GlobalOptoisolator™

VDE | UL | CSA | SETI | SEMKO | DEMKO | NEMKO | BABT

# MOC3041
**[IFT = 15 mA Max]**
# MOC3042
**[IFT = 10 mA Max]**
# MOC3043*
**[IFT = 5 mA Max]**

***Motorola Preferred Device**

# 6-Pin DIP Zero-Cross Optoisolators Triac Driver Output
## (400 Volts Peak)

The MOC3041, MOC3042 and MOC3043 devices consist of gallium arsenide infrared emitting diodes optically coupled to a monolithic silicon detector performing the function of a Zero Voltage Crossing bilateral triac driver.

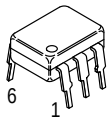
They are designed for use with a triac in the interface of logic systems to equipment powered from 115 Vac lines, such as solid–state relays, industrial controls, motors, solenoids and consumer appliances, etc.

- Simplifies Logic Control of 115 Vac Power
- Zero Voltage Crossing
- dv/dt of 2000 V/µs Typical, 1000 V/µs Guaranteed
- ***To order devices that are tested and marked per VDE 0884 requirements, the suffix "V" must be included at end of part number. VDE 0884 is a test option.***

**Recommended for 115/240 Vac(rms) Applications:**

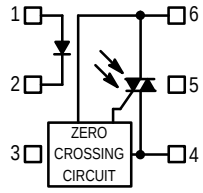
- Solenoid/Valve Controls
- Lighting Controls
- Static Power Switches
- AC Motor Drives
- Temperature Controls
- E.M. Contactors
- AC Motor Starters
- Solid State Relays

**STYLE 6 PLASTIC**




**STANDARD THRU HOLE**
**CASE 730A–04**

**COUPLER SCHEMATIC**




1. ANODE
2. CATHODE
3. NC
4. MAIN TERMINAL
5. SUBSTRATE
   DO NOT CONNECT
6. MAIN TERMINAL

**MAXIMUM RATINGS** ($T_A$ = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| **INFRARED EMITTING DIODE** | | | |
| Reverse Voltage | $V_R$ | 6 | Volts |
| Forward Current — Continuous | $I_F$ | 60 | mA |
| Total Power Dissipation @ $T_A$ = 25°C<br>Negligible Power in Output Driver<br>Derate above 25°C | $P_D$ | 120<br><br>1.41 | mW<br><br>mW/°C |
| **OUTPUT DRIVER** | | | |
| Off–State Output Terminal Voltage | $V_{DRM}$ | 400 | Volts |
| Peak Repetitive Surge Current<br>(PW = 100 µs, 120 pps) | $I_{TSM}$ | 1 | A |
| Total Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 150<br>1.76 | mW<br>mW/°C |
| **TOTAL DEVICE** | | | |
| Isolation Surge Voltage(1)<br>(Peak ac Voltage, 60 Hz, 1 Second Duration) | $V_{ISO}$ | 7500 | Vac(pk) |
| Total Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 250<br>2.94 | mW<br>mW/°C |
| Junction Temperature Range | $T_J$ | –40 to +100 | °C |
| Ambient Operating Temperature Range(2) | $T_A$ | –40 to +85 | °C |
| Storage Temperature Range(2) | $T_{stg}$ | –40 to +150 | °C |
| Soldering Temperature (10 s) | $T_L$ | 260 | °C |

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.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

**Preferred** devices are Motorola recommended choices for future use and best overall value.

GlobalOptoisolator is a trademark of Motorola, Inc.

**(Replaces MOC3040/D)**

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**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted)

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **INPUT LED** | | | | | | |
| Reverse Leakage Current ($V_R$ = 6 V) | | $I_R$ | — | 0.05 | 100 | μA |
| Forward Voltage ($I_F$ = 30 mA) | | $V_F$ | — | 1.3 | 1.5 | Volts |
| **OUTPUT DETECTOR** ($I_F$ = 0 unless otherwise noted) | | | | | | |
| Leakage with LED Off, Either Direction (Rated $V_{DRM}$(1)) | | $I_{DRM1}$ | — | 2 | 100 | nA |
| Peak On–State Voltage, Either Direction ($I_{TM}$ = 100 mA Peak) | | $V_{TM}$ | — | 1.8 | 3 | Volts |
| Critical Rate of Rise of Off–State Voltage(3) | | dv/dt | 1000 | 2000 | — | V/μs |
| **COUPLED** | | | | | | |
| LED Trigger Current, Current Required to Latch Output (Main Terminal Voltage = 3 V(2)) | MOC3041 | $I_{FT}$ | — | — | 15 | mA |
| | MOC3042 | | — | — | 10 | |
| | MOC3043 | | — | — | 5 | |
| Holding Current, Either Direction | | $I_H$ | — | 250 | — | μA |
| Isolation Voltage (f = 60 Hz, t = 1 sec) | | $V_{ISO}$ | 7500 | — | — | Vac(pk) |
| **ZERO CROSSING** | | | | | | |
| Inhibit Voltage ($I_F$ = Rated $I_{FT}$, MT1–MT2 Voltage above which device will not trigger.) | | $V_{IH}$ | — | 5 | 20 | Volts |
| Leakage in Inhibited State ($I_F$ = Rated $I_{FT}$, Rated $V_{DRM}$, Off State) | | $I_{DRM2}$ | — | — | 500 | μA |

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 $I_{FT}$ (15 mA for MOC3041, 10 mA for MOC3042, 5 mA for MOC3043) and absolute max $I_F$ (60 mA).
3. This is static dv/dt. See Figure 7 for test circuit. Commutating dv/dt is a function of the load–driving thyristor(s) only.

**TYPICAL ELECTRICAL CHARACTERISTICS**

**$T_A$ = 25°C**

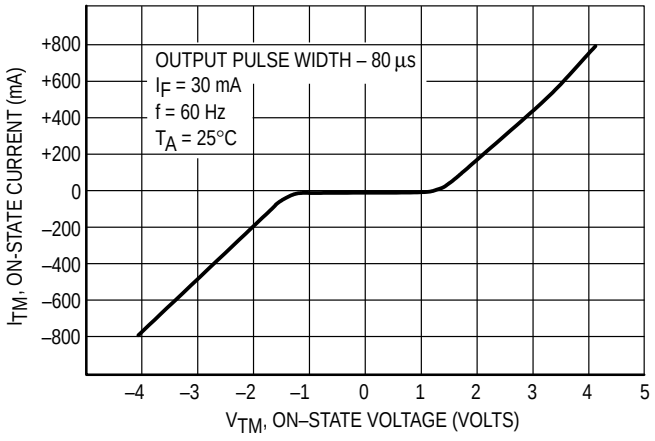



**Figure 1. On–State Characteristics**

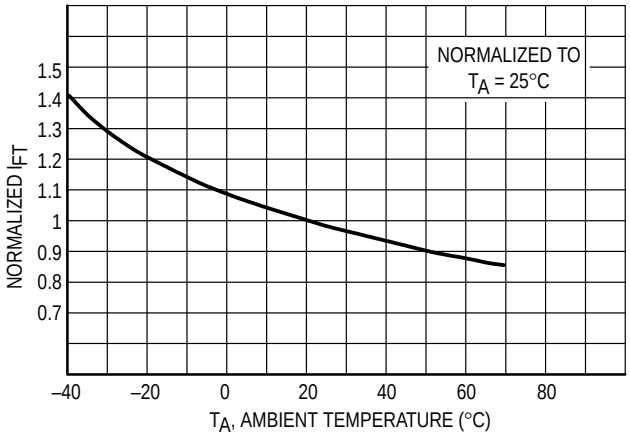



**Figure 2. Trigger Current versus Temperature**

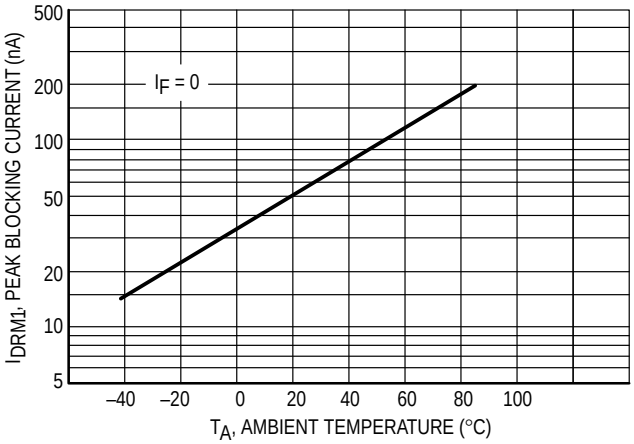



**Figure 3. $I_{DRM1}$, Peak Blocking Current versus Temperature**

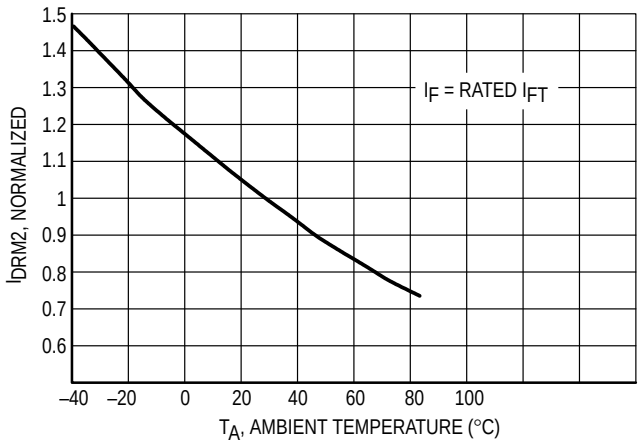



**Figure 4. $I_{DRM2}$, Leakage in Inhibit State versus Temperature**

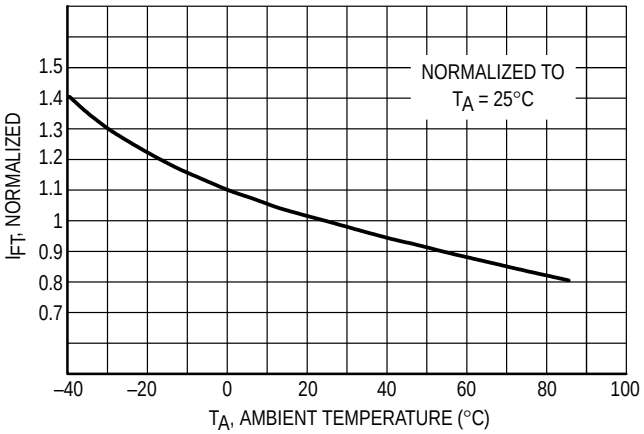



**Figure 5. Trigger Current versus Temperature**

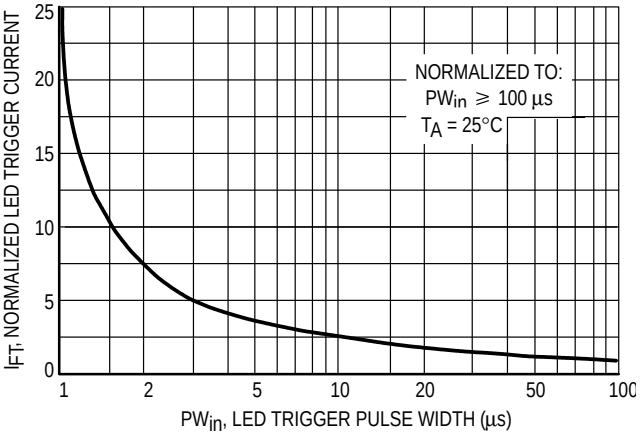
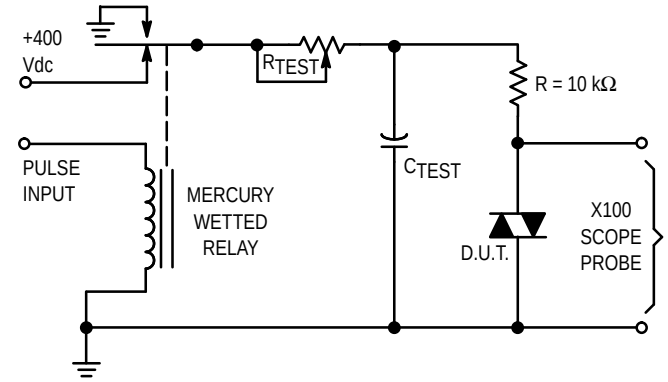



**Figure 6. LED Current Required to Trigger versus LED Pulse Width**




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.

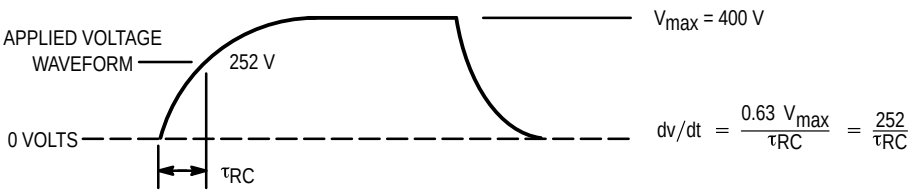
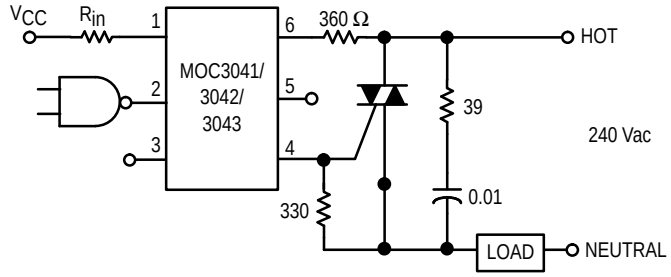



**Figure 7. Static dv/dt Test Circuit**

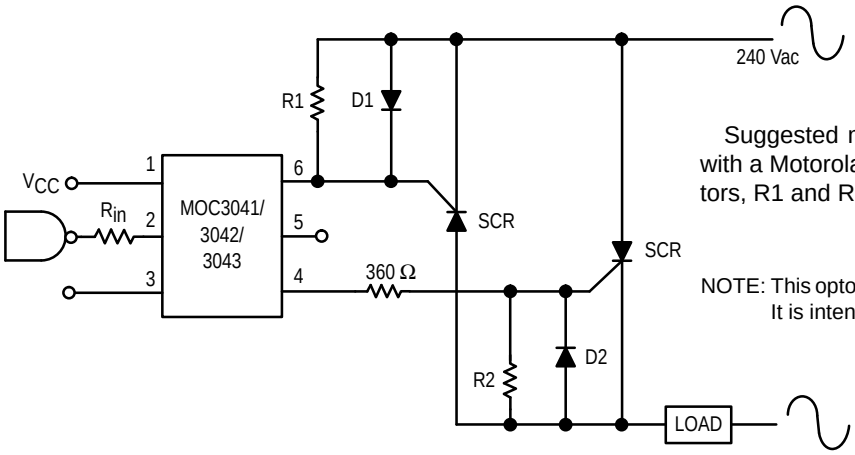



* For highly inductive loads (power factor < 0.5), change this value to 360 ohms.

Typical circuit 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 MOC3043, 10 mA for the MOC3042, or 15 mA for the MOC3041. The 39 ohm resistor and 0.01 μF capacitor are for snubbing of the triac and may or may not be necessary depending upon the particular triac and load used.

**Figure 8. Hot–Line Switching Application Circuit**

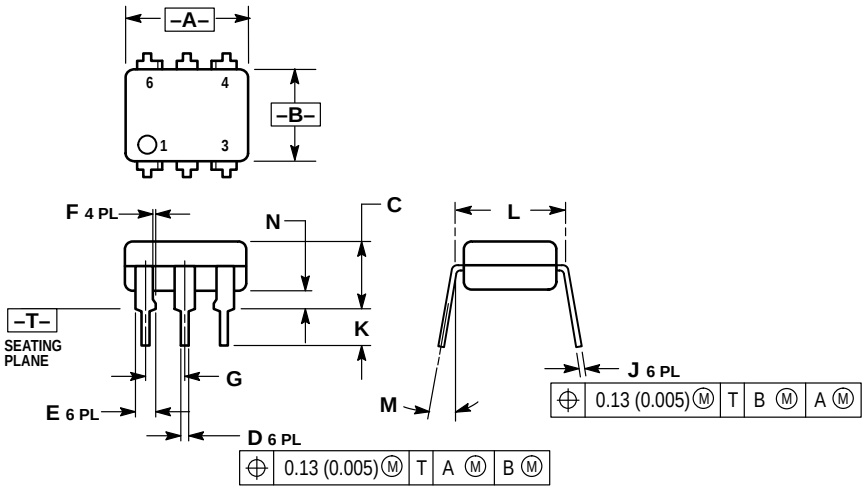



Suggested method of firing two, back–to–back SCR’s, with a Motorola triac driver. Diodes can be 1N4001; resistors, R1 and R2, are optional 330 ohms.

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

**Figure 9. Inverse–Parallel SCR Driver Circuit**

## PACKAGE DIMENSIONS

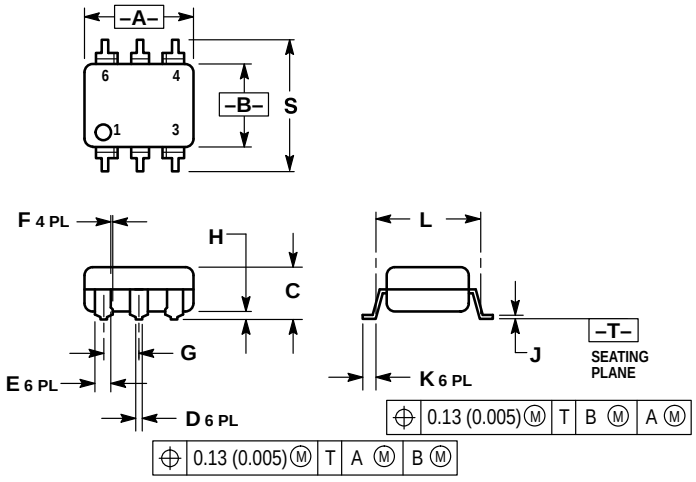



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.320 | 0.350 | 8.13 | 8.89 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.115 | 0.200 | 2.93 | 5.08 |
| D | 0.016 | 0.020 | 0.41 | 0.50 |
| E | 0.040 | 0.070 | 1.02 | 1.77 |
| F | 0.010 | 0.014 | 0.25 | 0.36 |
| G | 0.100 BSC | | 2.54 BSC | |
| J | 0.008 | 0.012 | 0.21 | 0.30 |
| K | 0.100 | 0.150 | 2.54 | 3.81 |
| L | 0.300 BSC | | 7.62 BSC | |
| M | 0 ° | 15 ° | 0 ° | 15 ° |
| N | 0.015 | 0.100 | 0.38 | 2.54 |

STYLE 6:
PIN 1. ANODE
2. CATHODE
3. NC
4. MAIN TERMINAL
5. SUBSTRATE
6. MAIN TERMINAL

**CASE 730A–04**
**ISSUE G**

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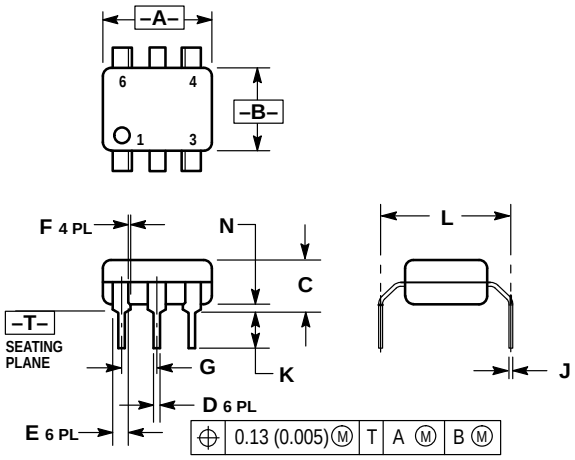
2. CONTROLLING DIMENSION: INCH.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.320 | 0.350 | 8.13 | 8.89 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.115 | 0.200 | 2.93 | 5.08 |
| D | 0.016 | 0.020 | 0.41 | 0.50 |
| E | 0.040 | 0.070 | 1.02 | 1.77 |
| F | 0.010 | 0.014 | 0.25 | 0.36 |
| G | 0.100 BSC | | 2.54 BSC | |
| H | 0.020 | 0.025 | 0.51 | 0.63 |
| J | 0.008 | 0.012 | 0.20 | 0.30 |
| K | 0.006 | 0.035 | 0.16 | 0.88 |
| L | 0.320 BSC | | 8.13 BSC | |
| S | 0.332 | 0.390 | 8.43 | 9.90 |

***Consult factory for leadform option availability**

**CASE 730C–04**
**ISSUE D**




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.320 | 0.350 | 8.13 | 8.89 |
| B | 0.240 | 0.260 | 6.10 | 6.60 |
| C | 0.115 | 0.200 | 2.93 | 5.08 |
| D | 0.016 | 0.020 | 0.41 | 0.50 |
| E | 0.040 | 0.070 | 1.02 | 1.77 |
| F | 0.010 | 0.014 | 0.25 | 0.36 |
| G | 0.100 BSC | | 2.54 BSC | |
| J | 0.008 | 0.012 | 0.21 | 0.30 |
| K | 0.100 | 0.150 | 2.54 | 3.81 |
| L | 0.400 | 0.425 | 10.16 | 10.80 |
| N | 0.015 | 0.040 | 0.38 | 1.02 |

***Consult factory for leadform option availability**

**CASE 730D–05**
**ISSUE D**

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