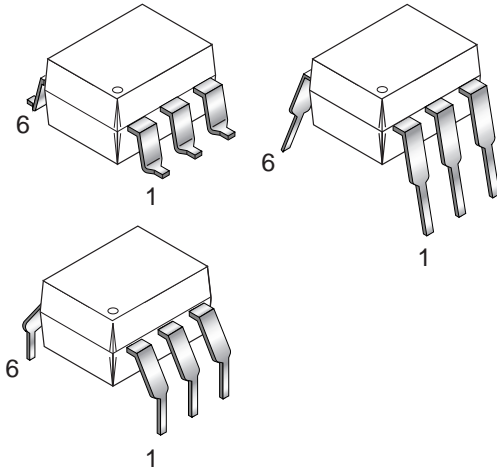


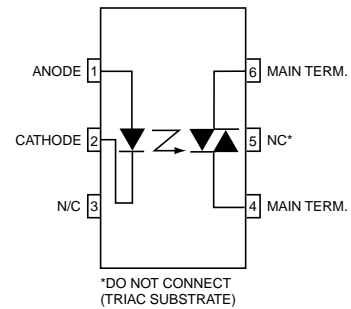
**6-PIN DIP RANDOM-PHASE
OPTOISOLATORS TRIAC DRIVER OUTPUT
(250/400 VOLT PEAK)**

MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M

PACKAGE



SCHEMATIC



DESCRIPTION

The MOC301XM and MOC302XM series are optically isolated triac driver devices. These devices contain a GaAs infrared emitting diode and a light activated silicon bilateral switch, which functions like a triac. They are designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115 VAC operations.

FEATURES

- Excellent I_{FT} stability—IR emitting diode has low degradation
- High isolation voltage—minimum 5300 VAC RMS
- Underwriters Laboratory (UL) recognized—File #E90700
- Peak blocking voltage
 - 250V-MOC301XM
 - 400V-MOC302XM
- VDE recognized (File #94766)
 - Ordering option V (e.g. MOC3023VM)

APPLICATIONS

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

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| ABSOLUTE MAXIMUM RATINGS (T _A = 25°C unless otherwise noted) | | | | |
|---|------------------|-------------------------------------|----------------|---------|
| Parameters | Symbol | Device | Value | Units |
| TOTAL DEVICE | | | | |
| Storage Temperature | T _{STG} | All | -40 to +150 | °C |
| Operating Temperature | T _{OPR} | All | -40 to +85 | °C |
| Lead Solder Temperature | T _{SOL} | All | 260 for 10 sec | °C |
| Junction Temperature Range | T _J | All | -40 to +100 | °C |
| Isolation Surge Voltage ⁽¹⁾ (peak AC voltage, 60Hz, 1 sec duration) | V _{ISO} | All | 7500 | Vac(pk) |
| Total Device Power Dissipation @ 25°C | P _D | All | 330 | mW |
| Derate above 25°C | | | 4.4 | mW/°C |
| EMITTER | | | | |
| Continuous Forward Current | I _F | All | 60 | mA |
| Reverse Voltage | V _R | All | 3 | V |
| Total Power Dissipation 25°C Ambient | P _D | All | 100 | mW |
| Derate above 25°C | | | 1.33 | mW/°C |
| DETECTOR | | | | |
| Off-State Output Terminal Voltage | V _{DRM} | MOC3010M/1M/2M MOC3020M/1M/2M/3M | 250 400 | V |
| Peak Repetitive Surge Current (PW = 1 ms, 120 pps) | I _{TSM} | All | 1 | A |
| Total Power Dissipation @ 25°C Ambient | P _D | All | 300 | mW |
| Derate above 25°C | | | 4 | mW/°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.

MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M

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 | $I_F = 10\text{ mA}$ | V_F | All | | 1.15 | 1.5 | V |
| Reverse Leakage Current | $V_R = 3\text{ V}, T_A = 25^\circ\text{C}$ | I_R | All | | 0.01 | 100 | μA |
| DETECTOR | | | | | | | |
| Peak Blocking Current, Either Direction | Rated V_{DRM} , $I_F = 0$ (note 1) | I_{DRM} | All | | 10 | 100 | nA |
| Peak On-State Voltage, Either Direction | $I_{\text{TM}} = 100\text{ mA peak}, I_F = 0$ | V_{TM} | All | | 1.8 | 3 | V |

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

| DC Characteristics | Test Conditions | Symbol | Device | Min | Typ | Max | Units |
|-----------------------------------|-----------------------|-----------------|----------|-----|-----|-----|---------------|
| LED Trigger Current | Voltage = 3V (note 3) | I_{FT} | MOC3020M | | | 30 | mA |
| | | | MOC3010M | | | 15 | |
| | | | MOC3021M | | | 15 | |
| | | | MOC3011M | | | 10 | |
| | | | MOC3022M | | | 10 | |
| | | | MOC3012M | | | 5 | |
| | | | MOC3023M | | | 5 | |
| Holding Current, Either Direction | | I_H | All | | 100 | | μA |

Note

1. Test voltage must be applied within dv/dt rating.
2. This is static dv/dt. See Figure 5 for test circuit. Commutating dv/dt is a 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} (30 mA for MOC3020M, 15 mA for MOC3010M and MOC3021M, 10 mA for MOC3011M and MOC3022M, 5 mA for MOC3012M and MOC3023M) and absolute max I_F (60 mA).

MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M

Fig. 1 LED Forward Voltage vs. Forward Current

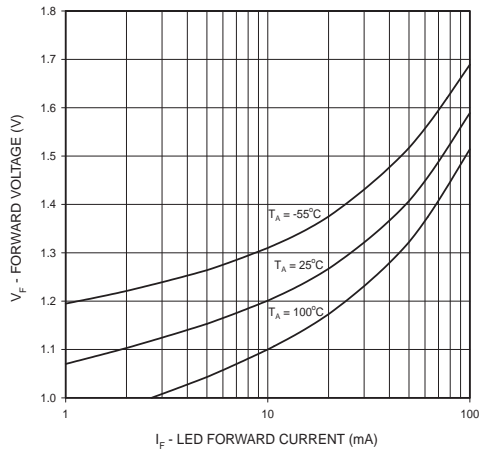


Fig. 2 On-State Characteristics

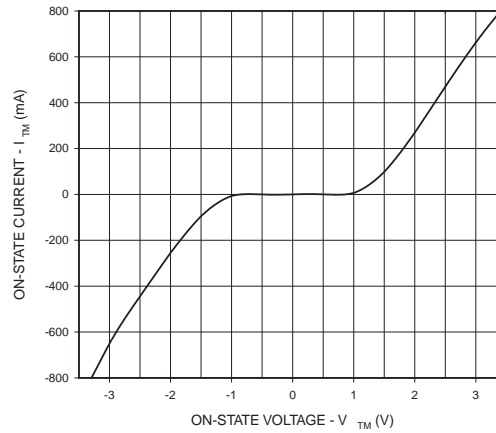


Fig. 3 Trigger Current vs. Ambient Temperature

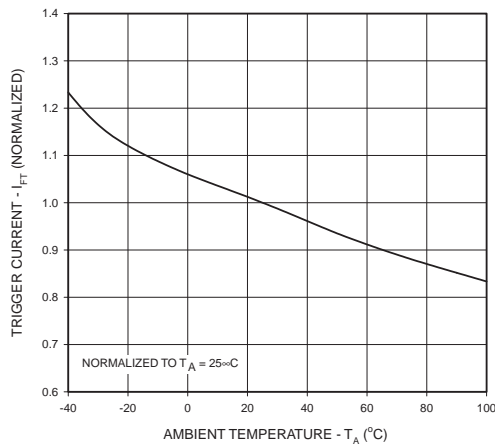


Fig. 4 LED Current Required to Trigger vs. LED Pulse Width

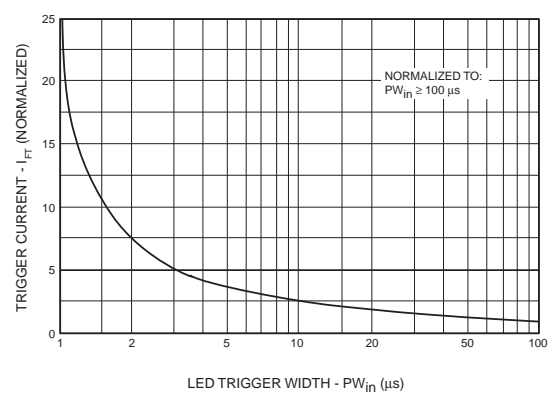


Fig. 5 dv/dt vs. Temperature

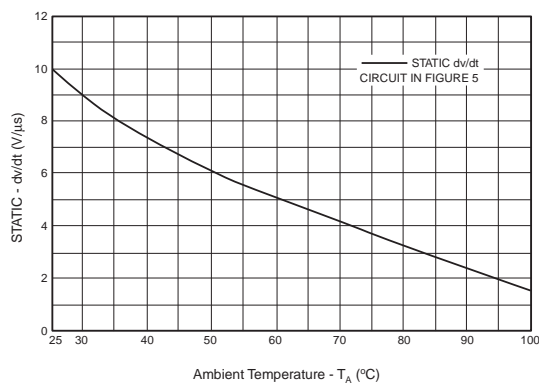
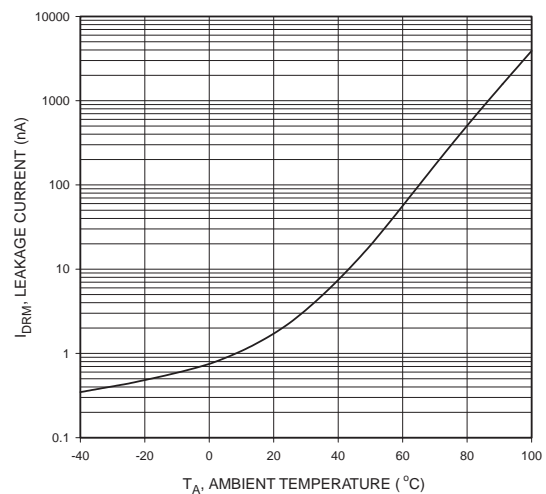
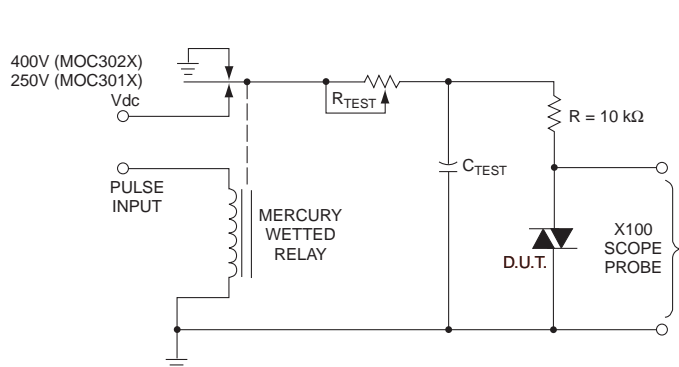


Fig. 6 Leakage Current, I_{DRM} vs. Temperature



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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.

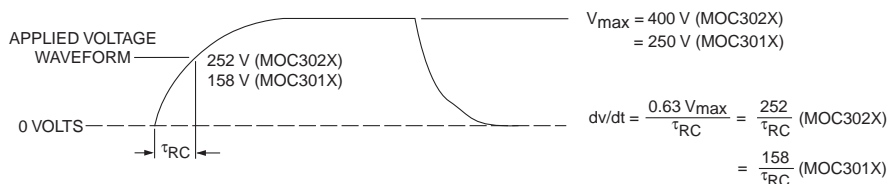


Figure 5. Static dv/dt Test Circuit

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

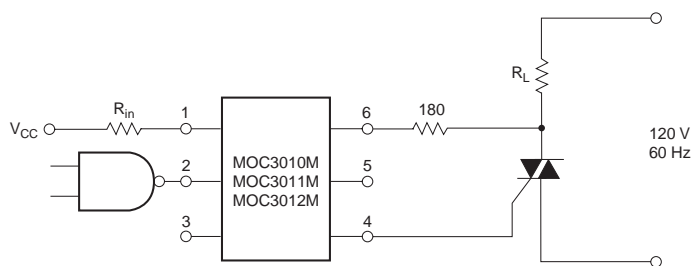


Figure 6. Resistive Load

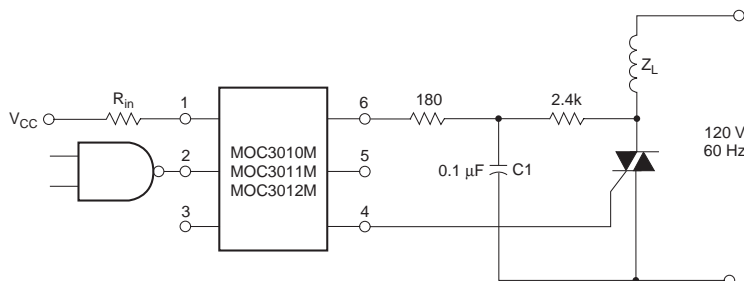


Figure 7. Inductive Load with Sensitive Gate Triac ($I_{GT} \leq 15 \text{ mA}$)