ORIENT

Photo coupler

Product Data Sheet

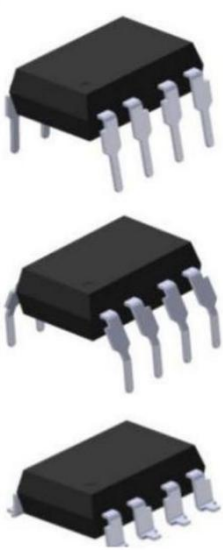
Part Number: OR-3120_OR-3150

Customer: _____

Date: _____

SHENZHEN ORIENT COMPONENTS CO ., LTD

1. Features



- 0.6A maximum peak output current for OR-3150,
  2.5 A maximum peak output current for OR-3120.
- 0.5A minimum peak output current for OR-3150,
  2.0 A minimum peak output current for OR-3120.
- 15-kV/μs minimum Common Mode Rejection (CMR) at V_{CM} = 1500V
- 1.0V maximum low level output voltage (V_{OL}) eliminates need for negative gate drive
- I_{CC} = 5 mA maximum supply current
- Under voltage lock-out protection (UVLO) with hysteresis
- Wide operating V_{CC} range: 15V to 30V
- 0.5-μs maximum propagation delay
- ±0.35-μs maximum delay between devices/channels
- Industrial temperature range: –40°C to 100°C

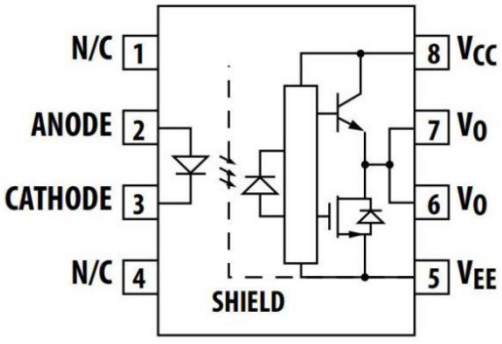
2. Instructions

The OR-3120/OR-3150 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

- IGBT/MOSFET gate drive
- AC/Brushless DC motor drives
- Industrial inverters
- Switch mode power supplies

4. Functional Diagram



LED	V_{CC} - V_{EE} "POSITIVEGOING" (i.e., TURN-ON)	V_{CC} - V_{EE} "NEGATIVE GOING" (i.e., TURN-OFF)	V_O
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	OR-3120	$I_{OH(PEAK)}$	2.5	A
		OR-3150		0.6	
	"Low" Peak Output Current	OR-3120	$I_{OL(PEAK)}$	2.5	A
		OR-3150		0.6	
	Output Collector Power Dissipation		P_O	250	mW
Total Power Dissipation			P_T	295	mW
Supply Voltage			V_{CC}	35	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	OR-3120	I_{OH}	0.5	1.5	—	A	VO = (VCC – 4V)
			2.0	—	—		VO = (VCC – 15V)
	OR-3150		0.1	0.4	—		VO = (VCC – 4V)
			0.5	—	—		VO = (VCC – 15V)
Low Level Output Current	OR-3120	I_{OL}	0.5	2.0	—	A	VO = (VEE + 2.5V)
			2.0	—	—		VO = (VEE + 15V)
	OR-3150		0.1	0.6	—		VO = (VEE + 2.5V)
			0.5	—	—		VO = (VEE + 15V)
High Level Output Voltage		V_{OH}	(VCC – 4)	(VCC – 3)	—	V	IO = –100 mA
Low Level Output Voltage	OR-3120	v_{OL}	—	0.1	0.5	V	IO = 100 mA
	OR-3150		—	0.4	1.0		
High Level Supply Current		I_{CCH}	—	2.5	5.0	mA	Output Open, IF = 7 to 16 mA
Low Level Supply Current		I_{CCL}	—	2.7	5.0	mA	Output Open,VF = –3.0 to +0.8V
Threshold Input Current Low to High		I_{FLH}	—	2.2	5.0	mA	IO = 0 mA, VO > 5V
Threshold Input Voltage High to Low		v_{FHL}	0.8	—	—	V	
Input Forward Voltage		V_F	1.2	1.5	1.8	V	IF = 10 mA
Temperature Coefficient of Forward Voltage		$\Delta V_F/\Delta T_A$	—	–1.6	—	mV/°C	IF = 10 mA
Input Reverse Breakdown Voltage		B_{VR}	5	—	—	V	IR = 10 μA
Input Capacitance		C_{IN}	—	70	—	pF	f = 1 MHz, VF = 0V
UVLO Threshold		V_{UVLO+}	11.0	12.3	13.5	V	VO > 5 V IF = 10 mA
		V_{UVLO-}	9.5	10.7	12.0		
UVLO Hysteresis		U_{VLOHYS}	—	1.6	—		

1. All typical values at T_A = 25°C and $V_{CC} - V_{EE}$ = 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, 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.
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	t_{PLH}	0.10	0.30	0.50	μs	**OR-3120:** Rg=10Ω,Cg=10nF, f=10kHz, Duty Cycle=50% **OR-3150:** Rg=47Ω,Cg=3nF, f=10kHz, Duty Cycle = 50%
Propagation Delay Time to Low Output Level	t_{PHL}	0.10	0.30	0.50	μs	
Pulse Width Distortion	PWD	—	—	0.3	μs	
Propagation Delay Difference Between Any Two Parts	PDD $(t_{PHL}-t_{PLH})$	–0.35	—	0.35	μs	
Rise Time	t_r	—	0.1	—	μs	
Fall Time	t_f	—	0.1	—	μs	
UVLO Turn On Delay	$t_{UVLO\ ON}$	—	0.8	—	μs	V_O>5V,I_F=10mA
UVLO Turn Off Delay	$t_{UVLO\ OFF}$	—	0.6	—		V_O<5V,I_F=10mA
Output High Level Common Mode Transient Immunity	$\|CM_H\|$	25	35	—	kV/μs	T_A=25°C, I_F=10 to 16mA, V_{CM}=1500V, V_{CC}=30V
Output Low Level Common Mode Transient Immunity	$\|CM_L\|$	25	35	—	kV/μs	T_A=25°C, V_{CM}= 1500V, V_F=0V,V_{CC}=30V

1. All typical values at TA = 25 °C and VCC – VEE = 30 V, unless otherwise noted.
2. This load condition approximates the gate load of a 1200 V/75A IGBT.
3. Pulse Width Distortion (PWD) is defined as |tPHL-tPLH| for any given device.
4. The difference between tPHL and tPLH between any two HCPL-3120 parts under the same test condition.
5. Pins 1 and 4 need to be connected to LED common.
6. 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., V_O>15.0V).
7. 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<1.0V).

8. Order Information

Part Number

OR-3120X-Z
OR-3150X-Z

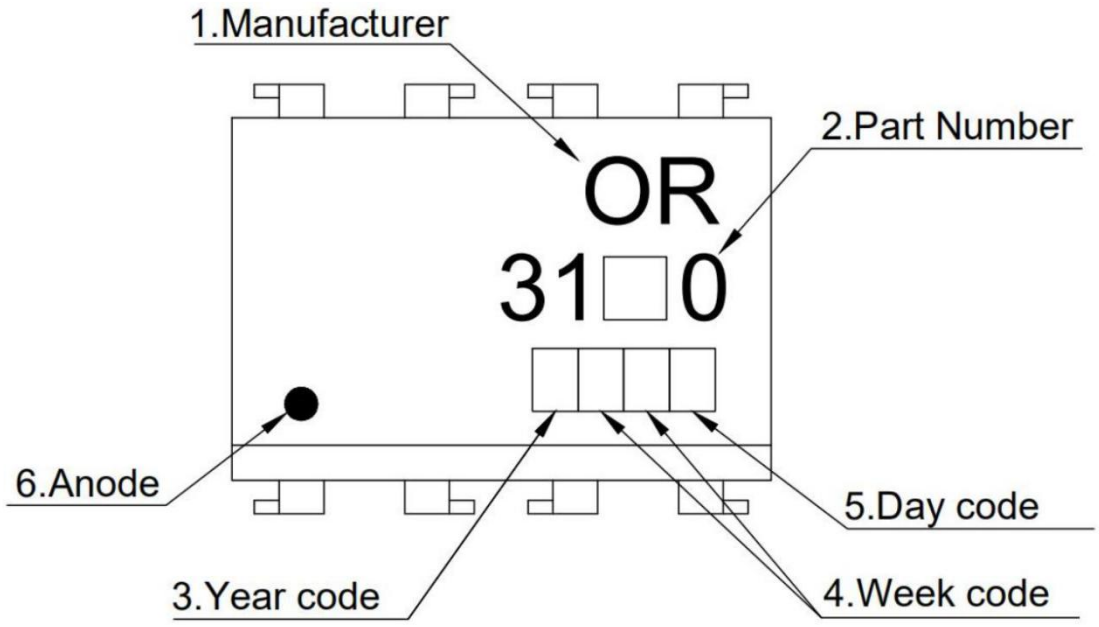
Note

X = Lead form option (S, M or none)
Z = Tape and reel option (TA,TA1 or none).

* Halogen Free can be selected.
* 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



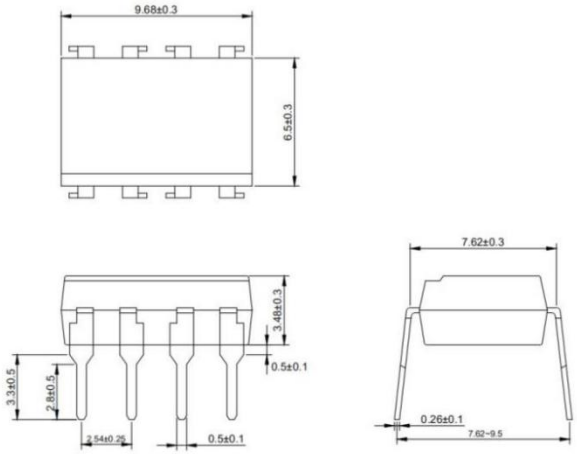
NOTE:

1. ORIENT.
2. Part Number,3120 or 3150.
3. Year Code： '0' means '2020' and so on.
4. Week Code： 01 represents the first week, 02 represents the second week, and so on.
5. Day Code： 'A to F' means 'Monday to Sunday'.
6. Anode.

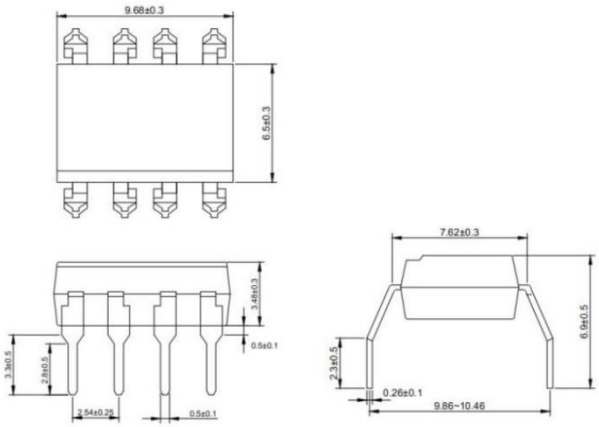
* If the photo coupler is Free from Halogen，there will be a ' G' mark in the upper left corner.
* VDE Code can be selected.

10. Outer Dimension

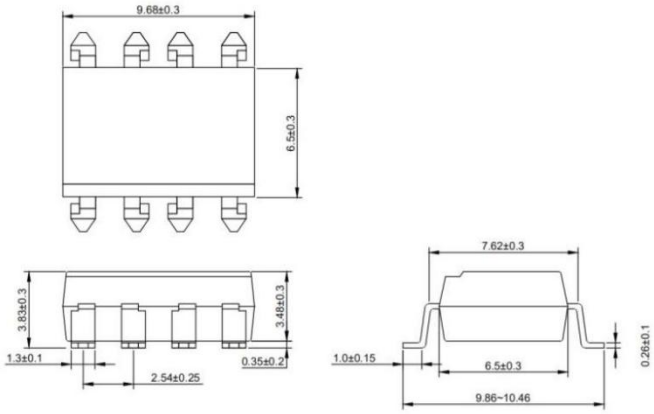
（1）OR-3120_OR-3150



（2）OR-3120M_OR-3150M

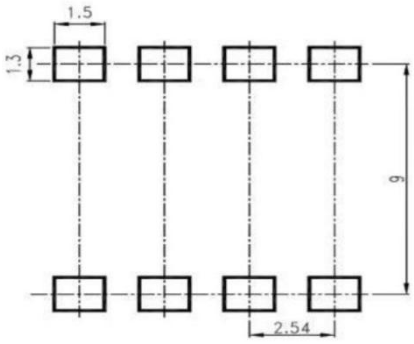


（3）OR-3120S_OR-3150S



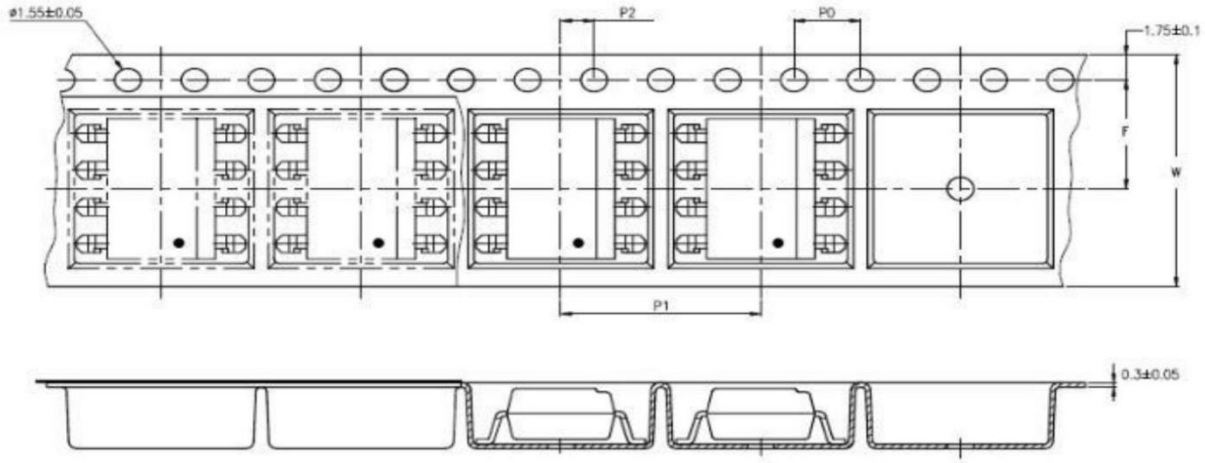
12、Recommended Foot Print Patterns (Mount Pad)

(unit：mm)

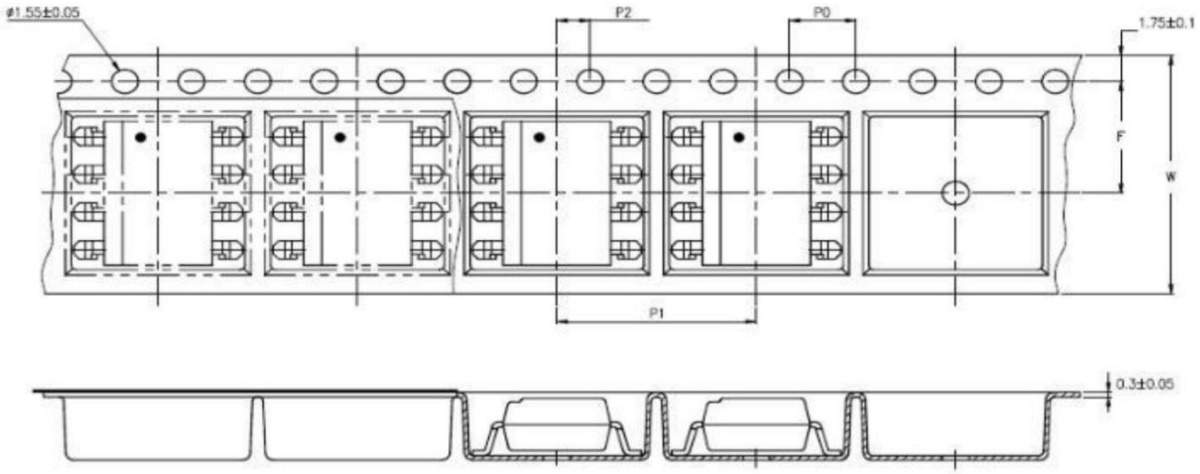


11. Taping Dimensions

（1）OR-3120S-TA_OR-2150S-TA



（2）OR-3120S-TA1_OR-2150S-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

12. Package Dimension

(1) package dimension

DIP/M type

Packing Information	
Packing type	Tube(Plug)
Qty per Tube	45
Small box (inner) Dimenaion	525*132*60mm
Max qty per small box	2250
Large box (Outer) Dimenaion	530*290*335mm
Max qty per large box	18000

SOP type

Packing Information	
Packing type	Reel type
Tape Width	16mm
Qty per Reel	1000
Small box (inner) Dimenaion	345*345*60mm
Max qty per small box	2000
Large box (Outer) Dimenaion	620x360x360mm
Max qty per large box	20000

(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.

13. Reliability Test

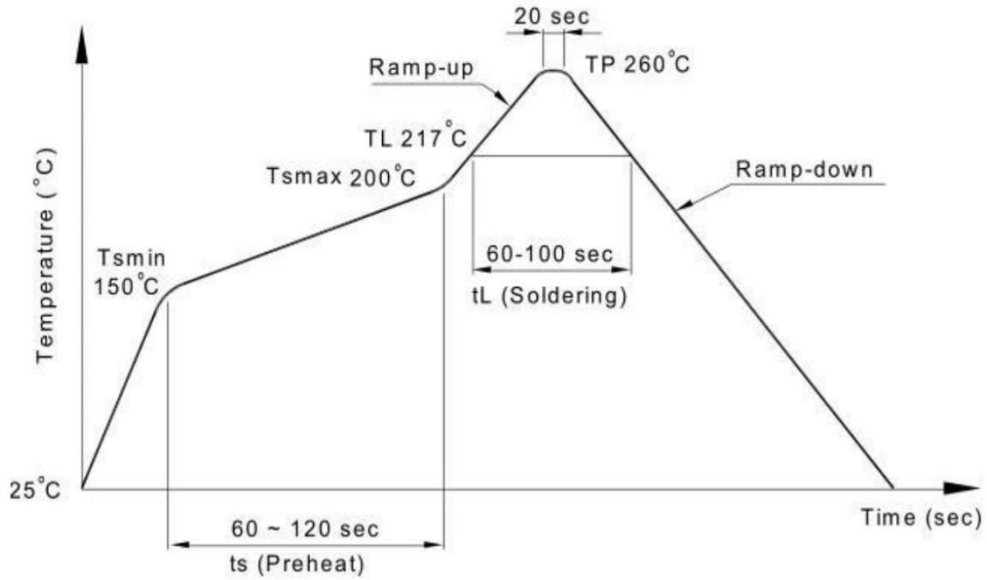
NO.	Item	Condition	Quantity	Cycle	Reference Standards
1	RSH, Resistance to Solder Heat	260±5°C,20s/cycle	22	3 cycles	JESC22A-106
2	SD, Solderability	260±5°C, 10s/cycle	22	1 cycle	JESD22-B102
3	TC, Temperature Cycle	H： 125°C 15min ∫ 5min L: -55°C 15min	77	300cycles	JESC22A-104
4	TS, Thermal Shock	H:100°C 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

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.

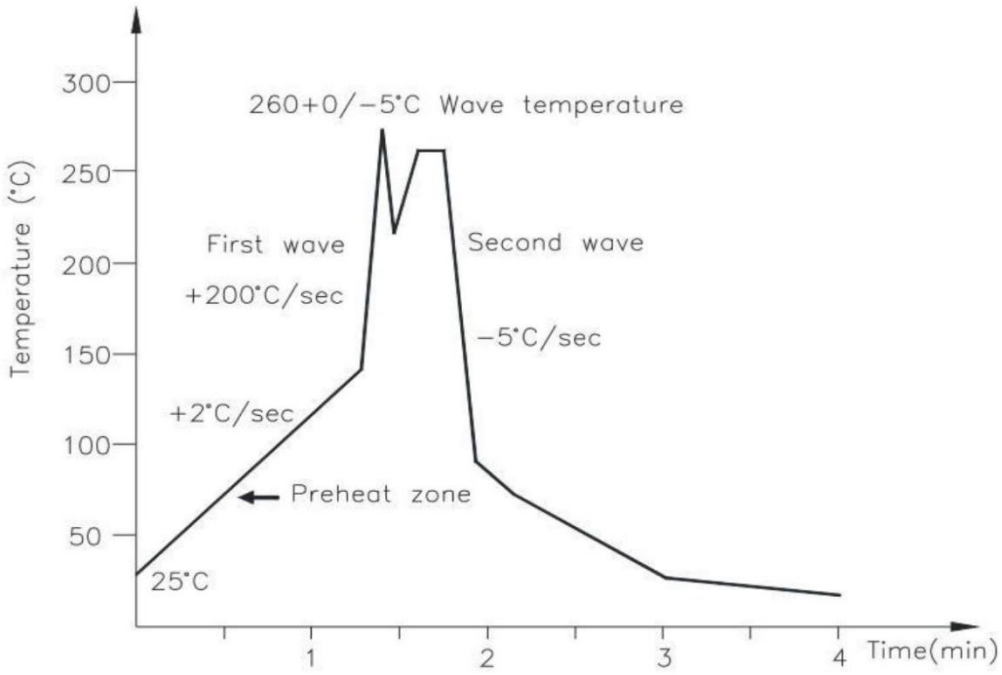
Profile item	Conditions
Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts)	 150˚C 200˚C 90±30 sec
Soldering zone - Temperature (TL) - Time (t L)	 217˚C 60 sec
Peak Temperature	260˚C
Peak Temperature time	20 sec
Ramp-up rate	3˚C / sec max.
Ramp-down rate from peak temperature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

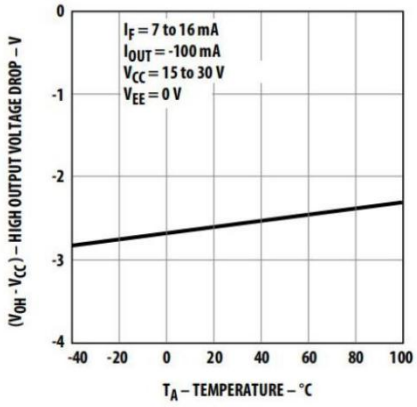


Figure 2: I_{OH} vs. Temperature

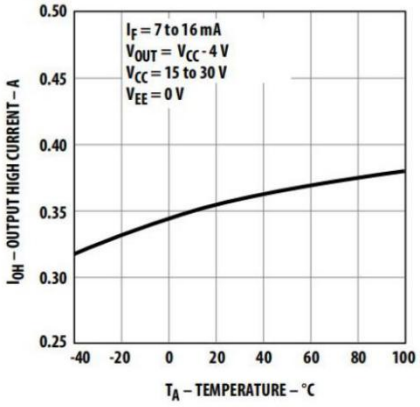


Figure 3: V_{OH} vs. I_{OH}

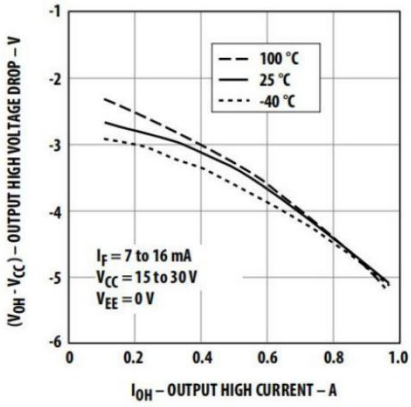


Figure 4: V_{OL} vs. Temperature

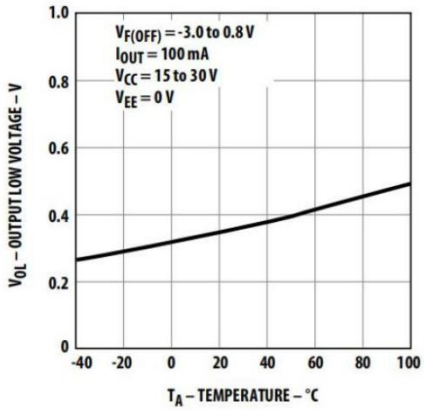


Figure 5: I_{OL} vs. Temperature

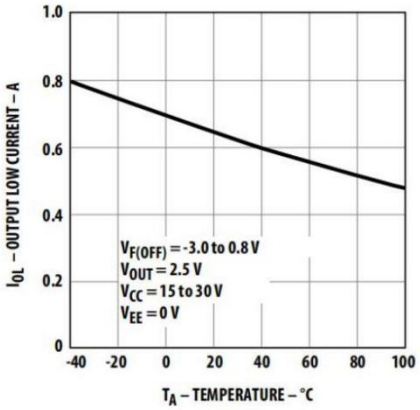


Figure 6: V_{OL} vs. I_{OL}

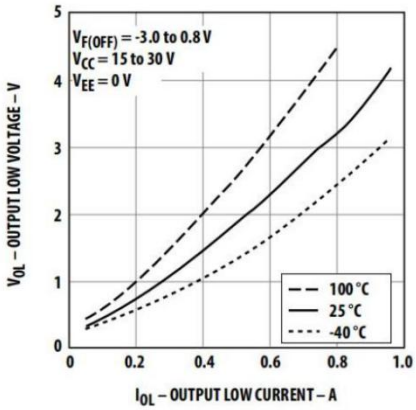


Figure 7: I_{CC} vs. Temperature

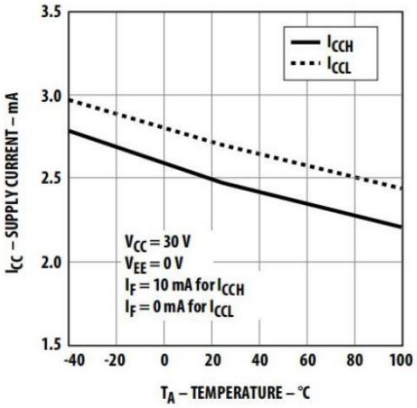


Figure 8: I_{CC} vs. V_{CC}

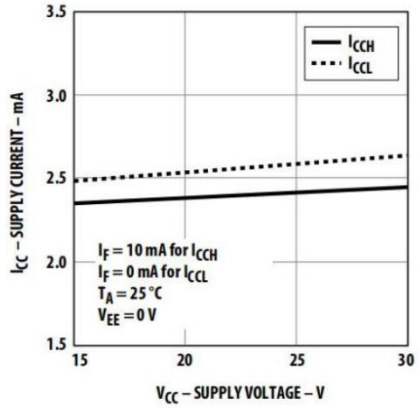


Figure 9: I_{FLH} vs. Temperature

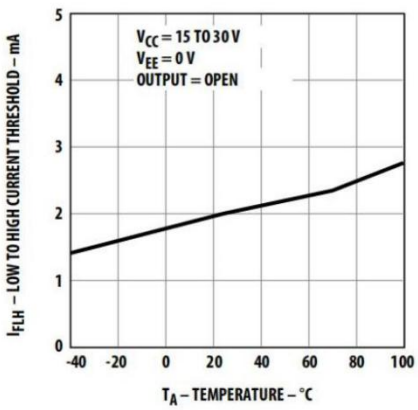


Figure 10 Propagation Delay vs. V_{CC} (OR-3120)

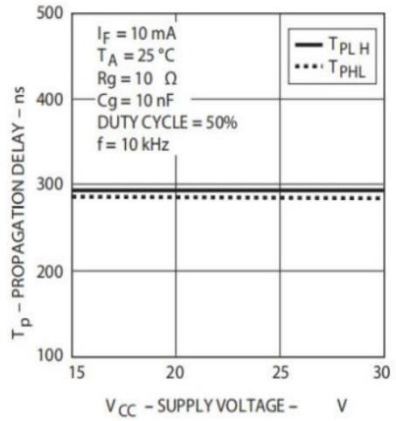


Figure 11 Propagation Delay vs. I_F (OR-3120)

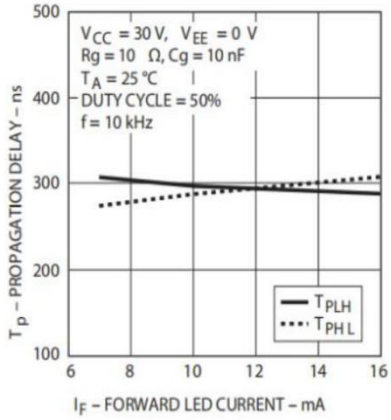
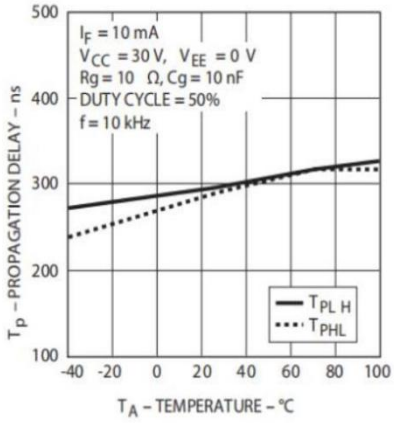
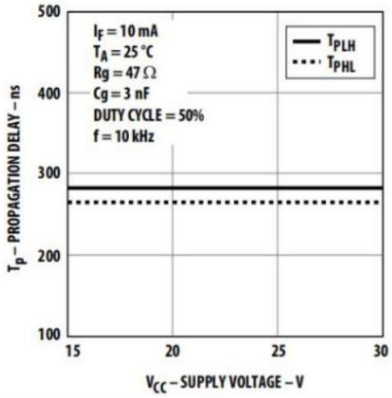


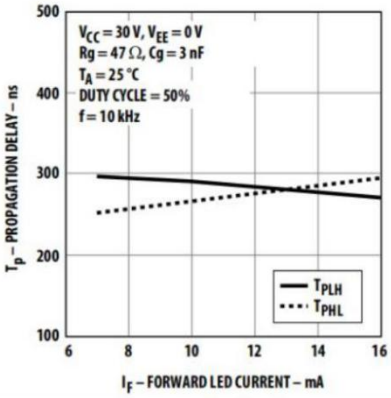
Figure 12 Propagation Delay vs. Temperature (OR-3120)



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



Propagation Delay vs. I_F (OR-3150)



Propagation Delay vs. Temperature (OR-3150)

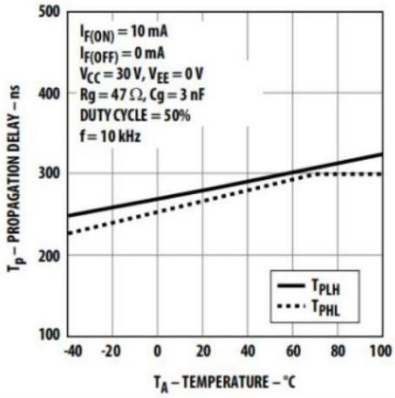


Figure 13 Propagation Delay vs. Rg (OR-3120)

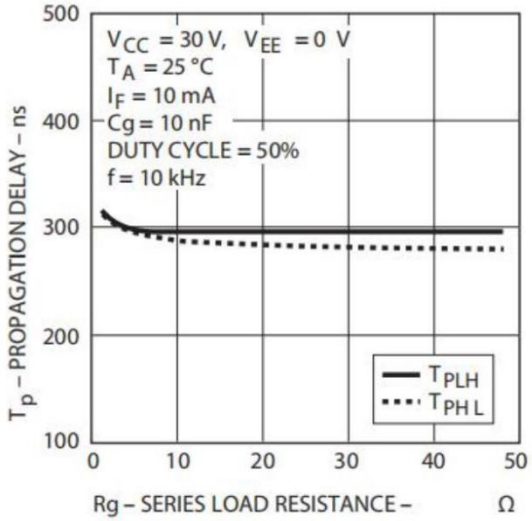
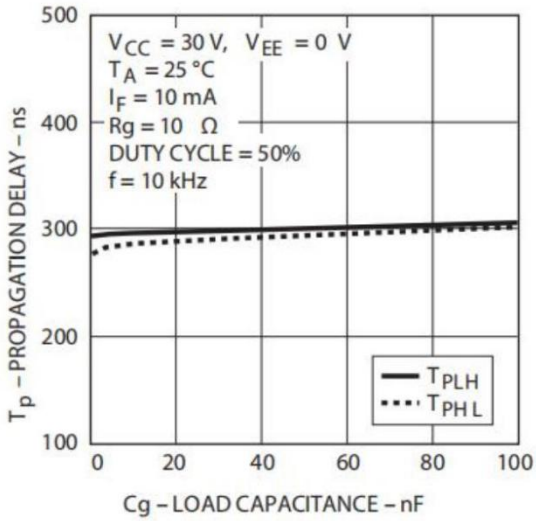
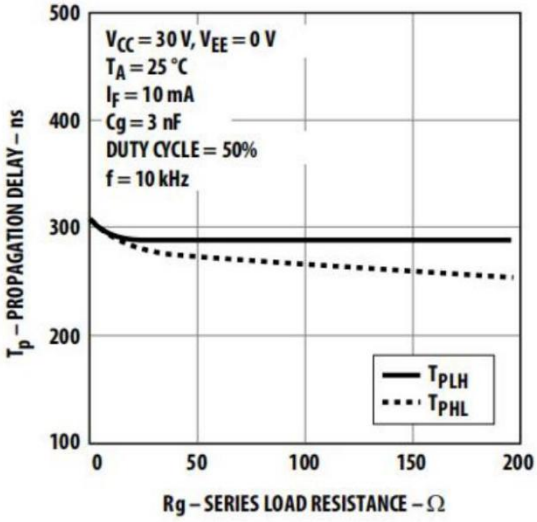


Figure 14 Propagation Delay vs. Cg (OR-3120)



Propagation Delay vs. Rg (OR-3150)



Propagation Delay vs. Cg (OR-3150)

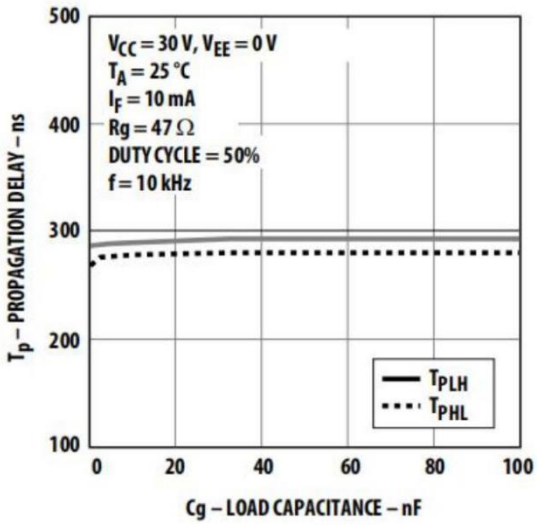
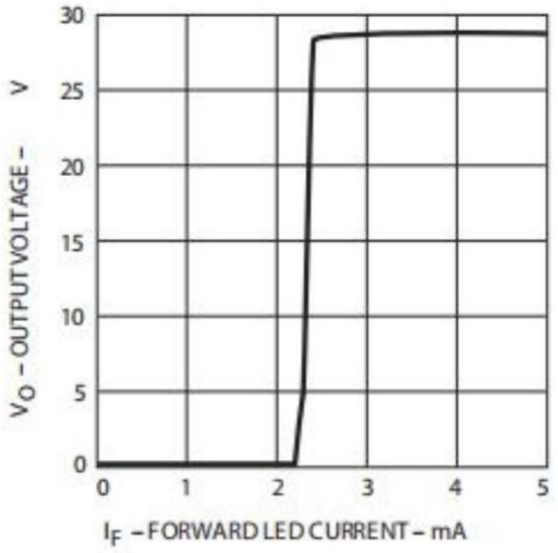


Figure 15 Transfer Characteristics



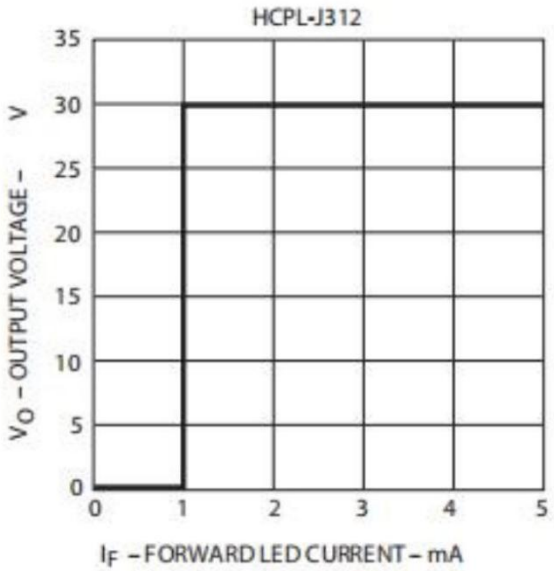
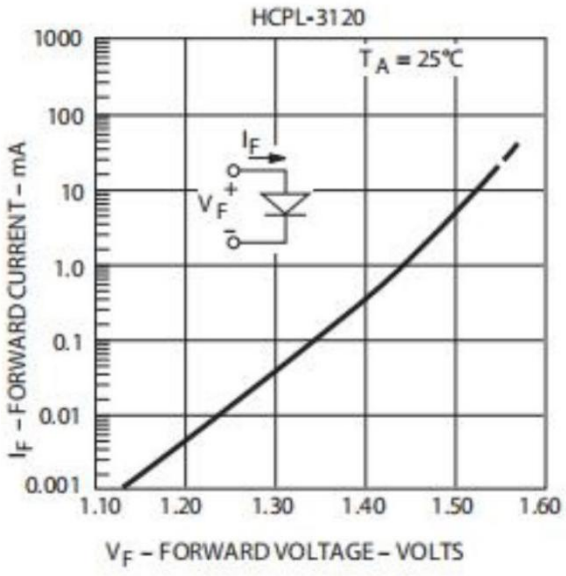


Figure 16 Input Current vs Forward Voltage



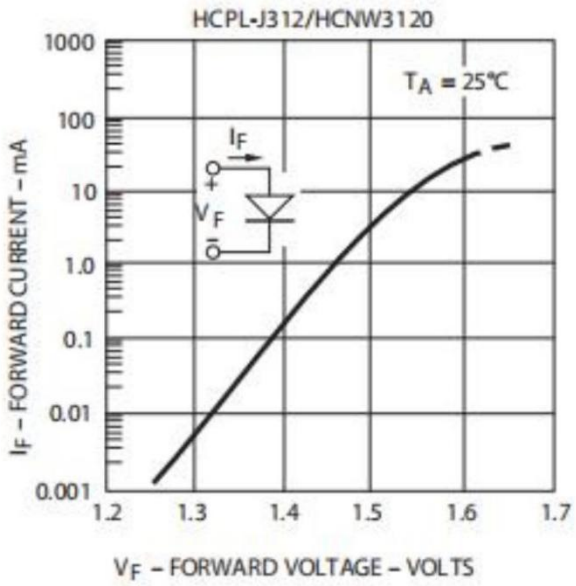


Figure 17: I_{OH} Test Circuit

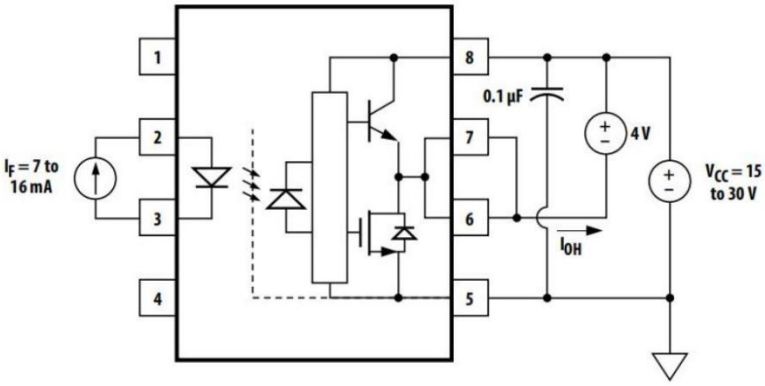


Figure 18: I_{OL} Test Circuit

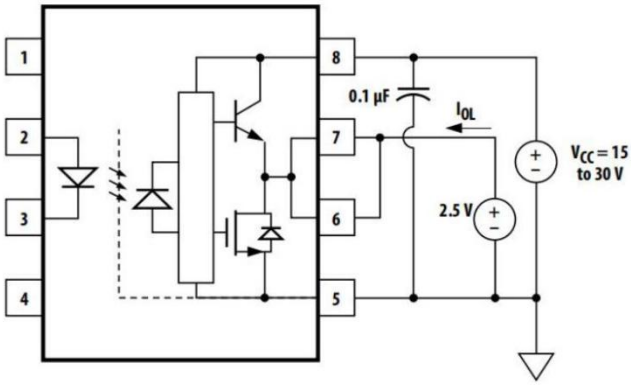


Figure 19: V_{OH} Test Circuit

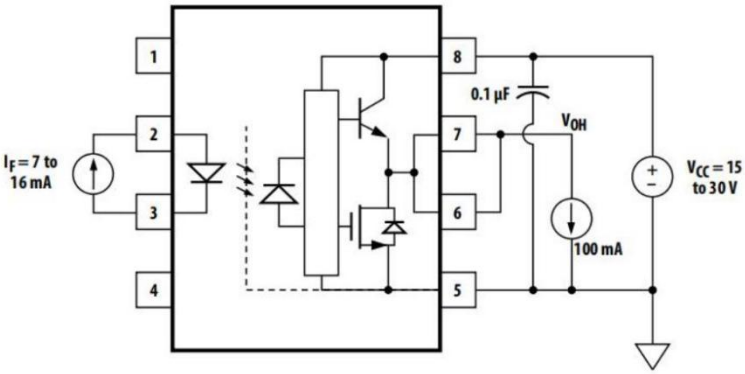


Figure 20: V_{OL} Test Circuit

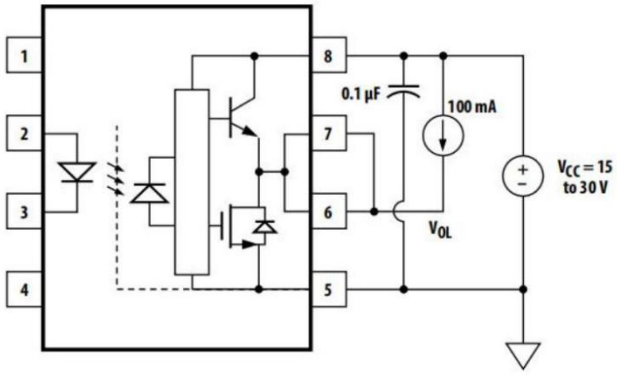


Figure 21: I_{FLH} Test Circuit

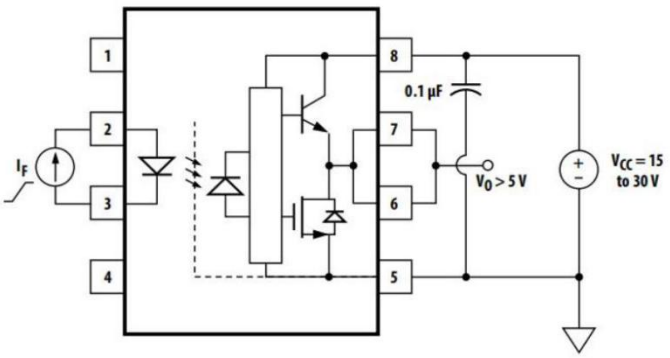


Figure 22: UVLO Test Circuit

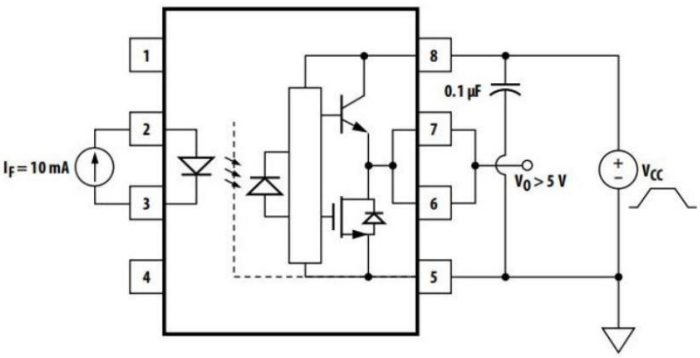
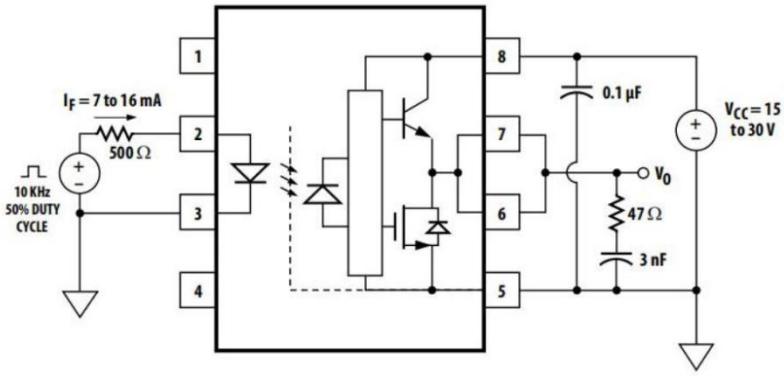


Figure 23: t_{PLH}, t_{PHL}, t_r, and t_f Test Circuit and Waveforms



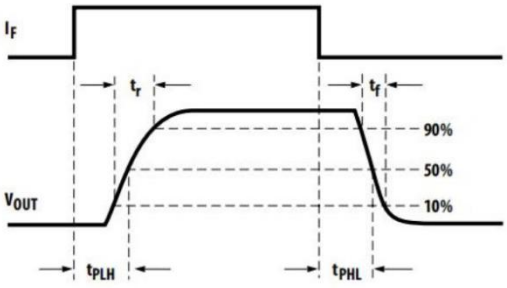


Figure 24: CMR Test Circuit and Waveforms