GlobalOptoisolator™

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

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

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

***Motorola Preferred Device**

STYLE 6 PLASTIC

6   1

**STANDARD THRU HOLE
CASE 730A–04**

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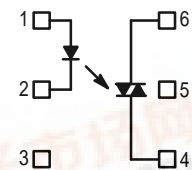
1. ANODE
2. CATHODE
3. NC
4. MAIN TERMINAL
5. SUBSTRATE
   DO NOT CONNECT
6. MAIN TERMINAL

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

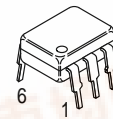| Rating	Symbol	Value	Unit
INFRARED EMITTING DIODE			
Reverse Voltage	V_R	3	Volts
Forward Current — Continuous	I_F	60	mA
Total Power Dissipation @ T_A = 25°C Negligible Power in Triac Driver Derate above 25°C	P_D	100 1.33	mW mW/°C
OUTPUT DRIVER			
Off–State Output Terminal Voltage	V_{DRM}	400	Volts
Peak Repetitive Surge Current (PW = 1 ms, 120 pps)	I_{TSM}	1	A
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	300 4	mW mW/°C
TOTAL DEVICE			
Isolation Surge Voltage[1] (Peak ac Voltage, 60 Hz, 1 Second Duration)	V_{ISO}	7500	Vac(pk)
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	330 4.4	mW 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.

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MOTOROLA

MOC3021 MOC3022 MOC3023

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

Characteristic	Symbol	Min	Typ	Max	Unit
INPUT LED					
Reverse Leakage Current (V_R = 3 V)	I_R	—	0.05	100	μA
Forward Voltage (I_F = 10 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 mA Peak)	V_{TM}	—	1.8	3	Volts
Critical Rate of Rise of Off–State Voltage (Figure 7, Note 2)	dv/dt	—	10	—	V/μs
COUPLED					
LED Trigger Current, Current Required to Latch Output (Main Terminal Voltage = 3 V[3]) MOC3021 MOC3022 MOC3023	I_{FT}	— — —	8 — —	15 10 5	mA
Holding Current, Either Direction	I_H	—	100	—	μA

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).
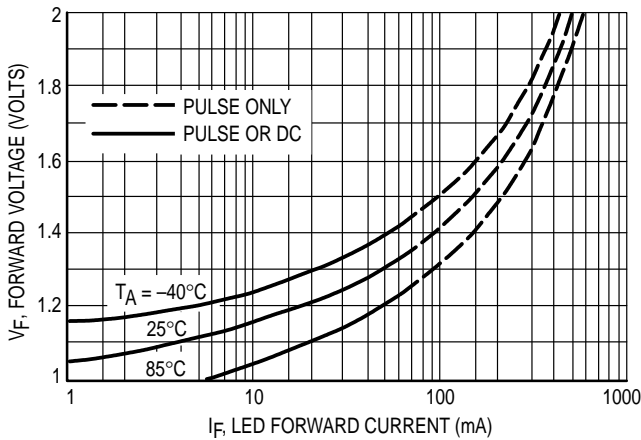
TYPICAL ELECTRICAL CHARACTERISTICS

T_A = 25°C
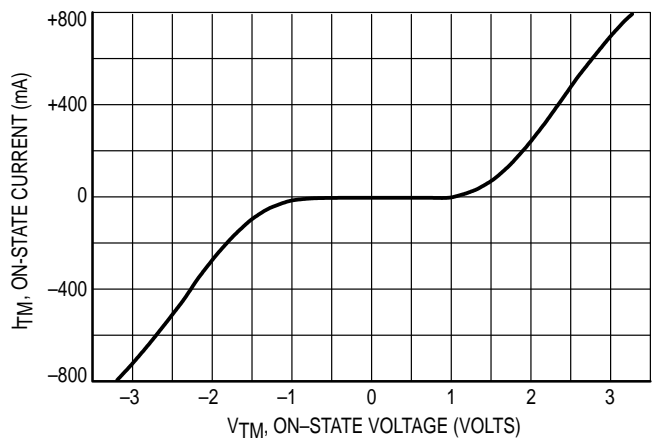

Figure 1. LED Forward Voltage versus Forward Current

Figure 2. On–State Characteristics
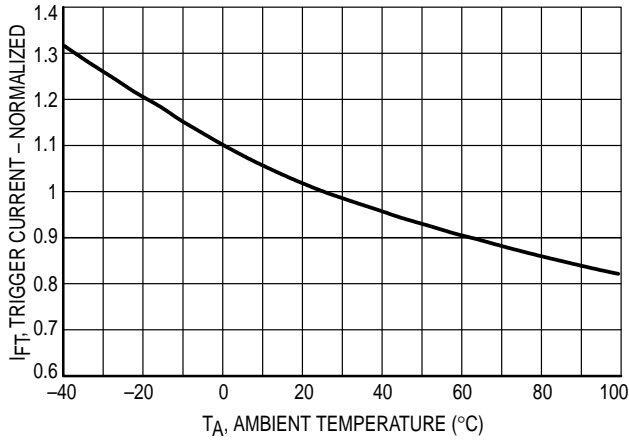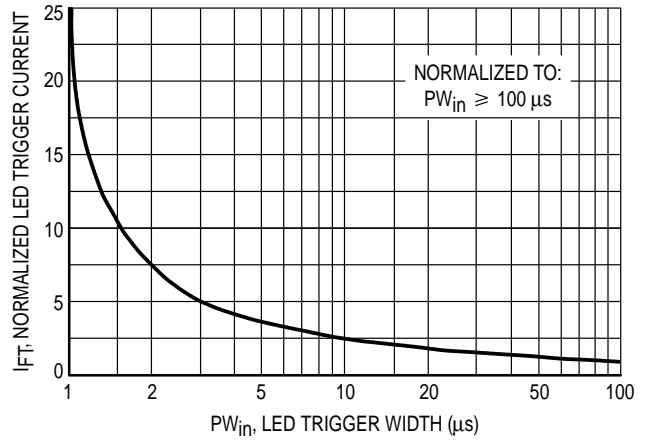
Figure 3. Trigger Current versus Temperature

I$_{FT}$, TRIGGER CURRENT – NORMALIZED

T$_A$, AMBIENT TEMPERATURE (°C)

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

I$_{FT}$, NORMALIZED LED TRIGGER CURRENT

NORMALIZED TO:
PW$_{in}$ ⩾ 100 µs

PW$_{in}$, LED TRIGGER WIDTH (µs)
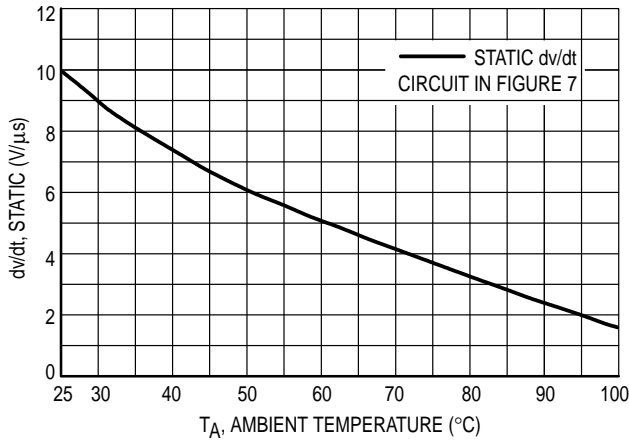
Figure 5. dv/dt versus Temperature

dv/dt, STATIC (V/µs)

STATIC dv/dt
CIRCUIT IN FIGURE 7

T$_A$, AMBIENT TEMPERATURE (°C)
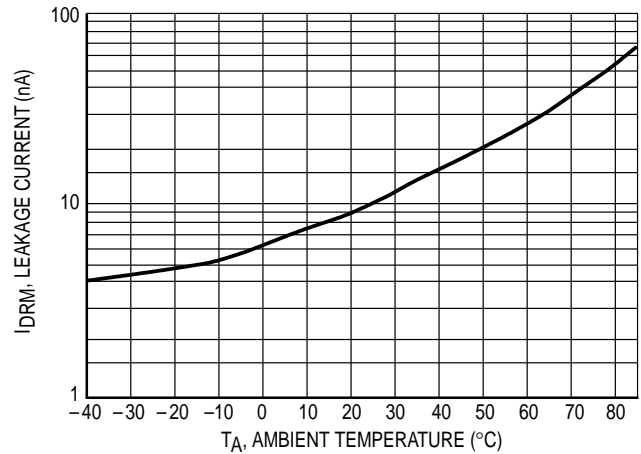
Figure 6. Leakage Current, I$_{DRM}$ versus Temperature

I$_{DRM}$, LEAKAGE CURRENT (nA)

T$_A$, AMBIENT TEMPERATURE (°C)

+400 Vdc

R$_{TEST}$

R = 10 kΩ

PULSE INPUT

MERCURY WETTED RELAY

C$_{TEST}$

D.U.T.
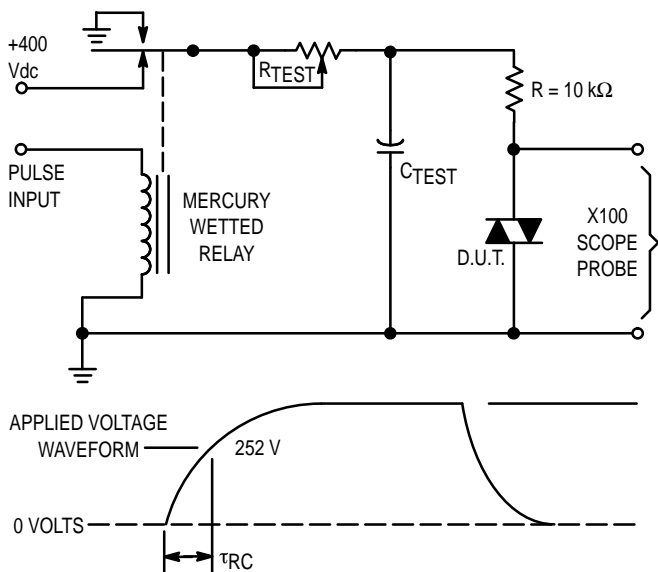
X100 SCOPE PROBE

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.
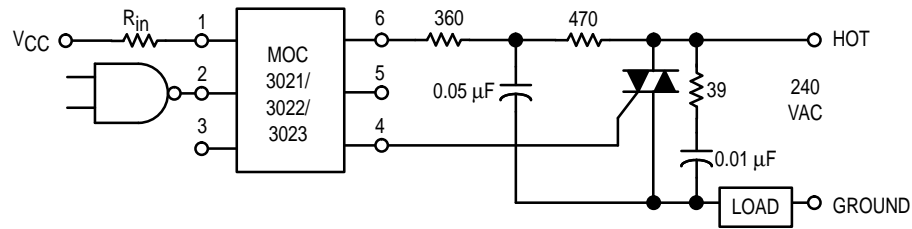
APPLIED VOLTAGE WAVEFORM

V$_{max}$ = 400 V

252 V

0 VOLTS

τ$_{RC}$

$$dv/dt = \frac{0.63 \ V_{max}}{\tau_{RC}} = \frac{252}{\tau_{RC}}$$

Figure 7. Static dv/dt Test Circuit

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.
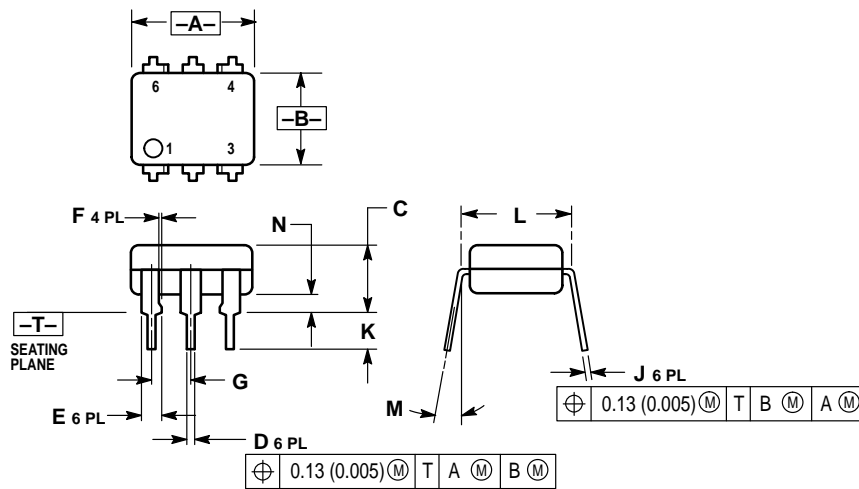
The 39 ohm resistor and 0.01 μF capacitor are for snubbing of the triac, and the 470 ohm resistor and 0.05 μF capacitor are for snubbing the coupler. These components may or may not be necessary depending upon the particular triac and load used.

Figure 8. Typical Application Circuit

PACKAGE DIMENSIONS

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
2. CATHODE
3. NC
4. MAIN TERMINAL
5. SUBSTRATE
6. MAIN TERMINAL

**CASE 730A–04
ISSUE G**
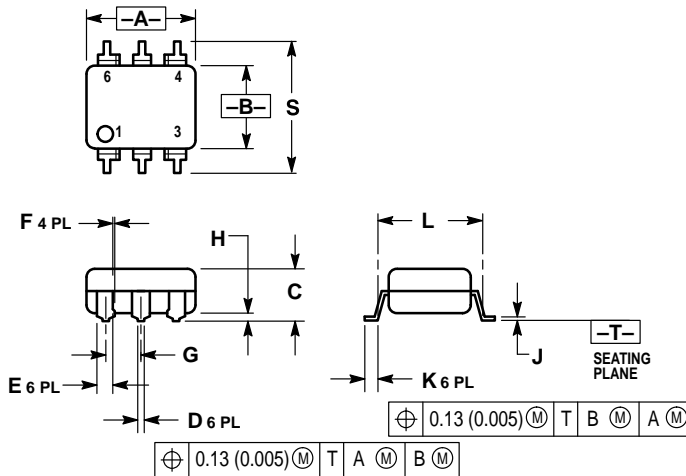
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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	
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**

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