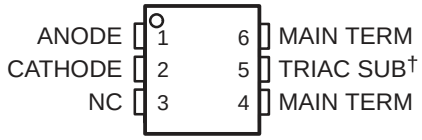
- **250 V Phototriac Driver Output**
- **Gallium-Arsenide-Diode Infrared Source and Optically Coupled Silicon Traic Driver (Bilateral Switch)**
- **UL Recognized . . . File Number E65085**
- **High Isolation . . . 7500 V Peak**
- **Output Driver Designed for 115 Vac**
- **Standard 6-Pin Plastic DIP**
- **Directly Interchangeable with Motorola MOC3009, MOC3010, MOC3011, and MOC3012**

typical 115 Vac(rms) applications

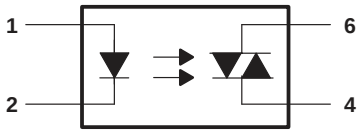
- **Solenoid/Valve Controls**
- **Lamp Ballasts**
- **Interfacing Microprocessors to 115-Vac Peripherals**
- **Motor Controls**
- **Incandescent Lamp Dimmers**

MOC30209– MOC3012 . . . PACKAGE
(TOP VIEW)



† Do not connect this terminal
NC – No internal connection

logic diagram



absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)†

Input-to-output peak voltage, 5 s maximum duration, 60 Hz (see Note 1) . . . . . 7.5 kV
Input diode reverse voltage . . . . . 3 V
Input diode forward current, continuous . . . . . 50 mA
Output repetitive peak off-state voltage . . . . . 250 V
Output on-state current, total rms value (50-60 Hz, full sine wave): T_A = 25°C . . . . . 100 mA
T_A = 70°C . . . . . 50 mA
Output driver nonrepetitive peak on-state current (t_w = 10 ms, duty cycle = 10%, see Figure 7) . . . . . 1.2 A
Continuous power dissipation at (or below) 25°C free-air temperature:
Infrared-emitting diode (see Note 2) . . . . . 100 mW
Phototriac (see Note 3) . . . . . 300 mW
Total device (see Note 4) . . . . . 330 mW
Operating junction temperature range, T_J . . . . . –40°C to 100°C
Storage temperature range, T_{stg} . . . . . –40°C to 150°C
Lead temperature 1,6 (1/16 inch) from case for 10 seconds . . . . . 260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

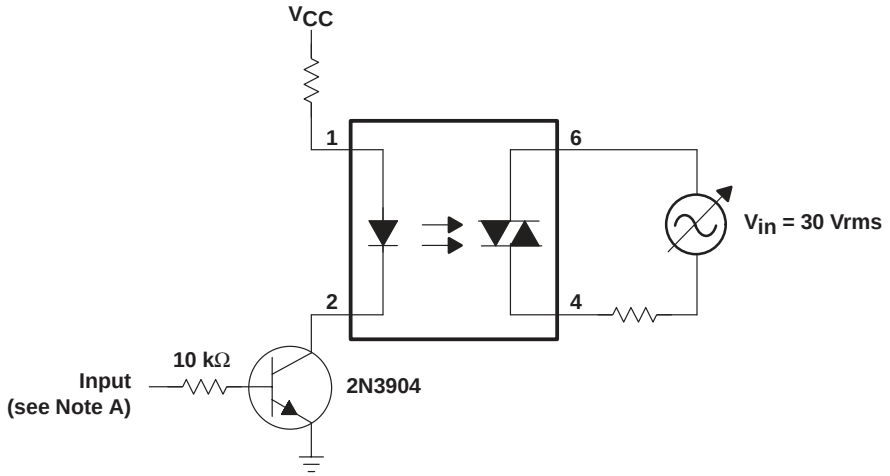
NOTES: 1. Input-to-output peak voltage is the internal device dielectric breakdown rating.
2. Derate linearly to 100°C free-air temperature at the rate of 1.33 mW/°C.
3. Derate linearly to 100°C free-air temperature at the rate of 4 mW/°C.
4. Derate linearly to 100°C free-air temperature at the rate of 4.4 mW/°C.

electrical characteristics at 25°C free-air temperature (unless otherwise noted)

PARAMETER			TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_R	Static reverse current		V_R = 3 V		0.05	100	μA
V_F	Static forward voltage		I_F = 10 mA		1.2	1.5	V
I_{DRM}	Repetitive off-state current, either direction		V_{DRM} = 250 V, See Note 5		10	100	nA
dv/dt	Critical rate of rise of off-state voltage		See Figure 1		12		V/μs
dv/dt(c)	Critical rate of rise of commutating voltage		I_O = 15 mA, See Figure 1		0.15		V/μs
I_{FT}	Input trigger current, either direction	MOC3009	Output supply voltage = 3 V		15	30	mA
		MOC3010			8	15	
		MOC3011			5	10	
		MOC3012				5	
V_{TM}	Peak on-state voltage, either direction		I_{TM} = 100 mA		1.8	3	V
I_H	Holding current, either direction				100		μA

NOTE 5: Test voltage must be applied within dv/dt rating.

PARAMETER MEASUREMENT INFORMATION



NOTE A. The critical rate of rise of off-state voltage, dv/dt, is measured with the input at 0 V. The frequency of V_{in} is increased until the phototriac just turns on. This frequency is then used to calculate the dv/dt according to the formula:

$$dv/dt = 2\sqrt{2}\pi f V_{in}$$

The critical rate of rise of commutating voltage, dv/dt(c), is measured by applying occasional 5-V pulses to the input and increasing the frequency of V_{in} until the phototriac stays on (latches) after the input pulse has ceased. With no further input pulses, the frequency of V_{in} is then gradually decreased until the phototriac turns off. The frequency at which turn-off occurs may then be used to calculate the dv/dt(c) according to the formula shown above.

Figure 1. Critical Rate of Rise Test Circuit

TYPICAL CHARACTERISTICS

**EMITTING-DIODE TRIGGER CURRENT (NORMALIZED)
vs
FREE-AIR TEMPERATURE**

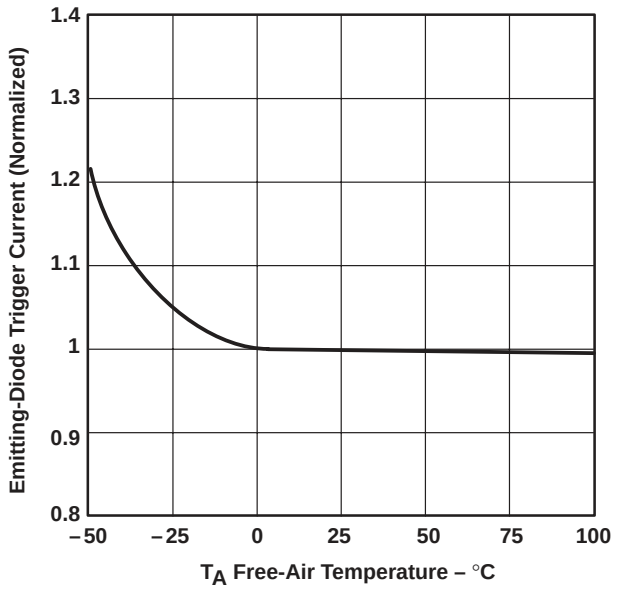


Figure 2

ON-STATE CHARACTERISTICS

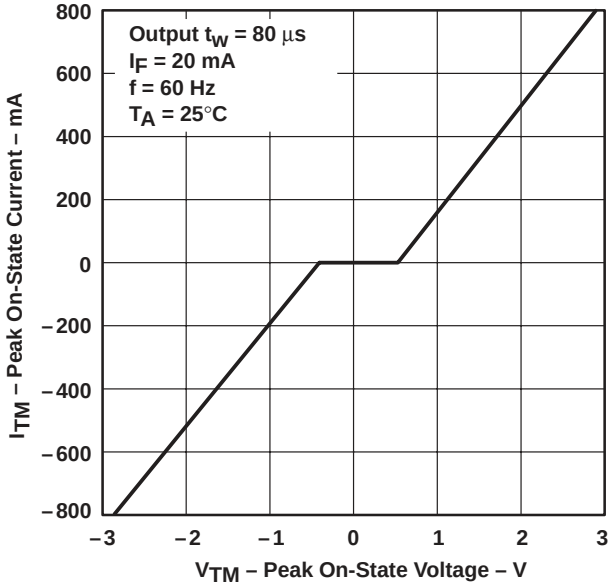


Figure 3

**CRITICAL RATE OF RISE OF OUTPUT VOLTAGE
OFF-STATE dv/dt AND COMMUTATING dv/dt(c)
vs
LOAD RESISTANCE**

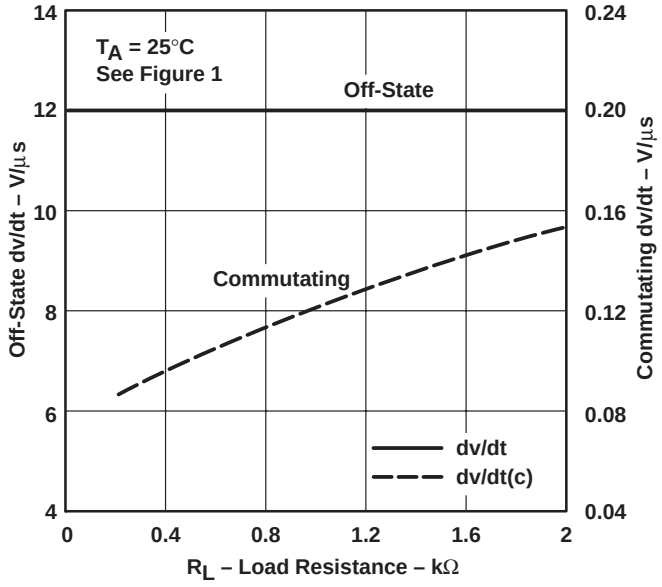


Figure 4

**CRITICAL RATE OF RISE OF OUTPUT VOLTAGE
OFF-STATE dv/dt AND COMMUTATING dv/dt(c)
vs
FREE-AIR TEMPERATURE**

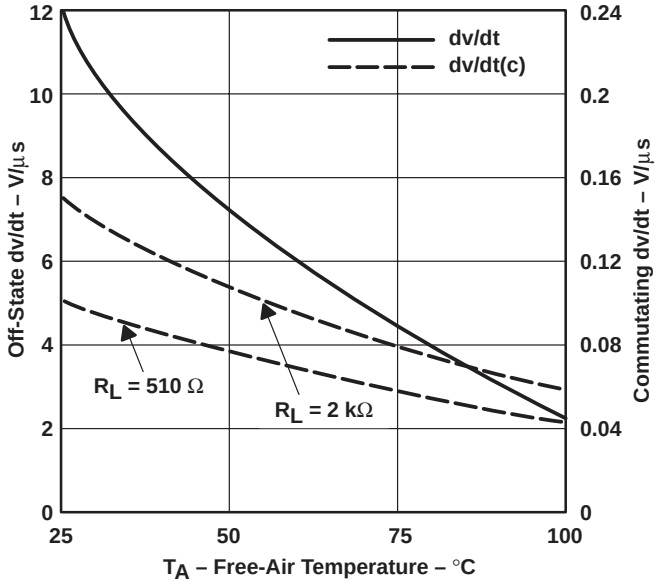


Figure 5

TYPICAL CHARACTERISTICS

**RMS APPLIED VOLTAGE
(FOR dv/dt(c) = 0.15 V/μs)
vs
FREQUENCY**

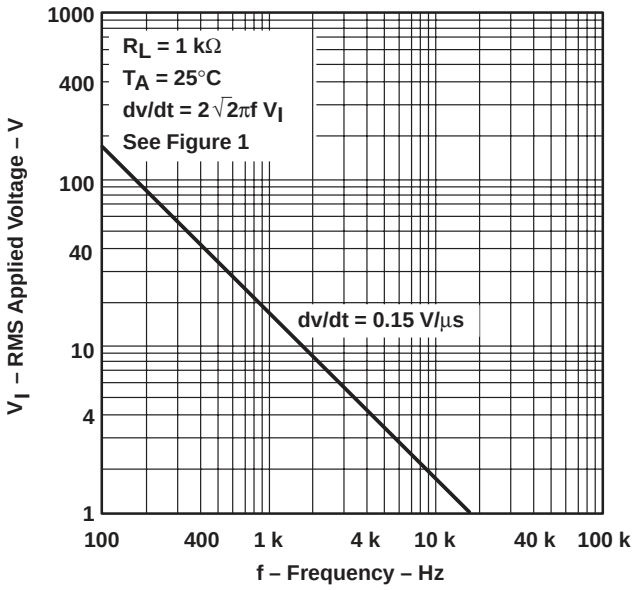


Figure 6

**NONREPETITIVE PEAK ON-STATE CURRENT
vs
PULSE DURATION**

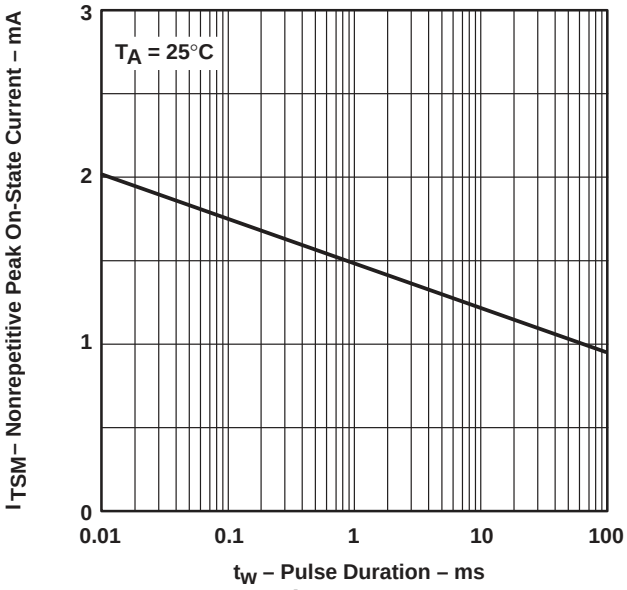


Figure 7

APPLICATIONS INFORMATION

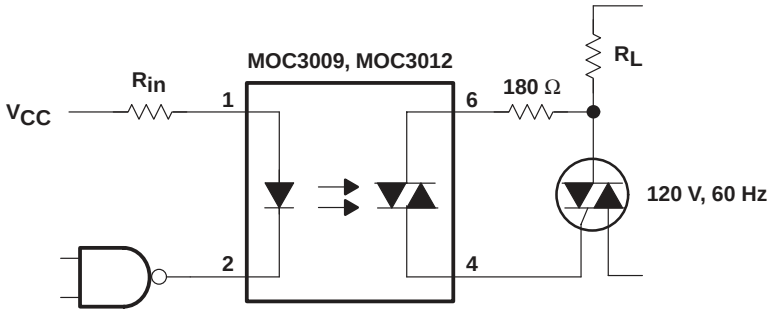
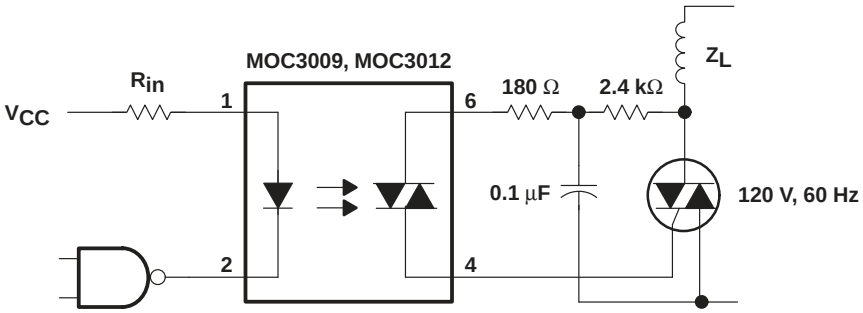
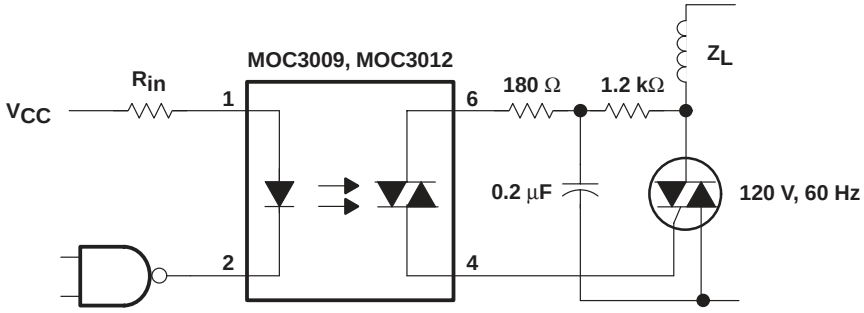


Figure 8. Resistive Load



$I_{GT} \leq 15$ mA

Figure 9. Inductive Load With Sensitive-Gate Triac

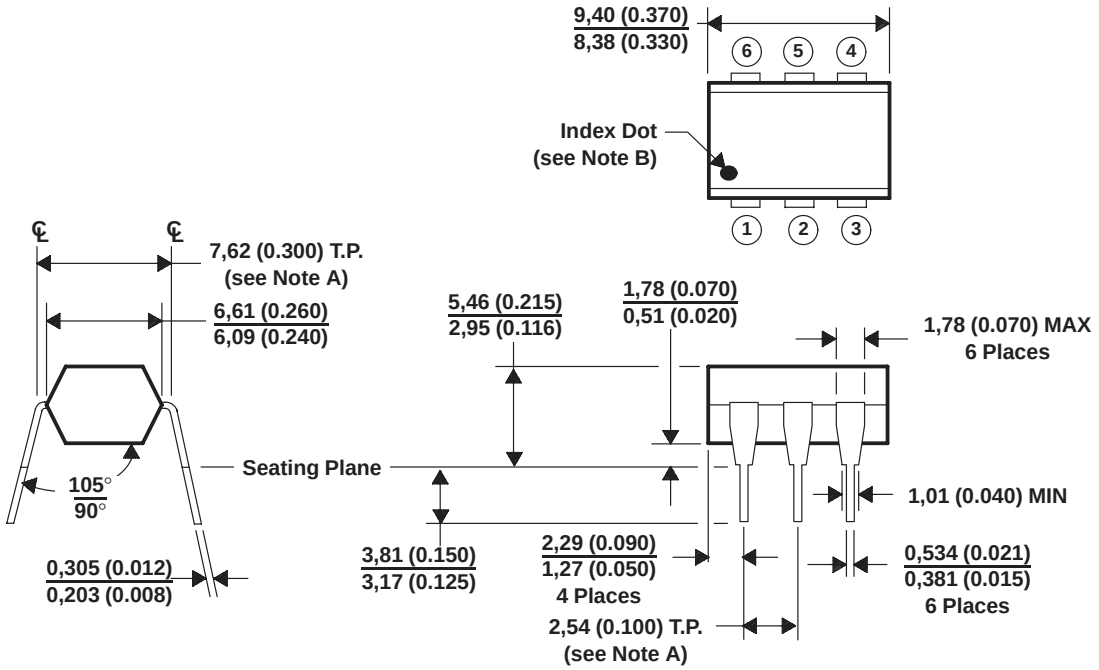


15 mA < I_{GT} < 50 mA

Figure 10. Inductive Load With Nonsensitive-Gate Triac

MECHANICAL INFORMATION

Each device consists of a gallium-arsenide infrared-emitting diode optically coupled to a silicon phototriac mounted on a 6-terminal lead frame encapsulated within an electrically nonconductive plastic compound. The case can withstand soldering temperature with no deformation and device performance characteristics remain stable when operated in high-humidity conditions.



NOTES: A. Leads are within 0,13 mm (0.005 inch) radius of true position (T.P.) with maximum material condition and unit installed.
B. Pin 1 identified by index dot.
C. The dimensions given fall within JEDEC MO-001 AM dimensions.
D. All linear dimensions are given in millimeters and parenthetically given in inches.

Figure 11. Packaging Specifications

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
MOC3009	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
MOC3010	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
MOC3011	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
MOC3012	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI

[1] The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

[2] Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

[3] MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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