Voltage Lock-Out protection (UVLO) with hysteresis
(6) Wide operating VCC range: 15 to 30 Volts
(7) 500 ns maximum switching speeds
(8) Industrial temperature range: -40°C to 100°C
(9) Safety approval
UL approved(No.E323844)
VDE approved(No.40029733)
CQC approved (No.CQC19001231254)
(10) In compliance with RoHS, REACH standards
(11) MSL Class I

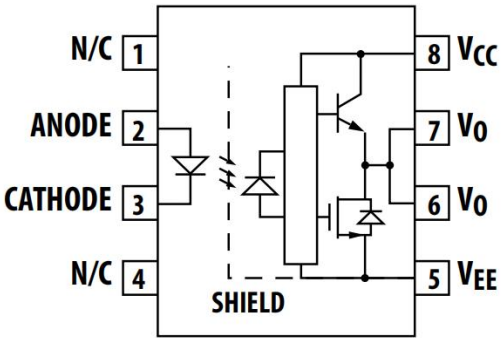
2. Instructions

The OR-T350 contains a GaAsP LED. The LED is optically coupled to an integrated circuit with a power output stage. These optocouplers are ideally suited for driving power IGBTs and MOSFETs used in motor control inverter applications. The high operating voltage range of the output stage provides the drive voltages required by gate controlled devices. The voltage and current supplied by these optocouplers make them ideally suited for directly driving IGBTs with ratings up to 1200 V/100 A. For IGBTs with higher ratings, the OR-T350 series can be used to drive a discrete power stage whichs drives the IGBT gate. The OR-T350 has an insulation voltage of VIORM = 630 Vpeak.

3. Application Range

(1) IGBT/MOSFET gate drive
(2) Inverter for Home Appliances
(3) Industrial Inverters
(4) Switching Power Supplies (SPS)

4. Functional Diagram



LED	VCC - VEE "POSITIVE GOING" (i.e., TURN-ON)	VCC - VEE "NEGATIVE GOING" (i.e., TURN-OFF)	VO
OFF	0–30 V	0–30 V	LOW
ON	0–11 V	0–9.5 V	LOW
ON	11 –13.5 V	9.5–12 V	TRANSITION
ON	13.5–30 V	12–30 V	HIGH
A0.1μF bypass capacitor must be connected between pins 5 and 8.			

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

Parameter		Symbol	Rated Value	Unit
Input	Average Forward Input Current	I_F	25	mA
	Reverse Input Voltage	V_R	5	V
Output	"High" Peak Output Current	$I_{OH(PEAK)}$	2.5	A
	"Low" Peak Output Current	$I_{OL(PEAK)}$	2.5	A
	Output Collector Power Dissipation	P_O	250	mW
Total Power Dissipation		P_T	295	mW
Supply Voltage		$V_{CC} – V_{EE}$	35	V
Input Current (Rise/Fall Time)		$t_{r(IN)}$ /$t_{f(IN)}$	500	ns
Output Voltage		$V_{O(PEAK)}$	V_{CC}	V
Insulation Voltage		V_{iso}	3750	Vrms
Working Temperature		T_{opr}	-40 ~ + 110	℃
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. Opto-electronic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
High Level Output Current	I_{OH}	0.5	1.5	—	A	$V_O = (V_{CC} – 4V)$
		2.0	—	—		$V_O = (V_{CC} – 15V)$
Low Level Output Current	I_{OL}	0.5	2.0	—	A	$V_O = (V_{EE} + 2.5V)$
		2.0	—	—		$V_O = (V_{EE} + 15V)$
High Level Output Voltage	V_{OH}	$(V_{CC} – 4)$	$(V_{CC} – 3)$	—	V	$I_O = –100$ mA
Low Level Output Voltage	V_{OL}	—	VEE+0.5	1.5	V	$I_O = 100$ mA
High Level Supply Current	I_{CCH}	—	2.0	4.0	mA	Output Open, $I_F = 7$ to 16 mA
Low Level Supply Current	I_{CCL}	—	2.0	4.0	mA	Output Open,$V_F = –3.0$ to +0.8V
Threshold Input Current Low to High	I_{FLH}	—	2.2	5.0	mA	$I_O = 0$ mA, $V_O > 5V$
Threshold Input Voltage High to Low	V_{FHL}	0.8	—	—	V	$I_O = 0$ mA, $V_O < 5V$
Input Forward Voltage	V_F	1.2	1.5	1.8	V	$I_F = 10$ mA
Temperature Coefficient of Forward Voltage	$\Delta V_F/\Delta T_A$	—	–2.0	—	mV/°C	$I_F = 10$ mA
Input Reverse Breakdown Voltage	B_{VR}	5	—	—	V	$I_R = 10$ µA
Input Capacitance	C_{IN}	—	60	—	pF	f = 1 MHz, VF = 0V
UVLO Threshold	V_{UVLO+}	11.0	12.3	13.5	V	$V_O > 5$ V, $I_F = 10$ mA
	V_{UVLO-}	9.5	10.7	12.0		
UVLO Hysteresis	U_{VLOHYS}	—	1.6	—		

1. All typical values at TA = 25°C and VCC – VEE = 30V, unless otherwise noted.
2. Maximum pulse width = 10 µs, maximum duty cycle = 0.2%. This value is intended to allow for component tolerances for designs with IO peak minimum = 0.5 A. See Applications section for additional details on limiting IOH peak.
3. Maximum pulse width = 50 µs, maximum duty cycle = 0.5%.
4. In this test, VOH is measured with a dc load current. When driving capacitive loads VOH will approach VCC as IOH approaches zero amps.
5. Maximum pulse width = 1 ms, maximum duty cycle = 20%.

7. Switching Characteristics

Parameter	Symbol	Min.	Typ	Max.	Units	Test Conditions
Propagation Delay Time to High Output Level	tPLH	0.05	0.25	0.5	µs	Rg=10Ω Cg=10nF f=10kHz Duty Cycle=50%
Propagation Delay Time to Low Output Level	tPHL	0.05	0.25	0.5	µs	
Pulse Width Distortion	PWD	—	—	0.3	µs	
Propagation Delay Difference Between Any Two Parts	PDD (tPHL – tPLH)	–0.35	—	0.35	µs	
Rise Time	tr	—	0.15	—	µs	
Fall Time	tf	—	0.2	—	µs	
Output High Level Common Mode Transient Immunity	$\|CM_H\|$	15	20	—	kV/µs	T_A=25°C I_F=10 to 16mA V_{CM}=1500V V_{CC}=30V
Output Low Level Common Mode Transient Immunity	$\|CM_L\|$	15	20	—	kV/µs	T_A=25°C V_{CM}= 1500 V_F=0 V_{CC}=30V

1. This load condition approximates the gate load of a 1200 V/100A IGBT.
2. Pulse Width Distortion (PWD) is defined as |tPHL - tPLH| for any given device.
3. The difference between tPHL and tPLH between any two OR-T350 parts under the same test condition.
4. Pins 1 and 4 need to be connected to LED common.
5. Common mode transient immunity in the high state is the maximum tolerable dVCM/dt of the common mode pulse, VCM, to assure that the output will remain in the high state (i.e., VO > 15.0 V).
6. Common mode transient immunity in a low state is the maximum tolerable dVCM/dt of the common mode pulse, VCM, to assure that the output will remain in a low state (i.e., VO < 2.0 V).

8. Order Information

Part Number

OR-T350U-Y-Z

Note

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

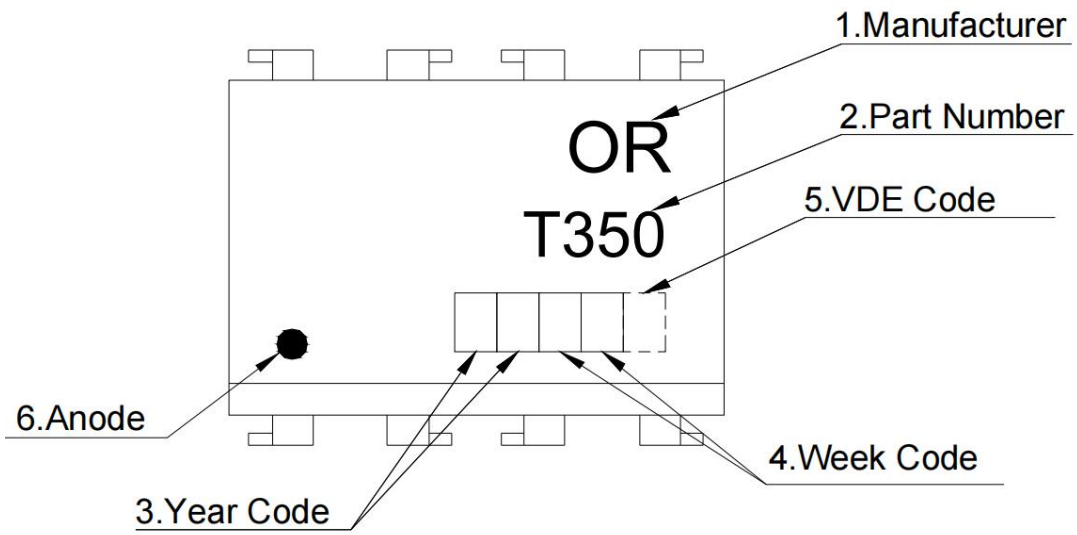
Y = Tape and reel option (TA,TA1 or none).

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

9. Naming Rule



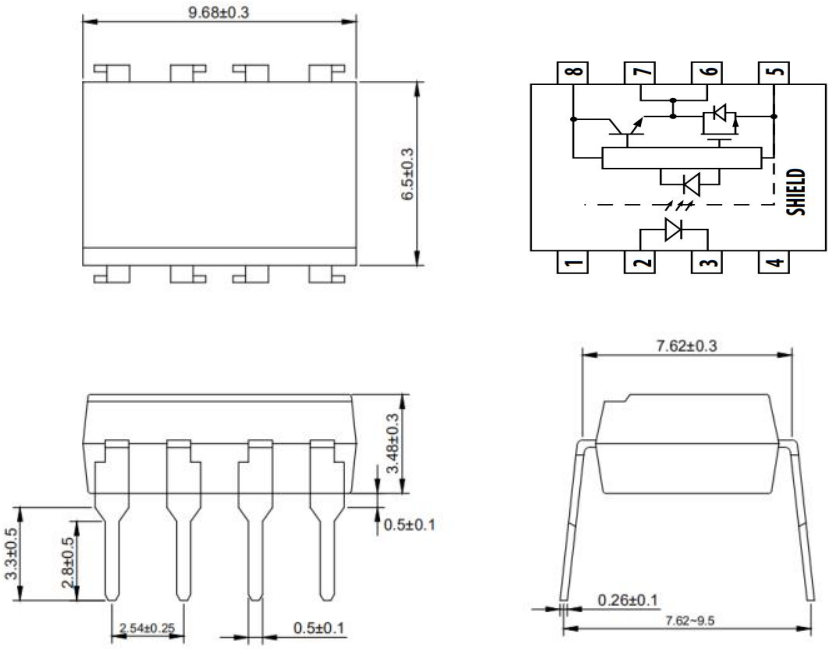
NOTE:

1. Manufacturer : ORIENT.
2. Part Number : T350.
3. Year Code □□: '21' means '2021' and so on.
4. Week Code □□: 01 represents the first week, 02 represents the second week, and so on.
5. VDE Code ⬚. (Optional)
6. Anode.

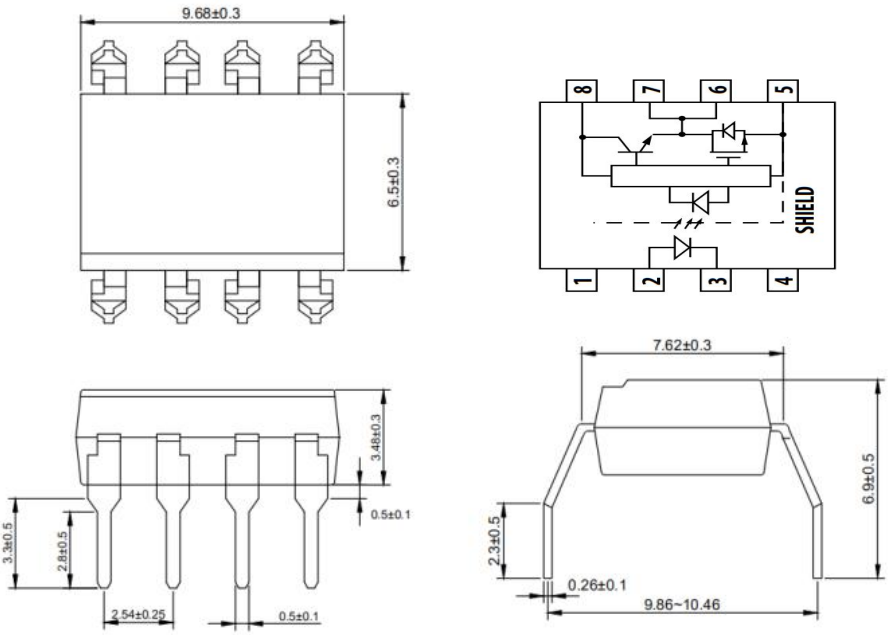
* VDE Mark can be selected.

10. Outer Dimension

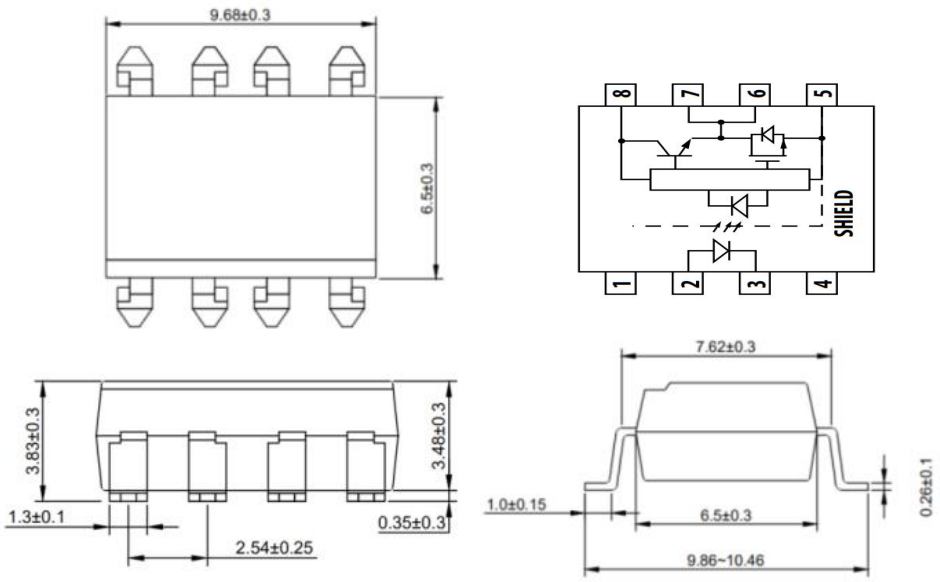
(1) OR-T350



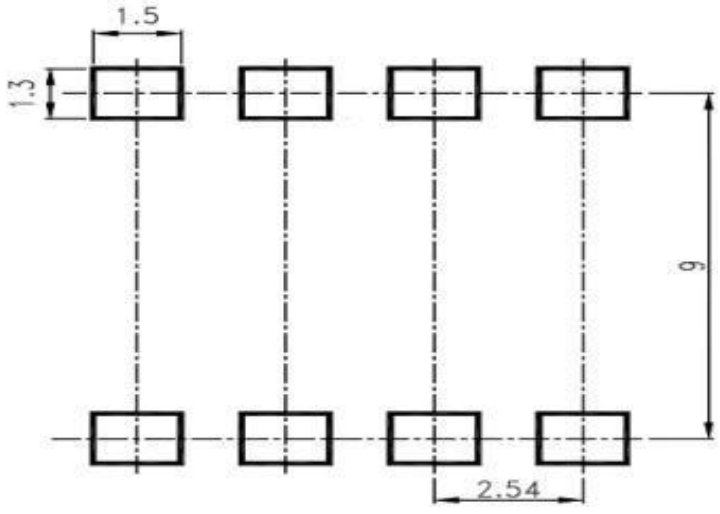
(2) OR-T350M



(3) OR-T350S



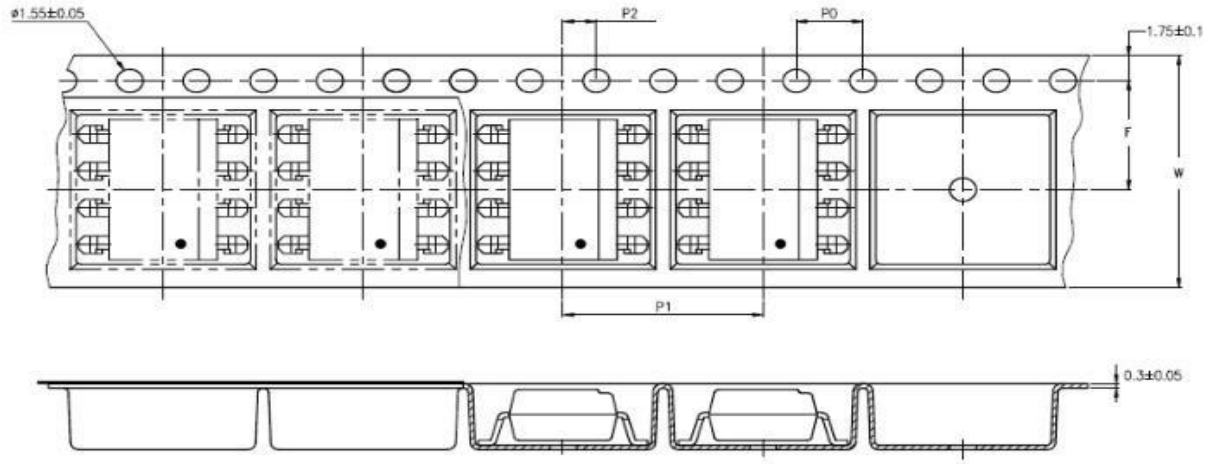
11. Recommended Foot Print Patterns (Mount Pad)



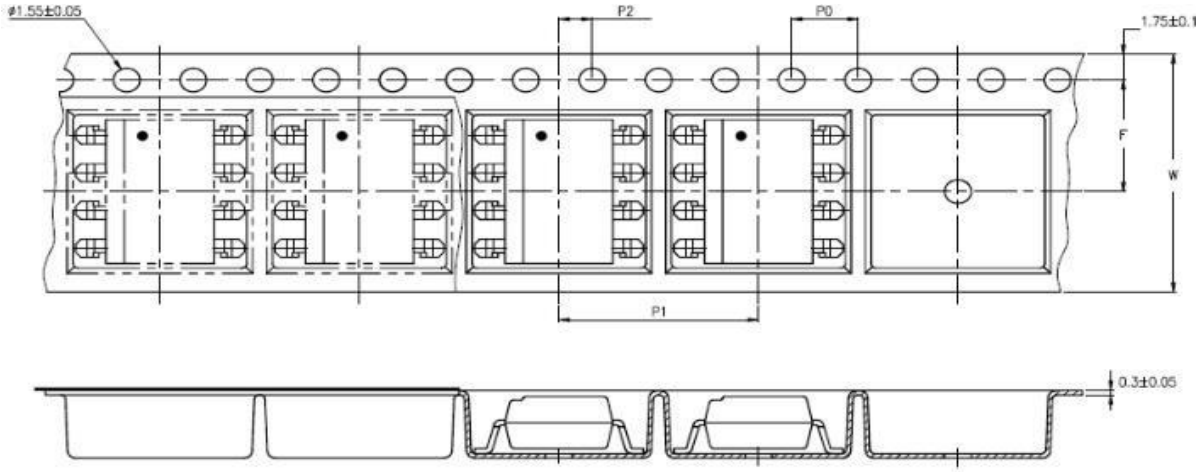
unit：mm

12. Taping Dimensions

(1) OR-T350S-TA



(2) OR-T350S-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

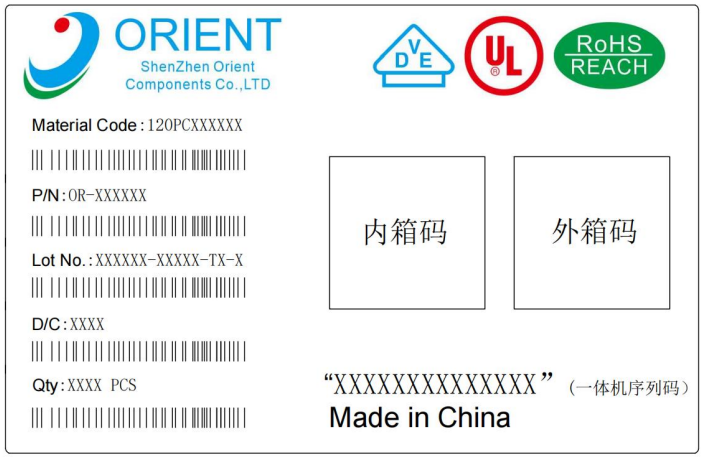
DIP Type

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



Note:

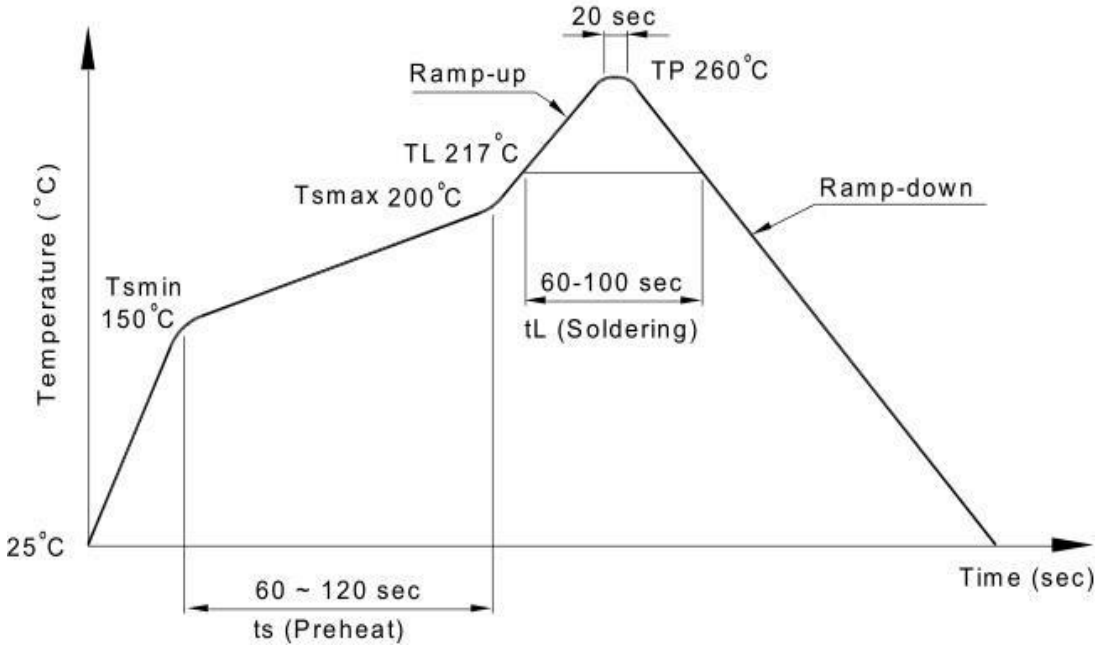
1. Material Code :Product ID.
2. P/N :Contents with "Order Information" in the specification.
3. Lot No. :Product data.
4. D/C :Product weeks.
5. Quantity :Packaging quantity.

14. 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.

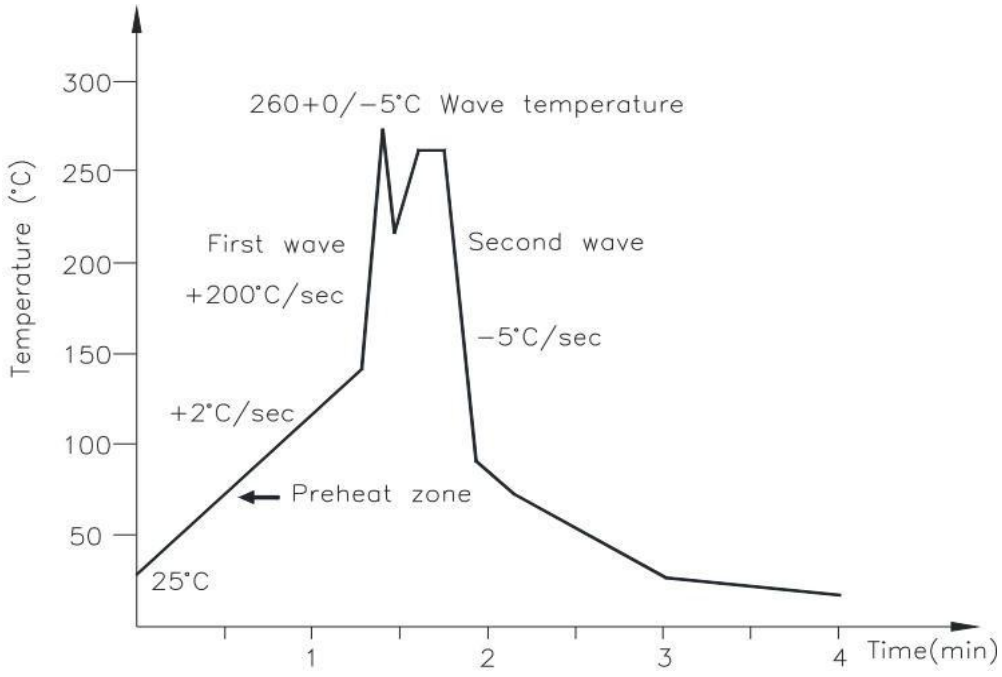
Profile item	Conditions
Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts)	 150˚C 200˚C 90±30 sec
Soldering zone - Temperature (TL) - Time (t L)	 217˚C 60 sec
Peak Temperature	260˚C
Peak Temperature time	20 sec
Ramp-up rate	3˚C / sec max.
Ramp-down rate from peak temperature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

15. Characteristics Curve

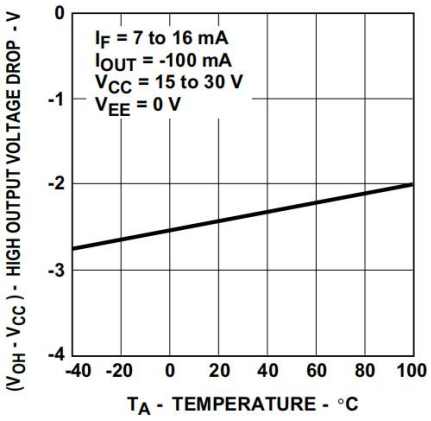


Figure 1. V_{OH} vs. temperature.

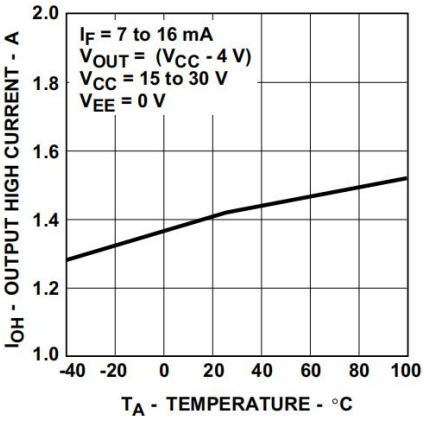


Figure 2. I_{OH} vs. temperature.

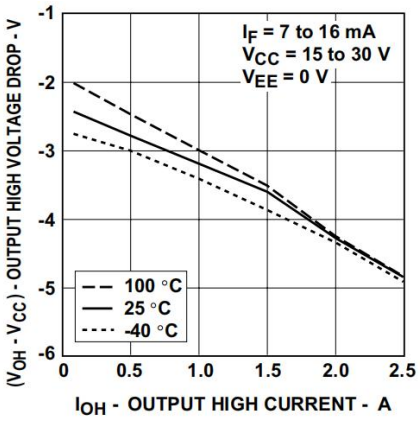


Figure 3. V_{OH} vs. I_{OH}.

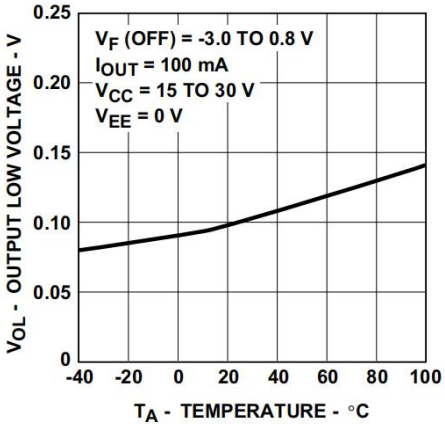


Figure 4. V_{OL} vs. temperature.

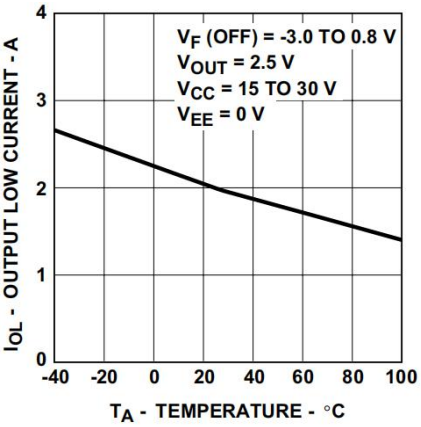


Figure 5. I_{OL} vs. temperature.

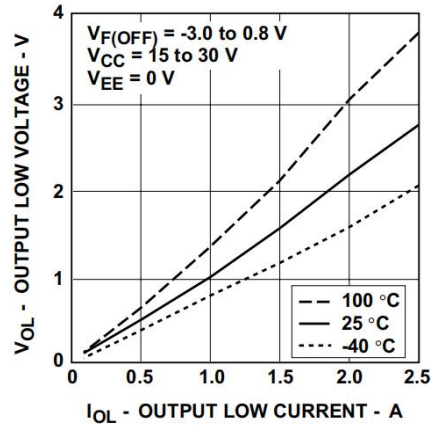


Figure 6. V_{OL} vs. I_{OL}.

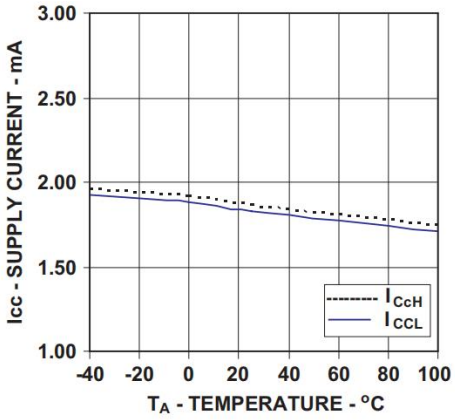


Figure 7. I_{CC} vs. Temperature

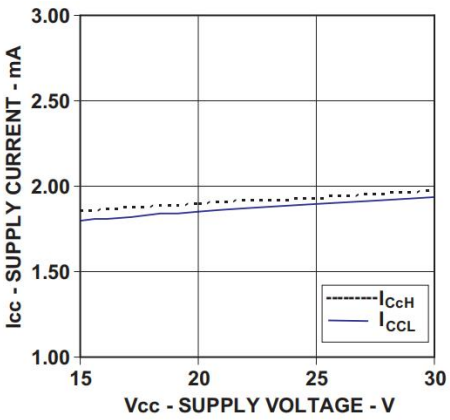


Figure 8. I_{CC} vs. V_{CC}

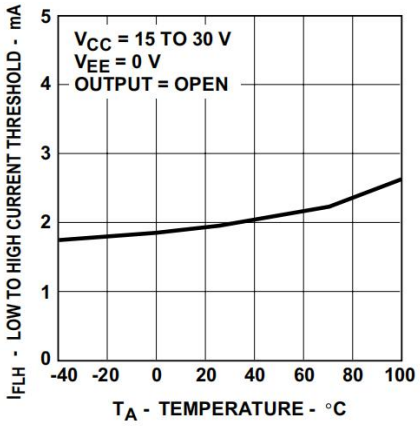


Figure 9. I_{FLH} vs. temperature.

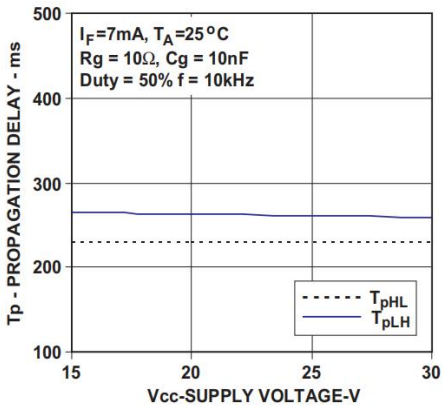


Figure 10. Propagation delay vs. V_{CC}.

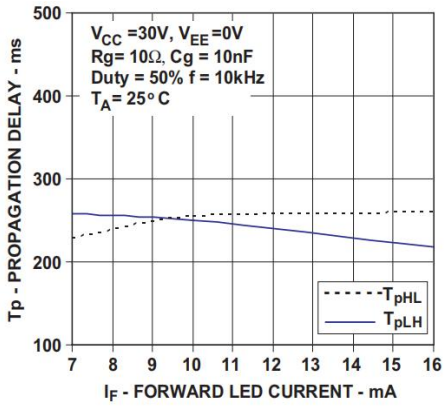


Figure 11. Propagation delay vs. I_F.

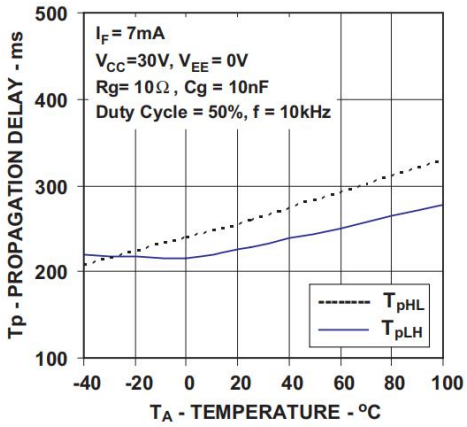


Figure 12. Propagation delay vs. Temperature

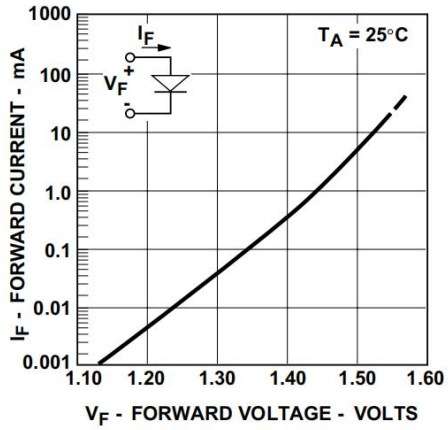


Figure 13. Input current vs. forward voltage.

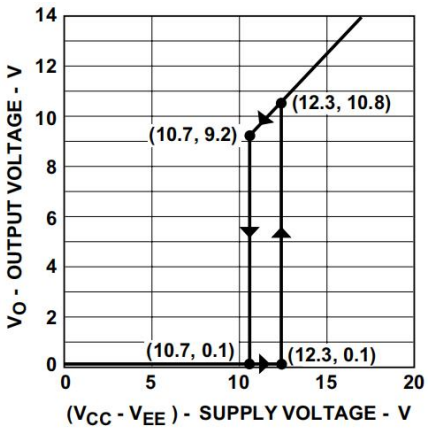


Figure 14. Under voltage lock out.

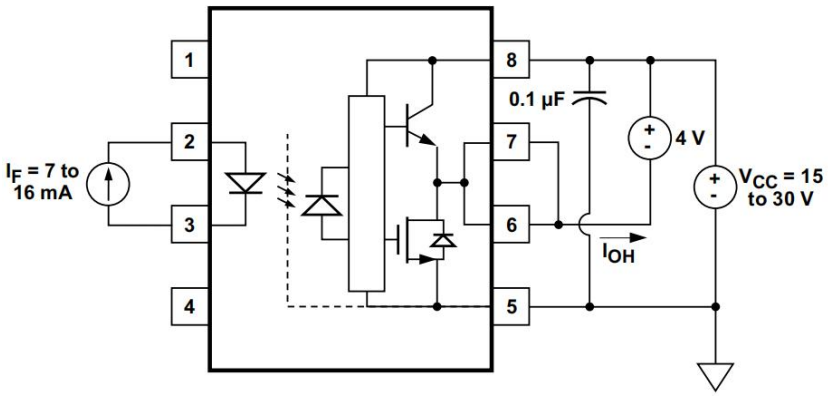


Figure 15. I_{OH} test circuit.

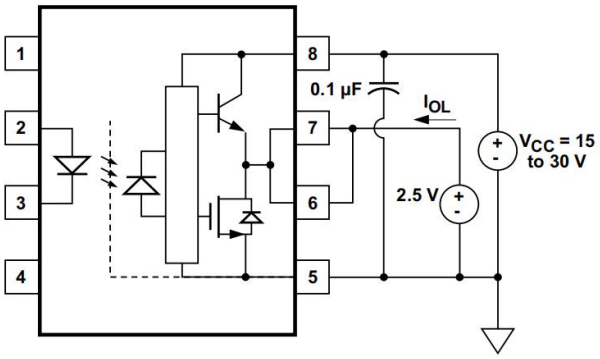


Figure 16. I_{OL} Test circuit.

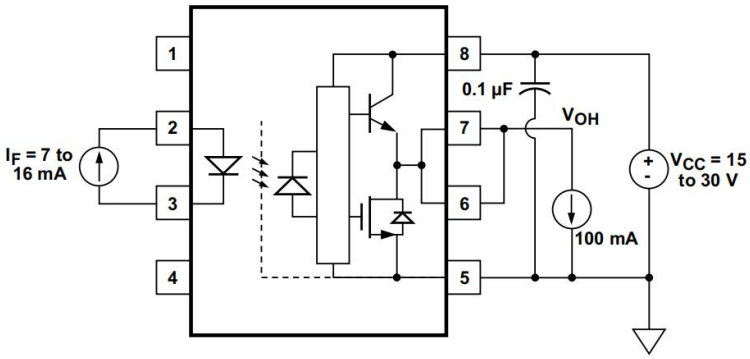


Figure 17. V_{OH} Test circuit.

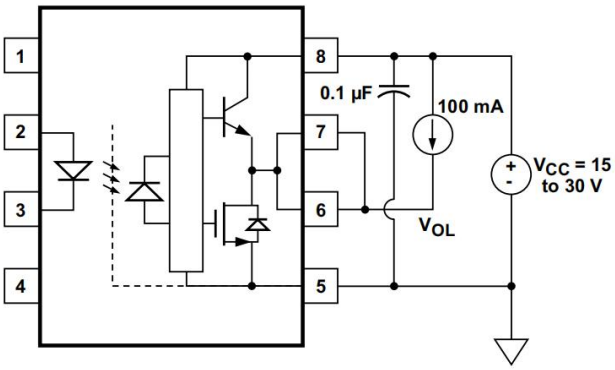


Figure 18. V_{OL} Test circuit.

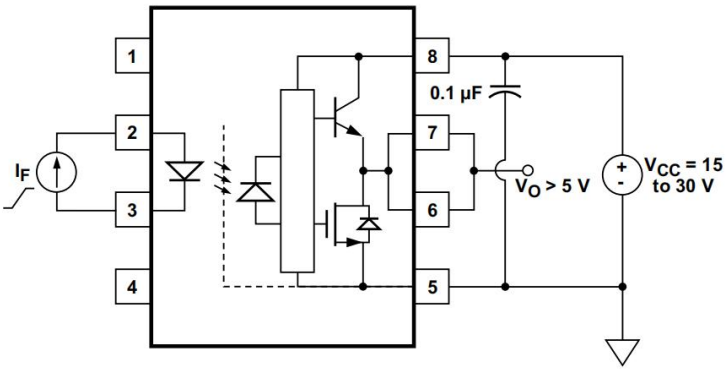


Figure 19. I_{FLH} Test circuit.

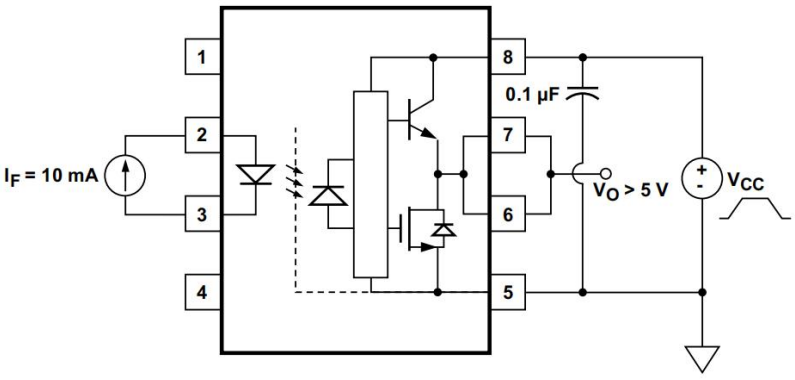
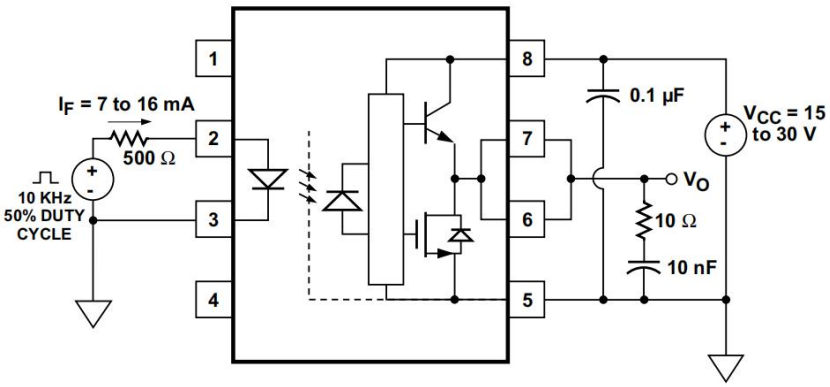


Figure 20. UVLO Test Circuit



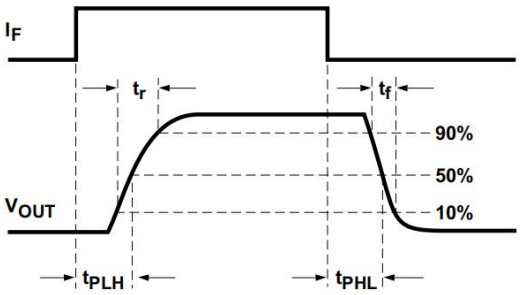
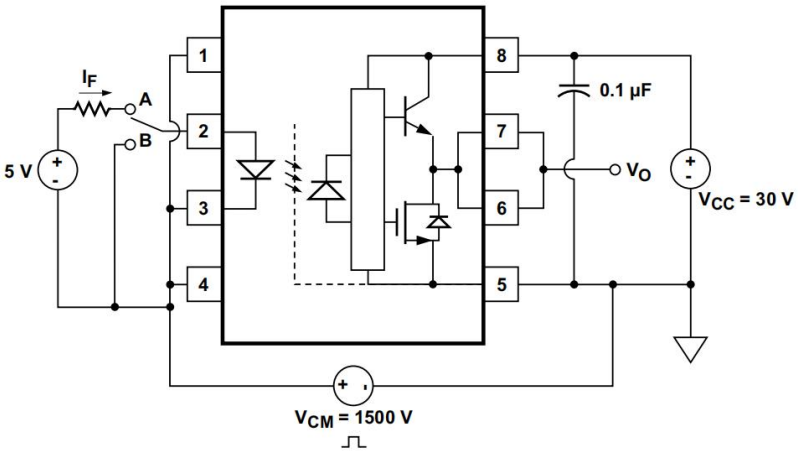


Figure 21. t_{PLH}, t_{PHL}, t_r, and t_f test circuit and waveforms.



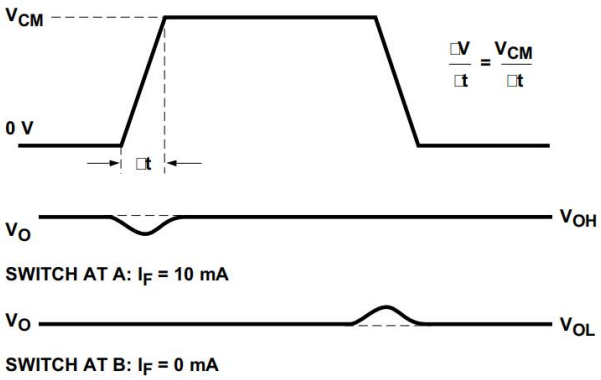


Figure 22. CMR test circuit and waveforms.