



# 6-Pin DIP Random-Phase Optoisolators Triac Driver Output (250 Volts Peak)

The MOC3010 Series consists of gallium arsenide infrared emitting diodes, optically coupled to silicon bilateral switch and are designed for applications requiring isolated triac triggering, low-current isolated ac switching, high electrical isolation (to 7500 Vac peak), high detector standoff voltage, small size, and low cost.

- 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 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<sub>A</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
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#### INFRARED EMITTING DIODE

Reverse Voltage	V <sub>R</sub>	3	Volts
Forward Current — Continuous	I <sub>F</sub>	60	mA
Total Power Dissipation @ T <sub>A</sub> = 25°C Negligible Power in Transistor Derate above 25°C	P <sub>D</sub>	100 1.33	mW mW/°C

#### OUTPUT DRIVER

Off-State Output Terminal Voltage	V <sub>DRM</sub>	250	Volts
Peak Repetitive Surge Current (PW = 1 ms, 120 pps)	I <sub>TSM</sub>	1	A
Total Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	300 4	mW mW/°C

#### TOTAL DEVICE

Isolation Surge Voltage <sup>(1)</sup> (Peak ac Voltage, 60 Hz, 1 Second Duration)	V <sub>ISO</sub>	7500	Vac(pk)
Total Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	330 4.4	mW mW/°C
Junction Temperature Range	T <sub>J</sub>	-40 to +100	°C
Ambient Operating Temperature Range <sup>(2)</sup>	T <sub>A</sub>	-40 to +85	°C
Storage Temperature Range <sup>(2)</sup>	T <sub>stg</sub>	-40 to +150	°C
Soldering Temperature (10 s)	T <sub>L</sub>	260	°C

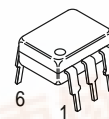
- Isolation surge voltage, V<sub>ISO</sub>, is an internal device dielectric breakdown rating. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
  - Refer to Quality and Reliability Section in Opto Data Book for information on test conditions. Preferred devices are Motorola recommended choices for future use and best overall value.
- Global Optoisolator is a trademark of Motorola, Inc.

(Replaces MOC3009/D)

**MOC3010**  
 [IFT = 15 mA Max]  
**MOC3011**  
 [IFT = 10 mA Max]  
**MOC3012\***  
 [IFT = 5 mA Max]

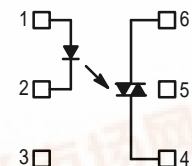
\*Motorola Preferred Device

### STYLE 6 PLASTIC



STANDARD THRU HOLE  
 CASE 730A-04

### COUPLER SCHEMATIC



- ANODE
- CATHODE
- NC
- MAIN TERMINAL
- SUBSTRATE  
DO NOT CONNECT
- MAIN TERMINAL



# MOC3010 MOC3011 MOC3012

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### INPUT LED

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	—	V/ $\mu\text{s}$

### COUPLED

LED Trigger Current, Current Required to Latch Output (Main Terminal Voltage = $3\text{ V}^{(3)}$ )	$I_{FT}$	—	8	15	mA
MOC3010		—	5	10	
MOC3011		—	3	5	
MOC3012		—	—	—	
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 MOC3010, 10 mA for MOC3011, 5 mA for MOC3012) and absolute max  $I_F$  (60 mA).

## TYPICAL ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$

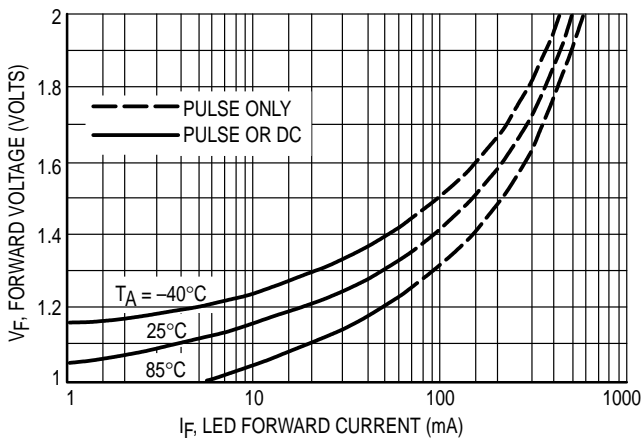


Figure 1. LED Forward Voltage versus Forward Current

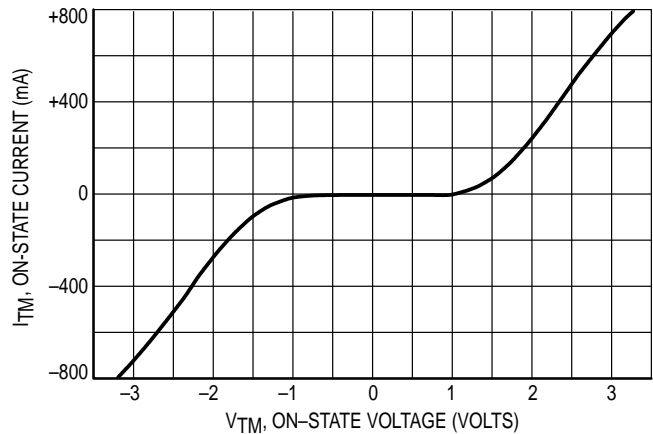


Figure 2. On-State Characteristics

# MOC3010 MOC3011 MOC3012

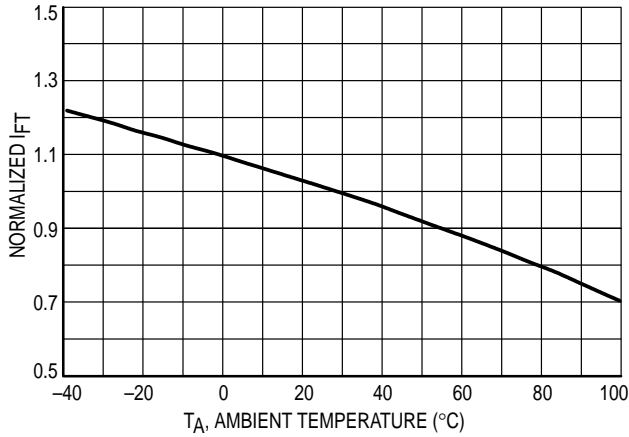


Figure 3. Trigger Current versus Temperature

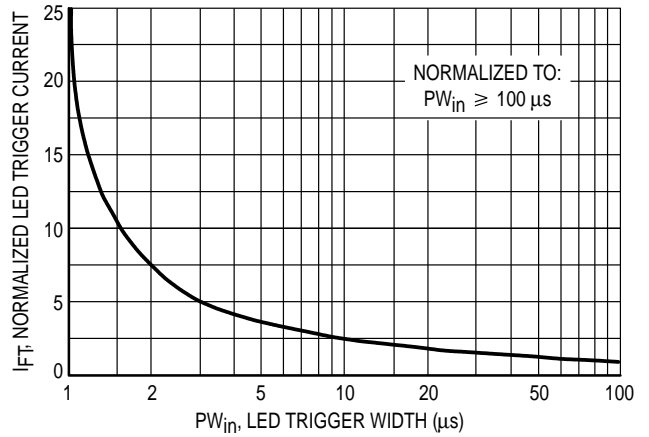


Figure 4. LED Current Required to Trigger versus LED Pulse Width

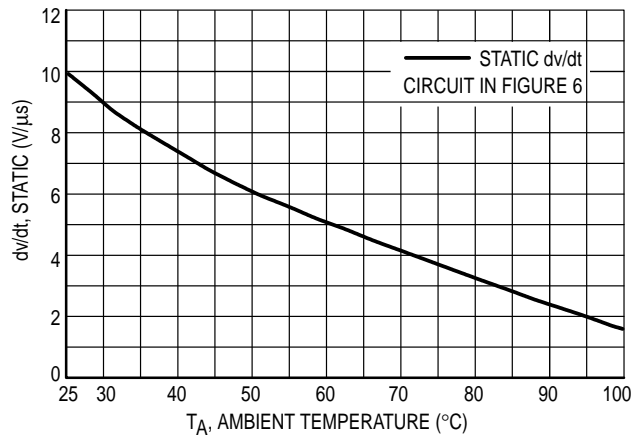
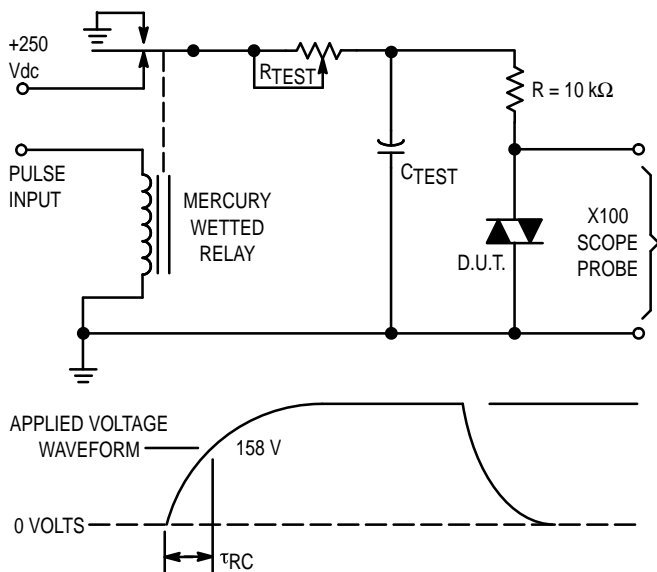


Figure 5. dv/dt versus Temperature



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<sub>TEST</sub> 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<sub>RC</sub> is measured at this point and recorded.

$$V_{max} = 250 \text{ V}$$

$$dv/dt = \frac{0.63 V_{max}}{\tau_{RC}} = \frac{158}{\tau_{RC}}$$

Figure 6. Static dv/dt Test Circuit

# MOC3010 MOC3011 MOC3012

## TYPICAL APPLICATION CIRCUITS

NOTE: 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 the MOC3010/3011/3012 is available in Application Note AN-780A.

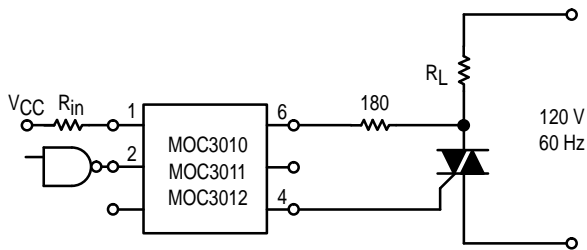


Figure 7. Resistive Load

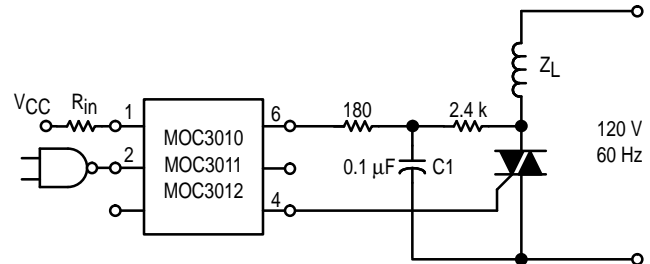


Figure 8. Inductive Load with Sensitive Gate Triac ( $I_{GT} \leq 15 \text{ mA}$ )

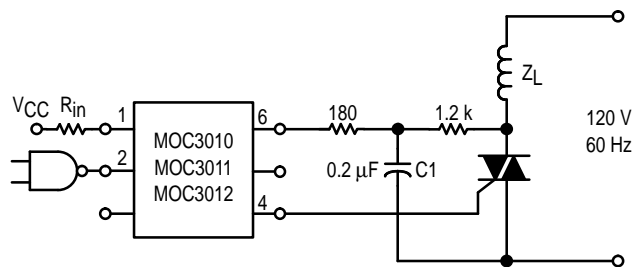
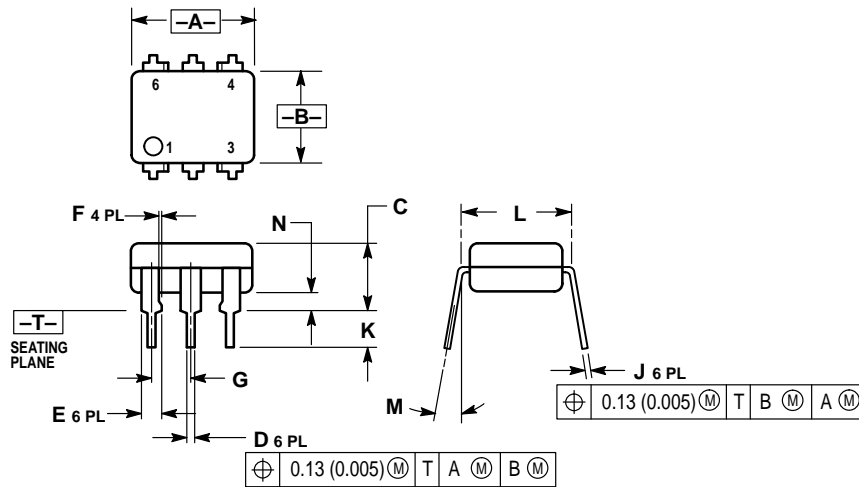


Figure 9. Inductive Load with Non-Sensitive Gate Triac ( $15 \text{ mA} < I_{GT} < 50 \text{ mA}$ )

# MOC3010 MOC3011 MOC3012

## PACKAGE DIMENSIONS

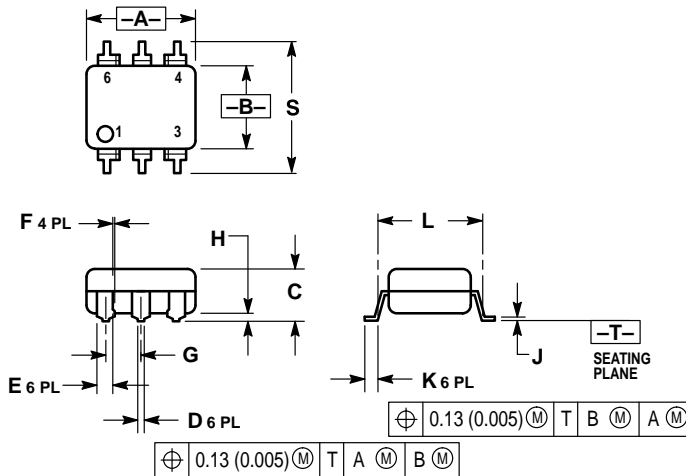


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

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	0.300 BSC		7.62 BSC	
M	0° 15°		0° 15°	
N	0.015	0.100	0.38	2.54

- STYLE 6:
- PIN 1. ANODE
  - CATHODE
  - NC
  - MAIN TERMINAL
  - SUBSTRATE
  - MAIN TERMINAL

**CASE 730A-04  
ISSUE G**



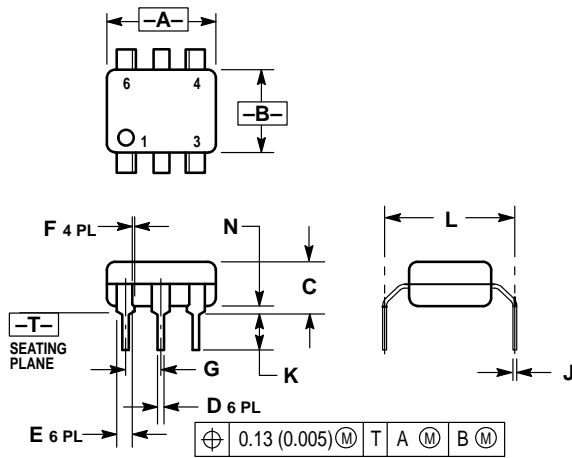
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DIM	INCHES		MILLIMETERS	
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C	0.115	0.200	2.93	5.08
D	0.016	0.020	0.41	0.50
E	0.040	0.070	1.02	1.77
F	0.010	0.014	0.25	0.36
G	0.100 BSC		2.54 BSC	
H	0.020	0.025	0.51	0.63
J	0.008	0.012	0.20	0.30
K	0.006	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**

# MOC3010 MOC3011 MOC3012




- 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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