FAIRCHILD SEMICONDUCTOR®

January 2009

MOC3010M, MOC3011M, MOC3012M, MOC3020M, MOC3021M, MOC3022M, MOC3023M
6-Pin DIP Random-Phase Optoisolators Triac Driver Output (250/400 Volt Peak)

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)

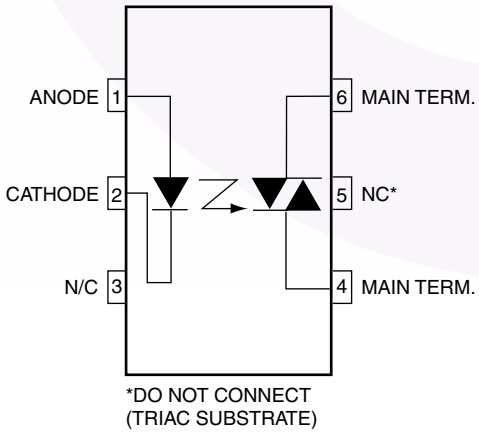
Applications

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

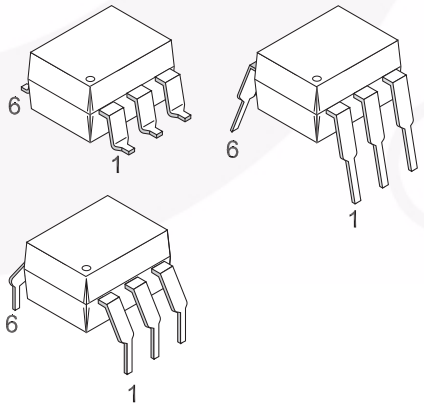
Description

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.

Schematic



Package Outlines



Absolute Maximum Ratings (T_A = 25°C unless otherwise noted)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameters	Device	Value	Units
TOTAL DEVICE				
T_{STG}	Storage Temperature	All	-40 to +150	°C
T_{OPR}	Operating Temperature	All	-40 to +85	°C
T_{SOL}	Lead Solder Temperature	All	260 for 10 sec	°C
T_J	Junction Temperature Range	All	-40 to +100	°C
V_{ISO}	Isolation Surge Voltage(1) (peak AC voltage, 60Hz, 1 sec. duration)	All	7500	Vac(pk)
P_D	Total Device Power Dissipation @ 25°C Ambient	All	330	mW
	Derate above 25°C		4.4	mW/°C
EMITTER				
I_F	Continuous Forward Current	All	60	mA
V_R	Reverse Voltage	All	3	V
P_D	Total Power Dissipation @ 25°C Ambient	All	100	mW
	Derate above 25°C		1.33	mW/°C
DETECTOR				
V_{DRM}	Off-State Output Terminal Voltage	MOC3010M/1M/2M MOC3020M/1M/2M/3M	250 400	V
I_{TSM}	Peak Repetitive Surge Current (PW = 1ms, 120pps)	All	1	A
P_D	Total Power Dissipation @ 25°C Ambient	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.

Electrical Characteristics (T_A = 25°C Unless otherwise specified)

Individual Component Characteristics

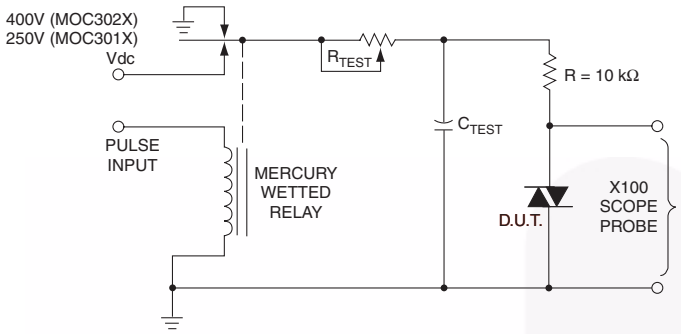
Symbol	Parameters	Test Conditions	Device	Min.	Typ.	Max.	Units
EMITTER							
V_F	Input Forward Voltage	I_F = 10mA	All		1.15	1.5	V
I_R	Reverse Leakage Current	V_R = 3V, T_A = 25°C	All		0.01	100	µA
DETECTOR							
I_{DRM}	Peak Blocking Current, Either Direction	Rated V_{DRM}, I_F = 0(2)	All		10	100	nA
V_{TM}	Peak On-State Voltage, Either Direction	I_{TM} = 100 mA peak, I_F = 0	All		1.8	3	V

Transfer Characteristics

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

Notes:

2. Test voltage must be applied within dv/dt rating.
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} (30mA for MOC3020M, 15mA for MOC3010M and MOC3021M, 10mA for MOC3011M and MOC3022M, 5mA for MOC3012M and MOC3023M) and absolute max I_F (60mA).



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.

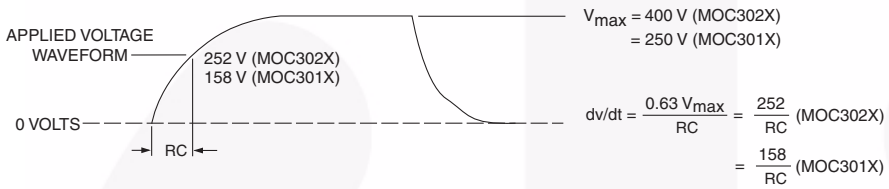


Figure 5. Static dv/dt Test Circuit

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

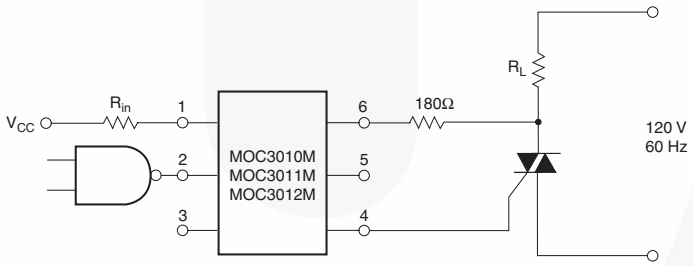


Figure 6. Resistive Load

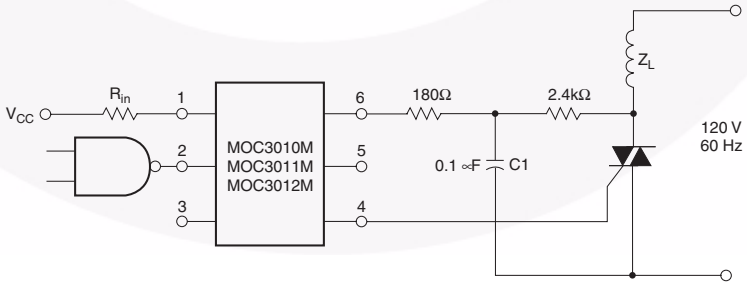


Figure 7. Inductive Load with Sensitive Gate Triac (I_{GT} 15 mA)

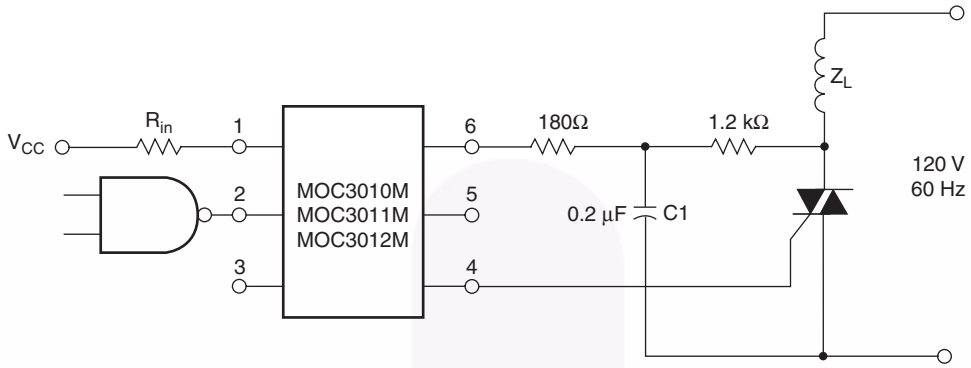
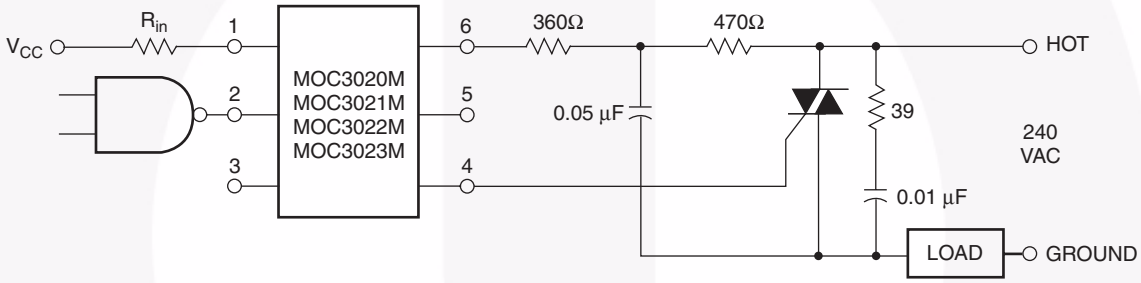


Figure 8. Inductive Load with Sensitive Gate Triac ($I_{GT} \leq 15$ mA)



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

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

Figure 9. Typical Application Circuit