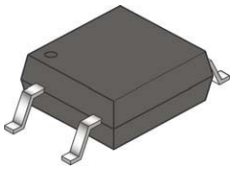
4-Pin Full Pitch Mini-Flat Package Random-Phase Triac Driver Output Optocouplers

FODM3011, FODM3012, FODM3022, FODM3023, FODM3052, FODM3053



MFP−4
CASE 100AP

Description

The FODM301X, FODM302X, and FODM305X series consists of a GaAs infrared emitting diode driving a silicon bilateral switch housed in a compact 4−pin mini−flat package. The lead pitch is 2.54 mm. They are designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115 V/240 V operations.

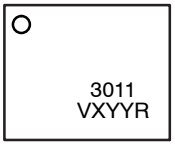
Features

- Compact 4−pin Surface Mount Package (2.4 mm Maximum Standoff Height)
- Peak Blocking Voltage
  - 250 V (FODM301X)
  - 400 V (FODM302X)
  - 600 V (FODM305X)
- Safety and Regulatory Approvals:
  - UL1577, 3,750 VAC_{RMS} for 1 Minute
  - DIN−EN/IEC60747−5−5, 565 V Peak Working Insulation Voltage
- These are Pb−Free Devices

Applications

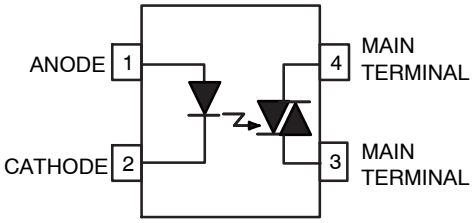
- Industrial Controls
- Traffic Lights
- Vending Machines
- Solid State Relay
- Lamp Ballasts
- Solenoid/Valve Controls
- Static AC Power Switch
- Incandescent Lamp Dimmers
- Motor Control

MARKING DIAGRAM



3011 = Specific Device Code
V = DIN EN/IEC60747−5−5 Option (only appears on component ordered with this option)
X = One Digit Year Code, e.g., “6”
YY = Digit Work Week, Ranging from “01” to “53”
R = Assembly Package Code

FUNCTIONAL SCHEMATIC



ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

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SAFETY AND INSULATION RATINGS (As per DIN EN/IEC 60747−5−5, 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		Characteristics
Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Mains Voltage	<150 V_{RMS}	I–IV
	<300 V_{RMS}	I–III
Climatic Classification		40/100/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V_{PR}	Input−to−Output Test Voltage, Method A, V_{IORM} x 1.6 = V_{PR}, Type and Sample Test with t_m = 10 s, Partial Discharge < 5 pC	904	V_{peak}
	Input−to−Output Test Voltage, Method B, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with t_m = 1 s, Partial Discharge < 5 pC	1060	V_{peak}
V_{IORM}	Maximum Working Insulation Voltage	565	V_{peak}
V_{IOTM}	Highest Allowable Over−Voltage	6000	V_{peak}
	External Creepage	≥5	mm
	External Clearance	≥5	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥0.4	mm
T_S	Case Temperature (Note 1)	150	°C
$I_{S,INPUT}$	Input Current (Note 1)	200	mA
$P_{S,OUTPUT}$	Output Power (Note 1)	300	mW
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500 V (Note 1)	$>10^9$	Ω

1. Safety limit values − maximum values allowed in the event of a failure.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, unless otherwise noted)

Symbol	Parameter		Value	Unit
TOTAL PACKAGE				
T_{STG}	Storage Temperature		−55 to +150	°C
T_{OPR}	Operating Temperature		−40 to +100	°C
T_J	Junction Temperature		−40 to +125	°C
T_{SOL}	Lead Solder Temperature		260 for 10 s	°C
EMITTER				
$I_{F(avg)}$	Continuous Forward Current		60	mA
V_R	Reverse Input Voltage		3	V
P_D	Power Dissipation (No Derating Required over Operating Temp. Range)		100	mW
DETECTOR				
I_{TSM}	Peak Non−Repetitive Surge Current (Single Cycle 60 Hz Sine Wave)		1	$A_{(PEAK)}$
$I_{TM(RMS)}$	On−State RMS Current		70	$mA_{(RMS)}$
V_{DRM}	Off−State Output Terminal Voltage	FODM3011, FODM3012	250	V
		FODM3022, FODM3023	400	
		FODM3052, FODM3053	600	
P_D	Power Dissipation (No Derating Required over Operating Temp. Range)		300	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.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Typ	Max	Unit
EMITTER							
V_F	Input Forward Voltage	All	I_F = 10 mA	–	1.20	1.50	V
I_R	Reverse Leakage Current	All	V_R = 3 V, T_A = 25°C	–	0.01	100	μA
DETECTOR							
I_{DRM}	Peak Blocking Current Either Direction	All	Rated V_{DRM}, I_F = 0 (Note 2)	–	2	100	nA
dV/dt	Critical Rate of Rise of Off−State Voltage	FODM3011, FODM3012, FODM3022, FODM3023	I_F = 0 (Note 3)	–	10	–	V/μs
		FODM3052, FODM3053		1,000	–	–	

TRANSFER CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Typ	Max	Unit
I_{FT}	LED Trigger Current	FODM3011, FODM3022, FODM3052	Main Terminal Voltage = 3 V (Note 4)	–	–	10	mA
		FODM3012, FODM3023, FODM3053		–	–	5	
I_H	Holding Current, Either Direction	All		–	450	–	μA
V_{TM}	Peak On−State Voltage Either Direction	All	I_{TM} = 100 mA peak	–	2.2	3	V

ISOLATION CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Typ	Max	Unit
V_{ISO}	Steady State Isolation Voltage	All	1 Minute, R.H. = 40% to 60%	3,750	–	–	VAC_{RMS}

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.

2. Test voltage must be applied within dv/dt rating.
3. This is static dv/dt. Commutating dv/dt is function of the load−driving thyristor(s) only.
4. All devices are guaranteed to trigger at an I_F value of less than or equal to the max I_{FT} specification. For optimum operation over temperature and lifetime of the device, the LED should be biased with an I_F that is at least 50% higher than the maximum I_{FT} specification. The I_{FT} should not exceed the absolute maximum rating of 60 mA. Example: For FODM3053M, the minimum I_F bias should be 5 mA x 150% = 7.5 mA.

TYPICAL PERFORMANCE CHARACTERISTICS

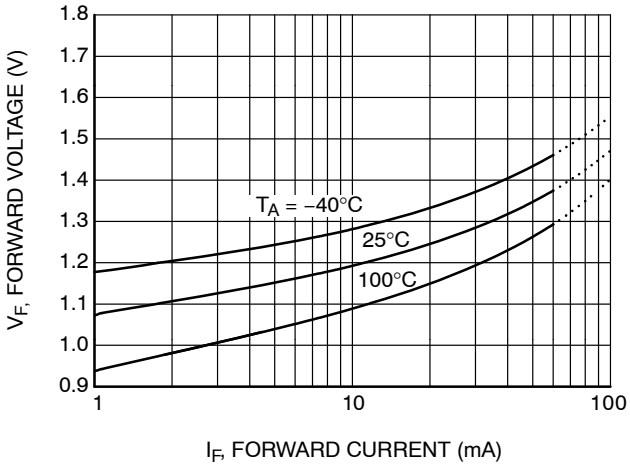


Figure 1. LED Forward Voltage vs. Forward Current

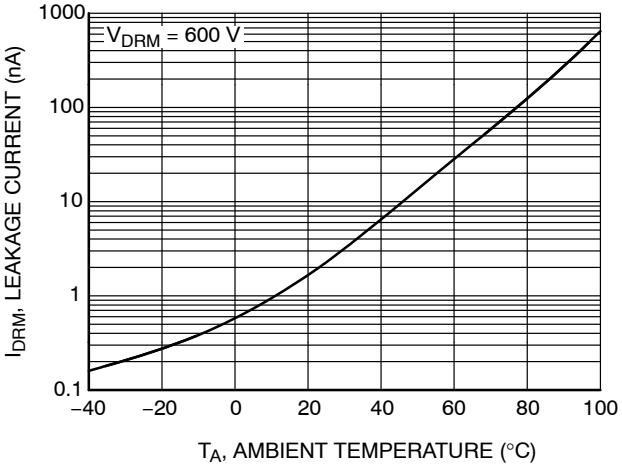


Figure 2. Leakage Current vs. Ambient Temperature

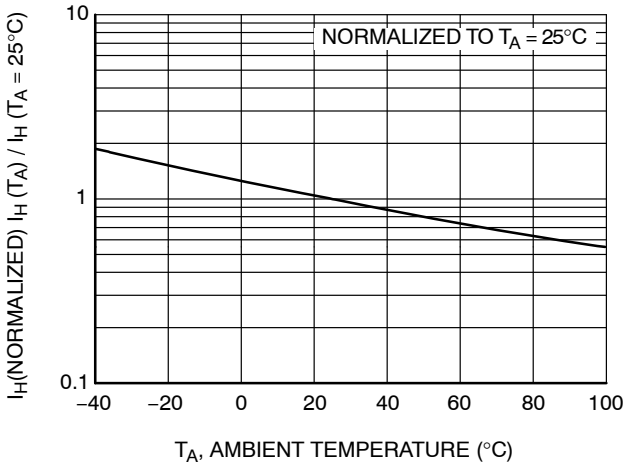


Figure 3. Normalized Holding Current vs. Ambient Temperature

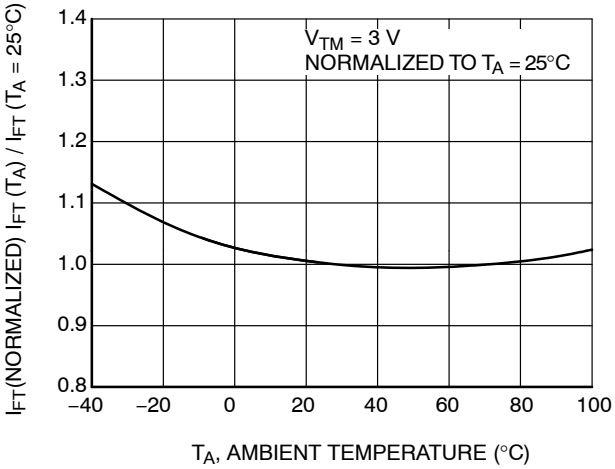


Figure 4. Normalized Trigger Current vs. Ambient Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

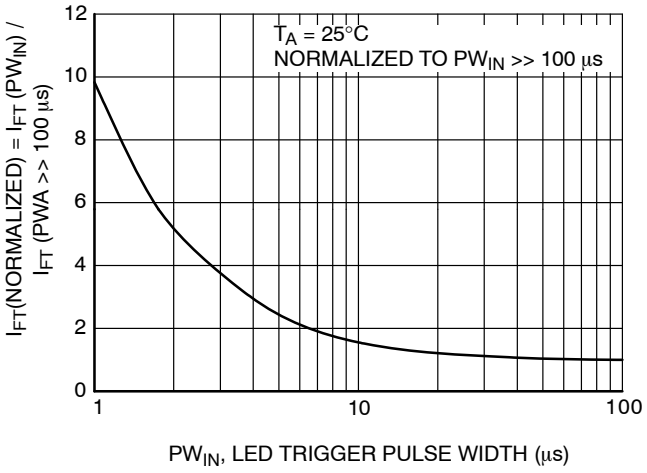


Figure 5. LED Current Required to Trigger vs. LED Pulse Width

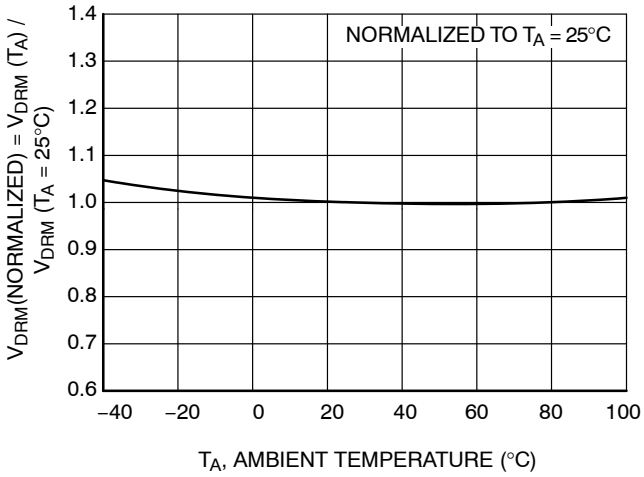


Figure 6. Normalized Off−State Output Terminal Voltage vs. Ambient Temperature

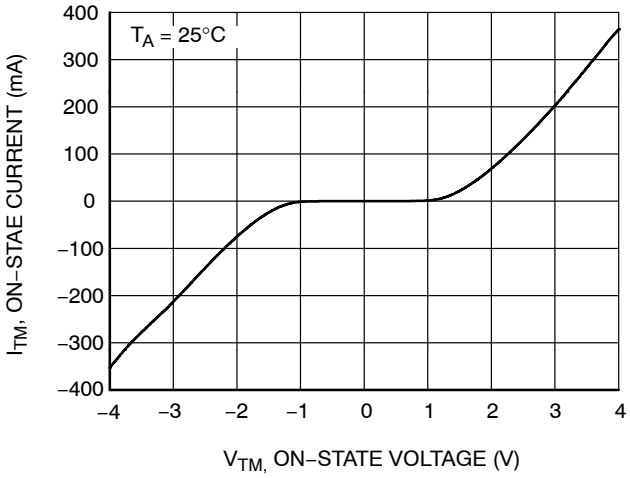


Figure 7. On−State Characteristics

TYPICAL APPLICATION INFORMATION

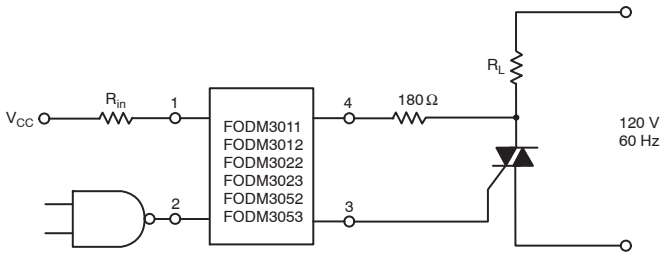


Figure 8. Resistive Load

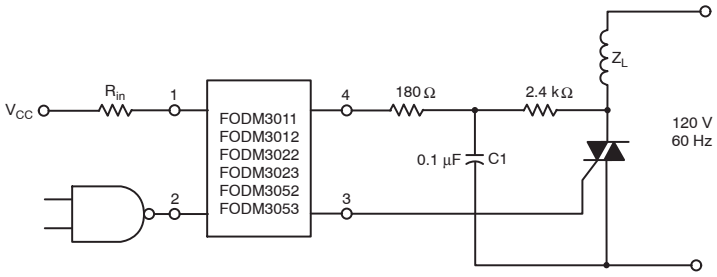
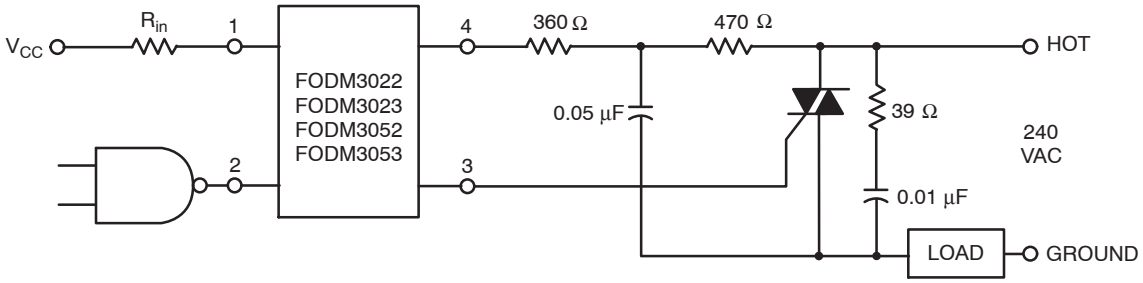


Figure 9. Inductive Load with Sensitive Gate Triac (IGT ≤ 15 mA)



In this circuit the “hot” side of the line is switched and the load connected to the cold or ground side. The 39 Ω resistor and 0.01 μF capacitor are for snubbing of the trisc, and the 470 Ω resistor and 0.05 μF capacitor are for snubbing the coupler. These components may or may not be necessary depending upon the particular and load used.

Figure 10. Typical Application Circuit

REFLOW PROFILE

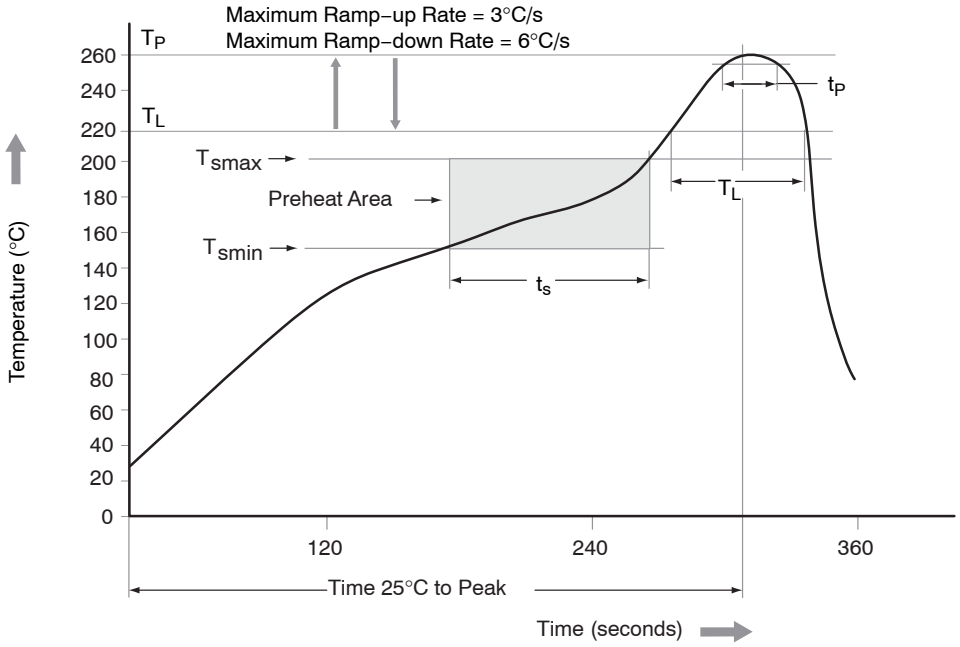


Figure 11. Reflow Profile

Table 1. 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 – 120 seconds
Ramp−up Rate (t_L to t_P)	3°C/second maximum
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60 – 150 seconds
Peak Body Package Temperature	260°C +0°C / –5°C
Time (t_P) within 5°C of 260°C	30 seconds
Ramp−down Rate (T_P to T_L)	6°C/second maximum
Time 25°C to Peak Temperature	8 minutes maximum

ORDERING INFORMATION (Note 5)

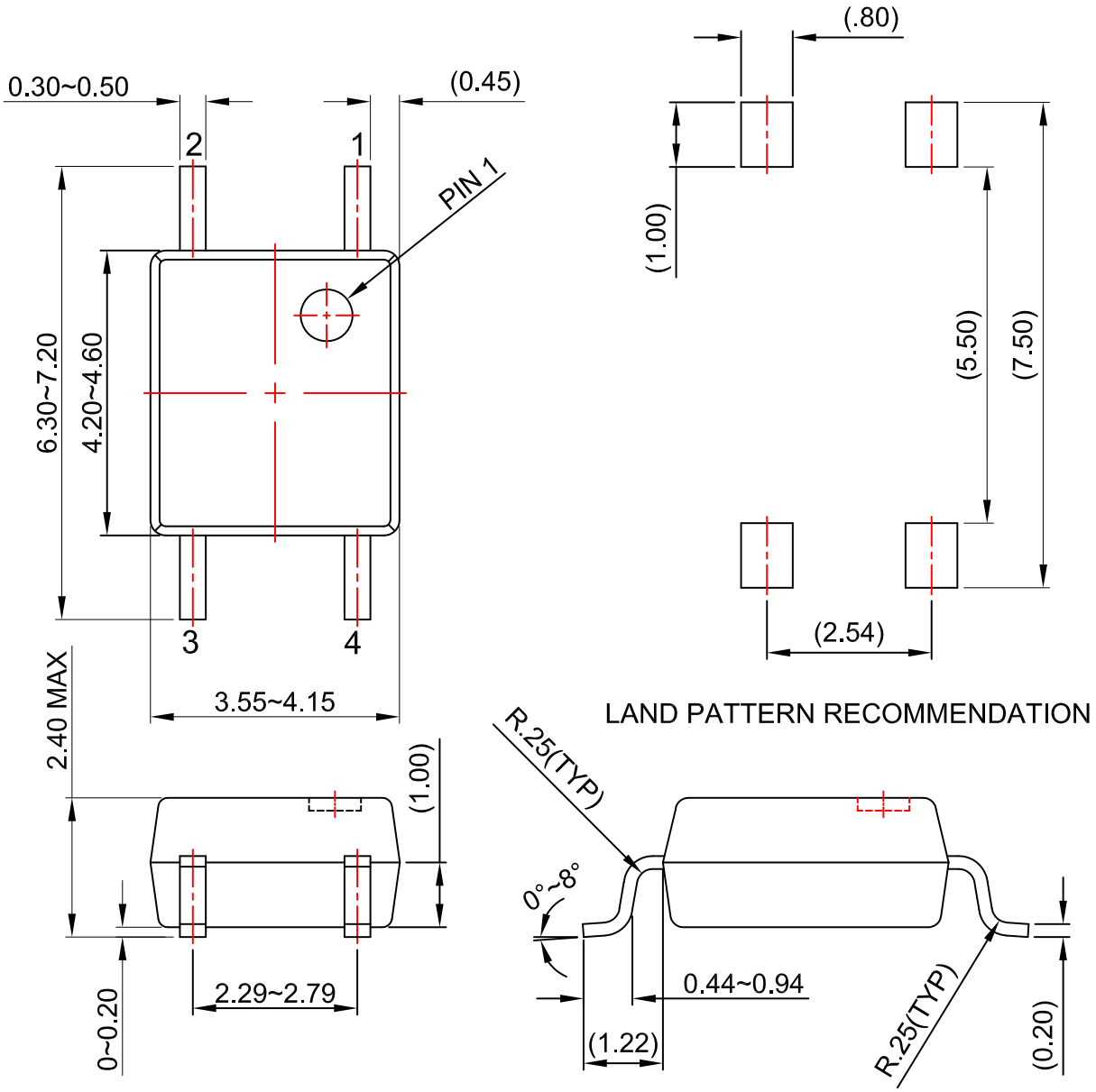
Part Number	Package	Shipping†
FODM3011−NF098	Full Pitch Mini−Flat 4−Pin	100 Units / Tube
FODM3011R2−NF098	Full Pitch Mini−Flat 4−Pin	2500 / Tape & Reel
FODM3011V−NF098	Full Pitch Mini−Flat 4−Pin, DIN EN/IEC60747−5−5 Option	100 Units / Tube
FODM3011R2V−NF098	Full Pitch Mini−Flat 4−Pin, DIN EN/IEC60747−5−5 Option	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

5. The product orderable part number system listed in this table also applies to the FODM3012, FODM3022, FODM3023, FODM3052, and FODM3053 products.

MFP4 3.85X4.4, 2.54P
CASE 100AP
ISSUE O

DATE 31 AUG 2016



NOTES:

A) NO STANDARD APPLIES TO THIS PACKAGE.

B) ALL DIMENSIONS ARE IN MILLIMETERS.

C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION

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