



ORIENT

Photo coupler

Product Data Sheet

Part Number: _____ OR-250H(B) _____

Customer: _____

Date: _____

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Preliminary

This datasheet is a preliminary design specification, and the formal specifications are subject to the recognition letter with jointly signed

1. Features

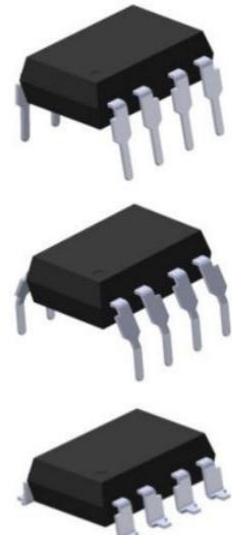
- (1) $\pm 3.0\text{A}$ maximum peak output current
- (2) $35\text{kV}/\mu\text{s}$ minimum Common Mode Rejection (CMR) at $V_{\text{CM}} = 1500\text{V}$
- (3) $I_{\text{CC}} = 3\text{ mA}$ maximum supply current
- (4) Under voltage lock-out protection (UVLO) with hysteresis
- (5) Wide operating V_{CC} range: 10V to 30V
- (6) $0.5\mu\text{s}$ maximum propagation delay
- (7) Industrial temperature range: -40°C to 125°C
- (8) Safety approval

UL approved(No.E323844)

VDE approved(No.40029733)

CQC approved (No.CQC19001231254)

- (9) In compliance with RoHS, REACH standards
- (10) MSL Class I



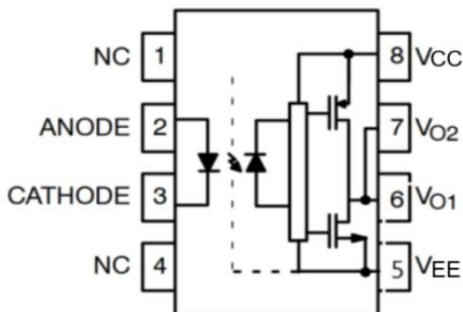
2. Instructions

The OR-250H(B) consists of an LED optically coupled to an integrated circuit with a power output stage. This optocoupler is 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.

3. Application Range

- (1) IGBT/MOSFET gate drive
- (2) AC/Brushless DC motor drives
- (3) Industrial inverter
- (4) Switch mode power supplies
- (5) Induction Cooktop and Home Appliances

4. Functional Diagram



Truth Table				
LED	VCC – VEE “POSITIVE GOING” (TURN-ON)		VCC – VEE “NEGATIVE GOING” (TURN-OFF)	
	VCC – VEE	VO	VCC – VEE	VO
OFF	0 – 30 V	LOW	30 – 0 V	LOW
ON	0 – 6.9 V	LOW	30 – 7.5 V	HIGH
ON	6.9 – 8.7 V	TRANSITION	7.5 – 5.9 V	TRANSITION
ON	8.7 – 30 V	HIGH	5.9 – 0 V	LOW

Note 1: A $0.1\mu\text{F}$ bypass capacitor must be connected between pins 5 and 8.

Note 2: Pin 1 and Pin 4 are suspension pins. Please do not connect to external circuits.

5. Absolute Maximum Ratings (Ta=25°C)*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	$I_{OH(PEAK)}$	3.0	A
	“Low” Peak Output Current	$I_{OL(PEAK)}$	3.0	A
	Output Power Dissipation	P_O	250	mW
Total Power Dissipation		P_T	295	mW
Total Output Supply Voltage		$V_{CC} - V_{EE}$	35	V
Output Voltage		$V_{O(PEAK)}$	V_{CC}	V
Insulation Voltage		V_{ISO}	5000	Vrms
Maximum Working Insulation Voltage		V_{IORM}	850	Vpeak
Operating Temperature		T_{opr}	-40 ~ + 125	°C
Storage Temperature		T_{stg}	-55 ~ + 150	
*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	125	°C
Power Supply	V_{CC}	10	30	V
Input Current	$I_{F(ON)}$	7	16	mA
Input Voltage(OFF)	$V_{F(OFF)}$	0	0.8	V

7. Electrical Optical Characteristics

Unless otherwise noted, all typical values are at $T_A = 25^\circ\text{C}$, $V_{CC} - V_{EE} = 30\text{V}$, $V_{EE} = \text{Ground}$; all minimum and maximum specifications are at recommended operating conditions ($T_A = -40$ to 125°C , $I_{F(\text{ON})} = 7$ to 16mA , $V_{F(\text{OFF})} = 0$ to 0.8V , $V_{EE} = \text{Ground}$, $V_{CC} = 10$ to 30V).

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
High Level Output Current	I_{OH}	—	-2.5	-1.0	A	$V_O = (V_{CC} - 3.5\text{V})$
		—	-3.3	-2.0		$V_O = (V_{CC} - 6\text{V})$
Low Level Output Current	I_{OL}	1.0	2.8	—	A	$V_O = (V_{EE} + 2.5\text{V})$
		2.0	3.3	—		$V_O = (V_{EE} + 6\text{V})$
High Level Output Voltage	V_{OH}	$(V_{CC} - 0.6)$	$(V_{CC} - 0.3)$	—	V	$I_F = 10\text{mA}$, $I_O = -100\text{mA}$
Low Level Output Voltage	V_{OL}	—	$(V_{EE} + 0.14)$	$(V_{EE} + 0.4)$	V	$I_F = 0\text{mA}$, $I_O = 100\text{mA}$
High Level Supply Current	I_{CCH}	—	1.4	3.0	mA	Output Open, $I_F = 7$ to 16mA
Low Level Supply Current	I_{CCL}	—	1.6	3.0	mA	Output Open, $V_F = 0$ to $+0.8\text{V}$
Threshold Input Current Low to High	I_{FLH}	—	3.0	5.0	mA	$V_{CC} = 15\text{V}$, $V_O > 1\text{V}$
Threshold Input Voltage High to Low	V_{FHL}	0.8	—	—	V	$V_{CC} = 15\text{V}$, $V_O < 1\text{V}$
Input Forward Voltage	V_F	1.2	1.4	1.8	V	$I_F = 10\text{mA}$
Temperature Coefficient of Forward Voltage	$\Delta V_F / \Delta T_A$	—	-1.6	—	mV/ $^\circ\text{C}$	$I_F = 10\text{mA}$
Input Reverse Breakdown Voltage	B_{VR}	5	—	—	V	$I_R = 10\mu\text{A}$
Input Capacitance	C_{IN}	—	70	—	pF	$f = 1\text{MHz}$, $V_F = 0\text{V}$
UVLO Threshold	V_{UVLO+}	6.9	7.9	8.7	V	$V_O > 2.5\text{V}$, $I_F = 10\text{mA}$
	V_{UVLO-}	5.9	6.8	7.5	V	$V_O < 2.5\text{V}$, $I_F = 10\text{mA}$
UVLO Hysteresis	$UVLO_{HYS}$	—	1.0	—	V	—

1. All typical values at $T_A = 25^\circ\text{C}$ and $V_{CC} - V_{EE} = 30\text{V}$, unless otherwise noted.

2. Maximum pulse width = $10\mu\text{s}$, 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 = $50\mu\text{s}$, maximum duty cycle = 0.5%.

4. In this test, V_{OH} is measured with a dc load current. When driving capacitive loads V_{OH} will approach V_{CC} as IOH approaches zero amps.

5. Maximum pulse width = 1 ms, maximum duty cycle = 20%.

8. Switching Characteristics

Unless otherwise noted, all typical values are at $T_A = 25^\circ\text{C}$, $V_{CC} - V_{EE} = 30\text{ V}$, $V_{EE} = \text{Ground}$; all minimum and maximum specifications are at recommended operating conditions ($T_A = -40$ to 125°C , $I_{F(\text{ON})} = 7$ to 16 mA , $V_{F(\text{OFF})} = 0$ to 0.8 V , $V_{EE} = \text{Ground}$, $V_{CC} = 10$ to 30 V).

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Propagation Delay Time to High Output Level	t_{PLH}	100	—	500	ns	$R_g = 20\Omega$, $C_g = 10\text{ nF}$, $f = 250\text{ kHz}$, Duty Cycle = 50% $I_F = 7$ to 16 mA , $V_{CC} = 10$ to 30 V
Propagation Delay Time to Low Output Level	t_{PHL}	100	—	500		
Pulse Width Distortion	PWD	—	15	50		
Propagation Delay Difference Between Any Two Parts	PDD	-150	—	150		
Rise Time	T_r	—	50	—		
Fall Time	T_f	—	50	—		
Output High Level Common Mode Transient Immunity	$ CM_H $	35	50	—	kV/ μs	$T_A = 25^\circ\text{C}$, $V_{CM} = 1500\text{ V}$, $I_F = 10$ to 16 mA , $V_{CC} = 30\text{ V}$
Output Low Level Common Mode Transient Immunity	$ CM_L $	35	50	—	kV/ μs	$T_A = 25^\circ\text{C}$, $V_{CM} = 1500\text{ V}$, $V_F = 0\text{ V}$, $V_{CC} = 30\text{ V}$

1. All typical values at $T_A = 25^\circ\text{C}$ and $V_{CC} - V_{EE} = 30\text{ V}$, unless otherwise noted.

2. Pulse Width Distortion (PWD) is defined as $|t_{PHL} - t_{PLH}|$ for any given device.

3. The difference between t_{PHL} and t_{PLH} between any two parts under the same test condition.

4. Common mode transient immunity in the high state is the maximum tolerable dV_{CM}/dt of the common mode pulse, V_{CM} , to assure that the output will remain in the high state (i.e., $V_O > 15.0\text{ V}$).

5. Common mode transient immunity in a low state is the maximum tolerable dV_{CM}/dt of the common mode pulse, V_{CM} , to assure that the output will remain in a low state (i.e., $V_O < 1.0\text{ V}$).

9. Order Information

Part Number

OR-250H(B)U-Y-Z

Note

250H(B) = Part Number.

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

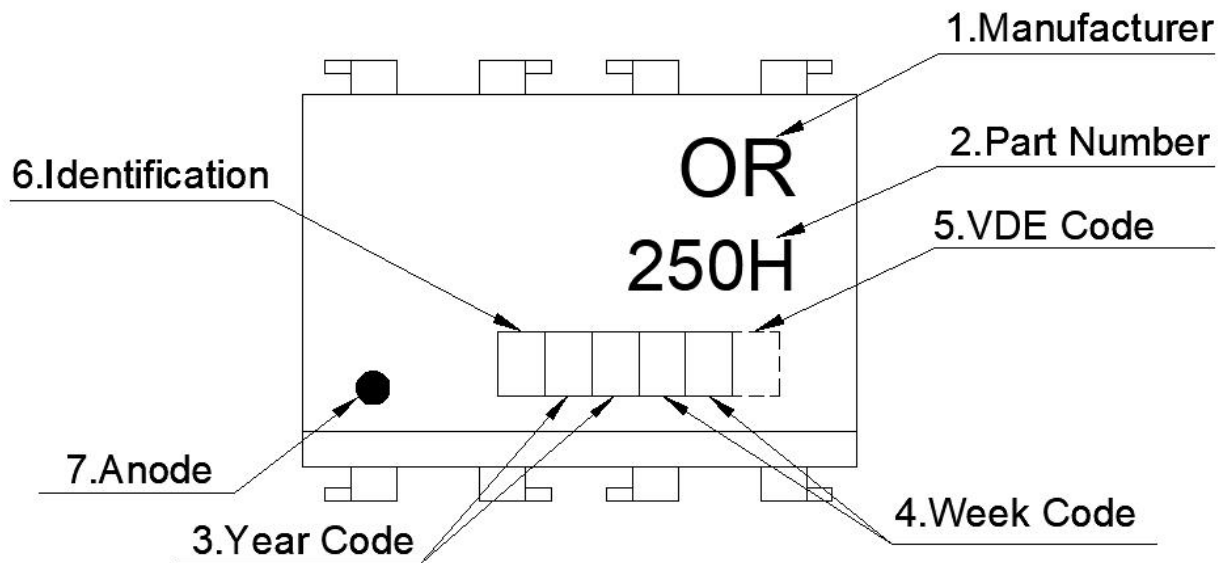
Y = Tape and reel option (TA, TA1 or none).

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

* VDE Code can be selected.

Option	Description	Packing quantity
None	Standard DIP 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

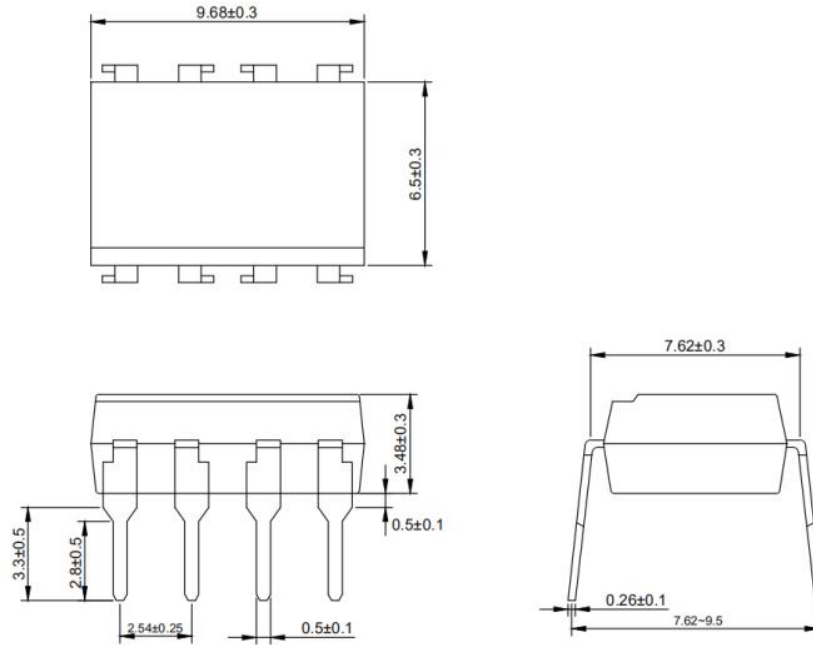


1. Manufacturer : ORIENT.
2. Part Number : 250H.
3. Year Code : '21' means '2021' and so on.
4. Week Code : 01 represents the first week, 02 represents the second week, and so on.
5. VDE Code . (Optional)
6. Identification "B".
7. Anode.

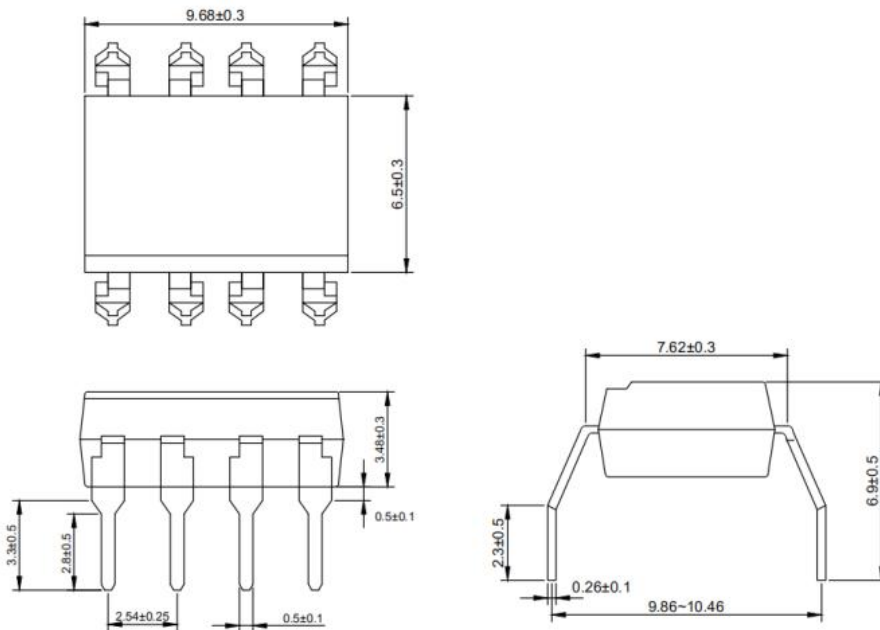
* VDE Mark can be selected.

11. Outer Dimension

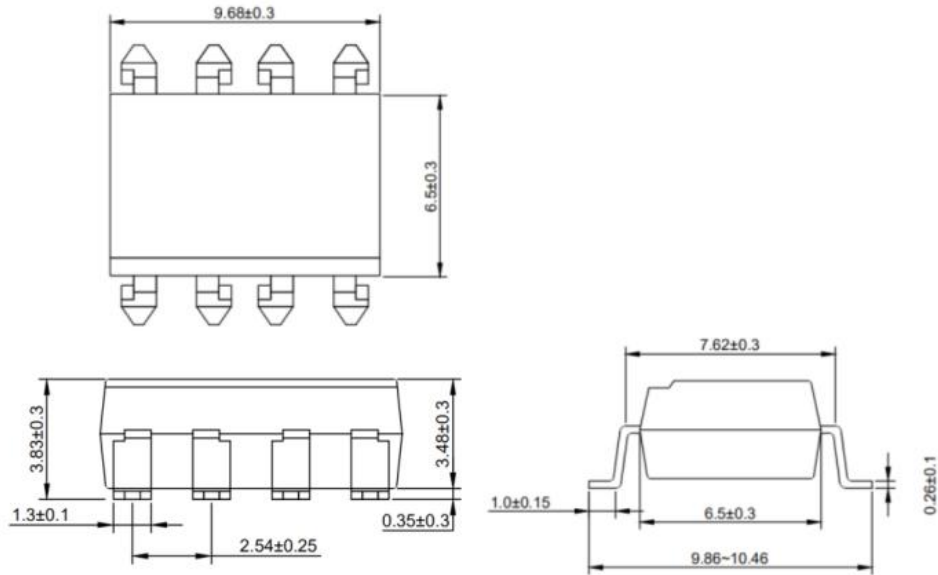
(1) OR-250H(B)



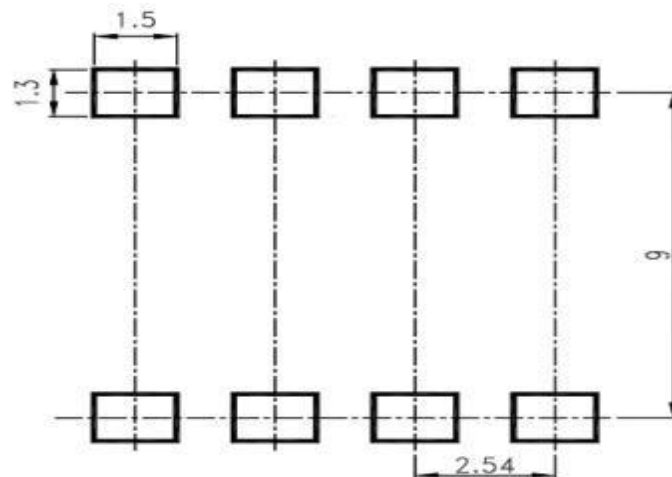
(2) OR-250H(B)M



(3) OR-250H(B)S



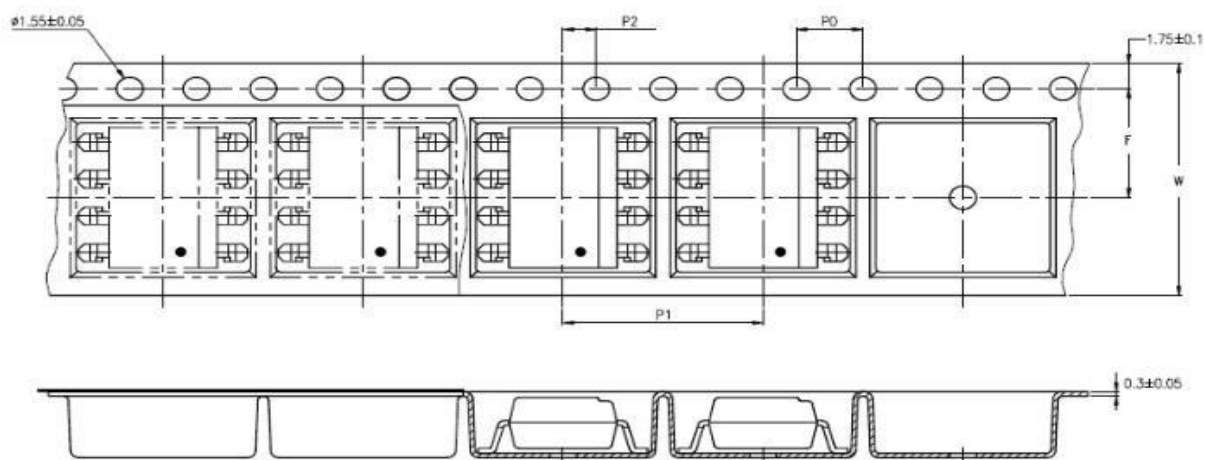
12. Recommended Foot Print Patterns (Mount Pad)



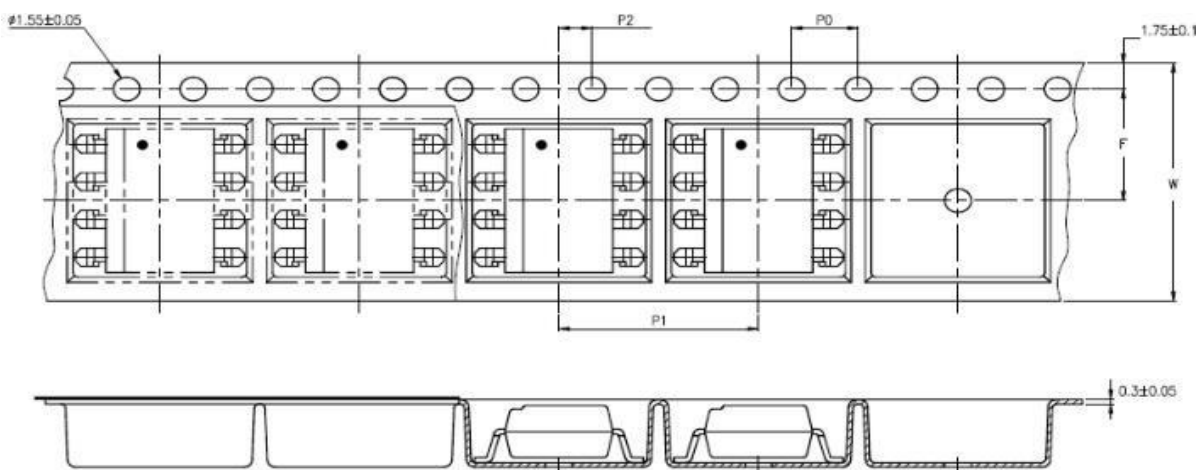
unit: mm

13. Taping Dimensions

(1) OR-250H(B)S-TA



(2) OR-250H(B)S-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

14. Package Dimension

(1) package dimension

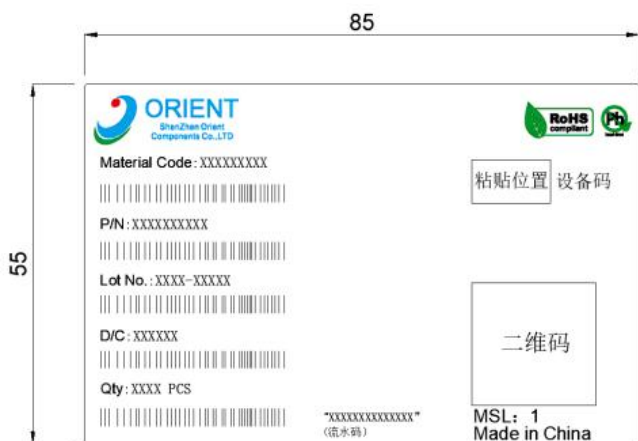
DIP Type

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:

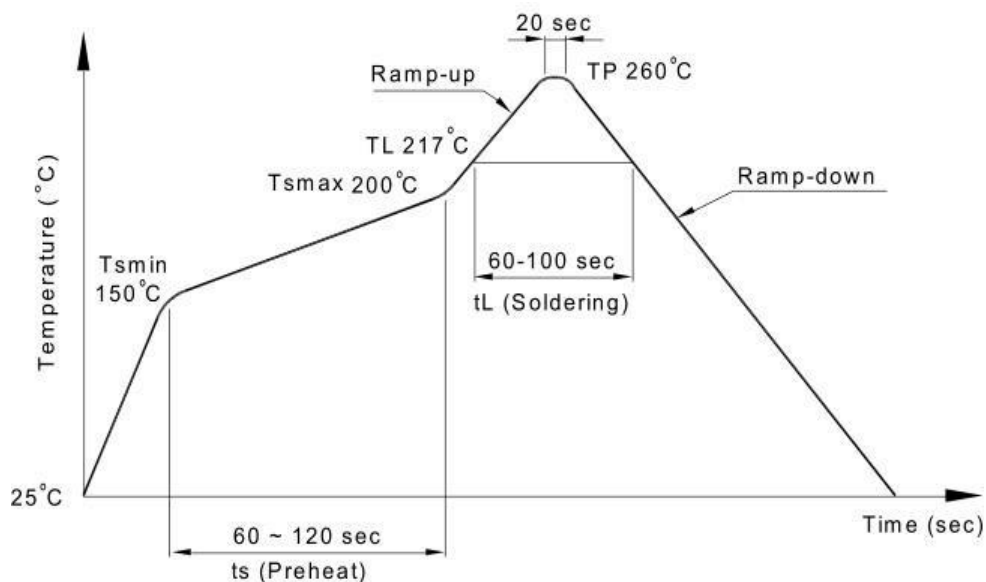
1. Material Code :Product ID.
2. P/N :Contents with "Order Information" in the specification.
3. Lot No. :Product data.
4. D/C :Product weeks.
5. Quantity :Packaging quantity.

15. Temperature Profile Of Soldering

(1).IR Reflow soldering (JEDEC-STD-020 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.

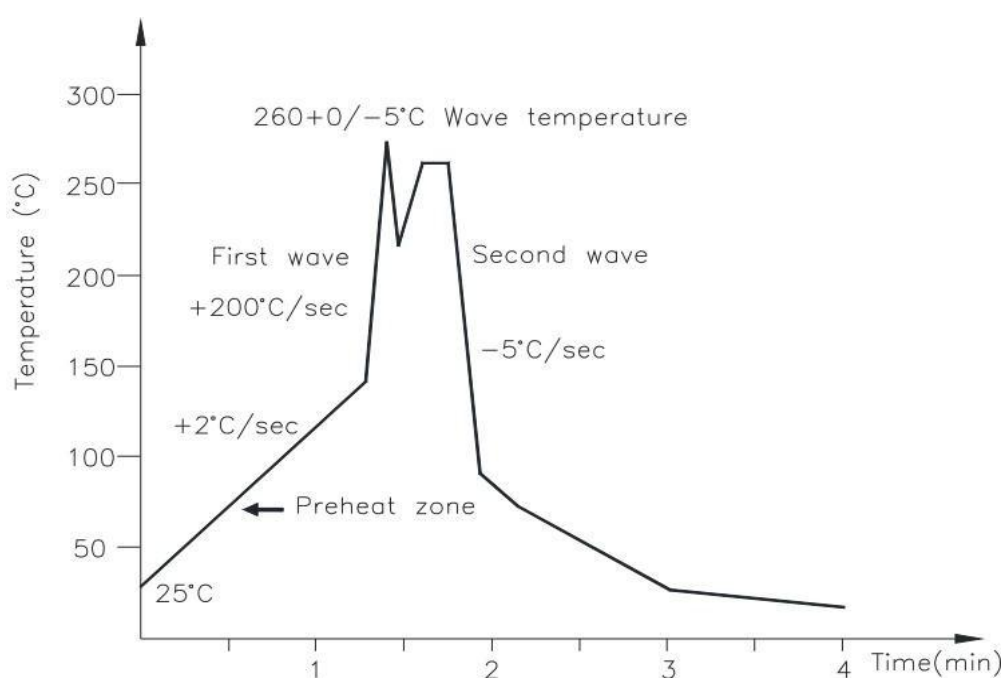
Profile item	Conditions
Preheat	
- Temperature Min (T Smin)	150°C
- Temperature Max (T Smax)	200°C
- Time (min to max) (ts)	90±30 sec
Soldering zone	
- Temperature (TL)	217°C
- Time (t L)	60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak temperature	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 80sec



(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 Curves & Test Circuits

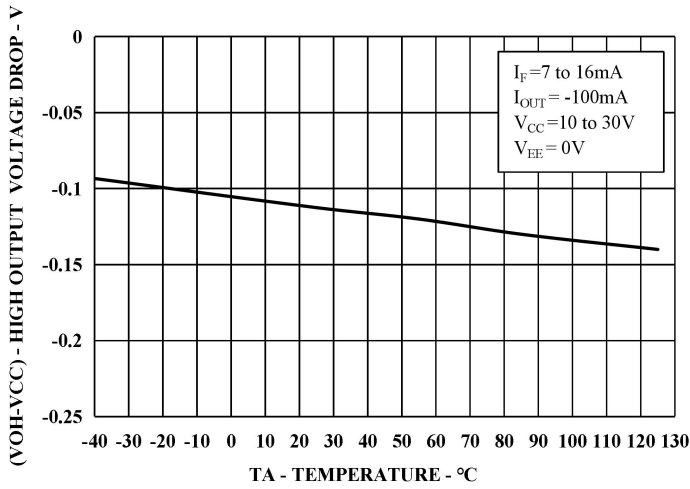


Figure 1: V_{OH} vs. Temperature

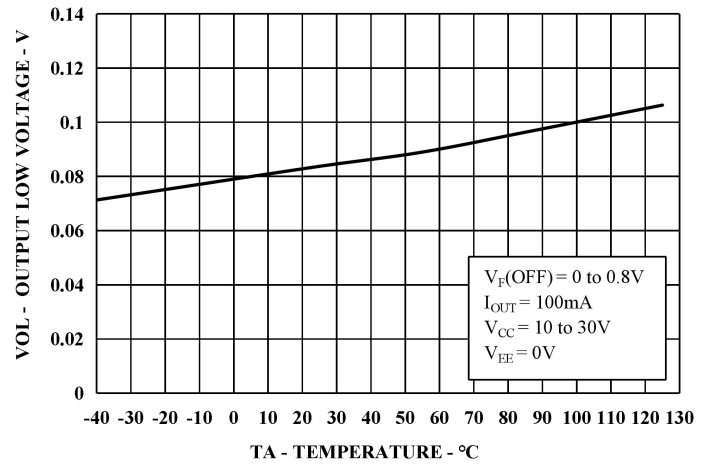


Figure 2: V_{OL} vs. Temperature

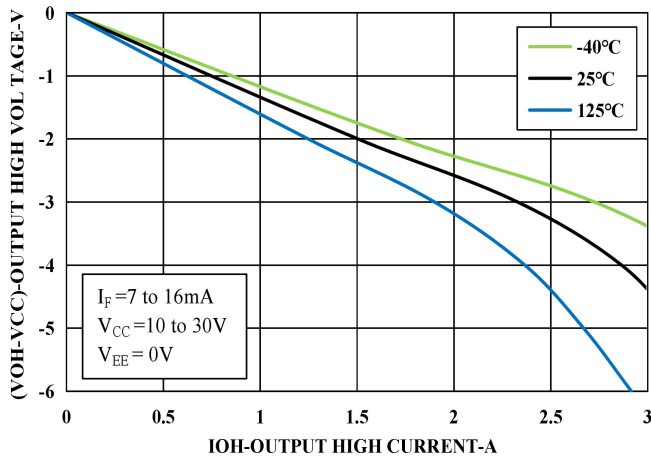


Figure 3: V_{OH} vs. I_{OH}

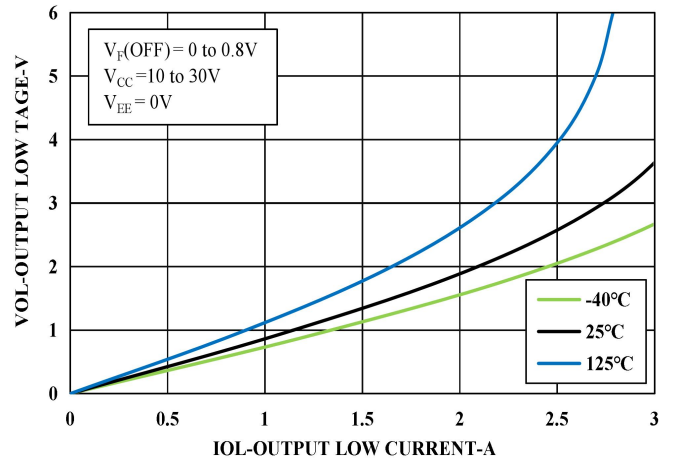


Figure 4: V_{OL} vs. I_{OL}

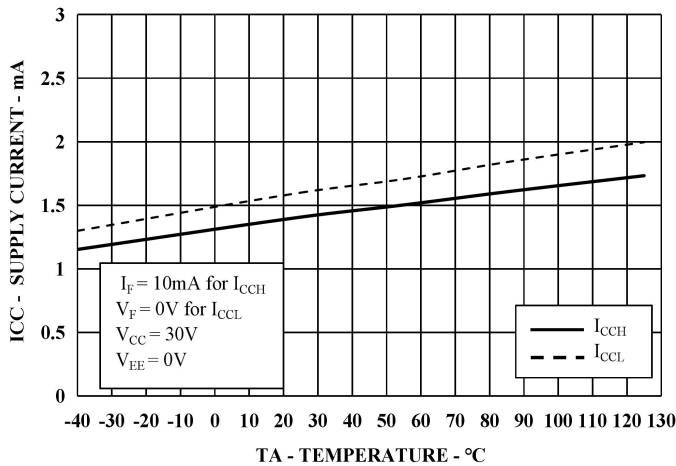


Figure 5: I_{CC} vs. Temperature

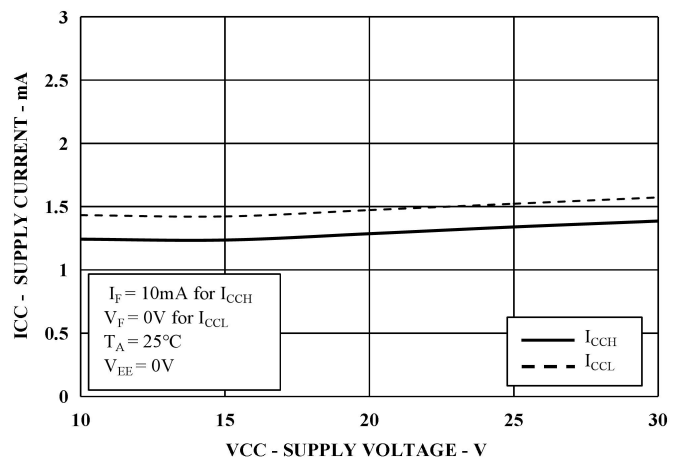


Figure 6: I_{CC} vs. V_{CC}

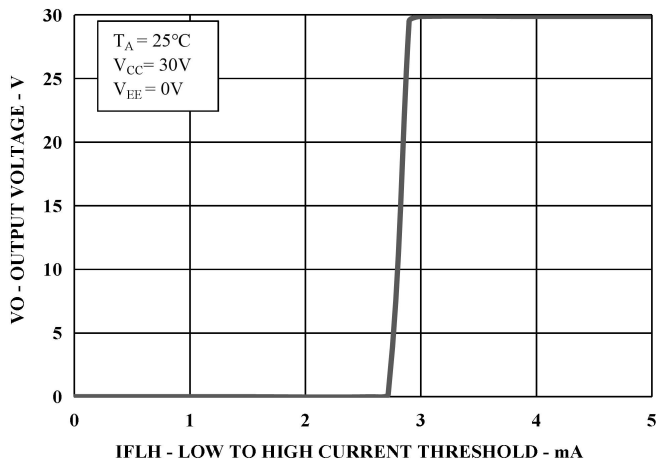


Figure 7: Transfer Characteristics

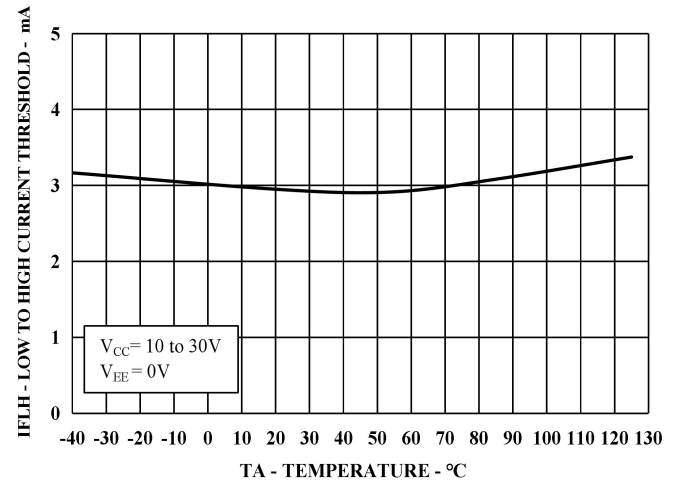
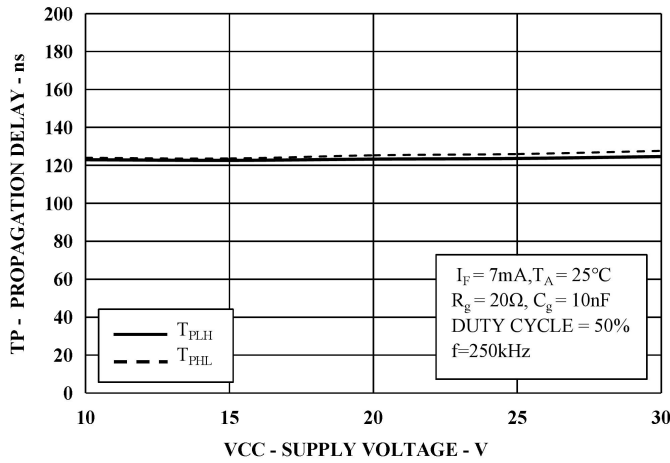
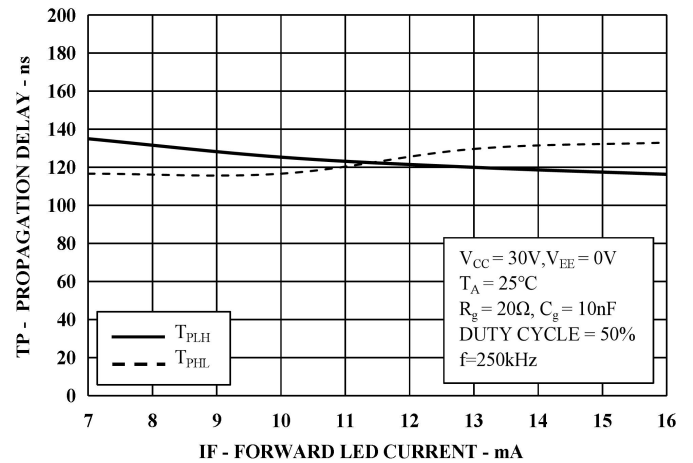
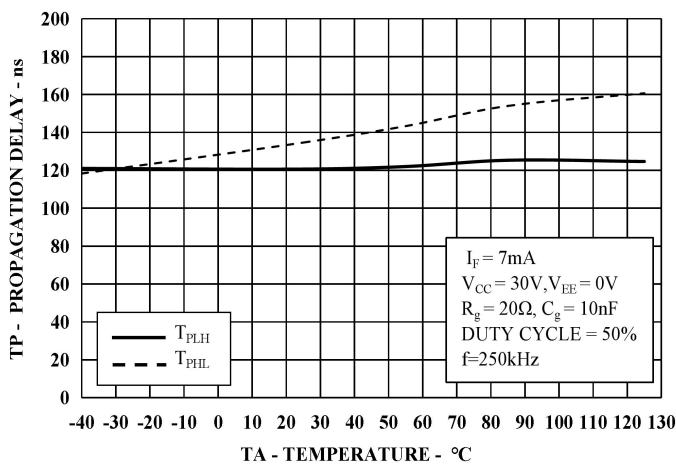
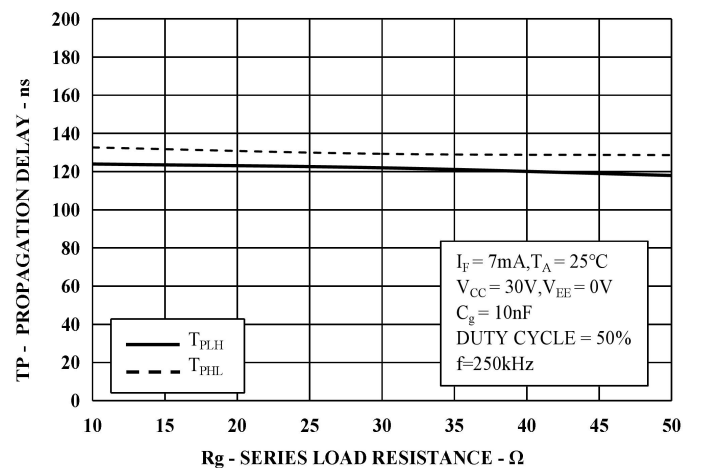

Figure 8: I_{FLH} vs. Temperature

Figure 9: Propagation Delay vs. V_{CC}

Figure 10: Propagation Delay vs. I_F


Figure 11: Propagation Delay vs. Temperature


Figure 12: Propagation Delay vs. R_g

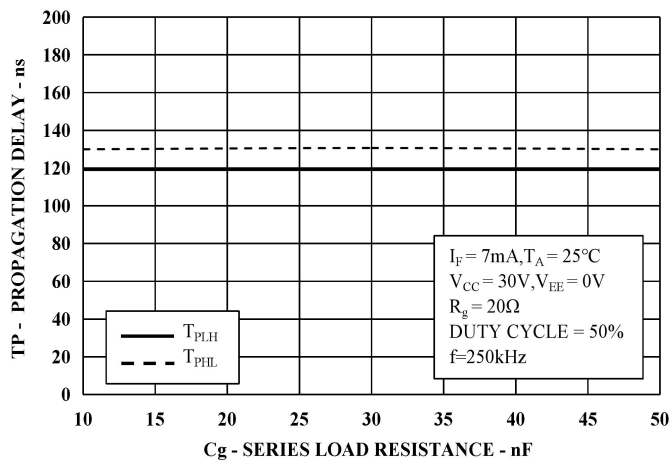


Figure 13: Propagation Delay vs. Cg

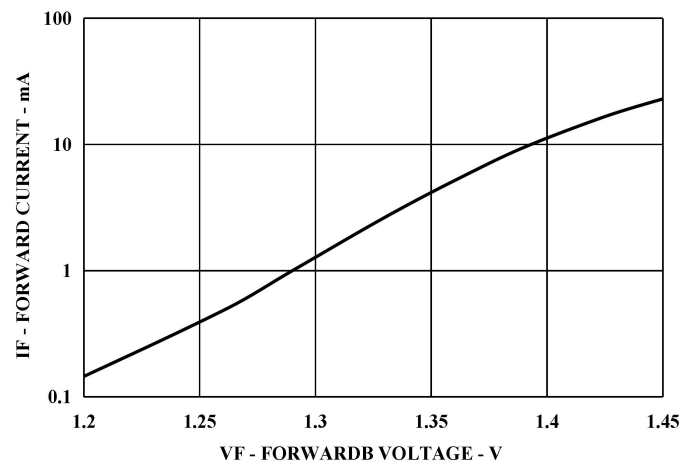
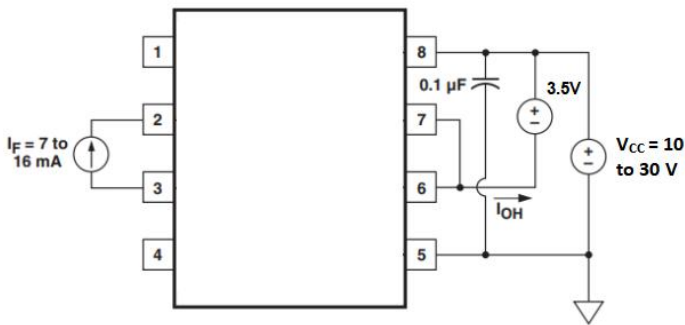
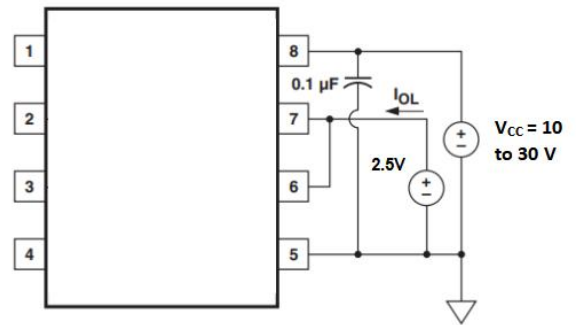
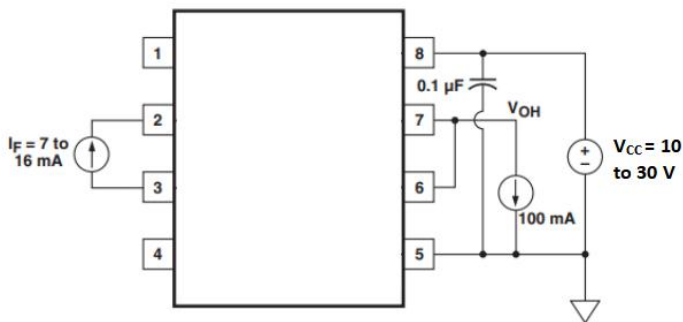
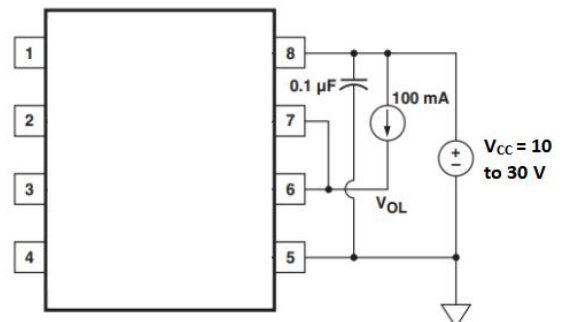


Figure 14: Input Current vs Forward Voltage


Figure 15: I_{OH} Test Circuit

Figure 16: I_{OL} Test Circuit

Figure 17: V_{OH} Test Circuit

Figure 18: V_{OL} Test Circuit

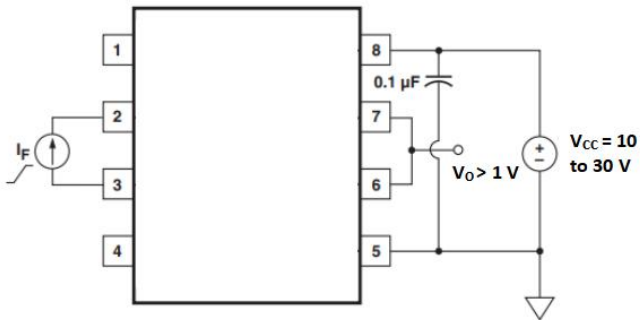
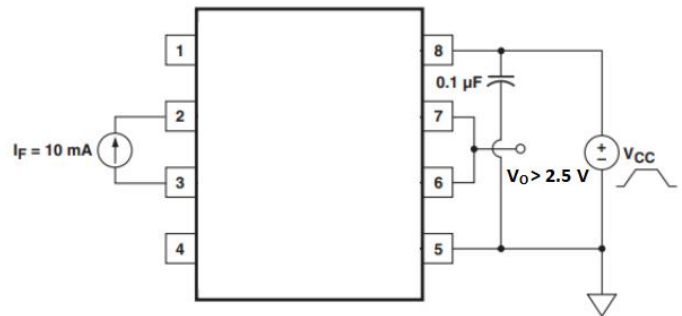

Figure 19: I_{FLH} Test Circuit


Figure 20: UVLO Test Circuit

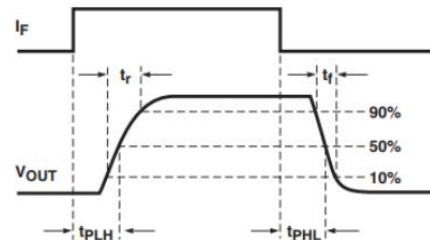
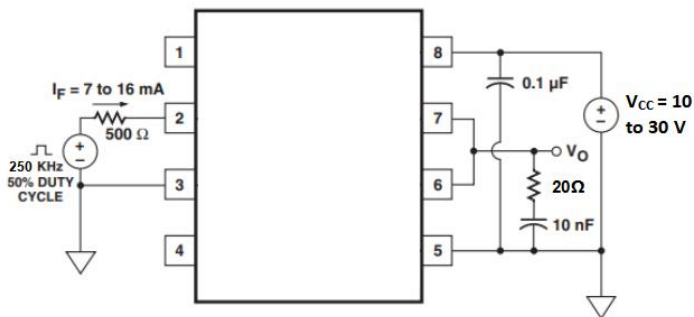
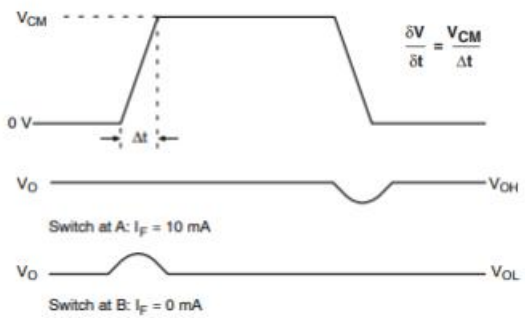
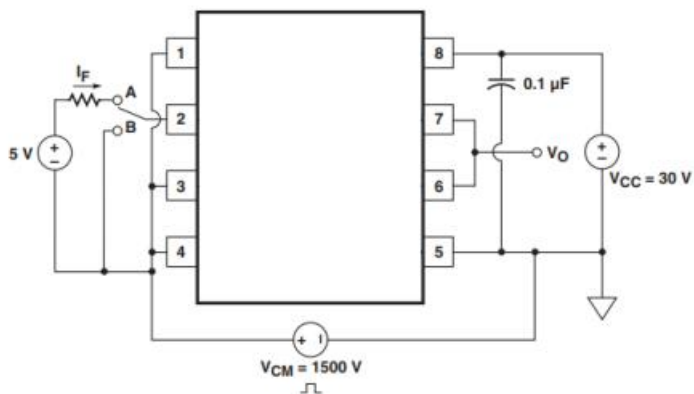

Figure 21: t_{PLH} , t_{PHL} , t_r , and t_f Test Circuit Waveforms


Figure 22: CMR Test Circuit and Waveforms



17. Notes

17.1 Orient is continually improving the quality, reliability, function or design and Orient reserves the right to make changes without further notices.

17.2 The products shown in this publication are designed for the general use in electronic applications such as office automation equipment, communications devices, audio/visual equipment, electrical application and instrumentation.

17.3 For equipment/devices where high reliability or safety is required, such as space applications, nuclear power control equipment, medical equipment, etc, please contact our sales representatives.

17.4 When requiring a device for any “specific” application, please contact our sales in advice.

17.5 If there are any questions about the contents of this publication, please contact us at your convenience.

17.6 The contents described herein are subject to change without prior notice.

17.7 Immerge unit’s body in solder paste is not recommended.