



# 6-Pin DIP Random-Phase Optoisolators Triac Driver Output (400 Volts Peak)

The MOC3020 Series consists of gallium arsenide infrared emitting diodes, optically coupled to a silicon bilateral switch.

- **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.**

They are designed for applications requiring isolated triac triggering.

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

- Solenoid/Valve Controls
- Lamp Ballasts
- Interfacing Microprocessors to 115 Vac Peripherals
- Motor Controls
- Static ac Power Switch
- Solid State Relays
- Incandescent Lamp Dimmers

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
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#### INFRARED EMITTING DIODE

Reverse Voltage	$V_R$	3	Volts
Forward Current — Continuous	$I_F$	60	mA
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Negligible Power in Triac Driver Derate above $25^\circ\text{C}$	$P_D$	100 1.33	mW mW/ $^\circ\text{C}$

#### OUTPUT DRIVER

Off-State Output Terminal Voltage	$V_{DRM}$	400	Volts
Peak Repetitive Surge Current ( $PW = 1\text{ ms}$ , 120 pps)	$I_{TSM}$	1	A
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300 4	mW mW/ $^\circ\text{C}$

#### TOTAL DEVICE

Isolation Surge Voltage <sup>(1)</sup> (Peak ac Voltage, 60 Hz, 1 Second Duration)	$V_{ISO}$	7500	Vac(pk)
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	330 4.4	mW mW/ $^\circ\text{C}$
Junction Temperature Range	$T_J$	-40 to +100	$^\circ\text{C}$
Ambient Operating Temperature Range <sup>(2)</sup>	$T_A$	-40 to +85	$^\circ\text{C}$
Storage Temperature Range <sup>(2)</sup>	$T_{stg}$	-40 to +150	$^\circ\text{C}$
Soldering Temperature (10 s)	$T_L$	260	$^\circ\text{C}$

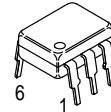
1. Isolation surge voltage,  $V_{ISO}$ , is an internal device dielectric breakdown rating. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

**Preferred** devices are Motorola recommended choices for future use and best overall value. GlobalOptoisolator is a trademark of Motorola, Inc.

**MOC3021**  
[IFT = 15 mA Max]  
**MOC3022**  
[IFT = 10 mA Max]  
**MOC3023\***  
[IFT = 5 mA Max]

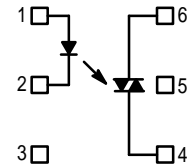
\*Motorola Preferred Device

### STYLE 6 PLASTIC



STANDARD THRU HOLE  
CASE 730A-04

### SCHEMATIC



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

# MOC3021 MOC3022 MOC3023

ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>INPUT LED</b>					
Reverse Leakage Current ( $V_R = 3\text{ V}$ )	$I_R$	—	0.05	100	$\mu\text{A}$
Forward Voltage ( $I_F = 10\text{ mA}$ )	$V_F$	—	1.15	1.5	Volts

**OUTPUT DETECTOR** ( $I_F = 0$  unless otherwise noted)

Peak Blocking Current, Either Direction (Rated $V_{DRM}^{(1)}$ )	$I_{DRM}$	—	10	100	nA
Peak On-State Voltage, Either Direction ( $I_{TM} = 100\text{ mA Peak}$ )	$V_{TM}$	—	1.8	3	Volts
Critical Rate of Rise of Off-State Voltage (Figure 7, Note 2)	$dv/dt$	—	10	—	$\text{V}/\mu\text{s}$

**COUPLED**

LED Trigger Current, Current Required to Latch Output (Main Terminal Voltage = 3 V <sup>(3)</sup> )	$I_{FT}$	—	8	15	mA
MOC3021		—	—	10	
MOC3022		—	—	5	
Holding Current, Either Direction	$I_H$	—	100	—	$\mu\text{A}$

1. Test voltage must be applied within  $dv/dt$  rating.
2. This is static  $dv/dt$ . See Figure 7 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  $I_{FT}$  (15 mA for MOC3021, 10 mA for MOC3022, 5 mA for MOC3023) and absolute max  $I_F$  (60 mA).

## TYPICAL ELECTRICAL CHARACTERISTICS

$T_A = 25^\circ\text{C}$

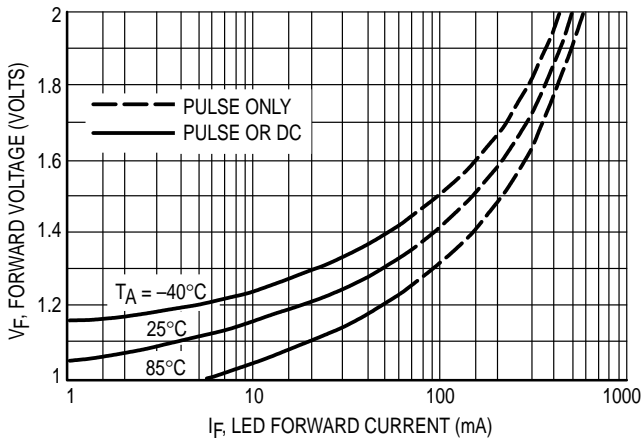


Figure 1. LED Forward Voltage versus Forward Current

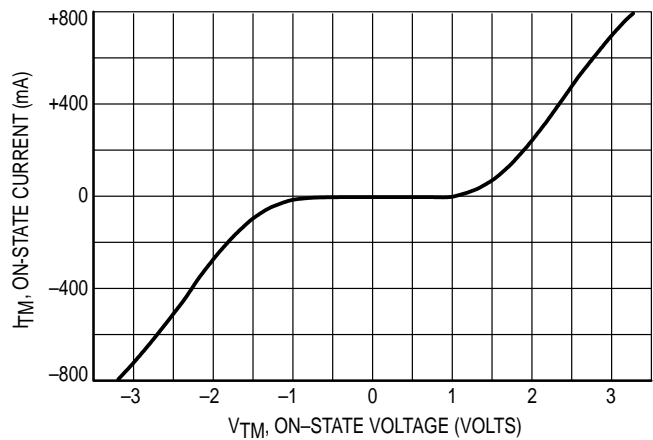


Figure 2. On-State Characteristics

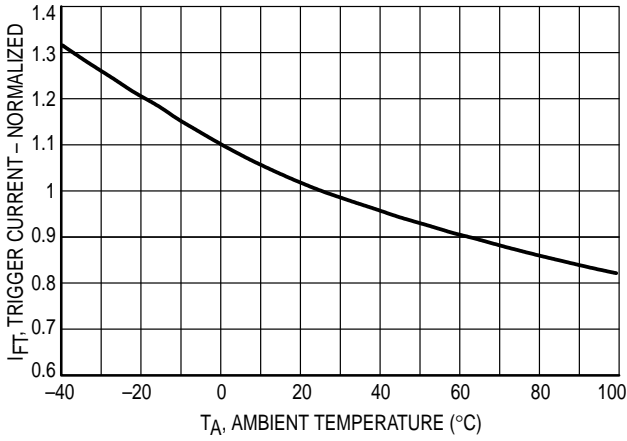


Figure 3. Trigger Current versus Temperature

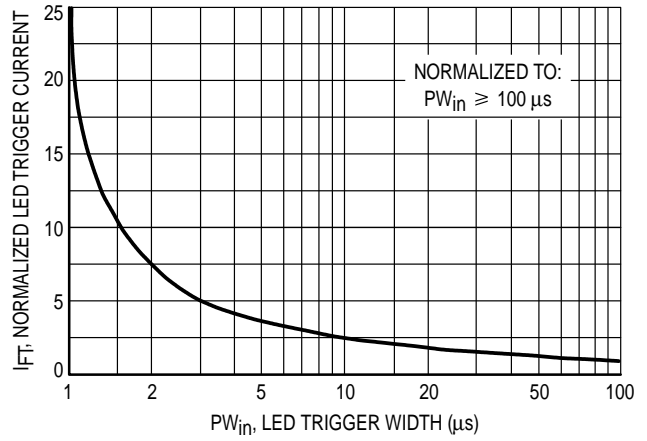


Figure 4. LED Current Required to Trigger versus LED Pulse Width

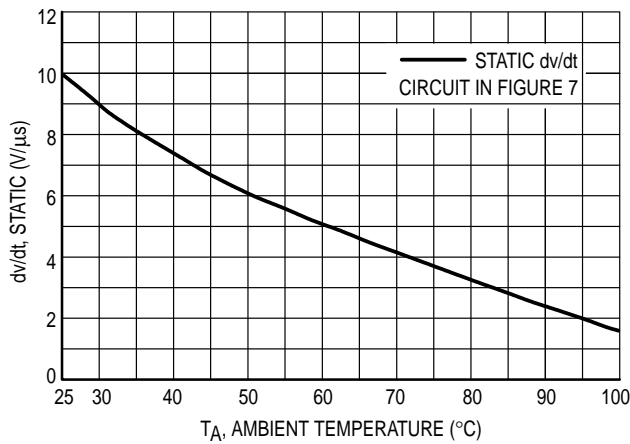


Figure 5. dv/dt versus Temperature

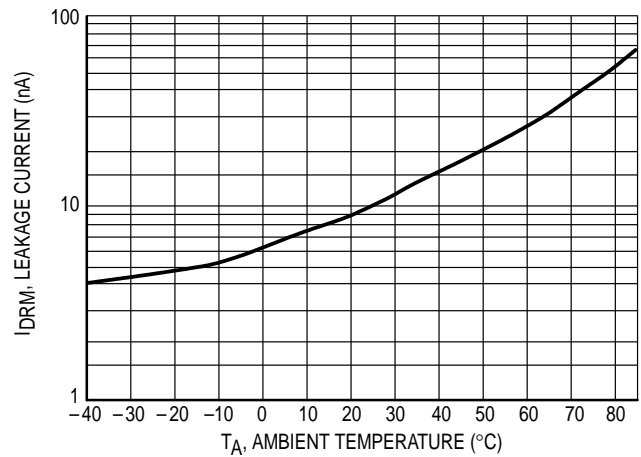


Figure 6. Leakage Current, IDRM versus Temperature

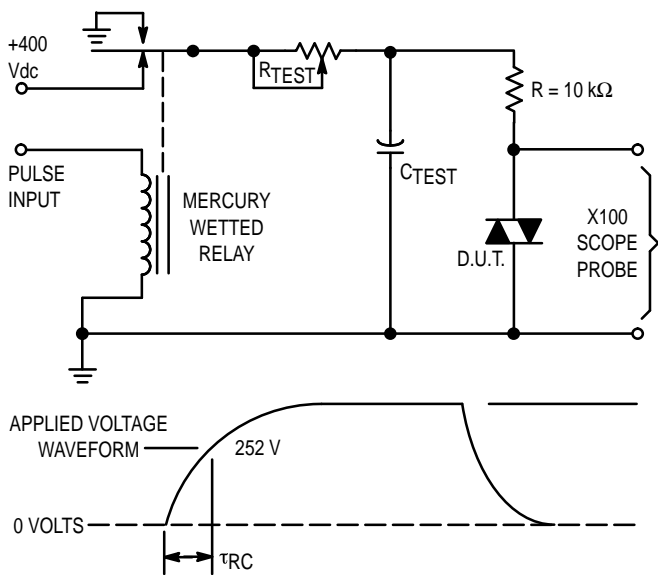
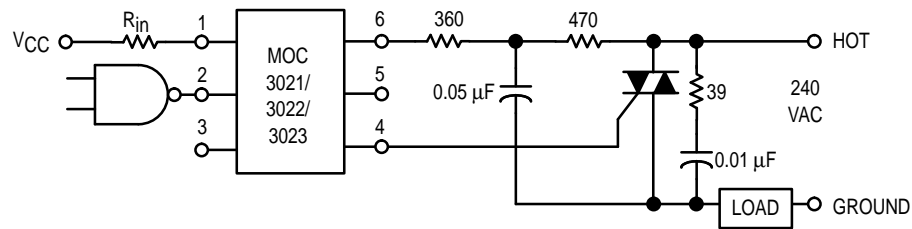


Figure 7. Static dv/dt Test Circuit

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.  $\tau_{RC}$  is measured at this point and recorded.

## MOC3021 MOC3022 MOC3023



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

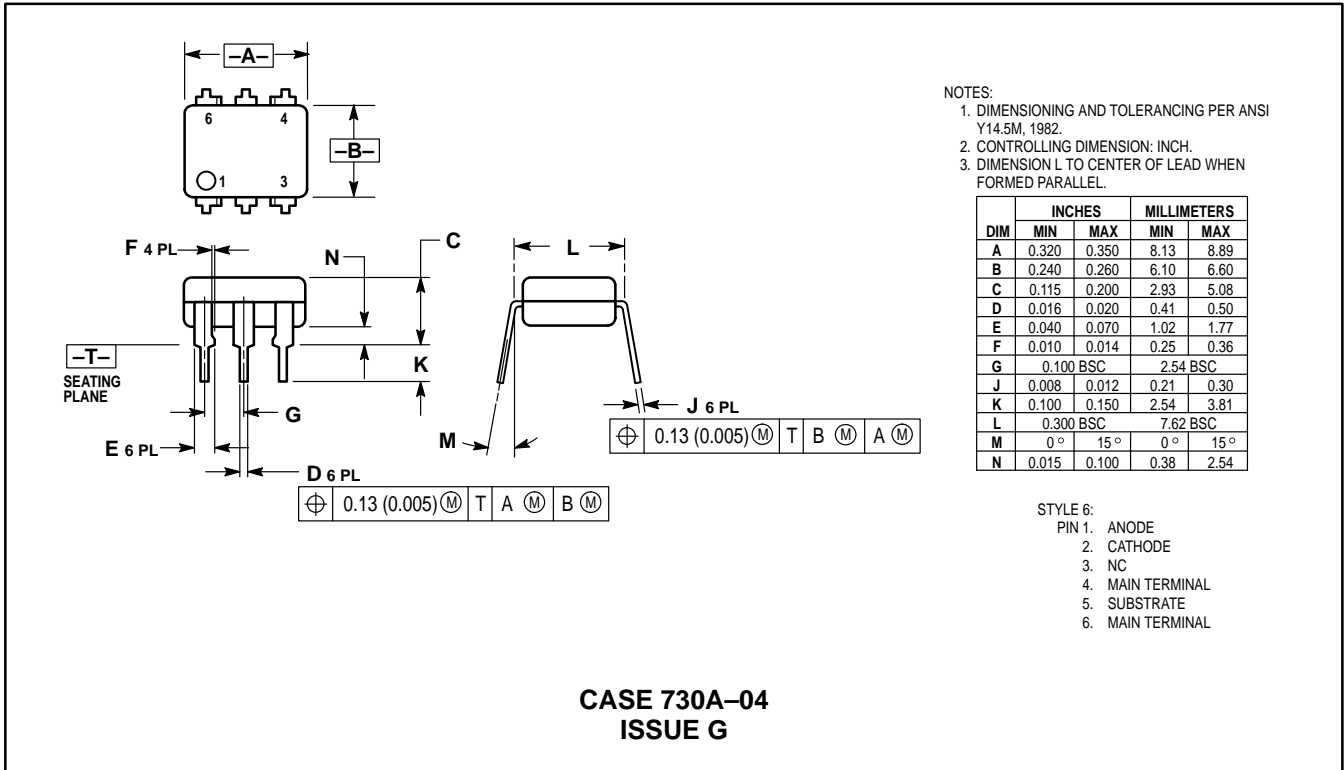
Additional information on the use of optically coupled triac drivers is available in Application Note AN-780A.

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

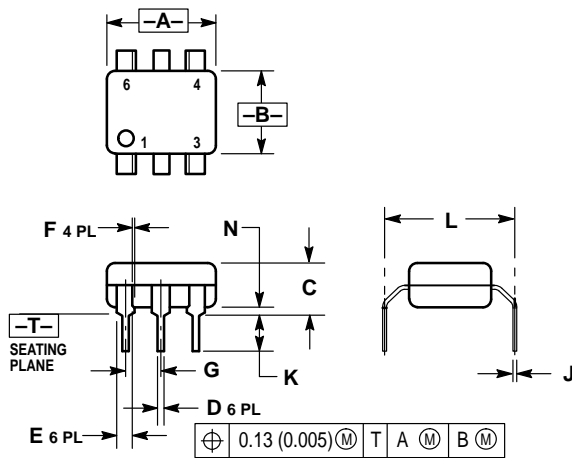
The 39 ohm resistor and 0.01  $\mu\text{F}$  capacitor are for snubbing of the triac, and the 470 ohm resistor and 0.05  $\mu\text{F}$  capacitor are for snubbing the coupler. These components may or may not be necessary depending upon the particular triac and load used.

**Figure 8. Typical Application Circuit**

PACKAGE DIMENSIONS



# MOC3021 MOC3022 MOC3023



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

DIM	INCHES		MILLIMETERS	
	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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MOC3020/D

