

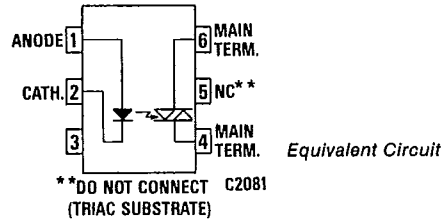
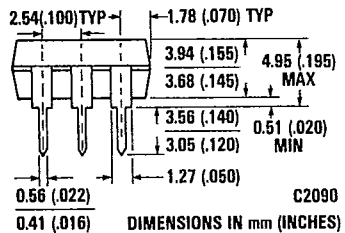
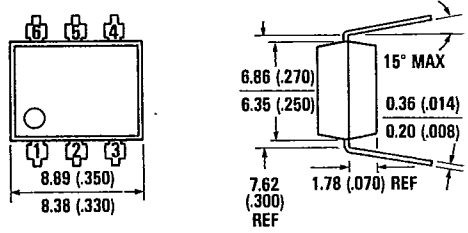
GENERAL INSTRUMENT

NON-ZERO-CROSSING TRIACS

Optocouplers

30 mA MCP3009* NON-ZERO-CROSSING 15 mA MCP3010 10 mA MCP3011

PACKAGE DIMENSIONS



DESCRIPTION

The MCP3009, MCP3010 and MCP3011 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. This series is designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 120 VAC operations.

FEATURES

- Low input current required (typically 5mA – MCP3011)
- Minimum commutating dv/dt is specified at 0.1V/μsec
- Pin for pin replacement for the MOC3009, 3010 and 3011 devices
- High isolation voltage – minimum 7500 VAC peak
- Underwriters Laboratory (UL) recognized – File E50151

APPLICATIONS

- Triac driver
- Industrial controls
- Traffic lights
- Vending machines
- Motor control
- Solid state relay

*Not Recommended For New Designs

ABSOLUTE MAXIMUM RATINGS

TOTAL PACKAGE	
Storage temperature	-55°C to 150°C
Operating temperature	-40°C to 100°C
Lead temperature	
(Soldering 10 sec)	260°C
Total package power dissipation @ 25°C	
(LED plus detector)	330 mW
Derate linearly from 25°C	4.0 mW/°C
Withstand test voltage	7500 VAC Peak (50-60 Hz)

INPUT DIODE	
Forward DC current	60 mA
Reverse voltage	3 V
Peak forward current	
(1 μs pulse, 300 pps)	3.0 A
Power dissipation 25°C ambient	100 mW
Derate linearly from 25°C	1.33 mW/°C
OUTPUT DRIVER	
Off-state output terminal voltage	250 volts
On-state RMS current	
T _A = 25°C	100 mA
(Full cycle, 50 to 60 Hz)	
T _A = 70°C	50 mA
Peak nonrepetitive surge current	1.2 A
(PW = 10 ms, DC = 10%)	
Total power dissipation @ T _A = 25°C	300 mW
Derate above 25°C	4.0 mW/°C

MCP3009 MCP3010 MCP3011

ELECTRO-OPTICAL CHARACTERISTICS (25°C Temperature Unless Otherwise Specified)

	TRANSFER CHARACTERISTICS							
	CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS	
DC	LED Trigger Current (Current Required to latch output)	MCP3009 MCP3010 MCP3011	I_{FT}	—	15.0 10.0 5.0	30 15 10	mA	Main terminal voltage = 3.0 V
	Holding Current		I_H	—	200	—	μ A	Either direction
dv/dt RATING	Critical Rate of Rise of Off-State Voltage		dv/dt	—	10.0	—	V/ μ s	Static dv/dt (see Figure 5)
	Critical Rate of Rise of Commutating Voltage		dv/dt	0.1	0.2	—	V/ μ S	Commutating dv/dt $I_{LOAD} = 15$ mA (see Figure 5)
ISOLATION	Isolation Voltage		V_{ISO}	5300			V_{ACRMS}	Relative humidity < 50%, $I_{I-O} < 10$ μ A, 5 seconds
			V_{ISO}	7500			V_{ACPEAK}	Relative humidity < 50%, $I_{I-O} < 10$ μ A, 5 seconds
	Isolation resistance		R_{ISO}	10^{11}			ohms	$V_{I-O} = 500$ VDC
	Isolation capacitance		C_{ISO}		0.5		pF	f = 1 MHz

	INDIVIDUAL COMPONENT CHARACTERISTICS						
	CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
INPUT DIODE	Forward voltage		V_F	1.3	1.50	V	$I_F = 30$ mA
	Forward voltage temp. coefficient			-1.8		mV/ $^{\circ}$ C	
	Reverse breakdown voltage		BV_R	3.0	25	V	$I_R = 10$ μ A
	Junction capacitance		C_J		50 65	pF	$V_F = 0$ V, f = 1 MHz $V_F = 1$ V, f = 1 MHz
	Reverse leakage current		I_R	.35	10	μ A	$V_R = 3.0$ V
OUTPUT DETECTOR	Peak Blocking Current, Either Direction		I_{DRM}	—	10 100	nA	$V_{DRM} = 250$ V, Note 1
	Peak On-State Voltage, Either Direction		V_{TM}	—	2.0 3.0	Volts	$I_{TM} = 100$ mA Peak
	Note 1. Test voltage must be applied within dv/dt rating.						

TYPICAL ELECTRICAL CHARACTERISTIC CURVES
 (25°C Free Air Temperature Unless Otherwise Specified)

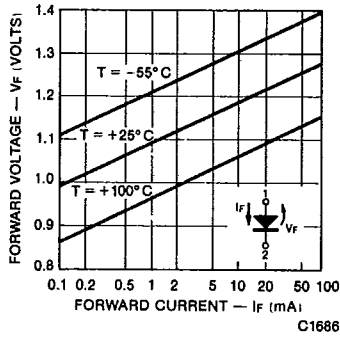


Fig. 1. Forward Voltage Drop vs. Forward Current

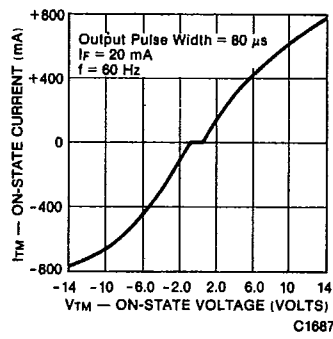


Fig. 2. On-State Characteristics

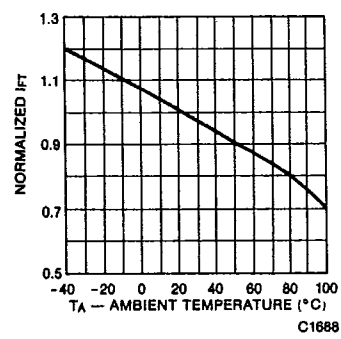


Fig. 3. Trigger Current vs. Temperature

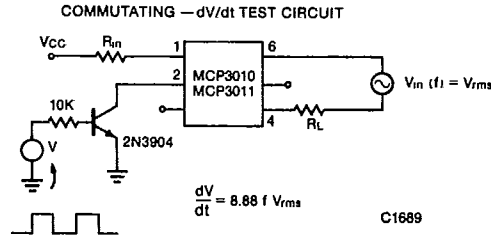
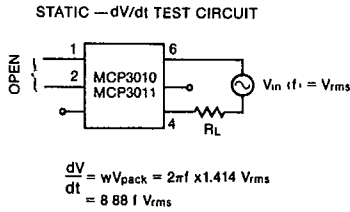


Fig. 4. dV/dt Test Circuits

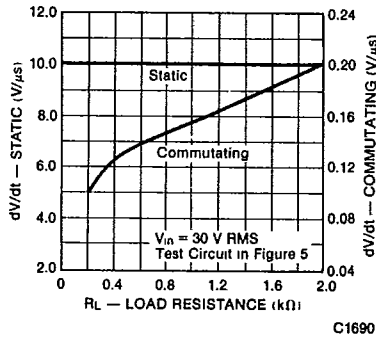


Fig. 5. dV/dt vs. Load Resistance

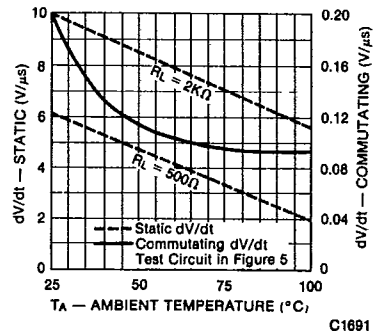


Fig. 6. dV/dt vs. Temperature

MCP3009 MCP3010 MCP3011

TYPICAL ELECTRICAL CHARACTERISTIC CURVES (25° C Temperature Unless Otherwise Specified)

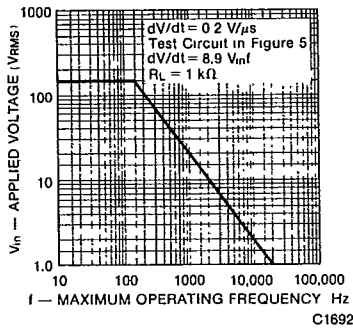


Fig. 7. Commutating dV/dt vs Frequency

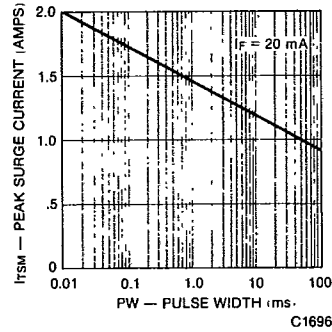


Fig. 8. Maximum Nonrepetitive Surge Current

TYPICAL APPLICATION CIRCUITS

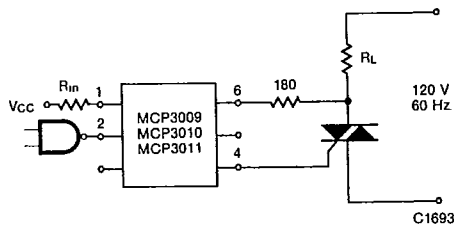


Fig. 9. Resistive Load

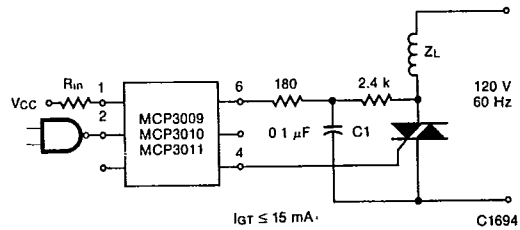


Fig. 10. Inductive Load With Sensitive Gate Triac

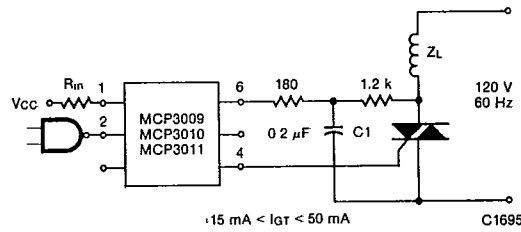


Fig. 11. Inductive Load With Non-Sensitive Gate Triac