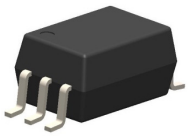
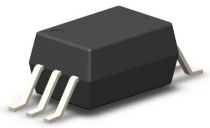
3.0 A Output Current, High Speed Gate Drive Optocoupler in Stretched Body SOP 6-Pin

FOD8342, FOD8342T

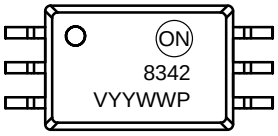


SOIC6
CASE 751EL



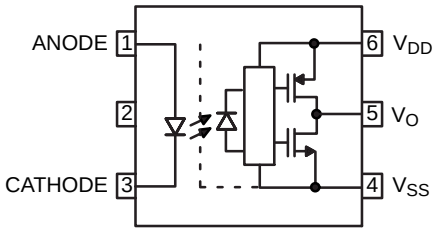
SOIC6 W
CASE 751EM

MARKING DIAGRAM



8342	= Specific Device Number
V	= DIN EN/IEC60747−5−5 Option
YY	= Two Digit Year Code
WW	= Two Digit Work Week
P	= Assembly Package Code

FUNCTIONAL SCHEMATIC



ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 18 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 18.

Description

The FOD8342 series is a 3.0 A output current gate drive optocoupler, capable of driving medium−power IGBT/ MOSFETs. It is ideally suited for fast−switching driving of power IGBT and MOSFET used in motor−control inverter applications, and high−performance power systems.

The FOD8342 series utilizes stretched body package to achieve 8 mm creepage and clearance distances (FOD8342T), and optimized IC design to achieve reliably high−insulation voltage and high−noise immunity.

The FOD8342 series consists of an Aluminum Gallium Arsenide (AlGaAs) Light−Emitting Diode (LED) optically coupled to an integrated circuit with a high−speed driver for push−pull MOSFET output stage. The device is housed in a stretched body, 6−pin, small outline, plastic package.

Features

- FOD8342T − 8 mm Creepage and Clearance Distance, and 0.4 mm Insulation Distance to Achieve Reliable and High−Voltage Insulation
- 3.0 A Peak Output Current Driving Capability for Medium− Power IGBT/MOSFET
  - Use of P−Channel MOSFETs at Output Stage Enables Output Voltage Swing Close to Supply Rail
- 20 kV/μs Minimum Common Mode Rejection
- Wide Supply Voltage Range: 10 V to 30 V
- Fast Switching Speed Over Full Operating Temperature Range
  - 210 ns Maximum Propagation Delay
  - 65 ns Maximum Pulse Width Distortion
- Under−Voltage Lockout (UVLO) with Hysteresis
- Extended Industrial Temperate Range: −40°C to 100°C
- Safety and Regulatory Approvals:
  - UL1577, 5,000 V_{RMS} for 1 Minute
  - DIN EN/IEC60747−5−5, 1,140V Peak Working Insulation Voltage

Applications

- AC and Brushless DC Motor Drives
- Industrial Inverter
- Uninterruptible Power Supply
- Induction Heating
- Isolated IGBT/Power MOSFET Gate Drive

Related Resources

- FOD3182, 3 A Output Current, High Speed MOSFET Gate Drive Optocoupler
- FOD8314, FOD8314T, 1.0 A Output Current, Gate Drive Optocoupler in Stretched Body SOP 6−Pin
- www.onsemi.com

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Table 1. TRUTH TABLE

LED	V_{DD} − V_{SS} "Positive Going" (Turn−On)	V_{DD} − V_{SS} "Negative Going" (Turn−Off)	V_O
Off	0 V to 30 V	0 V to 30 V	LOW
On	0 V to 7 V	0 V to 6.5 V	LOW
On	7 V to 9.5 V	6.5 V to 9 V	Transition
On	9.5 V to 30 V	9 V to 30 V	HIGH

Table 2. PIN DESCRIPTION

Pin No.	Name	Description
1	ANODE	LED Anode
2	N.C	Not Connection
3	CATHODE	LED Cathode
4	V_{SS}	Negative Supply Voltage
5	V_O	Output Voltage
6	V_{DD}	Positive Supply Voltage

Pin Configuration

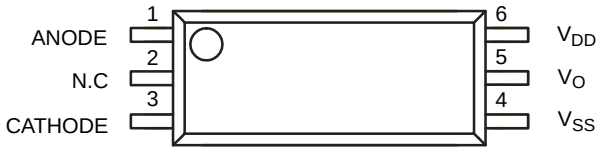


Figure 1. Pin Configuration

Table 3. SAFETY AND INSULATION RATINGS
As per DIN_EN/IEC60747−5−5. This optocoupler is suitable for “safe electrical insulation” only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.

Parameter		Symbol	FOD8342	FOD8342T	Unit
Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Main Voltage	<150 Vrms		I−IV	I−IV	
	<300 Vrms		I−IV	I−IV	
	<450 Vrms		I−III	I−IV	
	<600 Vrms		I−III	I−III	
Climatic Classification			40/100/21	40/100/21	
Pollution Degree (DIN VDE 0110/1.89)			2	2	
Comparative Tracking Index		CTI	175	175	
Input to Output Test Voltage, Method B, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with t_m = 1 sec, Partial Discharge <5 pC		V_{PR}	1,671	2,137	V_{peak}
Input to Output Test Voltage, Method A, V_{IORM} x 1.6 = V_{PR}, Type and Sample Test with t_m = 10 sec, Partial Discharge <5 pC			1,426	1,824	V_{peak}
Max Working Insulation Voltage		V_{IORM}	891	1,140	V_{peak}
Highest Allowable Over Voltage		V_{IOTM}	6,000	8,000	V_{peak}
External Creepage			≥8.0	≥8.0	mm
External Clearance			≥7.0	≥8.0	mm
Distance Through Insulation (Insulation Thickness)		DTI	≥0.4	≥0.4	mm
Safety Limit Values− Maximum Values Allowed in the Event of a Failure,					
Case Temperature		T_S	150	150	°C
Input Current		$I_{S,INPUT}$	200	200	mA
Output Power		$P_{S,OUTPUT}$	600	600	mW
Insulation Resistance at T_S, V_{IO} = 500 V		R_{IO}	10^9	10^9	Ω

Table 4. ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Symbol	Parameter	Value	Units
T_{STG}	Storage Temperature	−40 to +125	°C
T_{OPR}	Operating Temperature	−40 to +100	°C
T_J	Junction Temperature	−40 to +125	°C
T_{SOL}	Lead Solder Temperature *(Refer to Reflow Temperature Profile)*	260 for 10 s	°C
$I_{F(AVG)}$	Average Input Current	25	mA
V_R	Reverse Input Voltage	5.0	V
$I_{O(PEAK)}$	Peak Input Voltage (Note 1)	3	A
V_{DD}	Supply Voltage	−0.5 to 35	V
$V_{O(PEAK)}$	Peak Output Voltage	0 to V_{DD}	V
$t_{R(IN)}$, $t_{F(IN)}$	Input Signal Rise and Fall Time	250	ns
PD_I	Input Power Dissipation (Notes 2, 4)	45	mW
PD_O	Output Power Dissipation (Notes 3, 4)	500	mW

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Maximum pulse width = 10 μs, maximum duty cycle = 0.2%.
2. No derating required across operating temperature range.
3. Derate linearly from 25°C at a rate of 5.2 mW/°C.
4. Functional operation under these conditions is not implied. Permanent damage may occur if the device is subjected to conditions outside these ratings.

Table 5. RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
T_A	Ambient Operating Temperature	−40	+100	°C
$V_{DD} - V_{SS}$	Supply Voltages	10	30	V
$I_{F(ON)}$	Input Current (ON)	10	16	mA
$V_{F(OFF)}$	Input Voltage (OFF)	−3.0	0.8	V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

Table 6. ISOLATION CHARACTERISTICS (Apply over all recommended conditions, typical value is measured at T_A = 25°C)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{ISO}	Input−Output Isolation Voltage	T_A = 25°C, R.H. < 50%, t = 1.0 min, $I_{I-O} \le$ 20 μA (Notes 5, 6)	5000			VAC_{RMS}
R_{ISO}	Isolation Resistance	V_{I-O} = 500 V (Note 5)		10^{11}		Ω
C_{ISO}	Isolation Capacitance	V_{I-O} = 0 V, freq = 1.0 MHz (Note 5)		1		pF

5. Device is considered a two terminal device: Pins 1, 2 and 3 are shorted together and Pins 4, 5, and 6 are shorted together.
6. 5,000 VAC_{RMS} for 1 minute duration is equivalent to 6,000 VAC_{RMS} for 1 second duration.

Table 7. ELECTRICAL CHARACTERISTICS (Apply over all recommended conditions, T_A = −40°C to +100°C, 4.5 V ≤ V_{DD} ≤ 30 V, FOD8480: $I_{F(ON)}$ = 6 mA to 10 mA, FOD8482: $I_{F(ON)}$ = 4 mA to 7 mA, $V_{F(OFF)}$ = 0 to 0.8 V, unless otherwise specified. Typical value is measured at T_A = 25°C and V_{DD} = 5 V.)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_F	Input Forward Voltage	I_F = 10 mA	1.1	1.5	1.8	V
$\Delta V_F/\Delta T_A$	Temperature Coefficient of Forward Voltage			−1.8		mV/°C
BV_R	Input Reverse Breakdown Voltage	I_R = 10 μA	5.0			V
C_{IN}	Input Capacitance	V_F = 0 V, f = 1 MHz		20		pF
I_{OH}	High Level Output Current (Note 1)	$V_{OH} = V_{DD}$ − 3 V	1.0			A
		$V_{OH} = V_{DD}$ − 6 V	2.5			
I_{OL}	Low Level Output Current (Note 1)	$V_{OL} = V_{SS}$ + 3 V	1.0			A
		$V_{OL} = V_{SS}$ + 6 V	2.5			
V_{OH}	High Level Output Voltage (Notes 7, 8)	I_F = 10 mA, I_O = −100 mA	V_{DD} − 0.5	V_{DD} − 0.1		V
V_{OL}	Low Level Output Voltage (Notes 7, 8)	I_F = 0 mA, I_O = 100 mA		V_{SS} + 0.1	V_{SS} + 0.5	
I_{DDH}	High Output Supply Current	V_O = Open, I_F = 10 to 16 mA		2.9	4.0	mA
I_{DDL}	Low Output Supply Current	V_O = Open, V_F = −3.0 to 0.8 V		2.8	4.0	mA
I_{FLH}	Threshold Input Current Low to High	I_O = 0 mA, V_O > 5 V		2.0	7.5	mA
V_{FHL}	Threshold Input Voltage High to Low	I_O = 0 mA, V_O < 5 V	0.8			V
V_{UVLO+}	Under Voltage Lockout Threshold	I_F = 10 mA, V_O > 5 V	7.0	8.3	9.5	V
V_{UVLO-}		I_F = 10 mA, V_O < 5 V	6.5	7.7	9.0	
$UVLO_{HYS}$	Under Voltage Lockout Threshold Hysteresis			0.6		V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

7. In this test, V_{OH} is measured with a dc load current of 100 mA. When driving capacitive load V_{OH} will approach V_{DD} as I_{OH} approaches 0 A.
8. Maximum pulse width = 1 ms, maximum duty cycle = 20%.

Table 8. SWITCHING CHARACTERISTICS (Apply over all recommended conditions, typical value is measured at T_A = 25°C, V_{SS} = Ground and V_{DD} = 30 V, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{PHL}	Propagation Delay Time to Logic Low Output (Note 9)	I_F = 10 mA, R_g = 10 Ω, C_g = 10 nF, f = 250 kHz, Duty Cycle = 50%	50	145	210	ns
t_{PLH}	Propagation Delay Time to Logic High Output (Note 10)		50	120	210	ns
PWD	Pulse Width Distortion, $\|t_{PHL} - t_{PLH}\|$ (Note 11)			35	65	ns
PDD (Skew)	Propagation Delay Difference Between Any Two Parts (Note 12)		−90		90	
t_R	Output Rise Time (10% to 90%)			38		ns
t_F	Output Fall Time (90% to 10%)			24		ns
$t_{UVLO\ ON}$	ULVO Turn On Delay	I_F = 10 mA, V_O > 5 V		2.0		μs
$t_{UVLO\ OFF}$	ULVO Turn Off Delay	I_F = 10 mA, V_O < 5 V		0.3		μs
$\|CM_H\|$	Common Mode Transient Immunity at Output High	V_{DD} = 30 V, I_F = 10 mA to 16 mA, V_{CM} = 2000 V, T_A = 25°C (Note 13)	20	50		kV/μs
$\|CM_L\|$	Common Mode Transient Immunity at Output Low	V_{DD} = 30 V, V_F = 0 V, V_{CM} = 2000 V, T_A = 25°C (Note 14)	20	50		kV/μs

9. Propagation delay t_{PHL} is measured from the 50% level on the falling edge of the input pulse to the 50% level of the falling edge of the V_O signal.
10. Propagation delay t_{PLH} is measured from the 50% level on the rising edge of the input pulse to the 50% level of the rising edge of the V_O signal.
11. PWD is defined as $|t_{PHL} - t_{PLH}|$ for any given device.
12. The difference between t_{PHL} and t_{PLH} between any two FOD8342 parts under the same operating conditions, with equal loads.
13. Common mode transient immunity at output high is the maximum tolerable negative dVcm/dt on the trailing edge of the common mode impulse signal, V_{CM}, to ensure that the output remains high (i.e., V_O > 15.0 V).
14. Common mode transient immunity at output low is the maximum tolerable positive dVcm/dt on the leading edge of the common pulse signal, V_{CM}, to ensure that the output remains low (i.e., V_O < 1.0 V).

TYPICAL CHARACTERISTICS

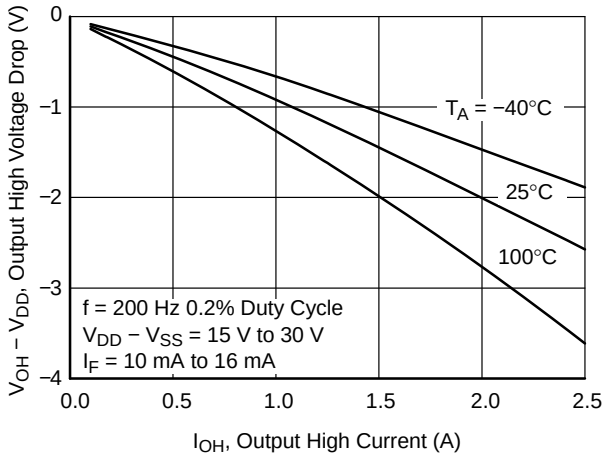


Figure 2. Output High Voltage Drop vs. Output High Current

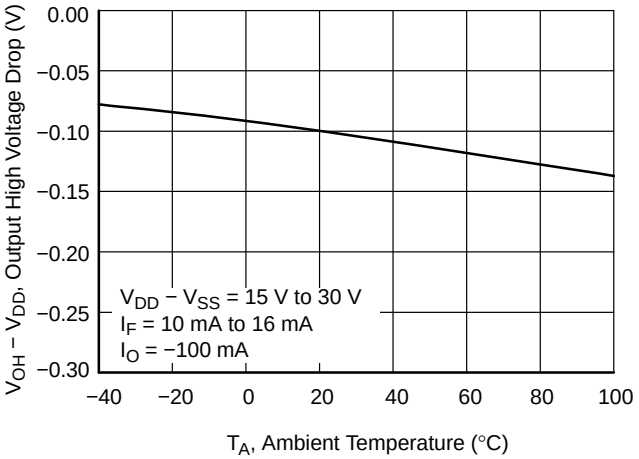


Figure 3. Output High Voltage Drop vs. Ambient Temperature

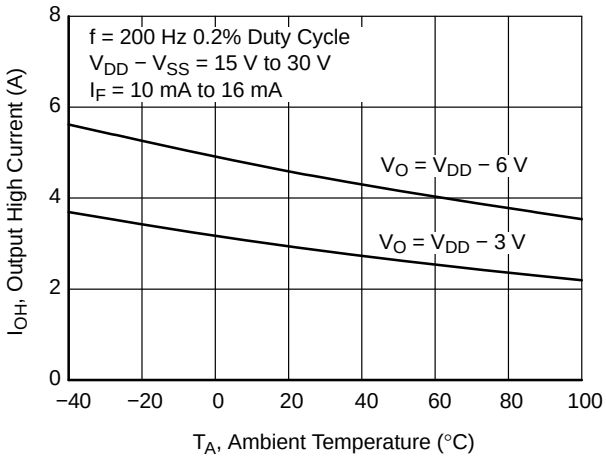


Figure 4. Output High Current vs. Ambient Temperature

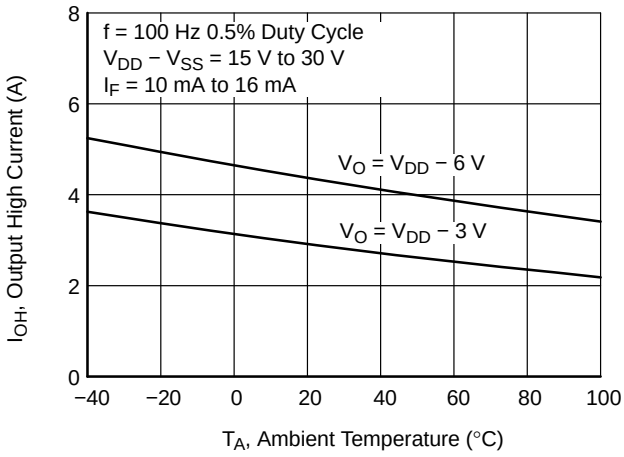


Figure 5. Output High Current vs. Ambient Temperature

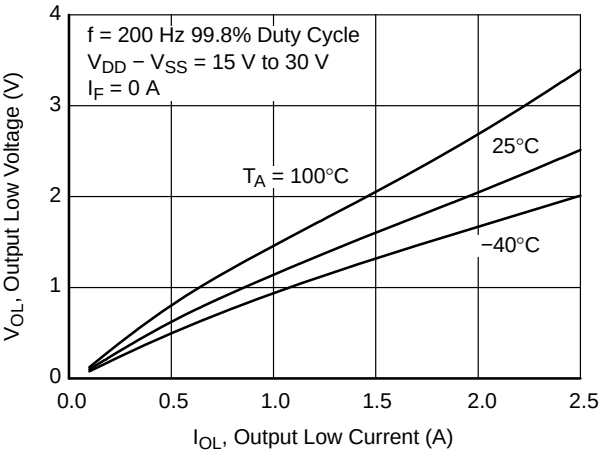


Figure 6. Output Low Voltage vs. Output Low Current

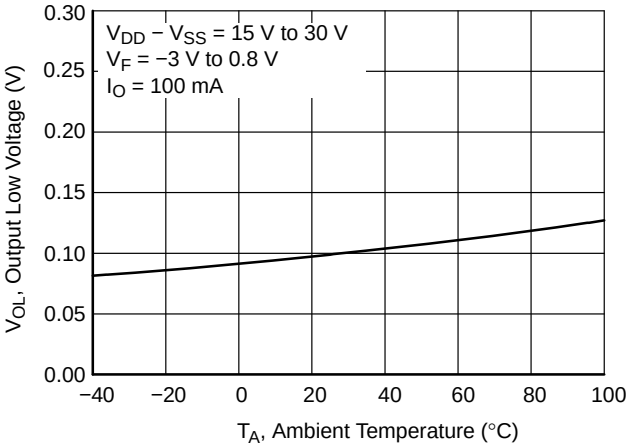


Figure 7. Output Low Voltage vs. Ambient Temperature

TYPICAL CHARACTERISTICS (CONTINUED)

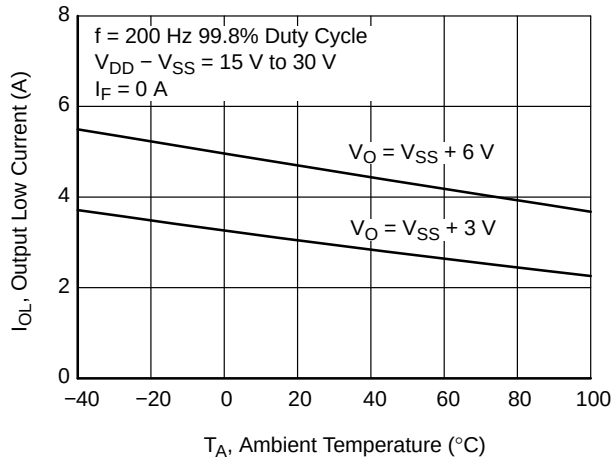


Figure 8. Output Low Current vs. Ambient Temperature

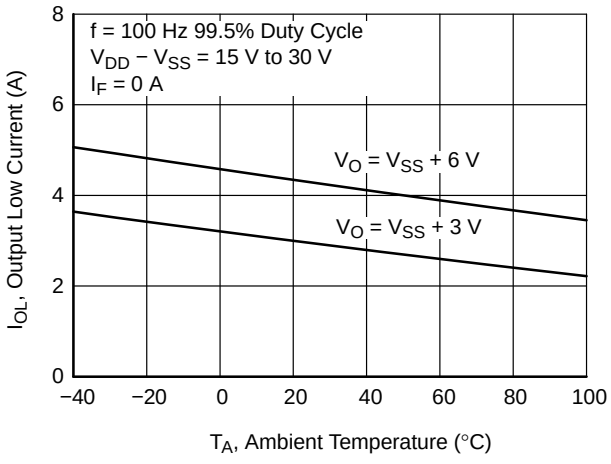


Figure 9. Output Low Current vs. Ambient Temperature

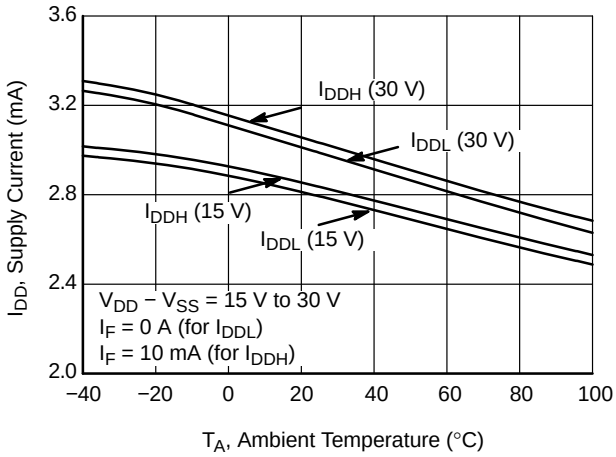


Figure 10. Supply Current vs. Ambient Temperature

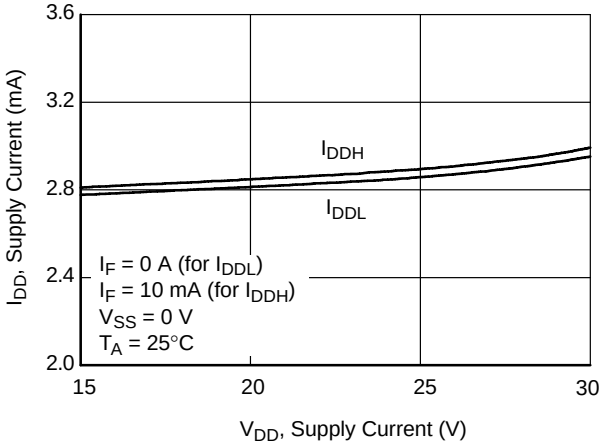


Figure 11. Supply Current vs. Supply Voltage

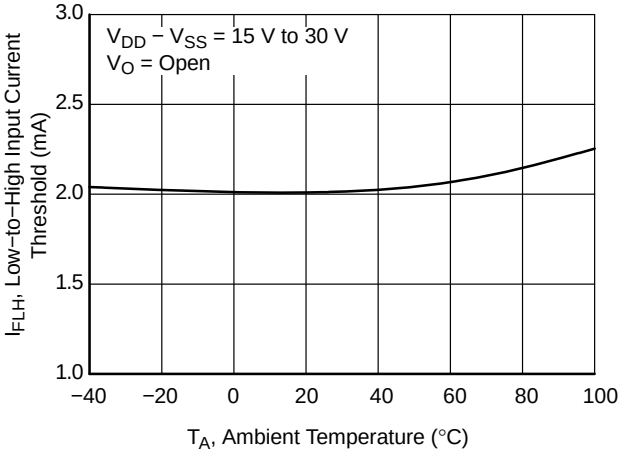


Figure 12. Low−to−High Input Current Threshold vs. Ambient Temperature

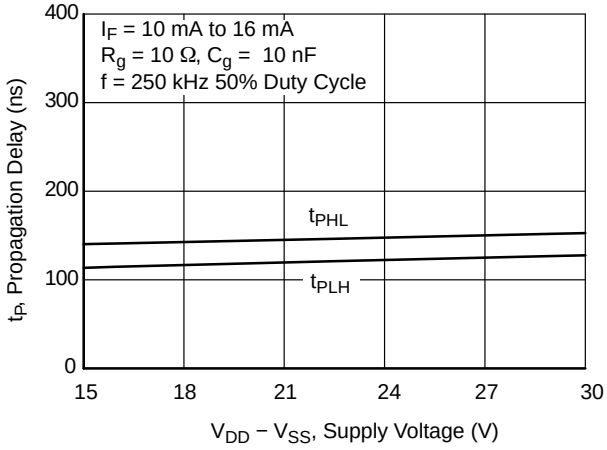


Figure 13. Propagation Delay vs. Supply Voltage

TYPICAL CHARACTERISTICS (CONTINUED)

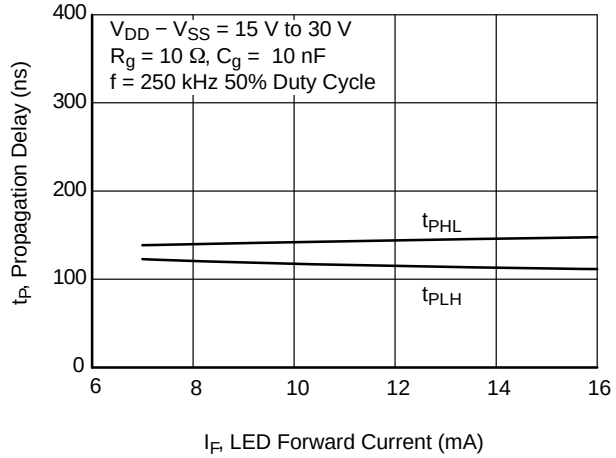


Figure 14. Propagation Delay vs. LED Forward Current

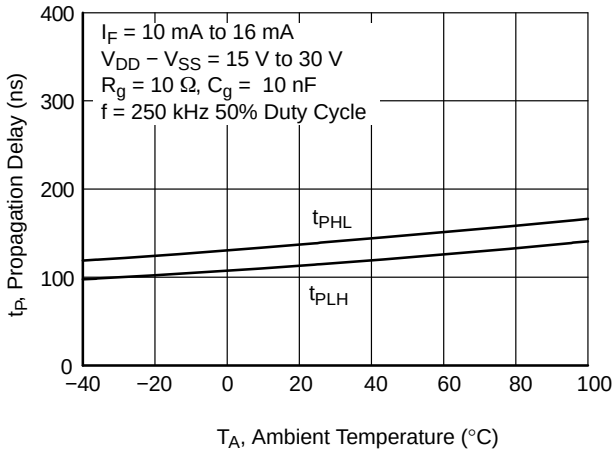


Figure 15. Propagation Delay vs. Ambient Temperature

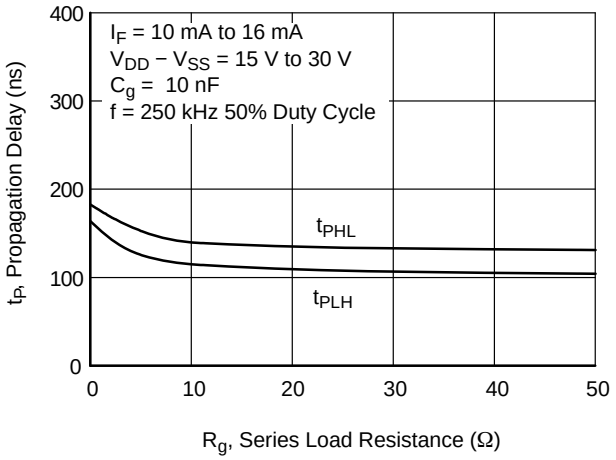


Figure 16. Propagation Delay vs. Series Load Resistance

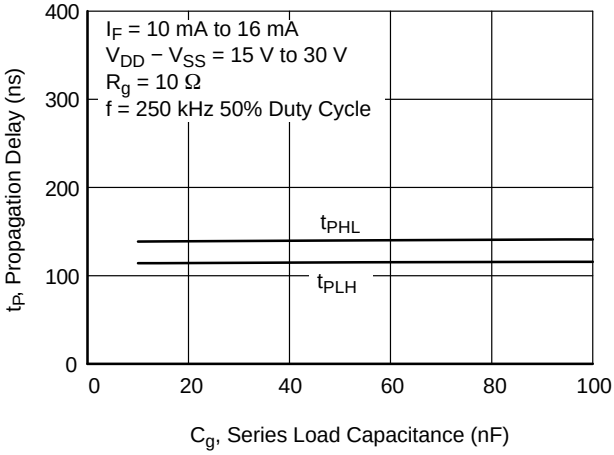


Figure 17. Propagation Delay vs. Series Load Capacitance

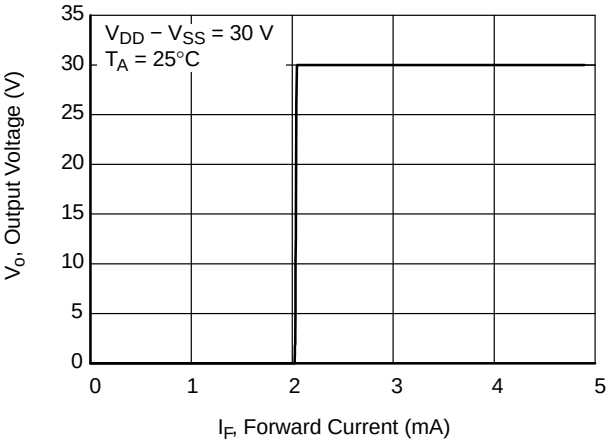


Figure 18. Transfer Characteristics

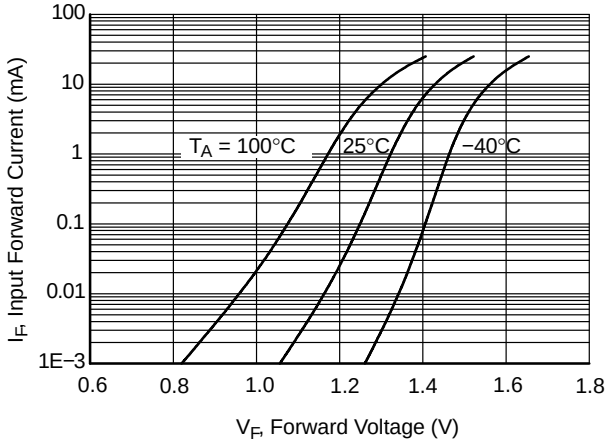


Figure 19. Input Forward Current vs. Forward Voltage

TYPICAL CHARACTERISTICS (CONTINUED)

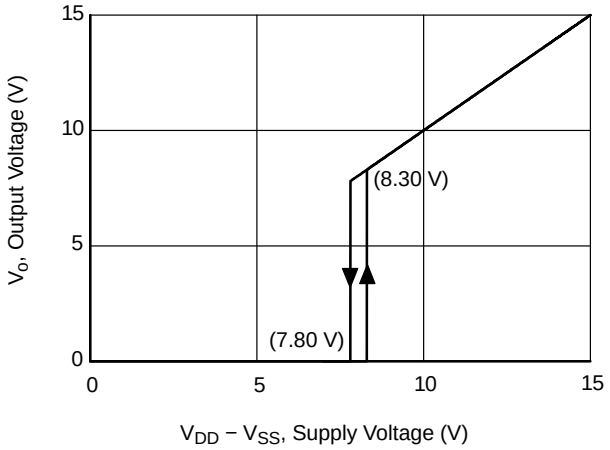


Figure 20. Under Voltage Lockout

TEST CIRCUIT

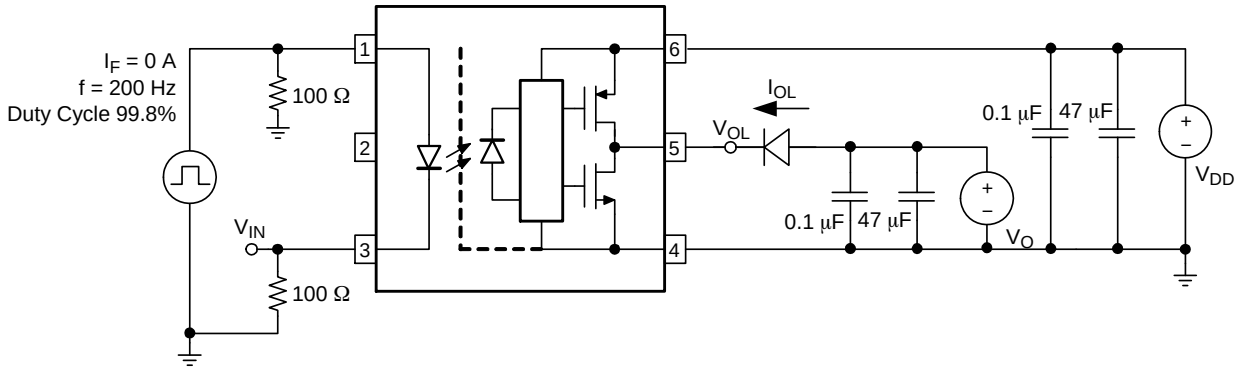


Figure 21. I_{OL} Test Circuit

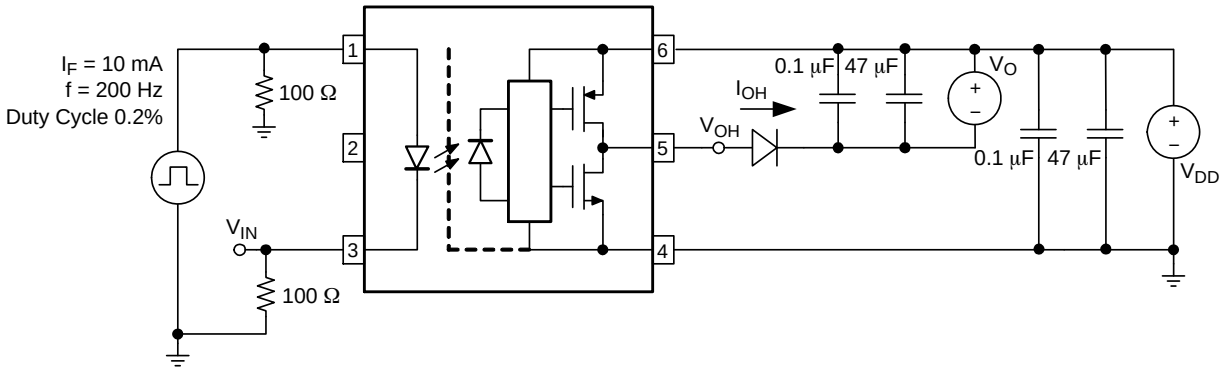


Figure 22. I_{OH} Test Circuit

TEST CIRCUIT (CONTINUED)

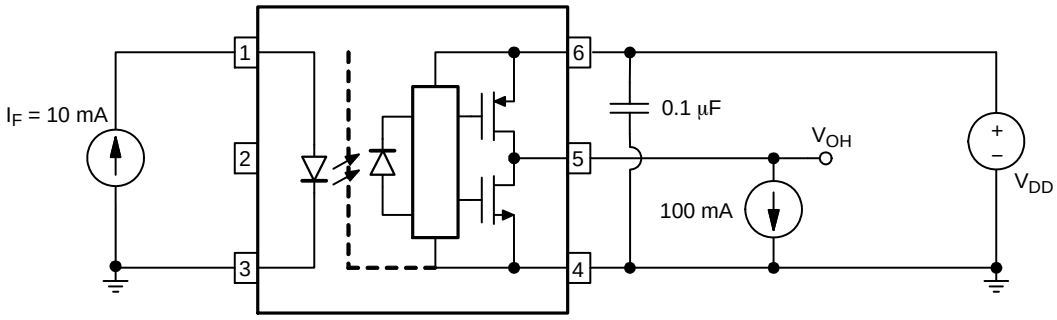


Figure 23. V_{OH} Test Circuit

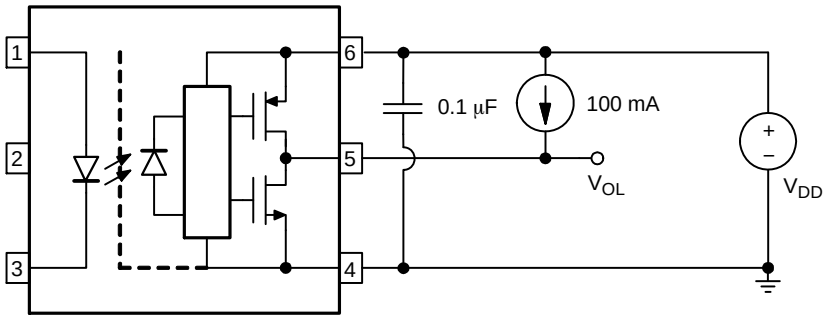


Figure 24. V_{OL} Test Circuit

TEST CIRCUIT (CONTINUED)

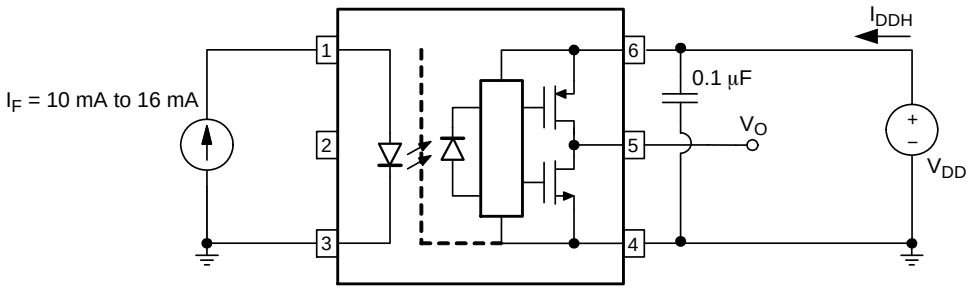


Figure 25. I_{DDH} Test Circuit

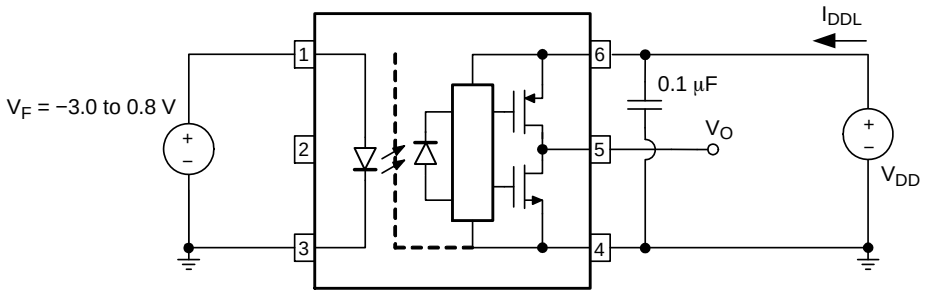


Figure 26. I_{DDL} Test Circuit

TEST CIRCUIT (CONTINUED)

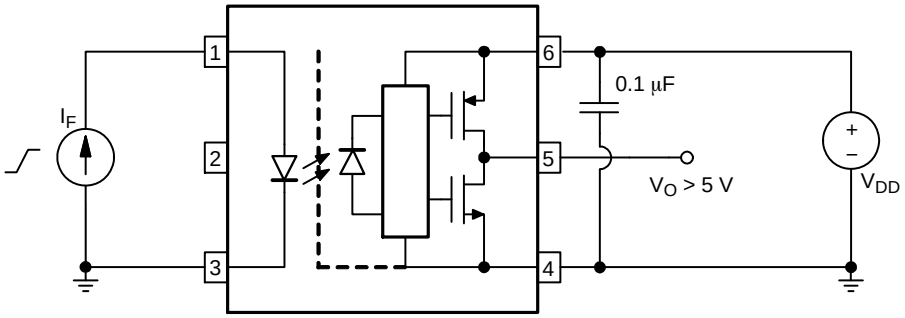


Figure 27. I_{FLH} Test Circuit

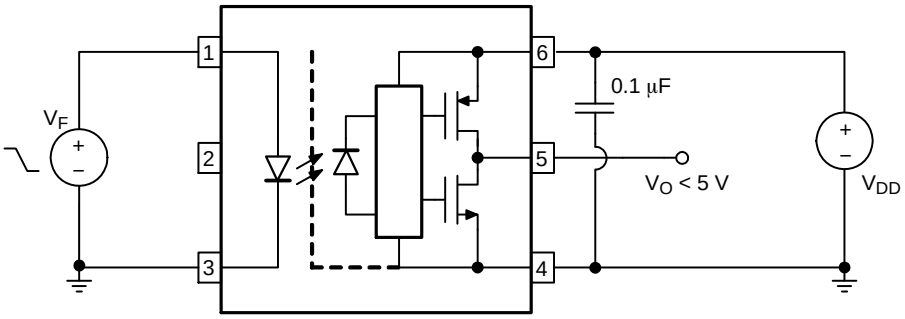


Figure 28. V_{FHL} Test Circuit

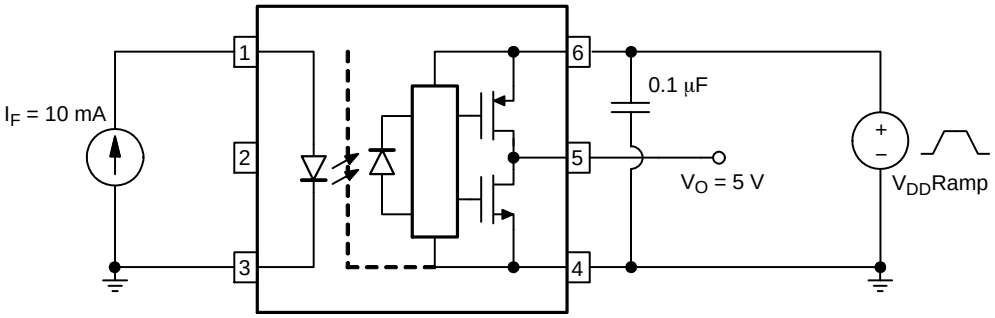


Figure 29. UVLO Test Circuit

TEST CIRCUIT (CONTINUED)

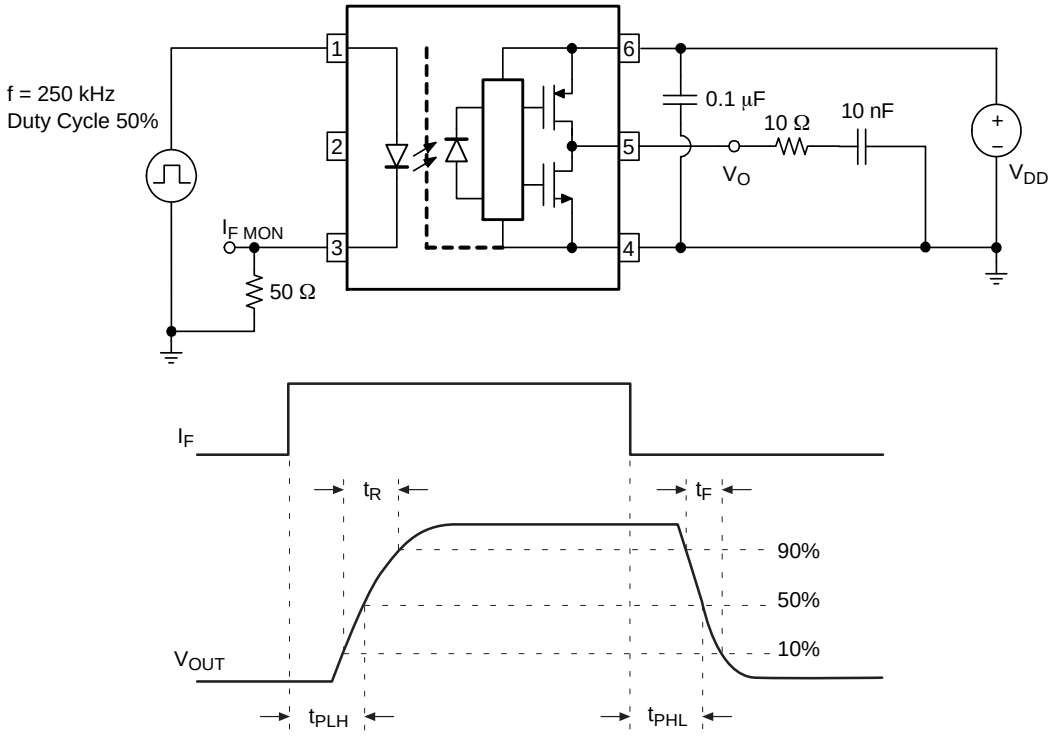
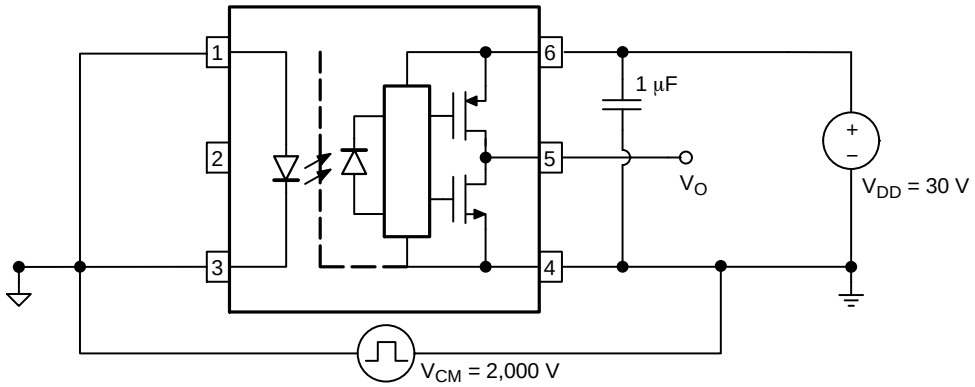
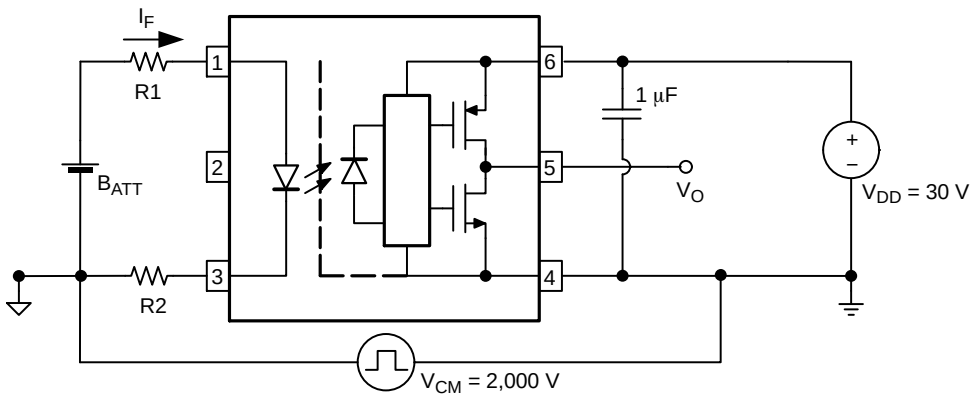


Figure 30. t_{PHL}, t_{PLH}, t_R and t_F Test Circuit and Waveforms

TEST CIRCUIT (CONTINUED)



Common−Mode Low (CML) Test Circuit



Common−Mode High (CMH) Test Circuit

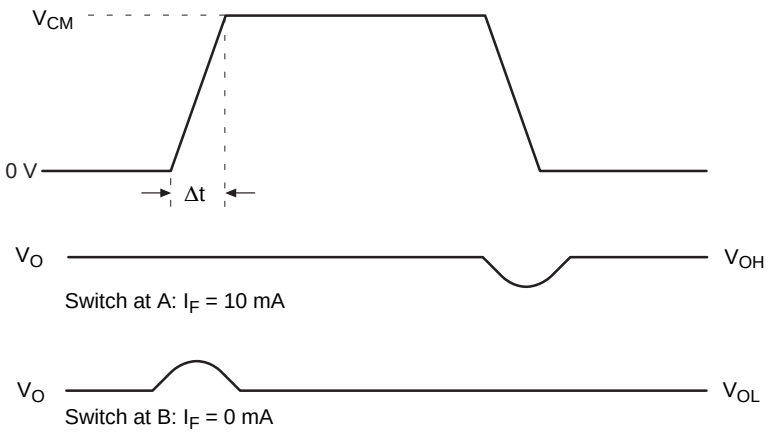
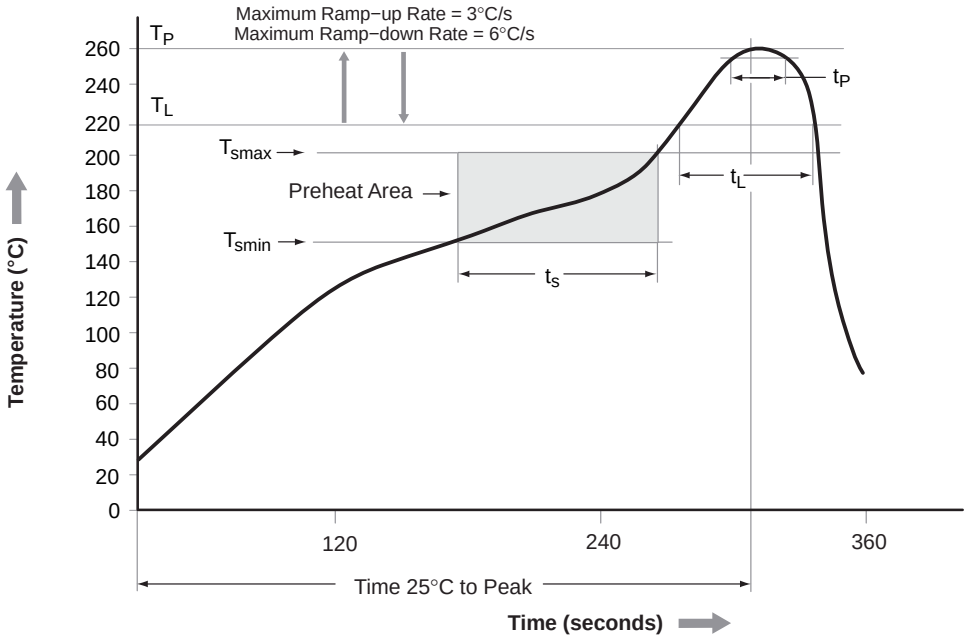


Figure 31. CMR Test Circuit and Waveforms

REFLOW PROFILE



Profile Feature	Pb−Free Assembly Profile
Temperature Minimum (T_{smin})	150°C
Temperature Maximum (T_{smax})	200°C
Time (t_S) from (T_{smin} to T_{smax})	60 s to 120 s
Ramp−up Rate (t_L to t_P)	3°C/s maximum
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60 s to 150 s
Peak Body Package Temperature	260°C +0°C / −5°C
Time (t_P) within 5°C of 260°C	30 s
Ramp−Down Rate (T_P to T_L)	6°C/s maximum
Time 25°C to Peak Temperature	8 minutes maximum

Figure 32. Reflow Profile

ORDERING INFORMATION

Part Number	Package	Packing Method
FOD8342	Stretched Body SOP 6−Pin	Tube (100 units per tube)
FOD8342R2	Stretched Body SOP 6−Pin	Tape and Reel (1,000 units per reel)
FOD8342V	Stretched Body SOP 6−Pin, DIN EN/IEC60747−5−5 Option	Tube (100 units per tube)
FOD8342R2V	Stretched Body SOP 6−Pin, DIN EN/ IEC60747−5−5 Option	Tape and Reel (1,000 units per reel)
FOD8342T	Stretched Body SOP 6−Pin, Wide Lead	Tube (100 units per tube)
FOD8342TR2	Stretched Body SOP 6−Pin, Wide Lead	Tape and Reel (1,000 units per reel)
FOD8342TR2V	Stretched Body SOP 6−Pin, Wide Lead, DIN EN/ IEC60747−5−5 Option	Tape and Reel (1,000 units per reel)

DISCONTINUED (Note 15)

FOD8342TV	Stretched Body SOP 6−Pin, Wide Lead, DIN EN/IEC60747−5−5 Option	Tube (100 units per tube)

*All packages are lead free per JEDEC: J−STD−020B standard.

15. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on www.onsemi.com.

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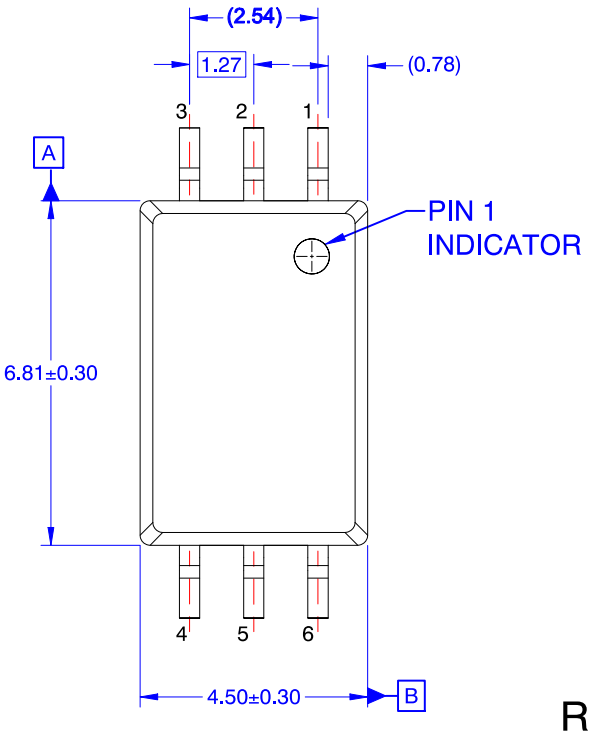
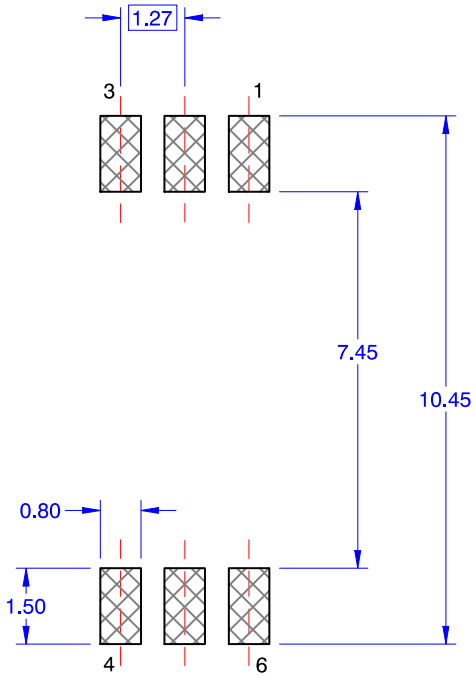
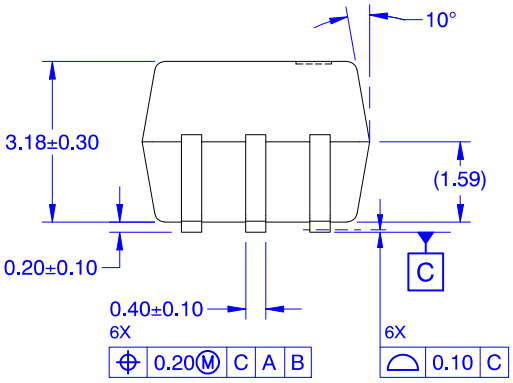
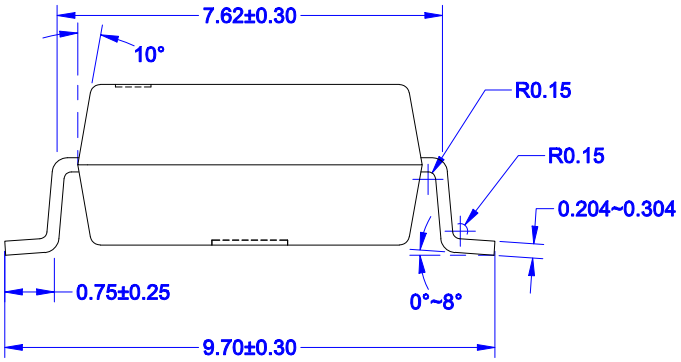




RECOMMENDED LAND PATTERN





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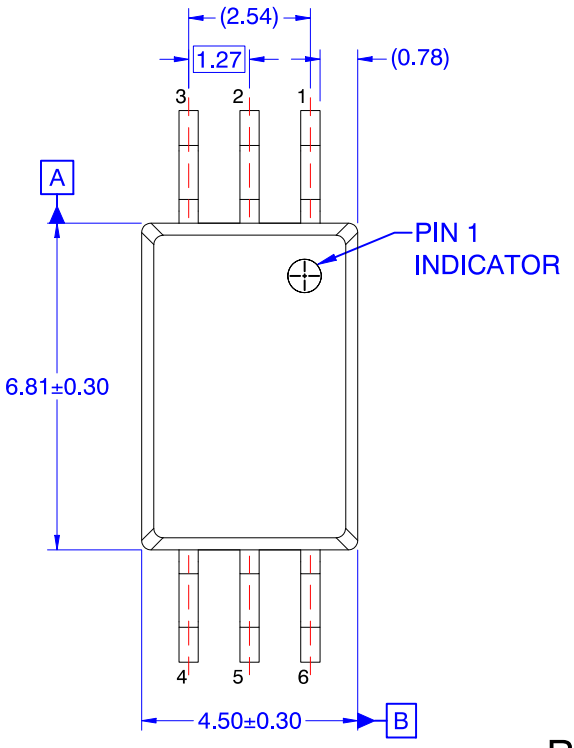

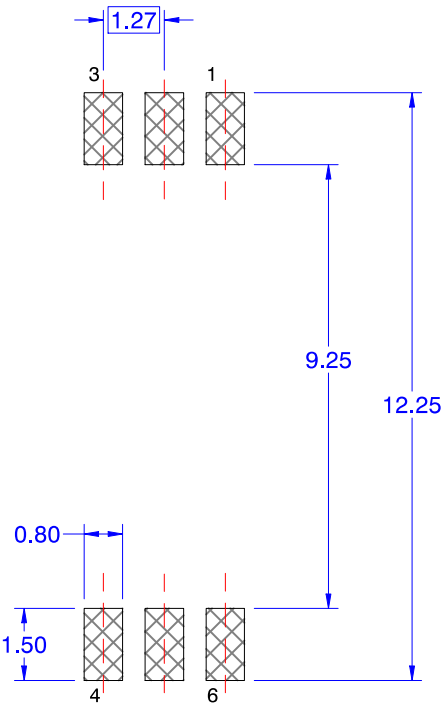

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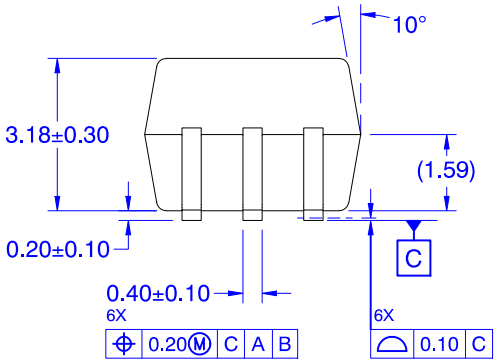

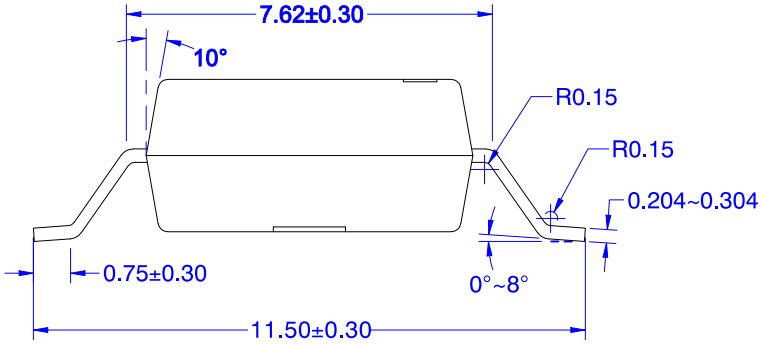

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