# 4-PIN FULL PITCH MINI-FLAT PACKAGE RANDOM-PHASE TRIAC DRIVER OUTPUT OPTOCOUPLERS

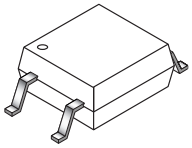
**FODM3010 FODM3011 FODM3012 FODM3021 FODM3022 FODM3023**

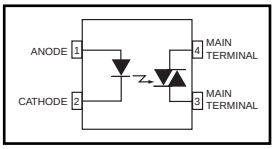
## DESCRIPTION

The FODM301X and FODM302X 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 115V/240V operations.

## FEATURES

- Compact 4-pin surface mount package (2.4 mm maximum standoff height)
- Peak blocking voltage
  250V (FODM301X)
  400V (FODM302X)
- Available in tape and reel quantities of 500 and 2500.
- Applicable to Infrared Ray reflow (230°C max, 30 seconds.)
- BSI, CSA and VDE certifications pending
- UL (File# E90700) certified

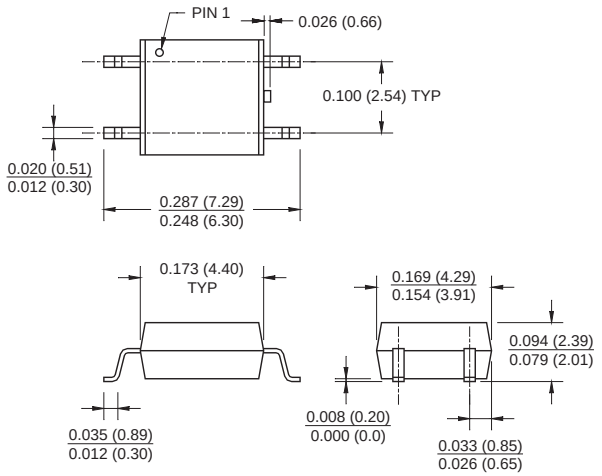





## APPLICATIONS

- Industrial controls
- Traffic lights
- Vending machines
- Solid state relay
- Lamp ballasts
- Solenoid/valve controls
- Static AC power switch
- Incandescent lamp dimmers
- Motor control

## PACKAGE DIMENSIONS




**NOTE**
All dimensions are in inches (millimeters)

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise specified)

| Parameter | | Symbol | Value | Units |
|---|---|---|---|---|
| **TOTAL PACKAGE** | | | | |
| Storage Temperature | | $T_{STG}$ | -40 to +125 | °C |
| Junction Temperature | | $T_J$ | 125 | °C |
| Operating Temperature | | $T_{OPR}$ | -40 to +85 | °C |
| **EMITTER** | | | | |
| Continuous Forward Current | | $I_{F\ (avg)}$ | 60 | mA |
| Peak Forward Current (1 µs pulse, 300 pps.) | | $I_{F\ (pk)}$ | 1 | A |
| Reverse Input Voltage | | $V_R$ | 3 | V |
| Power Dissipation (No derating required over operating temp. range) | | $P_D$ | 100 | mW |
| **DETECTOR** | | | | |
| On-State RMS Current | | $I_{T(RMS)}$ | 70 | mA (RMS) |
| Off-State Output Terminal Voltage | FODM3010/1/2 | $V_{DRM}$ | 250 | V |
| | FODM3021/2/3 | | 400 | |
| Power Dissipation (No derating required over operating temp. range) | | $P_D$ | 300 | mW |

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C)

### INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter | Test Conditions | Symbol | Device | Min | Typ* | Max | Unit |
|---|---|---|---|---|---|---|---|
| **EMITTER** | | | | | | | |
| Input Forward Voltage | $I_F$ = 10 mA | $V_F$ | All | | 1.20 | 1.5 | V |
| Reverse Leakage Current | $V_R$ = 3 V, $T_A$ = 25°C | $I_R$ | All | | 0.01 | 100 | µA |
| **DETECTOR** | | | | | | | |
| Peak Blocking Current Either Direction | Rated $V_{DRM}$, $I_F$ = 0 (note 1) | $I_{DRM}$ | All | | 2 | 100 | nA |
| Peak On-State Voltage Either Direction | $I_{TM}$ = 100mA peak | $V_{TM}$ | All | | 1.7 | 3 | V |
| Critical Rate of Rise of Off-State Voltage | $I_F$ = 0 (Figure 8, note 2) | dV/dt | All | | 10 | | V/µs |

## TRANSFER CHARACTERISTICS ($T_A$ = 25°C)

| DC Characteristics | Test Conditions | Symbol | Device | Min | Typ* | Max | Unit |
|---|---|---|---|---|---|---|---|
| LED Trigger Current | Main Terminal Voltage = 3V (note 3) | $I_{FT}$ | FODM3010 | | | 15 | mA |
| | | | FODM3021 | | | | |
| | | | FODM3011 | | | 10 | |
| | | | FODM3022 | | | | |
| | | | FODM3012 | | | 5 | |
| | | | FODM3023 | | | | |
| Holding Current, Either Direction | | $I_H$ | All | | 300 | | µA |

## ISOLATION CHARACTERISTICS

| Characteristic | Test Conditions | Symbol | Device | Min | Typ* | Max | Unit |
|---|---|---|---|---|---|---|---|
| Steady State Isolation Voltage | (1 Minute) | $V_{ISO}$ | All | 3750 | | | VRMS |

* All typicals at TA = 25°C

Note
1. Test voltage must be applied within dv/dt rating.
2. This is static dv/dt. See Figure 1 for test circuit Commutating dv/dt is function of the load-driving thyristor(s) only.
3. All devices are guaranteed to trigger at an $I_F$ value less than or equal to max $I_{FT}$. Therefore, recommended operating $I_F$ lies between max $I_{FT}$ (15 mA for FODM3010 and FODM3021, 10 mA for FODM3011 and FODM3022, 5 mA for FODM3012 and FODM3023) and absolute max $I_F$ (60 mA).

## TYPICAL PERFORMANCE CURVES

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

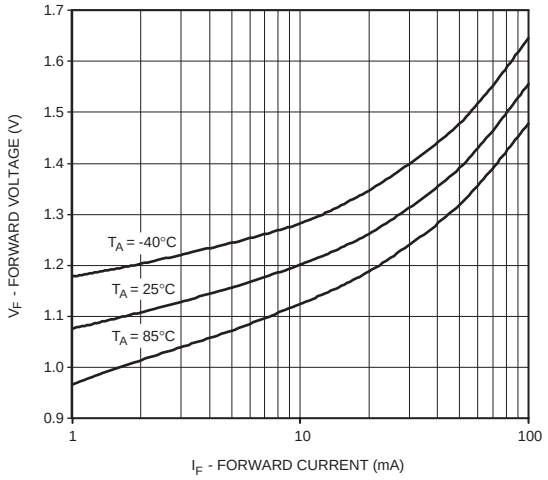



**Fig. 2 Leakage Current vs. Ambient Temperature**

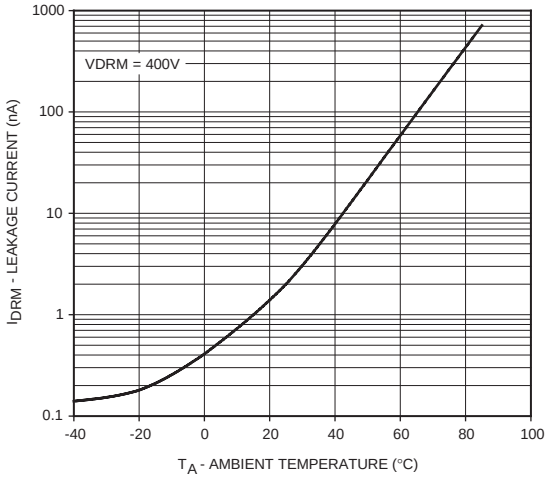



**Fig. 3 Holding Current vs. Ambient Temperature**

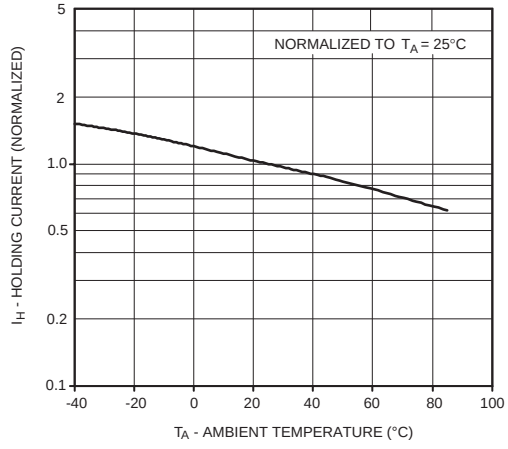
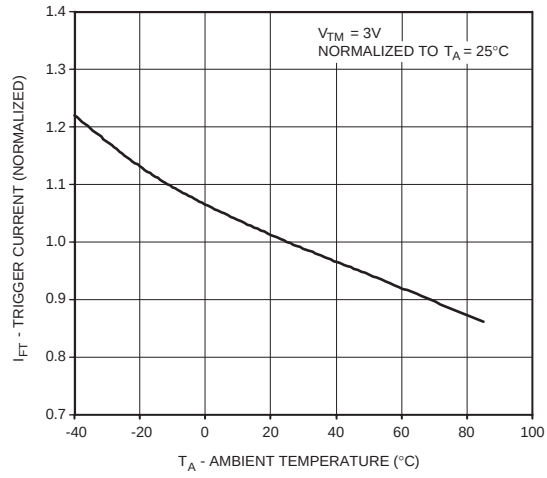



**Fig. 4 Trigger Current vs. Ambient Temperature**



## TYPICAL PERFORMANCE CURVES

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

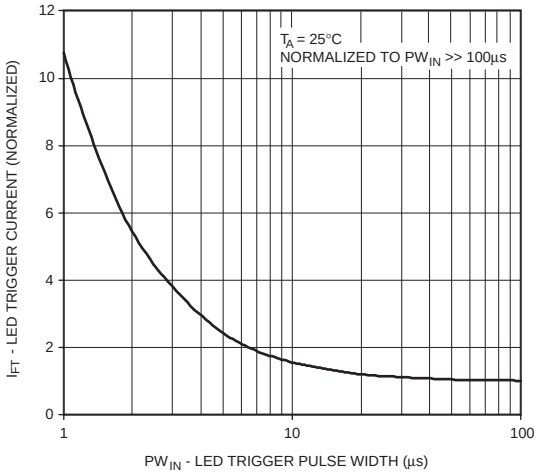



**Fig. 6 Off-state Output Terminal Voltage vs. Ambient Temperature**

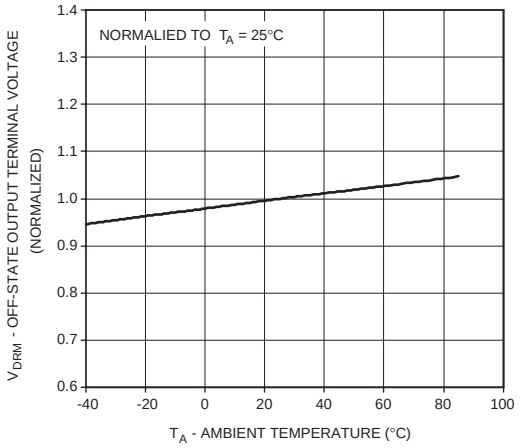
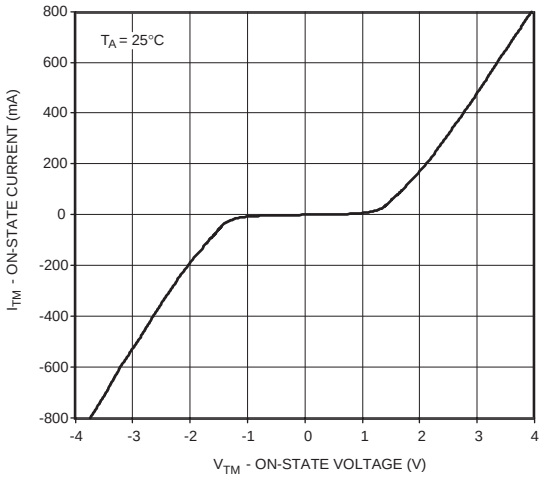
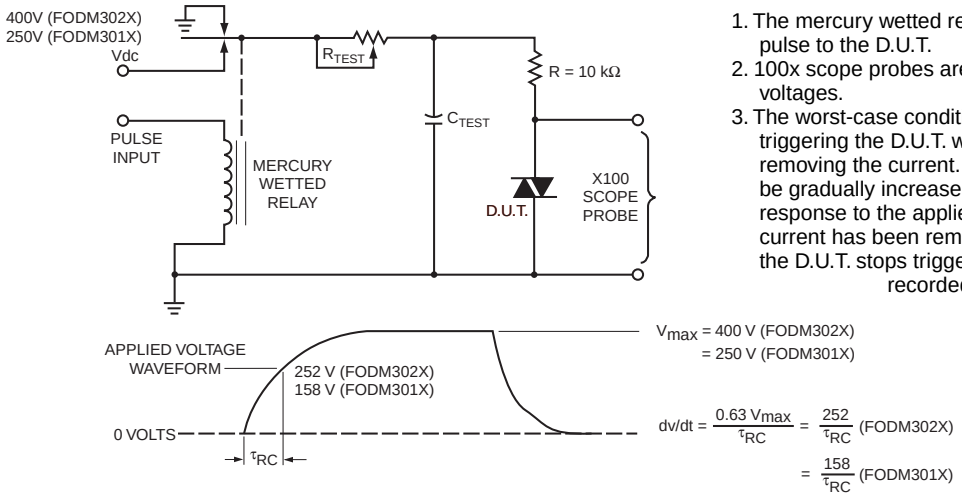



**Fig. 7 On-State Characteristics**



## TYPICAL PERFORMANCE CURVES




1. The mercury wetted relay provides a high speed repeated pulse to the D.U.T.
2. 100x scope probes are used, to allow high speeds and voltages.
3. The worst-case condition for static dv/dt is established by triggering the D.U.T. with a normal LED input current, then removing the current. The variable $R_{TEST}$ allows the dv/dt to be gradually increased until the D.U.T. continues to trigger in response to the applied voltage pulse, even after the LED current has been removed. The dv/dt is then decreased until the D.U.T. stops triggering. $\tau_{RC}$ is measured at this point and recorded.

**Figure 8. Static dv/dt Test Circuit**

NOTE: This optoisolator should not be used to drive a load directly. It is intended to be a trigger device only.

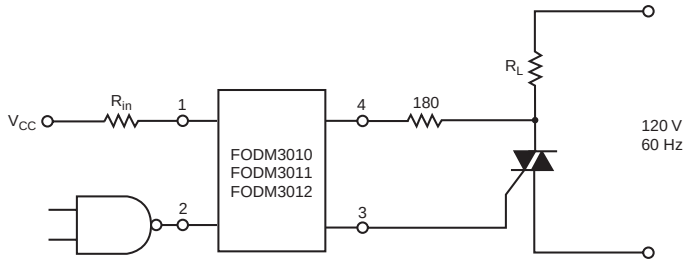



**Figure 9. Resistive Load**

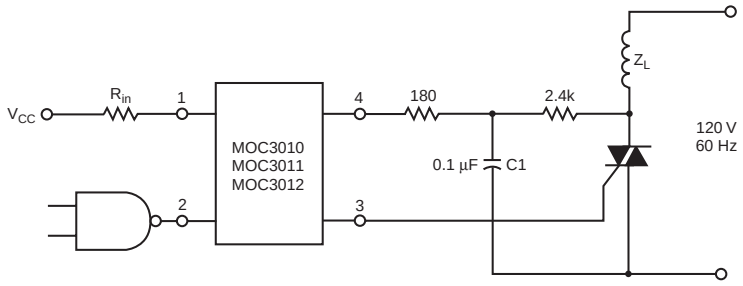



**Figure 10. Inductive Load with Sensitive Gate Triac ($I_{GT} \leq 15$ mA)**

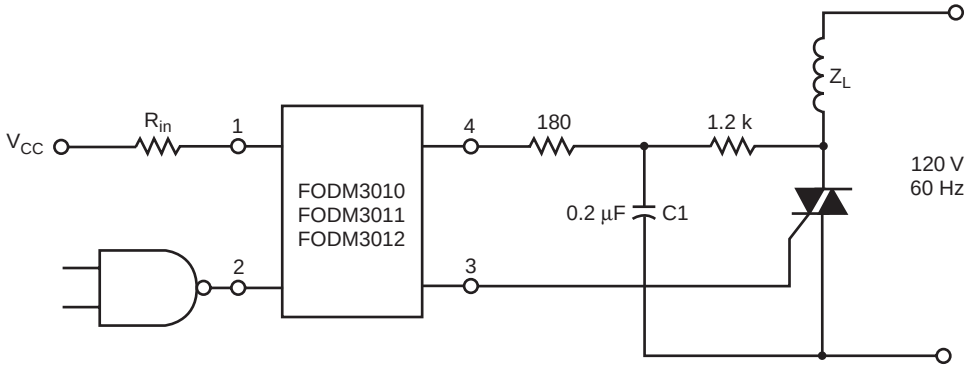
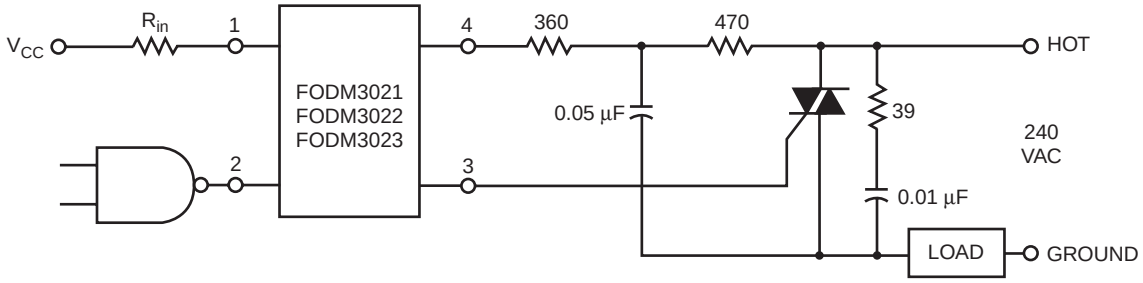



**Figure 11. Inductive Load with Sensitive Gate Triac ($I_{GT} \leq 15$ mA)**




In this circuit the “hot” side of the line is switched and the load connected to the cold or ground side.

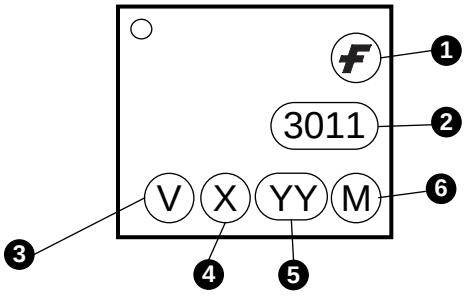
The 39 ohm resistor and 0.01 µF capacitor are for snubbing of the triac, and the 470 ohm resistor and 0.05 mF capacitor are for snubbing the coupler. These components may or may not be necessary depending upon the particular and load used.

**Figure 12. Typical Application Circuit**

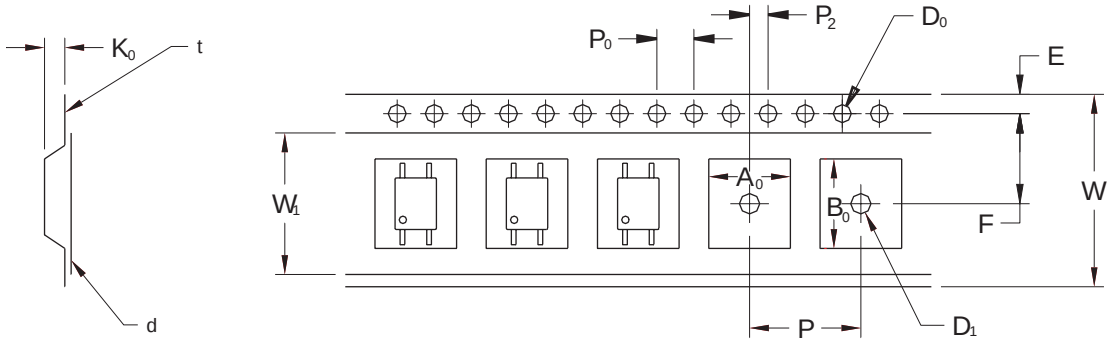
## ORDERING INFORMATION

| Option | Description |
|---|---|
| V | VDE Approved |
| R1 | Tape and Reel (500 units) |
| R2 | Tape and Reel (2500 units) |
| R3 | Tape and Reel (500 units; unit 180° rotated) |
| R4 | Tape and Reel (2500 units; unit 180° rotated) |
| R1V | Tape and Reel (500 units) and VDE Approved |
| R2V | Tape and Reel (2500 units) and VDE Approved |
| R3V | Tape and Reel (500 units; unit 180° rotated) and VDE Approved |
| R4V | Tape and Reel (2500 units; unit 180° rotated) and VDE Approved |

## MARKING INFORMATION

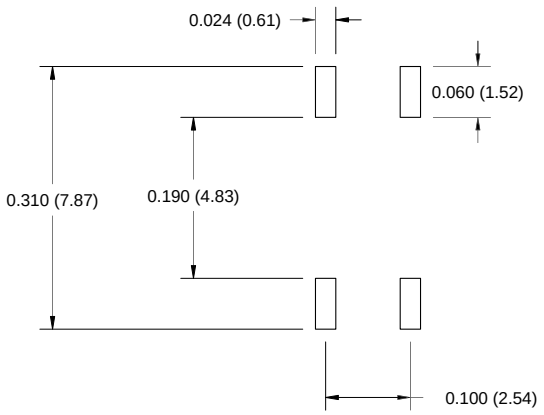



| Definitions | |
|---|---|
| 1 | Fairchild logo |
| 2 | Device number |
| 3 | VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table) |
| 4 | One digit year code |
| 5 | Two digit work week ranging from ‘01’ to ‘53’ |
| 6 | Assembly package code |

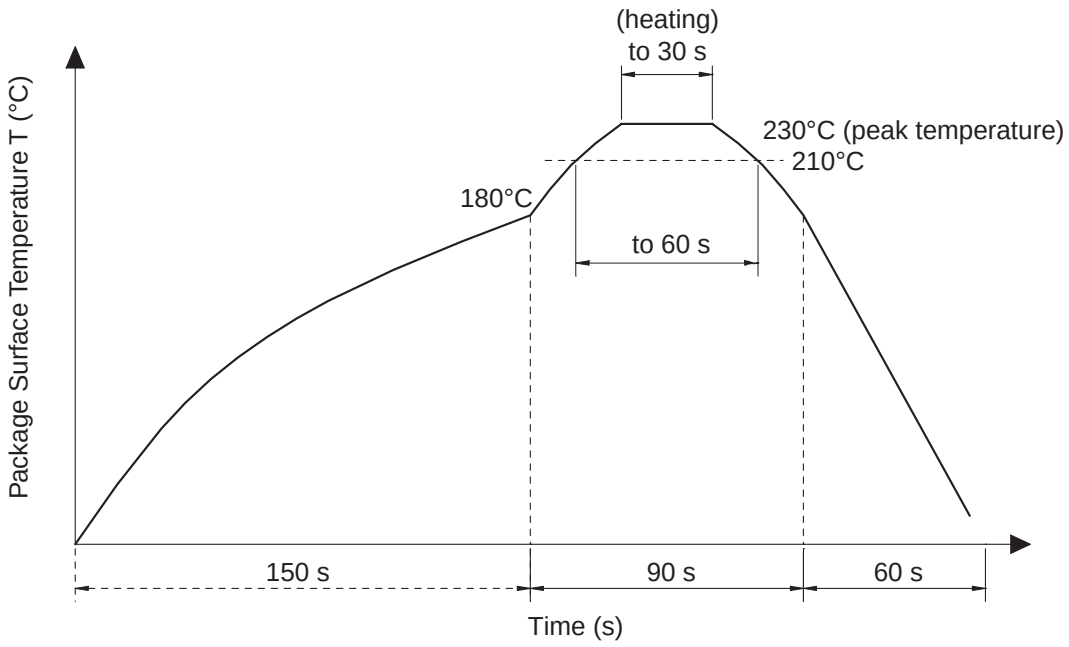



| | | | 2.54 Pitch |
|---|---|---|---|
| Description | | Symbol | Dimensions (mm) |
| Tape Width | | W | 12.00±0.4 |
| Tape Thickness | | t | 0.30±0.20 |
| Sprocket Hole Pitch | | $P_0$ | 4.00±0.20 |
| Sprocket Hole Dia. | | $D_0$ | 1.55±0.20 |
| Sprocket Hole Location | | E | 1.75±0.20 |
| Pocket Location | | F | 5.50±0.20 |
| | | $P_2$ | 2.00±0.20 |
| Pocket Pitch | | P | 8.00±0.20 |
| Pocket Dimension | | $A_0$ | 4.40±0.20 |
| | | $B_0$ | 7.30±0.20 |
| | | $K_0$ | 2.30±0.20 |
| Pocket Hole Dia. | | $D_1$ | 1.55±0.20 |
| Cover Tape Width | | $W_1$ | 9.20 |
| Cover Tape Thickness | | d | 0.065±0.02 |
| Max. Component Rotation or Tilt | | | 20˚ max |
| | | | |
| Devices Per Reel | R1 | | 500 |
| | R2 | | 2500 |
| Reel Diameter | R1 | | 178 mm (7") |
| | R2 | | 330 mm (13") |

## Footprint Drawing for PCB Layout




## Recommended Infrared Reflow Soldering Profile




- Peak reflow temperature: 230°C (package surface temperature) for 30 seconds
- Time of temperature higher than 210°C: 60 seconds or less
- One time soldering reflow is recommended

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