



ORIENT

Photo coupler

Product Data Sheet

Part Number: OR-3120(B)_OR-3150(B)

Customer: _____

Date: _____

SHENZHEN ORIENT COMPONENTS CO., LTD

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

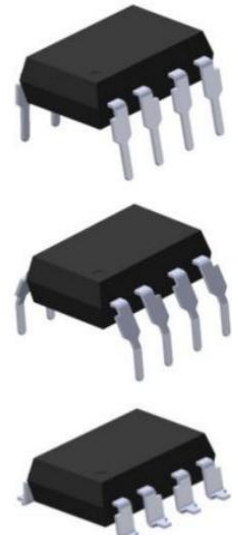
TEL: 0755-29681816

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www.orient-opto.com

1. Features

- (1) 1.5A maximum peak output current for OR-3150(B),
3.0A maximum peak output current for OR-3120(B).
- (2) 35-kV/ μ s minimum Common Mode Rejection (CMR) at $V_{CM} = 1500V$
- (3) 1.0V maximum low level output voltage (V_{OL}) eliminates need for negative gate drive
- (4) $I_{CC} = 5\text{ mA}$ maximum supply current
- (5) Under voltage lock-out protection (UVLO) with hysteresis
- (6) Wide operating V_{CC} range: 15V to 35V
- (7) 0.2 μ s maximum propagation delay
- (8) $\pm 0.1\mu$ s maximum delay between devices/channels
- (9) Industrial temperature range: $-40^{\circ}C$ to $110^{\circ}C$
- (10) Safety approval
 - UL approved(No.E323844)
 - VDE approved(No.40029733)
 - CQC approved (No.CQC19001231254)
- (11) In compliance with RoHS, REACH standards
- (12) MSL Class I



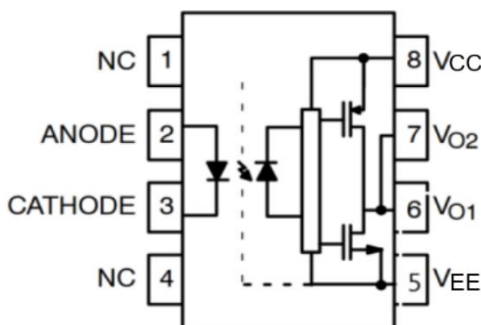
2. Instructions

The OR-3120(B)/OR-3150(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. The voltage and current supplied by this optocoupler makes it ideally suited for directly driving IGBTs with ratings up to 1200V/50A.

3. Application Range

- (1) IGBT/MOSFET gate drive
- (2) AC/Brushless DC motor drives
- (3) Industrial inverters
- (4) Switch mode power supplies

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 – 11.0 V	LOW	30 – 12.0 V	HIGH
ON	11.0 – 13.5 V	TRANSITION	12.0 – 9.5 V	TRANSITION
ON	13.5 – 30 V	HIGH	9.5 – 0 V	LOW

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	OR-3120(B)	3.0	A
		OR-3150(B)	1.5	
	“Low” Peak Output Current	OR-3120(B)	3.0	A
		OR-3150(B)	1.5	
Output Collector Power Dissipation		P_O	250	mW
Total Power Dissipation		P_T	295	mW
Total Output Supply Voltage		$V_{CC} - V_{EE}$	35	V
Total Output Supply Voltage (90°C)		$V_{CC} - V_{EE}$	30	V
Insulation Voltage		V_{iso}	5000	V _{rms}
Working Temperature		T_{opr}	-40 ~ + 110	°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	110	°C
Power Supply	$V_{CC} - V_{EE}$	15	30	V
Input Current	$I_{F(ON)}$	7	16	mA
Input Voltage(OFF)	$V_{F(OFF)}$	0	0.8	V

7. Opto-electronic Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Units	Test Conditions
High Level Output Current	OR-3120	I_{OH}	1.0	2.3	2.5	A	$V_O = (V_{CC} - 3V)$
			2.0	—	2.5		$V_O = (V_{CC} - 6V)$
	OR-3150		0.2	—	—		$V_O = (V_{CC} - 0.75V)$
			1.0	—	—		$V_O = (V_{CC} - 4V)$
Low Level Output Current	OR-3120	I_{OL}	1.0	2.5	2.5	A	$V_O = (V_{EE} + 3V)$
			2.0	—	2.5		$V_O = (V_{EE} + 6V)$
	OR-3150		0.2	—	—		$V_O = (V_{EE} + 0.75V)$
			1.0	—	—		$V_O = (V_{EE} + 4V)$
High Level Output Voltage		V_{OH}	$(V_{CC} - 0.3)$	$(V_{CC} - 0.1)$	—	V	$I_O = -100 \text{ mA}$
Low Level Output Voltage	OR-3120	V_{OL}	—	0.06	0.25	V	$I_O = 100 \text{ mA}$
	OR-3150		—	0.4	1.0		
High Level Supply Current		I_{CCH}	—	1.5	3.0	mA	Output Open, $I_F = 7$ to 16 mA
Low Level Supply Current		I_{CCL}	—	1.6	3.0	mA	Output Open, $V_F = -3.0$ to $+0.8V$
Threshold Input Current Low to High		I_{FLH}	—	1.9	5.0	mA	$I_O = 0 \text{ mA}, V_O > 5V$
Threshold Input Voltage High to Low		V_{FHL}	0.8	—	—	V	$I_O = 0 \text{ mA}, V_O < 5V$
Input Forward Voltage		V_F	1.2	1.5	1.8	V	$I_F = 10 \text{ mA}$
Temperature Coefficient of Forward Voltage		$\Delta V_F / \Delta T_A$	—	-1.6	—	mV/°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	$f = 1 \text{ MHz}, V_F = 0V$
UVLO Threshold	V_{UVLO+}	11.0	12.7	13.5	V	$V_O > 5 \text{ V}$ $I_F = 10 \text{ mA}$	
	V_{UVLO-}	9.5	11.2	12.0			
UVLO Hysteresis	U_{VLOHYS}	—	1.5	—			
Insulation Impedance		R_{iso}	5×10^{10}	1×10^{12}	---	Ω	DC500V, 40~60%R.H.

- All typical values at $T_A = 25^\circ\text{C}$ and $V_{CC} - V_{EE} = 30V$, unless otherwise noted.
- Maximum pulse width = $10 \mu\text{s}$, maximum duty cycle = 0.2%. This value is intended to allow for component tolerances for designs with I_O peak minimum = 0.5 A. See Applications section for additional details on limiting I_{OH} peak.
- Maximum pulse width = $50 \mu\text{s}$, maximum duty cycle = 0.5%.
- In this test, V_{OH} is measured with a dc load current. When driving capacitive loads V_{OH} will approach V_{CC} as I_{OH} approaches zero amps.
- Maximum pulse width = 1 ms, maximum duty cycle = 20%.

8. Switching Characteristics

Parameter	Symbol	Min.	Typ	Max.	Units	Test Conditions
Propagation Delay Time to High Output Level	t_{PLH}	0.05	0.11	0.20	μs	OR-3120: $R_g=10\ \Omega, C_g=10\text{nF},$ $f=10\text{kHz},$ Duty Cycle=50%
Propagation Delay Time to Low Output Level	t_{PHL}	0.05	0.11	0.20	μs	
Pulse Width Distortion	PWD	—	0.005	0.06	μs	
Propagation Delay Difference Between Any Two Parts	PDD ($t_{PHL} - t_{PLH}$)	-0.1	—	0.1	μs	OR-3150: $R_g=47\Omega, C_g=3\text{nF},$ $f=10\text{kHz},$ Duty Cycle = 50%
Rise Time	t_r	—	0.05	—	μs	
Fall Time	t_f	—	0.05	—	μs	
UVLO Turn On Delay	$t_{UVLO\ ON}$	—	0.9	—	μs	$V_O > 5V, I_F = 10\text{mA}$
UVLO Turn Off Delay	$t_{UVLO\ OFF}$	—	0.8	—		$V_O < 5V, I_F = 10\text{mA}$
Output High Level Common Mode Transient Immunity	$ CM_H $	35	50	—	$\text{kV}/\mu\text{s}$	$T_A=25^\circ\text{C},$ $I_F=10\ \text{to}\ 16\text{mA},$
Output Low Level Common Mode Transient Immunity	$ CM_L $	35	50	—	$\text{kV}/\mu\text{s}$	$T_A=25^\circ\text{C},$ $V_{CM}=1500\text{V},$ $V_F=0\text{V}, V_{CC}=30\text{V}$

- All typical values at $T_A = 25^\circ\text{C}$ and $V_{CC} - V_{EE} = 30\text{V}$, unless otherwise noted.
- This load condition approximates the gate load of a 1200 V/75A IGBT.
- Pulse Width Distortion (PWD) is defined as $|t_{PHL} - t_{PLH}|$ for any given device.
- The difference between t_{PHL} and t_{PLH} between any two OR-3120(B) parts under the same test condition.
- Pins 1 and 4 need to be connected to LED common.
- 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., $V_O > 15.0\text{V}$).
- 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-3120(B)U-Y-Z
Or **OR-3150(B)U-Y-Z**

Note

3120(B) / 3150(B) = Part Number.

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

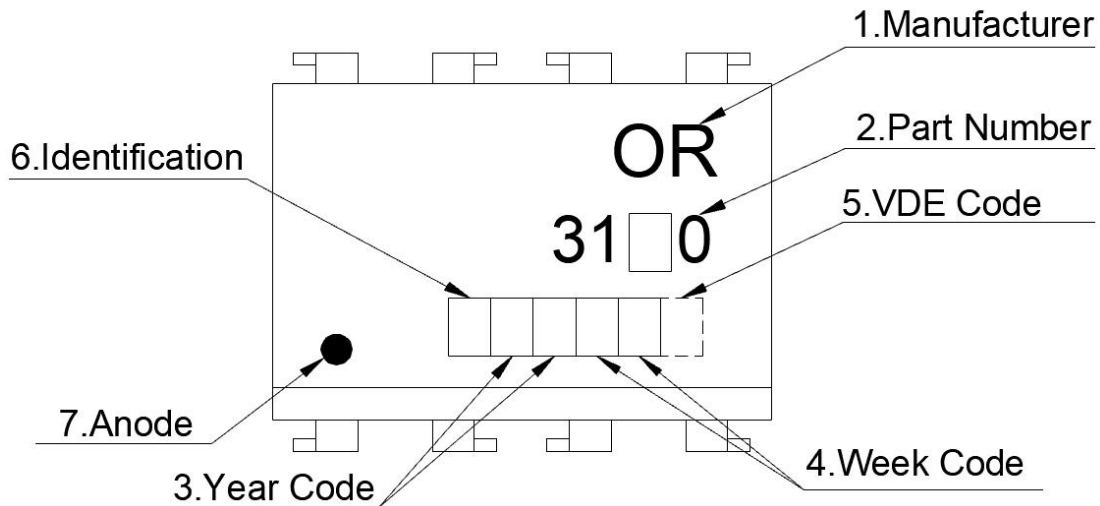
Y = Tape and reel option (TA,TA1 or none).

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



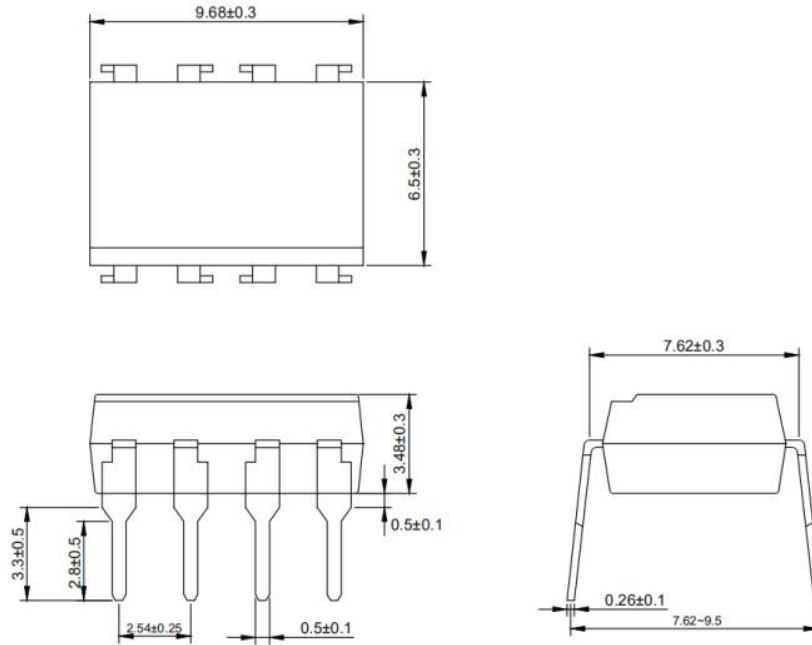
NOTE:

1. Manufacturer : ORIENT.
2. Part Number : 3120 or 3150.
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.

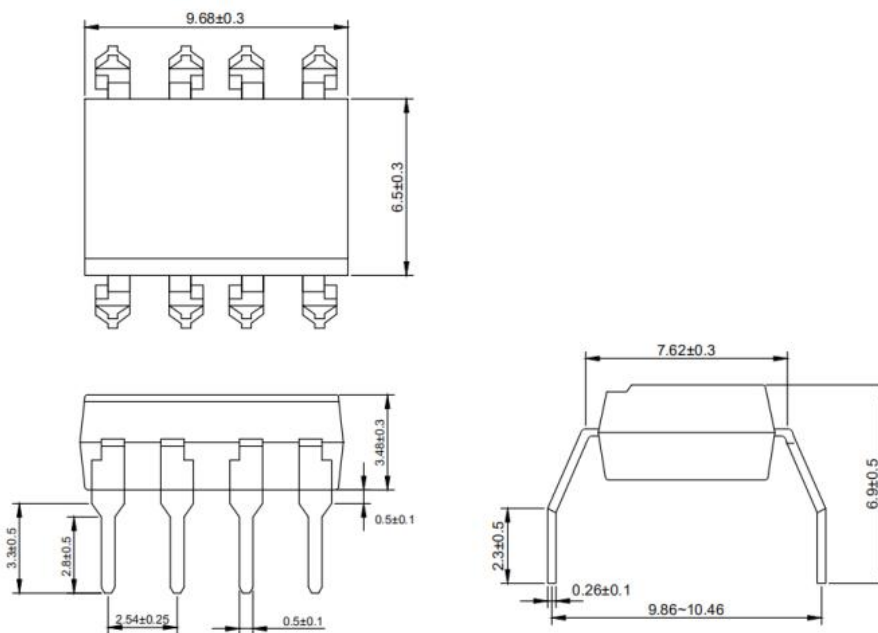
* VDE Mark can be selected.

11. Outer Dimension

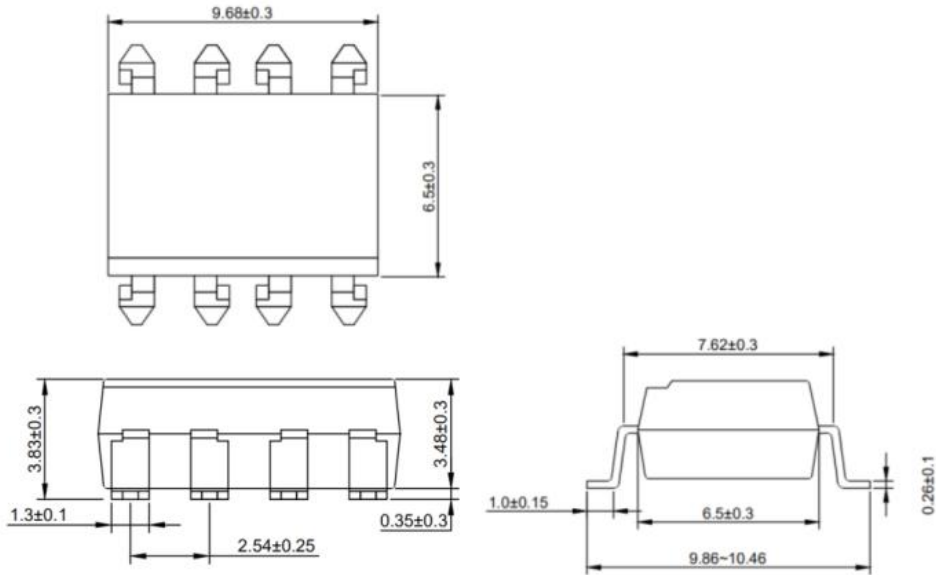
(1) OR-3120(B)_OR-3150(B)



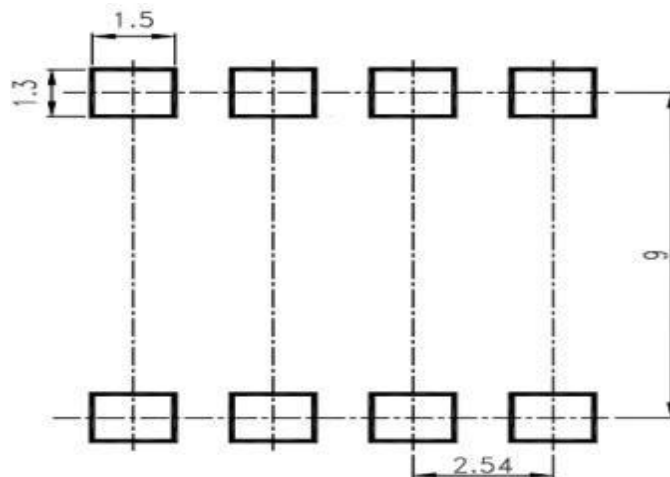
(2) OR-3120(B)M_OR-3150(B)M



(3) OR-3120(B)S_OR-3150(B)S



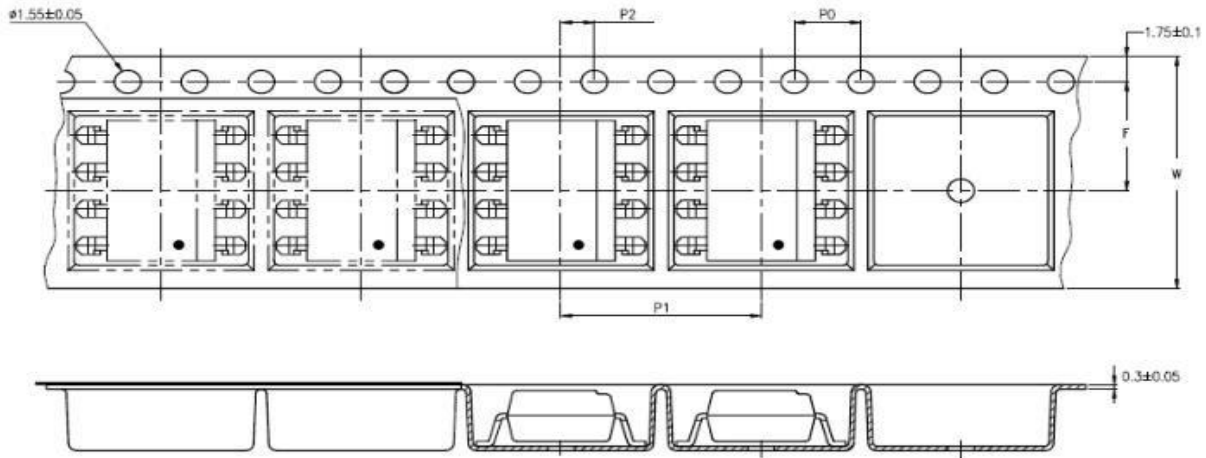
12. Recommended Foot Print Patterns (Mount Pad)



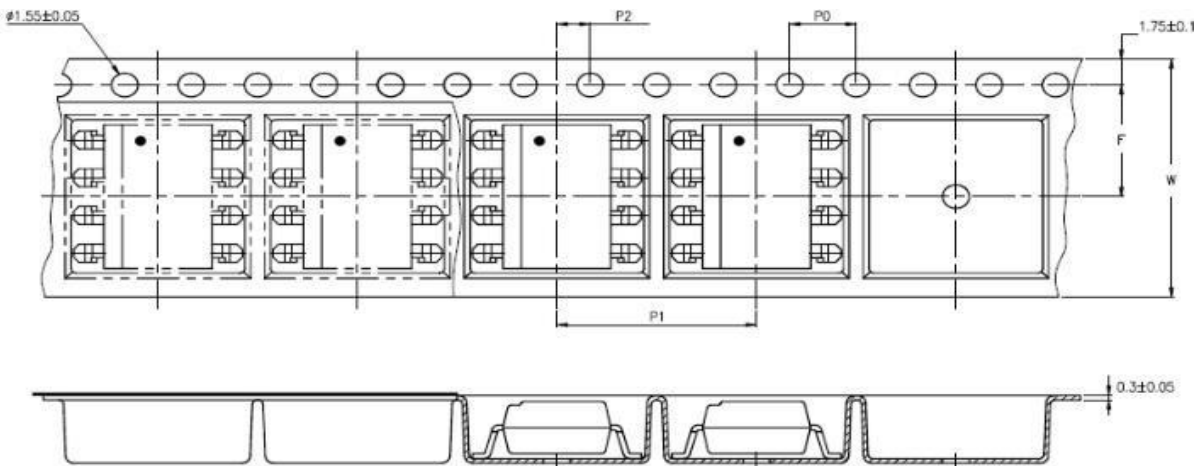
unit: mm

13. Taping Dimensions

(1) OR-3120(B)S-TA_OR-3150(B)S-TA



(2) OR-3120(B)S-TA1_OR-3150(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



The label features the ORIENT logo and company name at the top left. It includes several certification logos: VDE, UL, and RoHS REACH. The label contains the following text and barcodes:

- Material Code : 120PCXXXXXX
- P/N : OR-XXXXXX
- Lot No. : XXXXXX-XXXX-TX-X
- D/C : XXXX
- Qty : XXXX PCS
- Two boxes for "内箱码" (Inner Box Code) and "外箱码" (Outer Box Code)
- A large barcode area with the text "XXXXXXXXXXXXXXXX" (一体机序列码) and "Made in China" below it.

Note:

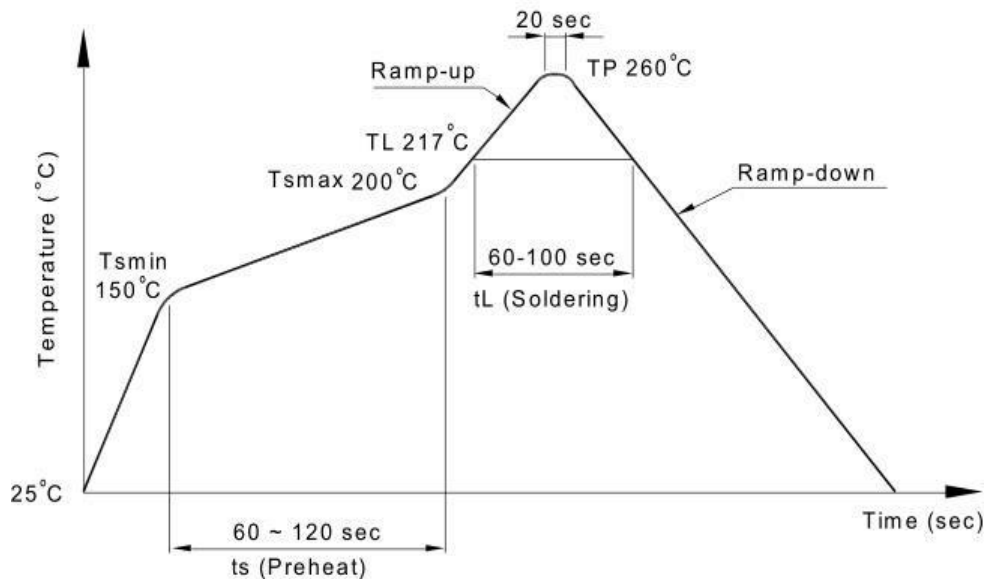
1. Material Code :Product ID.
2. P/N :Contents with "Order Information" in the specification.
3. Lot No. :Product data.
4. D/C :Product weeks.
5. Quantity :Packaging quantity.

15. Temperature Profile Of Soldering

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

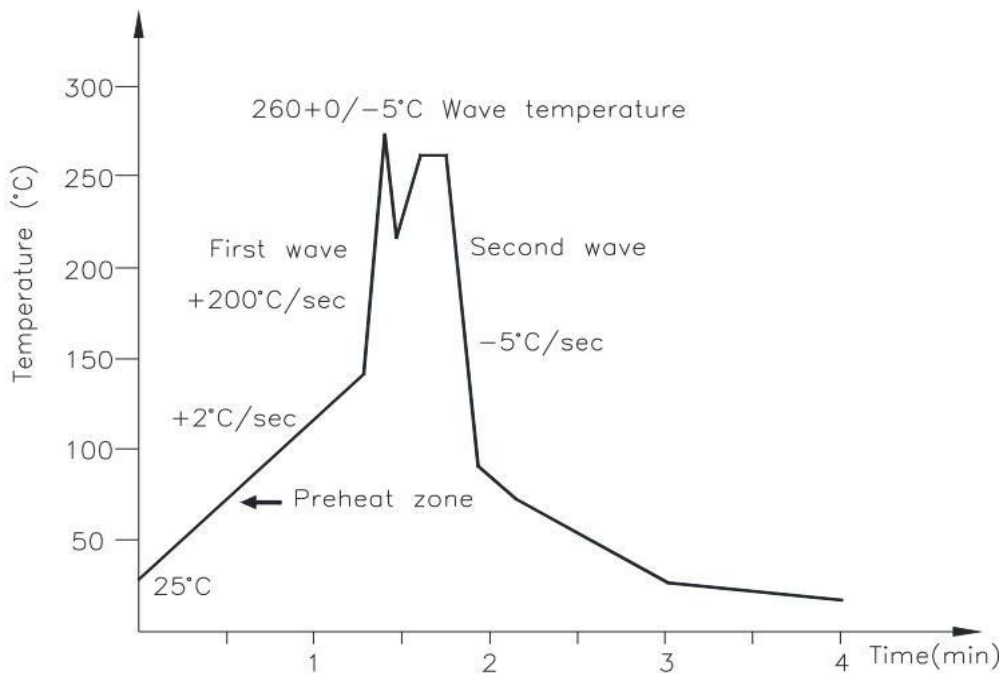
Profile item	Conditions
Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts)	150°C 200°C 90±30 sec
Soldering zone - Temperature (TL) - Time (t L)	217°C 60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak temperature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



(2) Wave soldering (JEDEC22A111 compliant)

One-time welding is recommended under the temperature condition.

Temperature	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 Curve

Figure 1: V_{OH} vs. Temperature

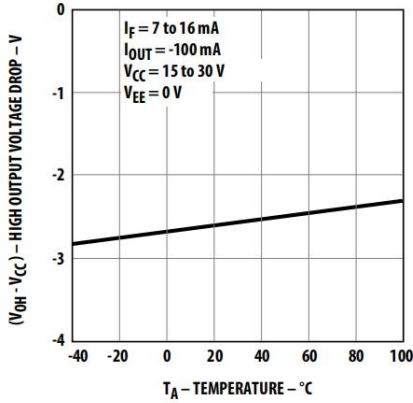


Figure 2: I_{OH} vs. Temperature

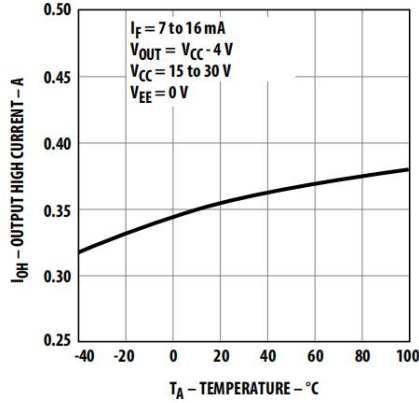


Figure 3: V_{OH} vs. I_{OH}

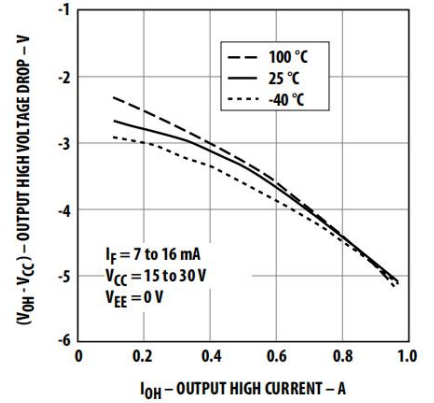


Figure 4: V_{OL} vs. Temperature

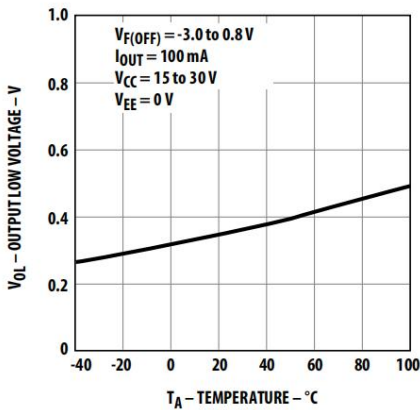


Figure 5: I_{OL} vs. Temperature

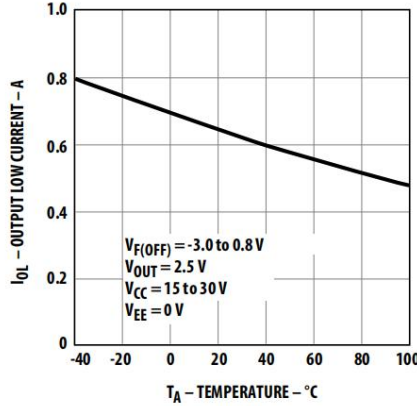


Figure 6: V_{OL} vs. I_{OL}

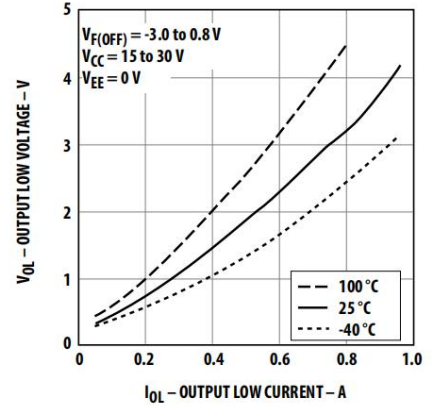


Figure 7: I_{CC} vs. Temperature

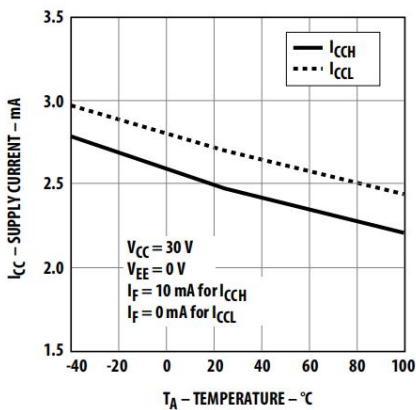


Figure 8: I_{CC} vs. V_{CC}

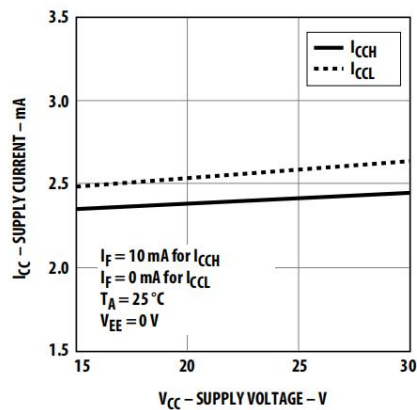


Figure 9: I_{FLH} vs. Temperature

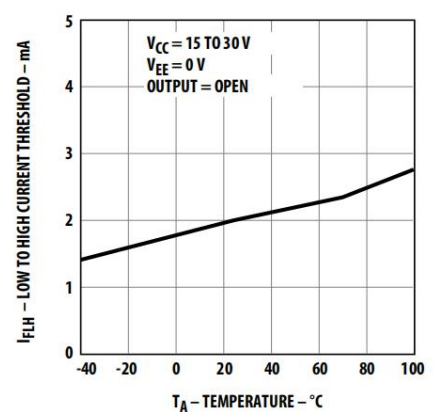


Figure 10 Propagation Delay vs. V_{CC} (OR-3120)

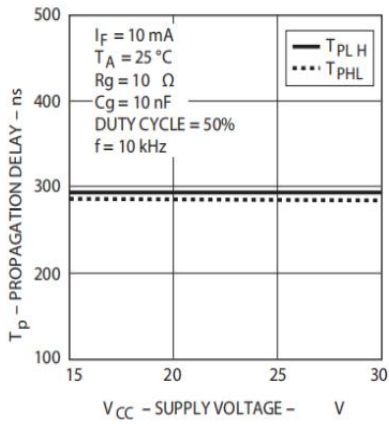


Figure 11 Propagation Delay vs. I_F (OR-3120)

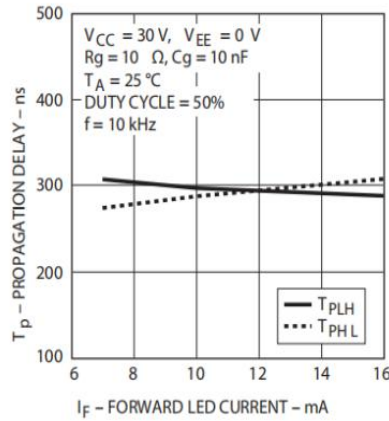
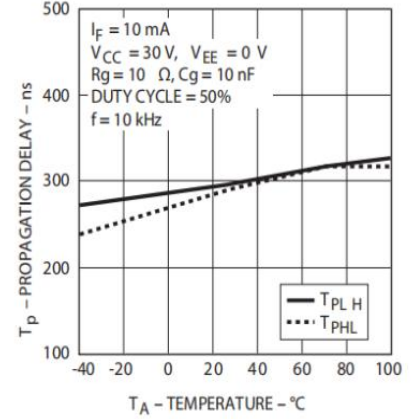
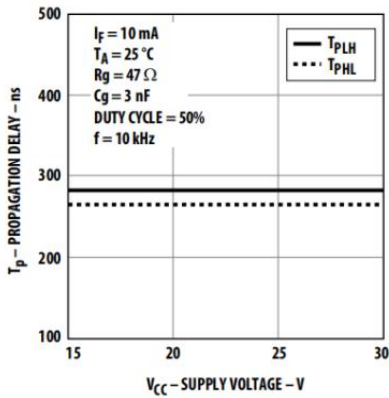


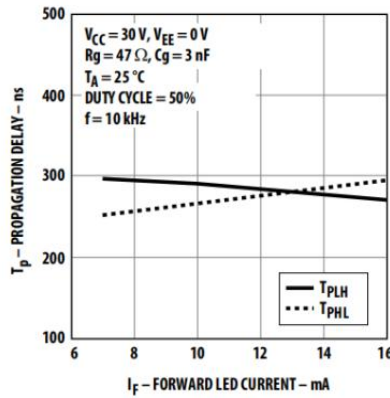
Figure 12 Propagation Delay vs. Temperature (OR-3120)



Propagation Delay vs. V_{CC} (OR-3150)



Propagation Delay vs. I_F (OR-3150)



Propagation Delay vs. Temperature (OR-3150)

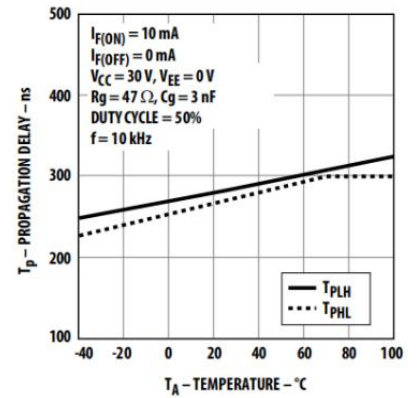


Figure 13 Propagation Delay vs. Rg (OR-3120)

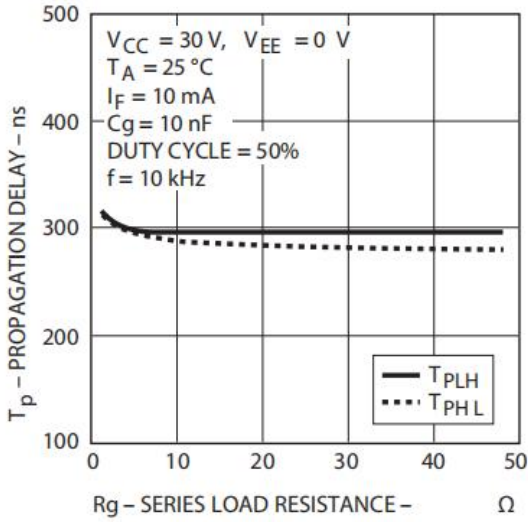
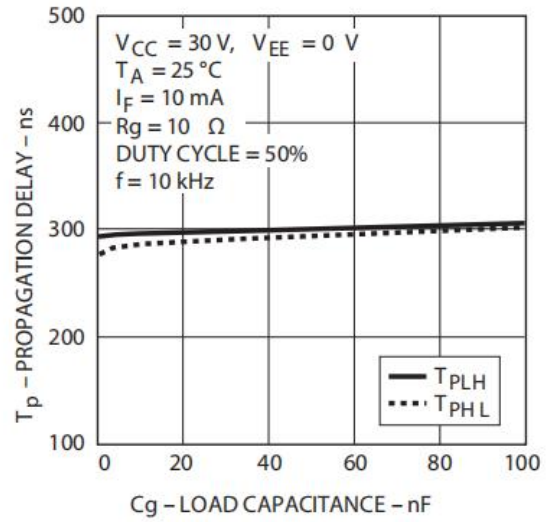
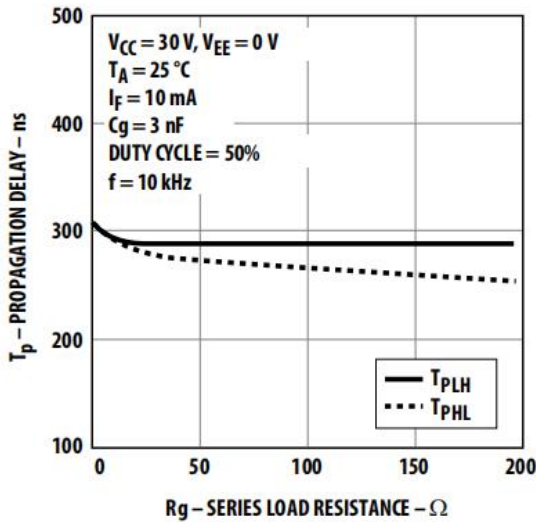


Figure 14 Propagation Delay vs. Cg (OR-3120)



Propagation Delay vs. Rg (OR-3150)



Propagation Delay vs. Cg (OR-3150)

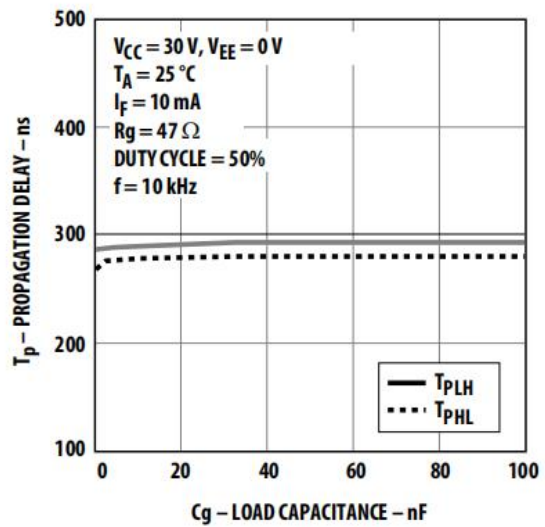


Figure 15 Transfer Characteristics

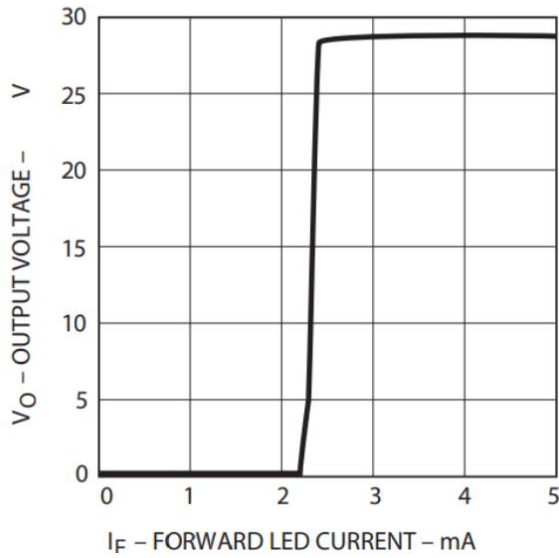


Figure 16 Input Current vs Forward Voltage

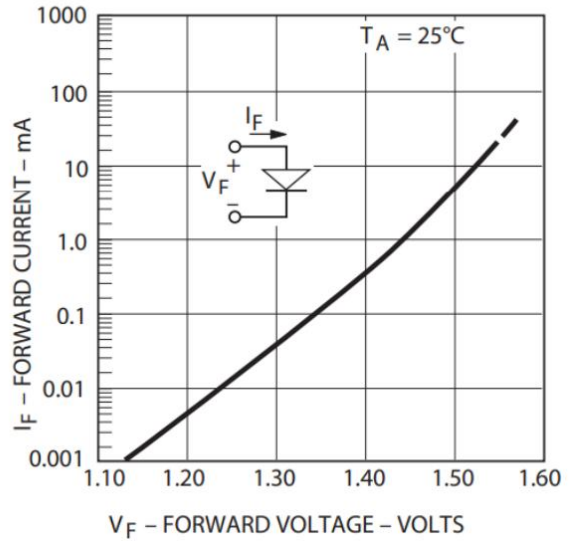


Figure 17: I_{OH} Test Circuit

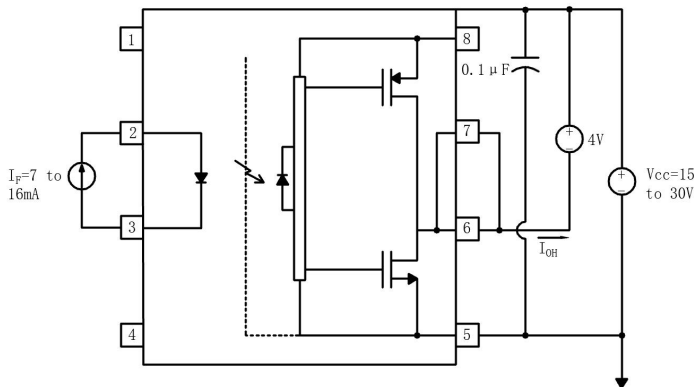


Figure 18: I_{OL} Test Circuit

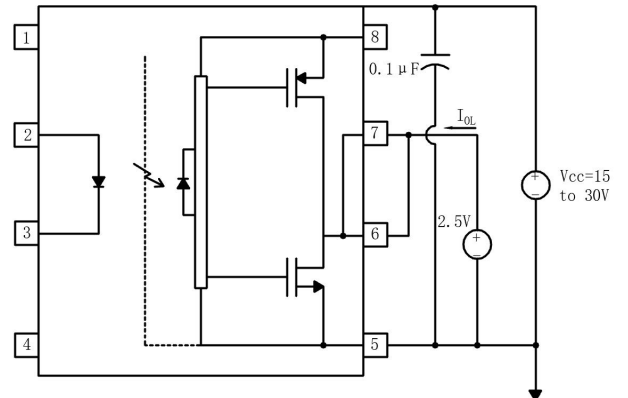


Figure 19: V_{OH} Test Circuit

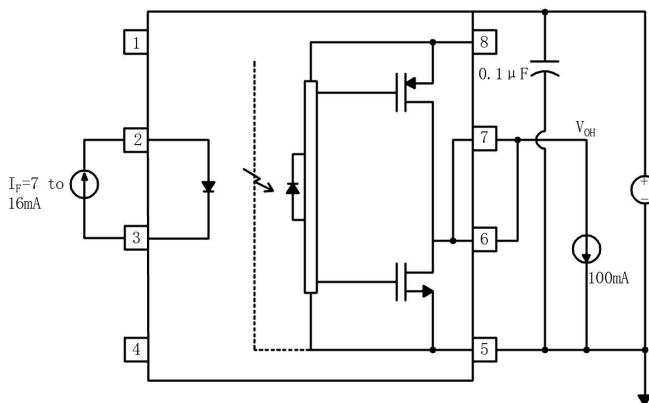


Figure 20: V_{OL} Test Circuit

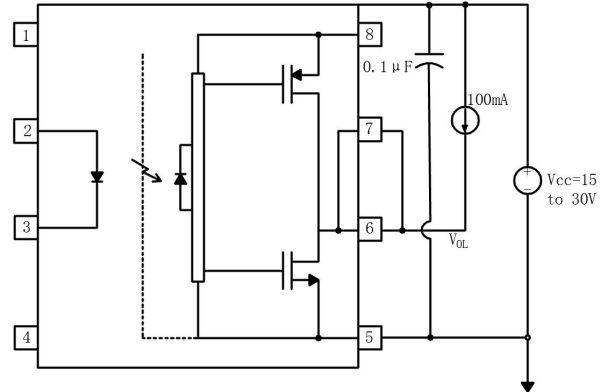


Figure 21 : I_{FLH} Test Circuit

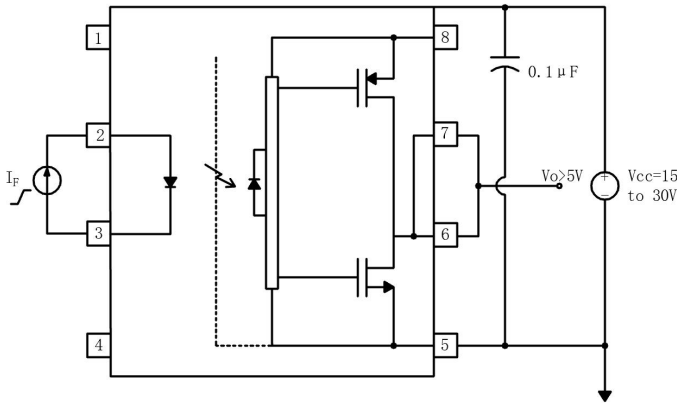


Figure 22 : UVLO Test Circuit

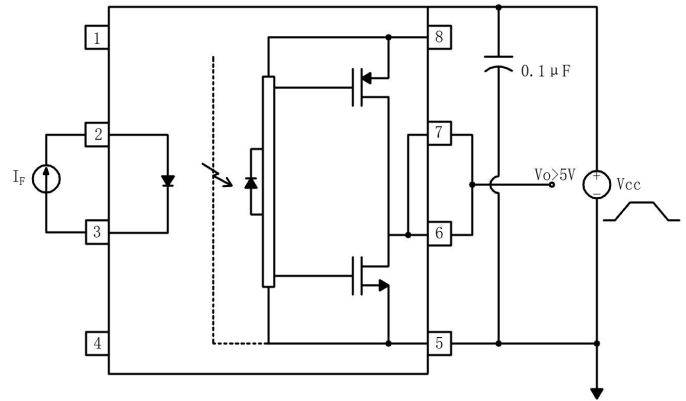


Figure 23: t_{PLH} , t_{PHL} , t_r , and t_f Test Circuit and Waveforms

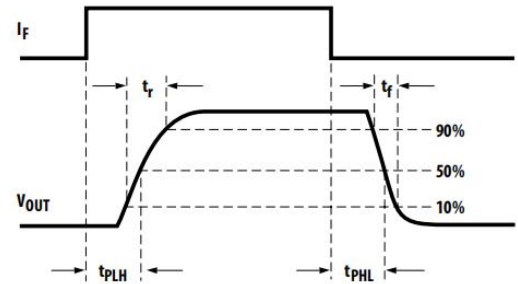
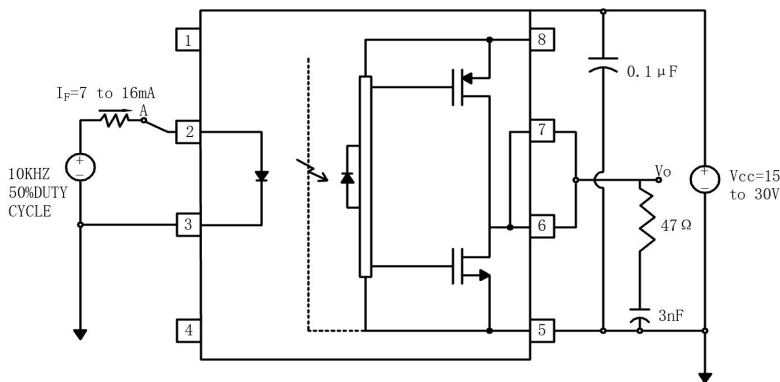


Figure 24: CMR Test Circuit and Waveforms

