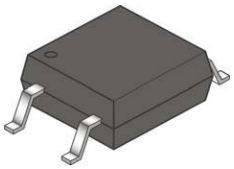
# 4-Pin Full Pitch Mini-Flat Package Random-Phase Triac Driver Output Optocouplers

# 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.

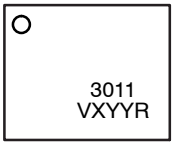
## Features

- 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

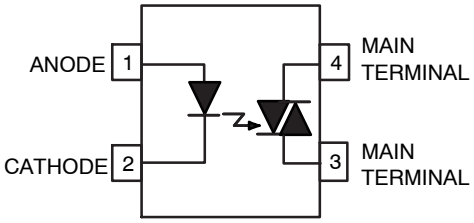
- Industrial Controls
- Traffic Lights
- Vending Machines
- Solid State Relay
- Lamp Ballasts
- Solenoid/Valve Controls
- Static AC Power Switch
- Incandescent Lamp Dimmers
- Motor Control

## 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

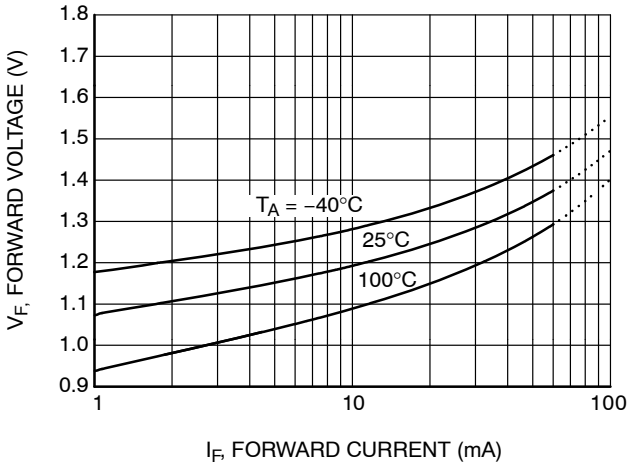



**Figure 1. LED Forward Voltage vs. Forward Current**

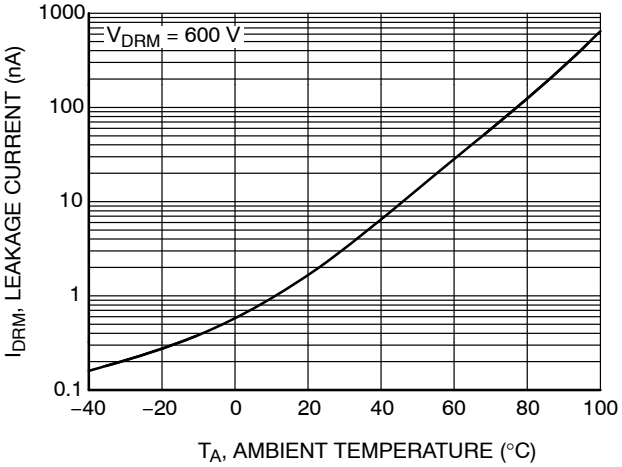



**Figure 2. Leakage Current vs. Ambient Temperature**

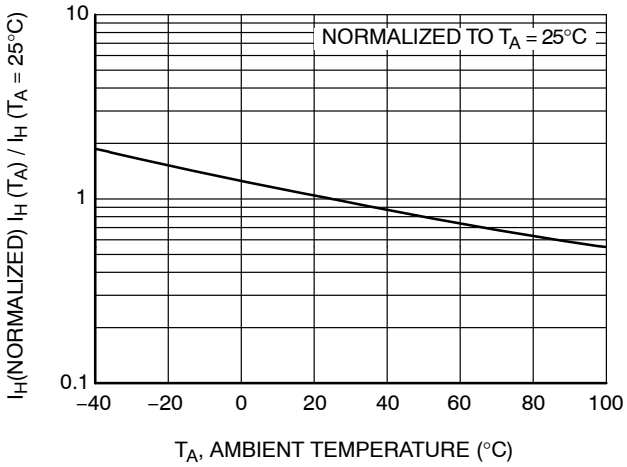



**Figure 3. Normalized Holding Current vs. Ambient Temperature**

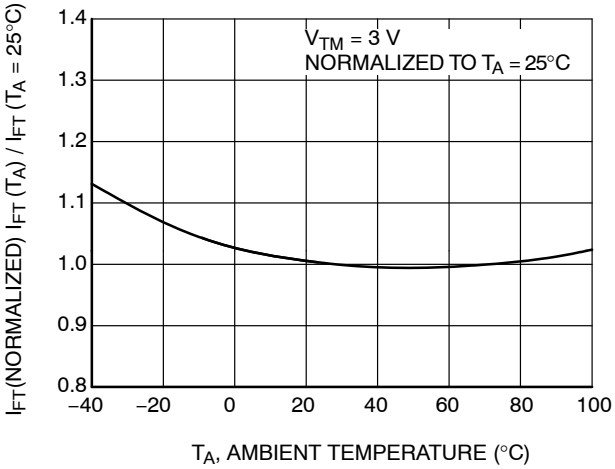



**Figure 4. Normalized Trigger Current vs. Ambient Temperature**

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

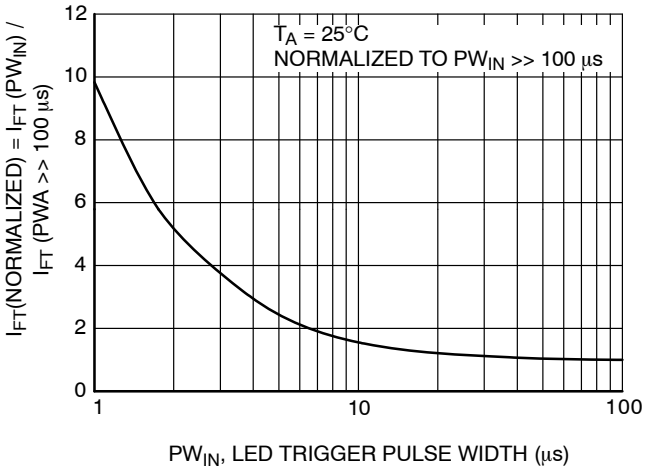



**Figure 5. LED Current Required to Trigger vs. LED Pulse Width**

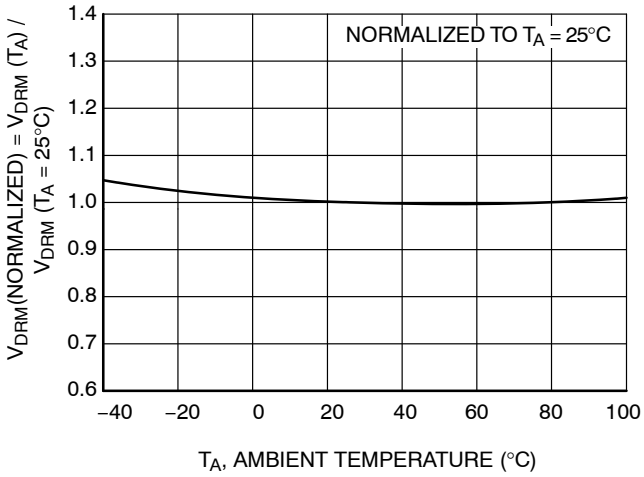



**Figure 6. Normalized Off−State Output Terminal Voltage vs. Ambient Temperature**

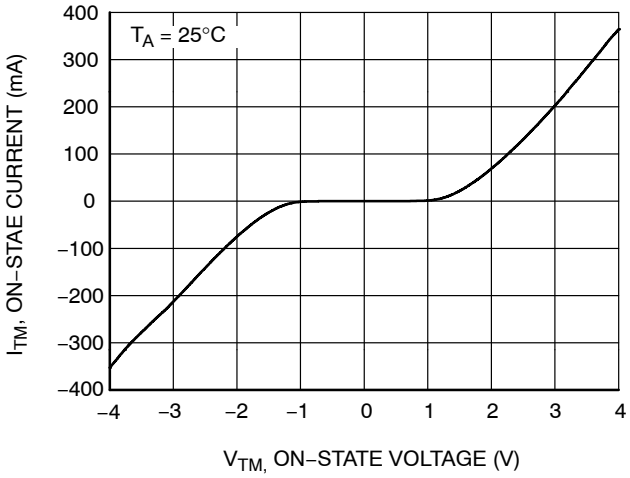



**Figure 7. On−State Characteristics**

## TYPICAL APPLICATION INFORMATION

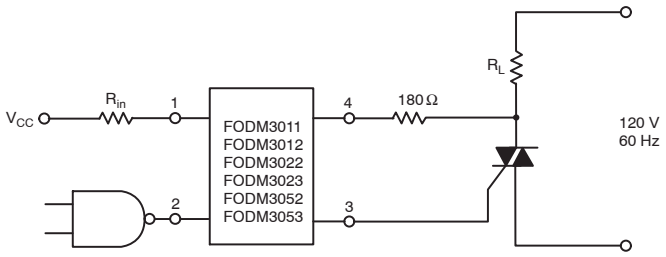



**Figure 8. Resistive Load**

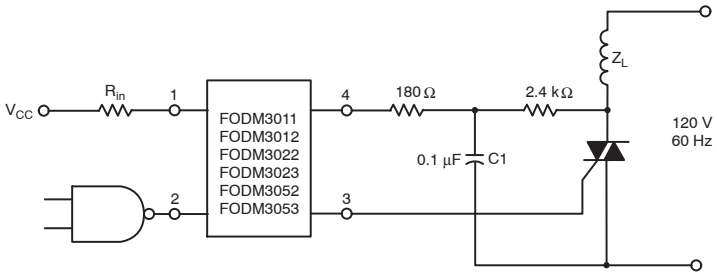
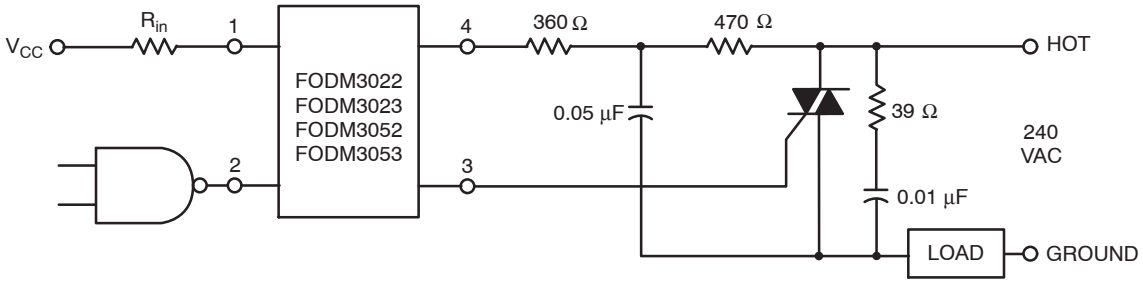



**Figure 9. Inductive Load with Sensitive Gate Triac (IGT ≤ 15 mA)**




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

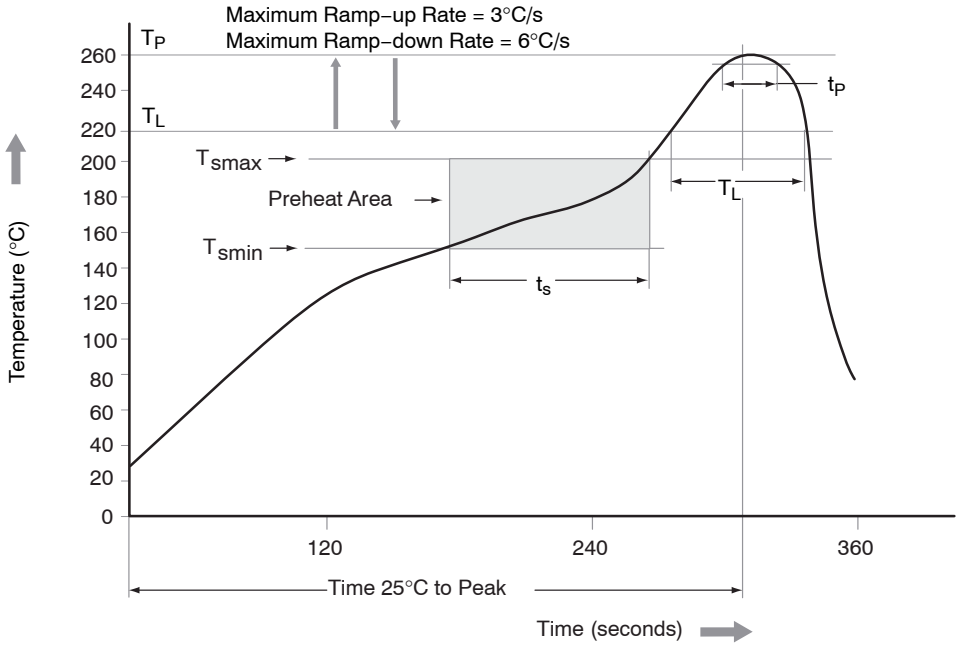



**Figure 11. Reflow Profile**

**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)

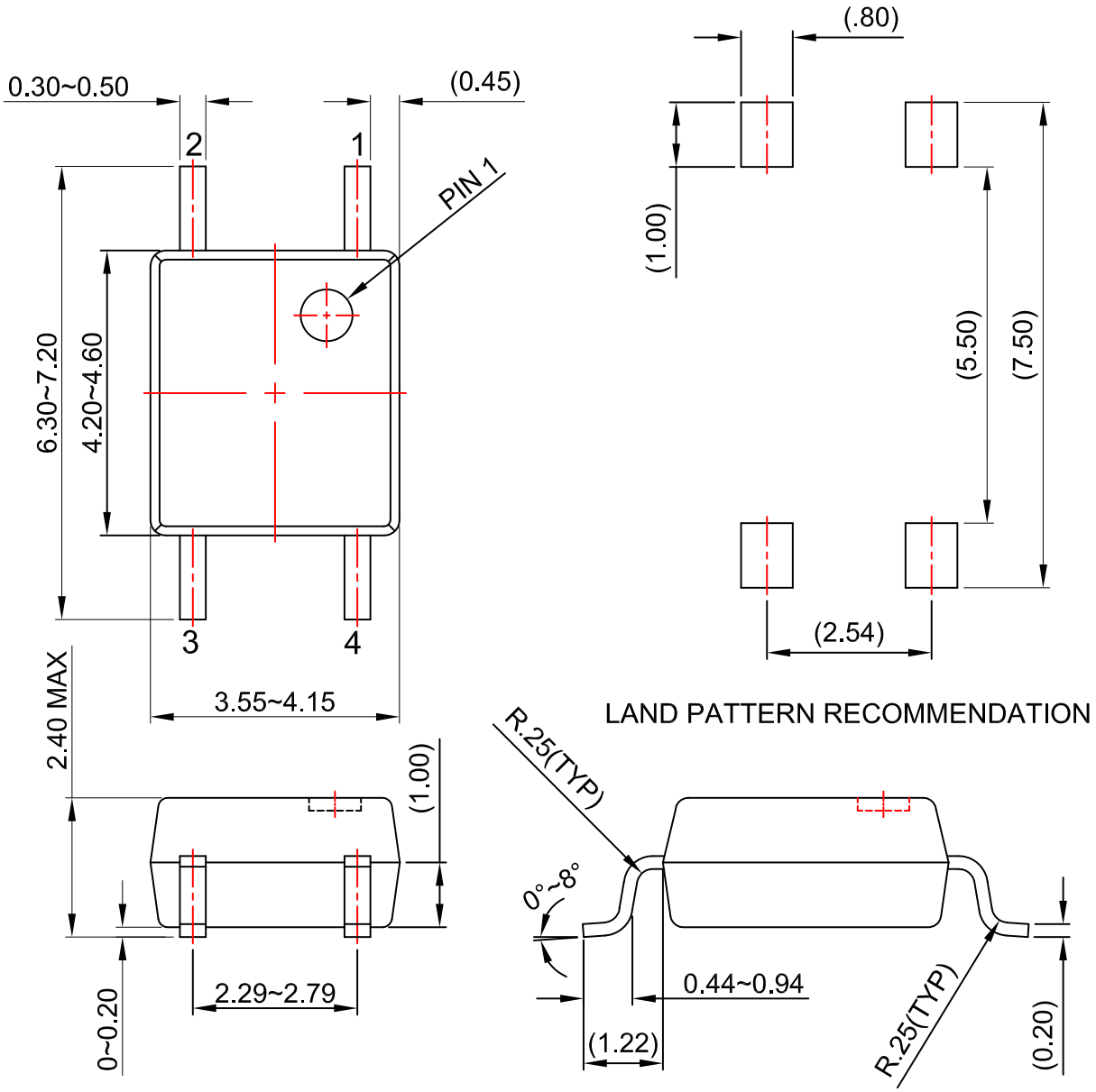
| Part Number | Package | Shipping† |
|---|---|---|
| FODM3011−NF098 | Full Pitch Mini−Flat 4−Pin | 100 Units / Tube |
| FODM3011R2−NF098 | Full Pitch Mini−Flat 4−Pin | 2500 / Tape & Reel |
| FODM3011V−NF098 | Full Pitch Mini−Flat 4−Pin, DIN EN/IEC60747−5−5 Option | 100 Units / Tube |
| FODM3011R2V−NF098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