

MOC3031M, MOC3032M, MOC3033M, MOC3041M, MOC3042M, MOC3043M 6-Pin DIP Zero-Cross Optoisolators Triac Driver Output (250/400 Volt Peak)

Features

- Simplifies logic control of 115 VAC power
- Zero voltage crossing
- dv/dt of 2000 V/ μs typical, 1000 V/ μs guaranteed
- VDE recognized (File # 94766), ordering option V (e.g., MOC3043VM)

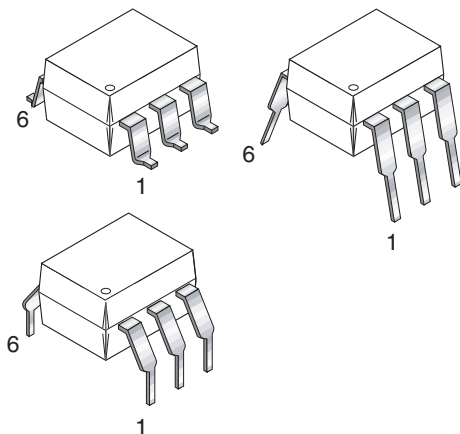
Applications

- | | |
|---------------------------|----------------------|
| ■ Solenoid/valve controls | ■ Lighting controls |
| ■ Static power switches | ■ AC motor drives |
| ■ Temperature controls | ■ E.M. contactors |
| ■ AC motor starters | ■ Solid state relays |

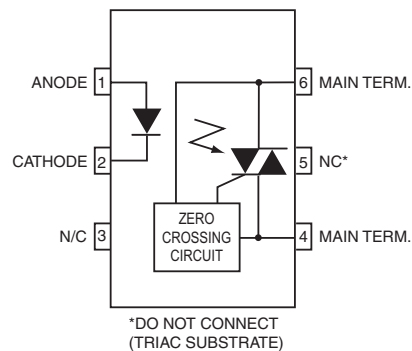
Description

The MOC303XM and MOC304XM devices consist of a AlGaAs infrared emitting diode optically coupled to a monolithic silicon detector performing the function of a zero voltage crossing bilateral triac driver.

They are designed for use with a triac in the interface of logic systems to equipment powered from 115 VAC lines, such as teletypewriters, CRTs, solid-state relays, industrial controls, printers, motors, solenoids and consumer appliances, etc.



Schematic



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Parameters | Symbol | Device | Value | Units |
|---|-----------|----------------------------------|----------------|----------------------------|
| TOTAL DEVICE | | | | |
| Storage Temperature | T_{STG} | All | -40 to +150 | $^\circ\text{C}$ |
| Operating Temperature | T_{OPR} | All | -40 to +85 | $^\circ\text{C}$ |
| Lead Solder Temperature | T_{SOL} | All | 260 for 10 sec | $^\circ\text{C}$ |
| Junction Temperature Range | T_J | All | -40 to +100 | $^\circ\text{C}$ |
| Isolation Surge Voltage ⁽¹⁾ (peak AC voltage, 60Hz, 1 sec duration) | V_{ISO} | All | 7500 | Vac(pk) |
| Total Device Power Dissipation @ 25 $^\circ\text{C}$ Derate above 25 $^\circ\text{C}$ | P_D | All | 250 2.94 | mW mW/ $^\circ\text{C}$ |
| EMITTER | | | | |
| Continuous Forward Current | I_F | All | 60 | mA |
| Reverse Voltage | V_R | All | 6 | V |
| Total Power Dissipation 25 $^\circ\text{C}$ Ambient Derate above 25 $^\circ\text{C}$ | P_D | All | 120 1.41 | mW mW/ $^\circ\text{C}$ |
| DETECTOR | | | | |
| Off-State Output Terminal Voltage | V_{DRM} | MOC3031M/2M/3M MOC3041M/2M/3M | 250 400 | V |
| Peak Repetitive Surge Current (PW = 100 μs , 120 pps) | I_{TSM} | All | 1 | A |
| Total Power Dissipation @ 25 $^\circ\text{C}$ Ambient Derate above 25 $^\circ\text{C}$ | P_D | All All | 150 1.76 | mW mW/ $^\circ\text{C}$ |

Note

1. Isolation surge voltage, V_{ISO} , is an internal device dielectric breakdown rating. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.

Electrical Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified)

Individual Component Characteristics

| Parameters | Test Conditions | Symbol | Device | Min | Typ | Max | Units |
|--|---|------------|--------|------|------|-----|------------------|
| EMITTER | | | | | | | |
| Input Forward Voltage | $I_F = 30\text{ mA}$ | V_F | All | | 1.25 | 1.5 | V |
| Reverse Leakage Current | $V_R = 6\text{ V}$ | I_R | All | | 0.01 | 100 | μA |
| DETECTOR | | | | | | | |
| Peak Blocking Current, Either Direction | Rated V_{DRM} , $I_F = 0$ (note 1) | I_{DRM1} | All | | | 100 | nA |
| Peak On-State Voltage, Either Direction | $I_{TM} = 100\text{ mA peak}$, $I_F = 0$ | V_{TM} | All | | 1.8 | 3 | V |
| Critical Rate of Rise of Off-State Voltage | $I_F = 0$ (Figure 9, note 3) | dv/dt | All | 1000 | | | V/ μs |

Transfer Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

| DC Characteristics | Test Conditions | Symbol | Device | Min | Typ | Max | Units |
|-----------------------------------|--|----------|---|-----|-----|---------------|---------------|
| LED Trigger Current | Main terminal voltage = 3V (note 2) | I_{FT} | MOC3031M/ MOC3041M MOC3032M/ MOC3042M MOC3033M/ MOC3043M | | | 15 10 5 | mA |
| Holding Current, Either Direction | | I_H | All | | 400 | | μA |

Zero Crossing Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

| Characteristics | Test Conditions | Symbol | Device | Min | Typ | Max | Units |
|----------------------------|--|------------|--------|-----|-----|-----|---------------|
| Inhibit Voltage | $I_F = \text{rated } I_{FT}$, MT1-MT2 voltage above which device will not trigger off-state | V_{IH} | All | | | 20 | V |
| Leakage in Inhibited State | $I_F = \text{rated } I_F$, rated V_{DRM} , off-state | I_{DRM2} | All | | | 500 | μA |

Note

1. Test voltage must be applied within dv/dt rating.
2. 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 MOC3031M & MOC3041M, 10 mA for MOC3032M & MOC3042M, 5 mA for MOC3033M & MOC3043M) and absolute max I_F (60 mA).
3. This is static dv/dt. See Figure 9 for test circuit. Commutating dv/dt is a function of the load-driving thyristor(s) only.

Figure 1. LED Forward Voltage vs. Forward Current

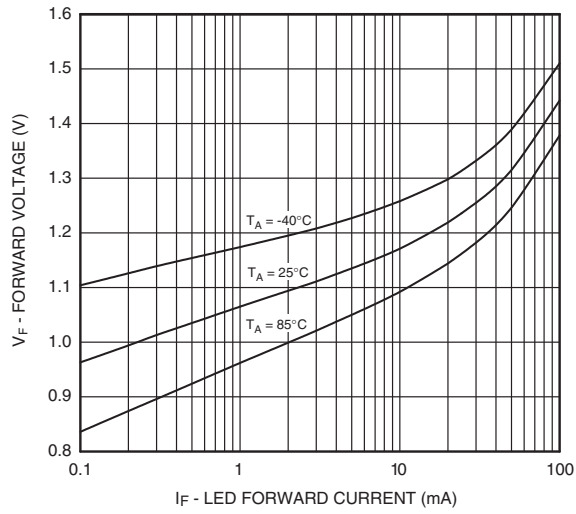


Figure 2. On-State Characteristics

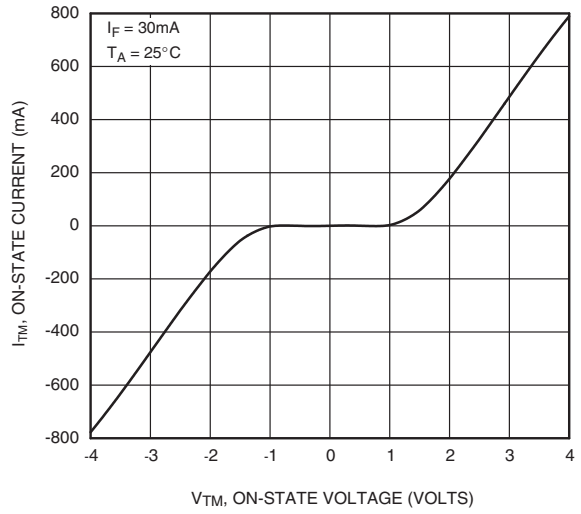


Figure 3. Trigger Current vs. Temperature

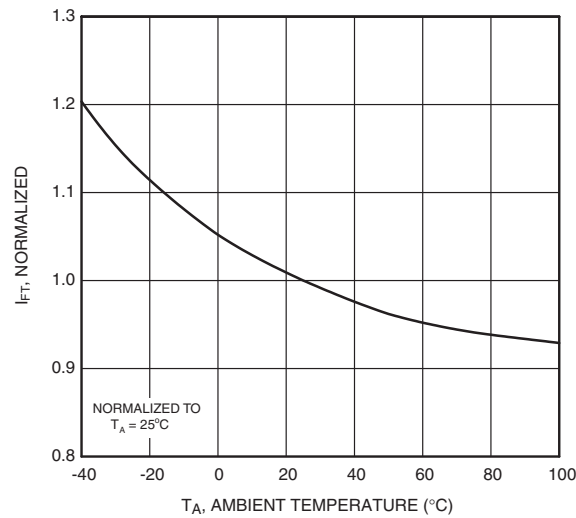


Figure 4. Leakage Current, I_{DRM} vs. Temperature

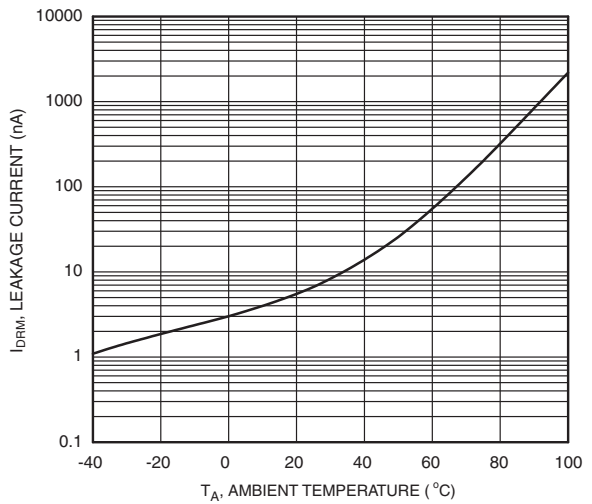


Figure 5. I_{DRM2} - Leakage in Inhibit State vs. Temperature

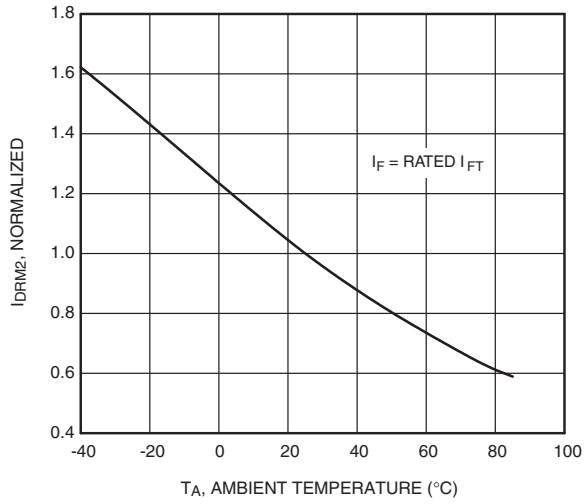


Figure 6. LED Current Required to Trigger vs. LED Pulse Width

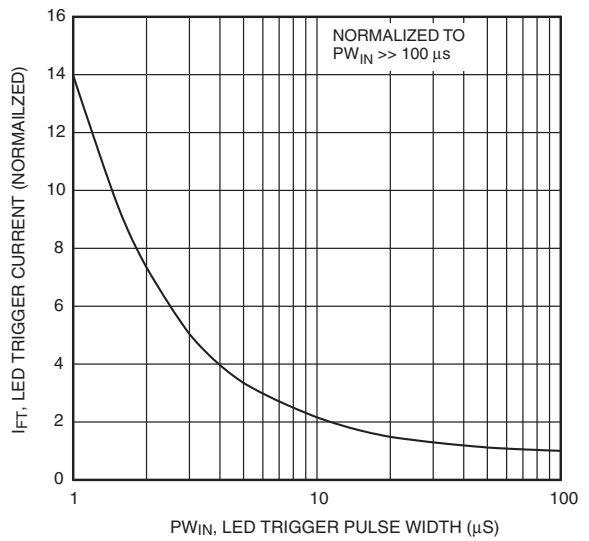


Figure 7. Holding Current, I_H vs. Temperature

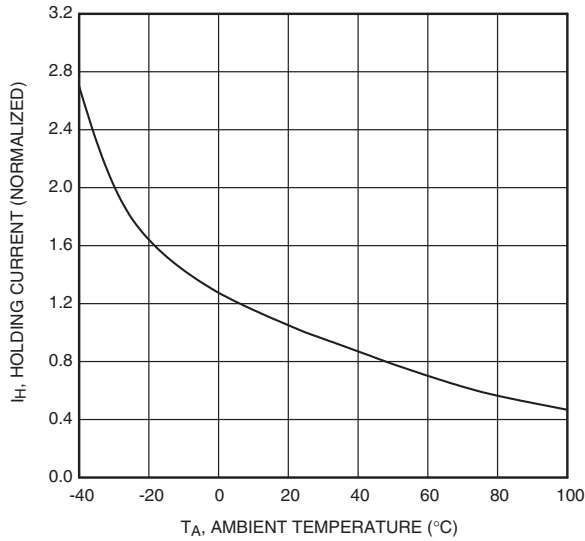
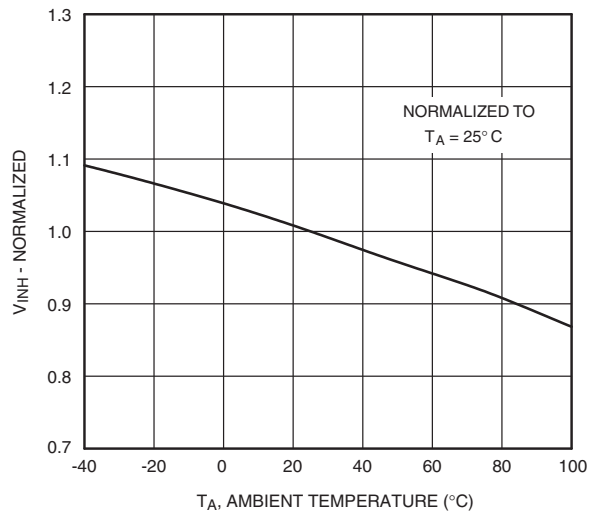


Figure 8. Inhibit Voltage vs. Temperature



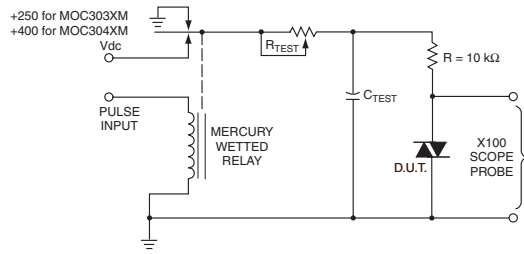


Figure 9. Static dv/dt Test Circuit

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. τ_{RC} is measured at this point and recorded.

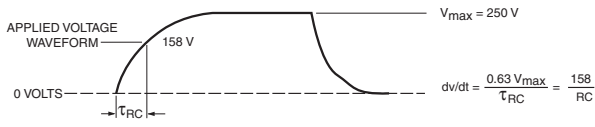


Figure 10. Static dv/dt Test Waveform (MOC3031M, MOC3032M, MOC3033M)

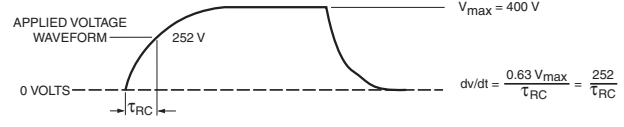
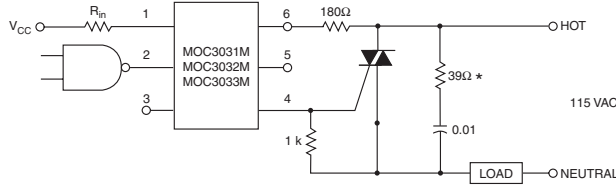


Figure 11. Static dv/dt Test Waveform (MOC3041M, MOC3042M, MOC3043M)

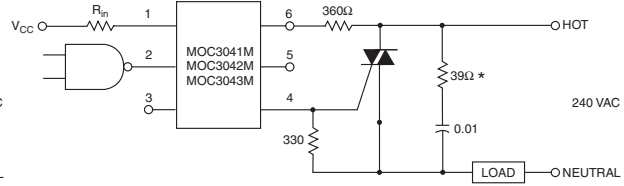
Typical circuit (Fig 12, 13) for use when hot line switching is required. In this circuit the “hot” side of the line is switched and the load connected to the cold or neutral side. The load may be connected to either the neutral or hot line.

R_{in} is calculated so that I_F is equal to the rated I_{FT} of the part, 5 mA for the MOC3033M and MOC3043M, 10 mA for the MOC3032M and MOC3042M, or 15 mA for the MOC3031M and MOC3041M. The 39 ohm resistor and 0.01 μ F capacitor are for snubbing of the triac and may or may not be necessary depending upon the particular triac and load used.



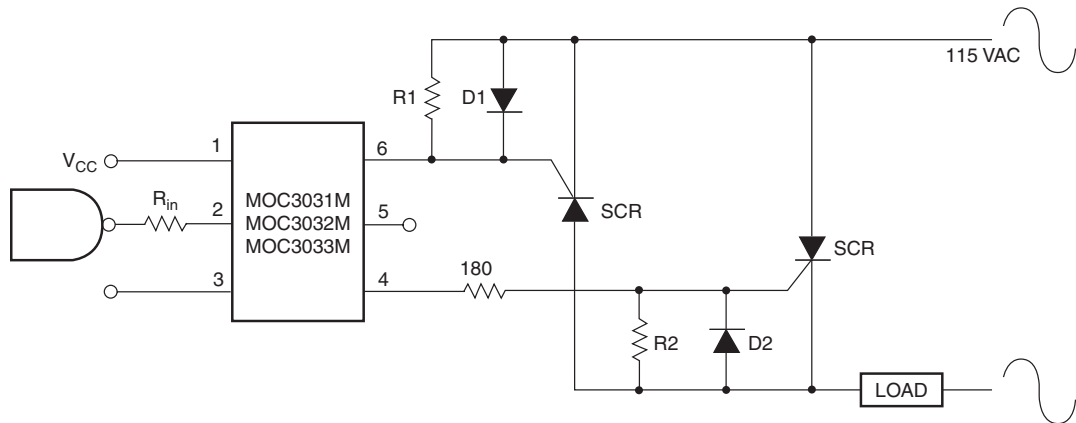
*For highly inductive loads (power factor < 0.5), change this value to 360 ohms.

Figure 12. Hot-Line Switching Application Circuit (MOC3031M, MOC3032M, MOC3033M)



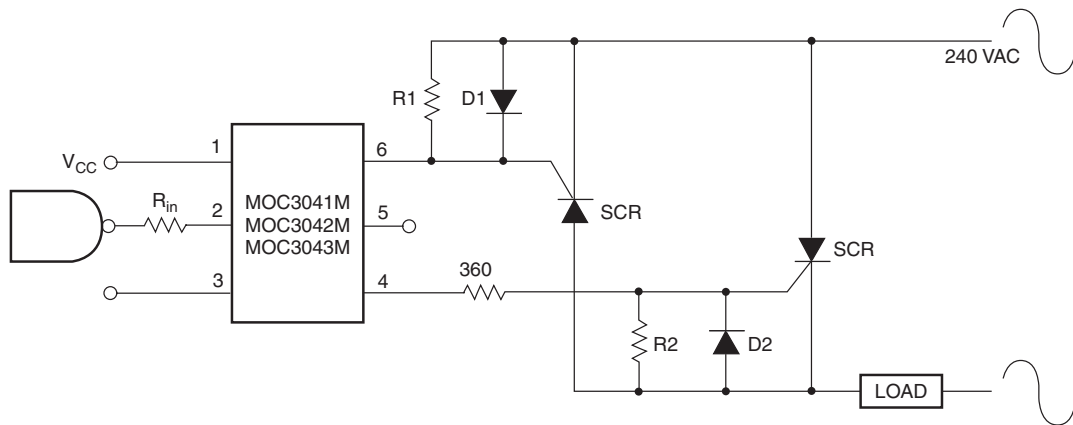
*For highly inductive loads (power factor < 0.5), change this value to 360 ohms.

Figure 13. Hot-Line Switching Application Circuit (MOC3041M, MOC3042M, MOC3043M)



**Figure 14. Inverse-Parallel SCR Driver Circuit
(MOC3031M, MOC3032M, MOC3033M)**

Suggested method of firing two, back-to-back SCR's with a Fairchild triac driver. Diodes can be 1N4001; resistors, R1 and R2, are optional 1 k ohm.

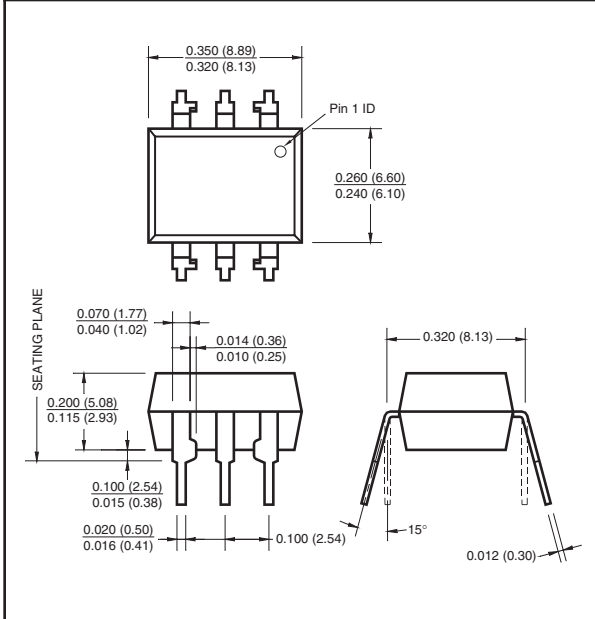


**Figure 15. Inverse-Parallel SCR Driver Circuit
(MOC3041M, MOC3042M, MOC3043M)**

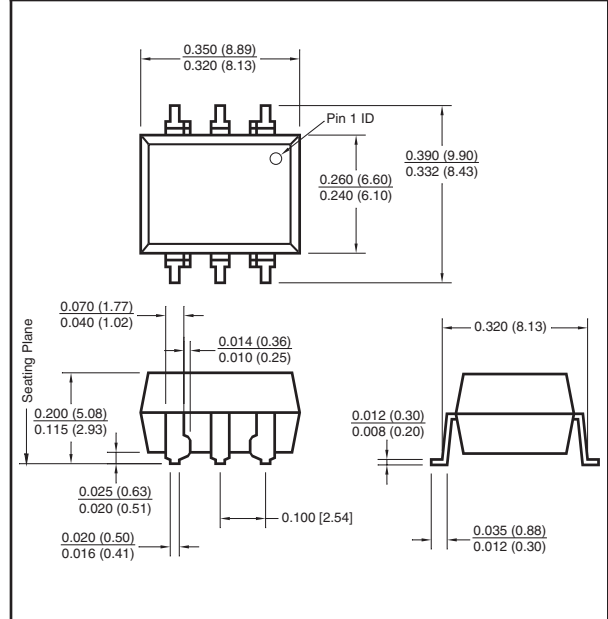
Suggested method of firing two, back-to-back SCR's with a Fairchild triac driver. Diodes can be 1N4001; resistors, R1 and R2, are optional 330 ohm.

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

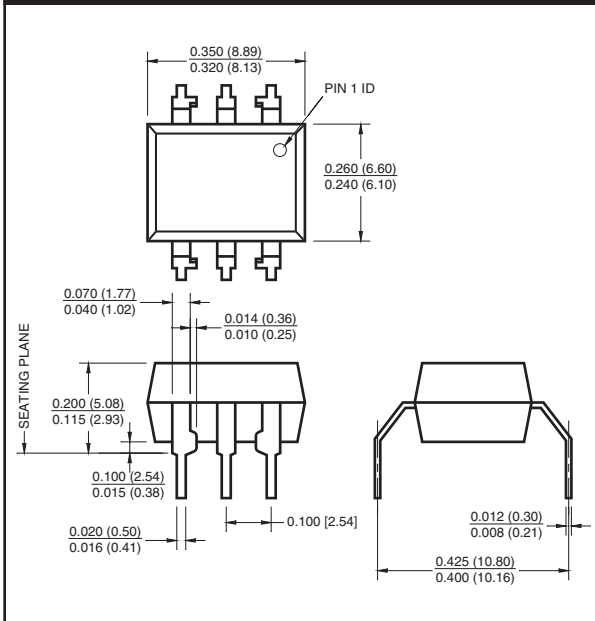
Package Dimensions (Through Hole)



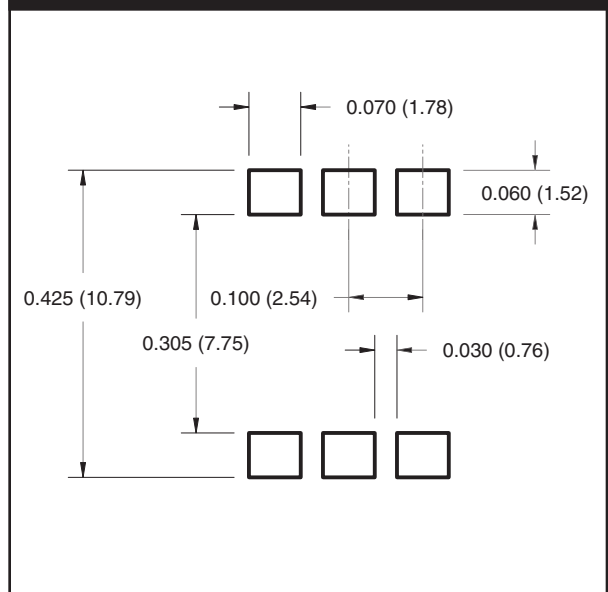
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



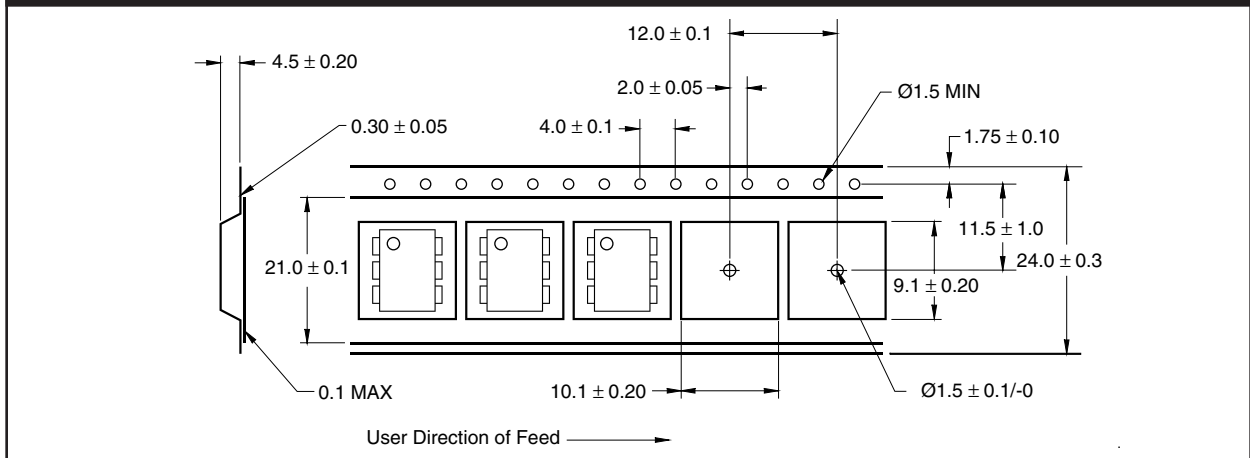
NOTE

All dimensions are in inches (millimeters)

Ordering Information

| Option | Order Entry Identifier | Description |
|--------|------------------------|--------------------------------------|
| S | S | Surface Mount Lead Bend |
| SR2 | SR2 | Surface Mount; Tape and reel |
| T | T | 0.4" Lead Spacing |
| V | V | VDE 0884 |
| TV | TV | VDE 0884, 0.4" Lead Spacing |
| SV | SV | VDE 0884, Surface Mount |
| SR2V | SR2V | VDE 0884, Surface Mount, Tape & Reel |

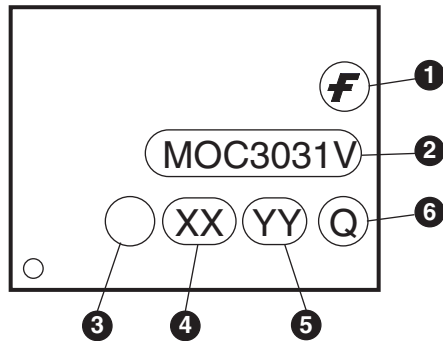
Carrier Tape Specifications (White Package, -M Suffix)



NOTE

All dimensions are in inches (millimeters)

Marking Information

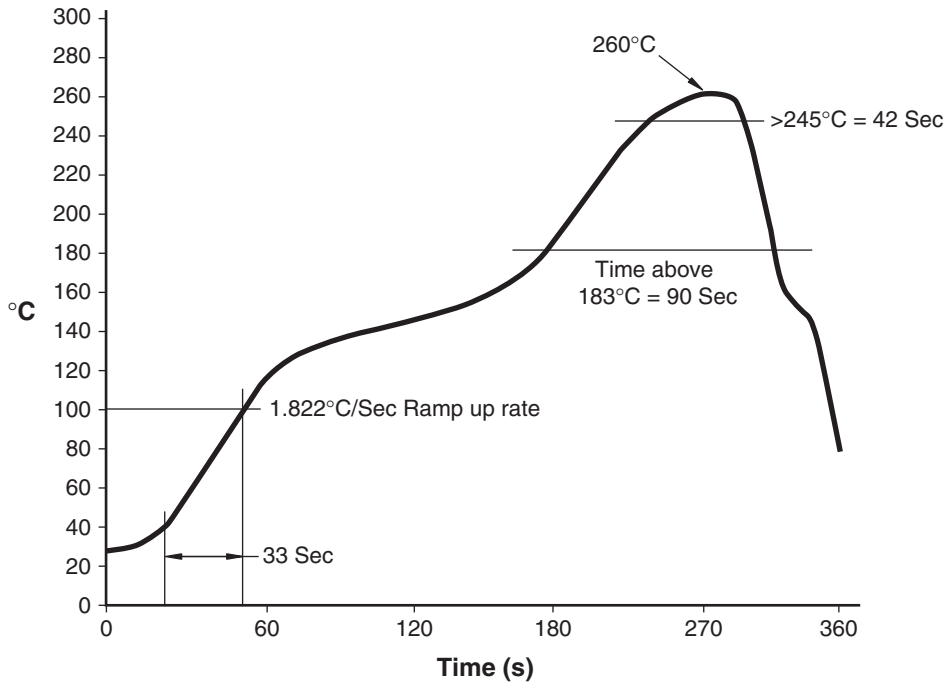


Definitions

| | |
|---|--|
| 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, e.g., '3' |
| 5 | Two digit work week ranging from '01' to '53' |
| 6 | Assembly package code |

*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

Reflow Profile (White Package, -M Suffix)



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|--------------------------|------------------------|---|
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