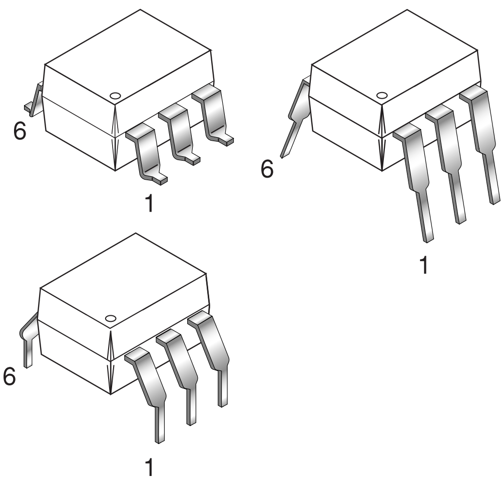
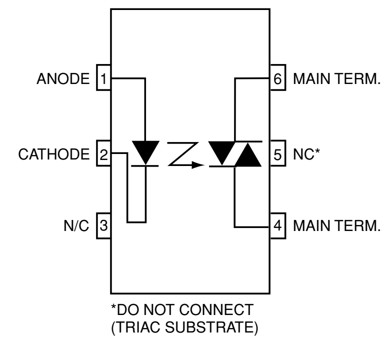
6-PIN DIP RANDOM-PHASE OPTOISOLATORS TRIAC DRIVERS (600 VOLT PEAK)

MOC3051-M MOC3052-M

PACKAGE



SCHEMATIC



DESCRIPTION

The MOC3051-M and MOC3052-M consist of a AlGaAs infrared emitting diode optically coupled to a non-zero-crossing silicon bilateral AC switch (triac). These devices isolate low voltage logic from 115 and 240 Vac lines to provide random phase control of high current triacs or thyristors. These devices feature greatly enhanced static dv/dt capability to ensure stable switching performance of inductive loads.

FEATURES

- Excellent I_{FT} stability—IR emitting diode has low degradation
- High isolation voltage—minimum 7500 peak VAC
- Underwriters Laboratory (UL) recognized—File #E90700
- 600V peak blocking voltage
- VDE recognized (File #94766)
  - Ordering option V (e.g. MOC3052V-M)

APPLICATIONS

- Solenoid/valve controls
- Lamp ballasts
- Static AC power switch
- Interfacing microprocessors to 115 and 240 Vac peripherals
- Solid state relay
- Incandescent lamp dimmers
- Temperature controls
- Motor controls

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

Parameters	Symbol	Device	Value	Units
TOTAL DEVICE				
Storage Temperature	T_{STG}	All	-40 to +150	°C
Operating Temperature	T_{OPR}	All	-40 to +85	°C
Lead Solder Temperature	T_{SOL}	All	260 for 10 sec	°C
Junction Temperature Range	T_J	All	-40 to +100	°C
Isolation Surge Voltage[3] (peak AC voltage, 60Hz, 1 sec duration)	V_{ISO}	All	7500	Vac(pk)
Total Device Power Dissipation @ 25°C	P_D	All	330	mW
Derate above 25°C			4.4	mW/°C
EMITTER				
Continuous Forward Current	I_F	All	60	mA
Reverse Voltage	V_R	All	3	V
Total Power Dissipation 25°C Ambient	P_D	All	100	mW
Derate above 25°C			1.33	mW/°C
DETECTOR				
Off-State Output Terminal Voltage	V_{DRM}	All	600	V
Peak Repetitive Surge Current (PW = 100 ms, 120 pps)	I_{TSM}	All	1	A
Total Power Dissipation @ 25°C Ambient	P_D	All	300	mW
Derate above 25°C			4	mW/°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless otherwise specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameters	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
EMITTER							
Input Forward Voltage	I_F = 10 mA	V_F	All		1.15	1.5	V
Reverse Leakage Current	V_R = 3 V	I_R	All		0.05	100	µA
DETECTOR							
Peak Blocking Current, Either Direction	V_{DRM}, I_F = 0 (note 1)	I_{DRM}	All		10	100	nA
Peak On-State Voltage, Either Direction	I_{TM} = 100 mA peak, I_F = 0	V_{TM}	All		1.7	2.5	V
Critical Rate of Rise of Off-State Voltage	I_F = 0 (figure 7, @400V)	dv/dt	All	1000			V/µs

TRANSFER CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
LED Trigger Current, either direction	Main terminal Voltage = 3V (note 2)	I_{FT}	MOC3051-M			15	mA
			MOC3052-M			10	
Holding Current, Either Direction		I_H	All		280		µA

*Typical values at T_A = 25°C

Note
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 max 15 mA for MOC3051, 10 mA for MOC3052 and absolute max I_F (60 mA).
3. Isolation surge votlage, VISO, is an internal device breakdown rating. For this text, pins 1 and 2 are common, and pins 4, 5 and 6 are common.

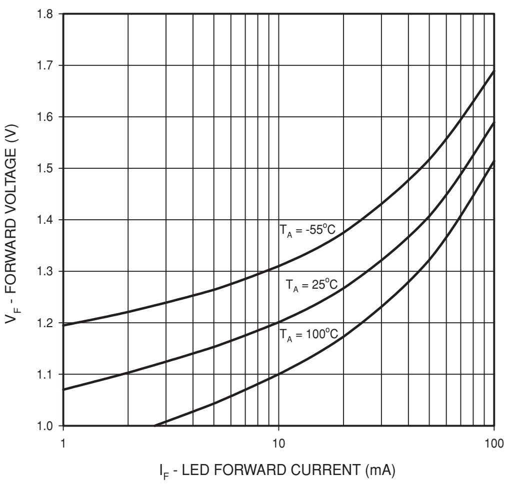


Figure. 1 LED Forward Voltage vs. Forward Current

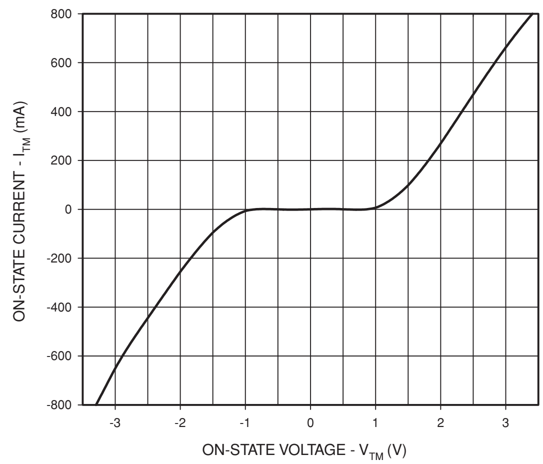


Figure. 2 On-State Characteristics

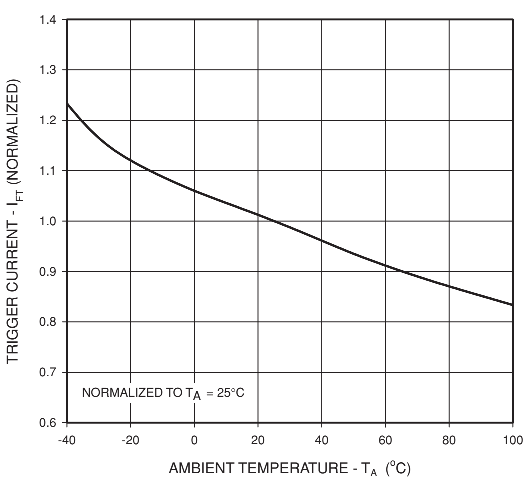


Figure. 3 Trigger Current vs. Ambient Temperature

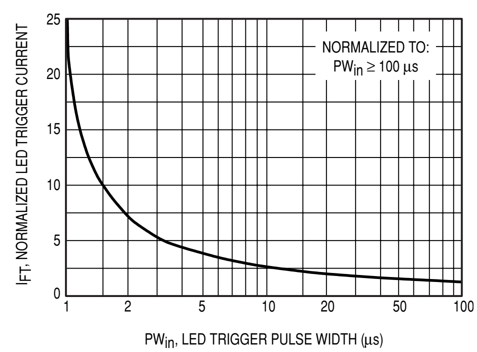


Figure. 4 LED Current Required to Trigger vs. LED Pulse Width

I_F versus Temperature (normalized)

This graph (figure 3) shows the increase of the trigger current when the device is expected to operate at an ambient temperature below 25°C. Multiply the normalized I_{FT} shown this graph with the data sheet guaranteed I_{FT}.

Example:
T_A = -40°C, I_{FT} = 10 mA
I_{FT} @ -40°C = 10 mA x 1.4 = 14 mA

Phase Control Considerations

LED Trigger Current versus PW (normalized)

Random Phase Triac drivers are designed to be phase controllable. They may be triggered at any phase angle within the AC sine wave. Phase control may be accomplished by an AC line zero cross detector and a variable pulse delay generator which is synchronized to the zero cross detector. The same task can be accomplished by a microprocessor which is synchronized to the AC zero crossing. The phase controlled trigger current may be a very short pulse which saves energy delivered to the input LED. LED trigger pulse currents shorter than 100 µs must have an increased amplitude as shown on Figure 4. This graph shows the dependency of the trigger current I_{FT} versus the pulse width can be seen on the chart delay t(d) versus the LED trigger current.

I_{FT} in the graph I_{FT} versus (PW) is normalized in respect to the minimum specified I_{FT} for static condition, which is specified in the device characteristic. The normalized I_{FT} has to be multiplied with the devices guaranteed static trigger current.

Example:
Guaranteed I_{FT} = 10 mA, Trigger pulse width PW = 3 µs
I_{FT} (pulsed) = 10 mA x 5 = 50 mA