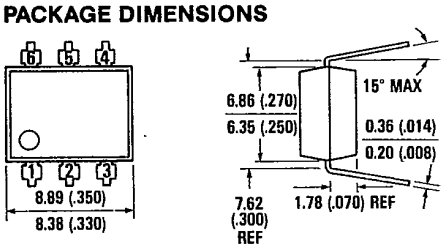
GENERAL INSTRUMENT

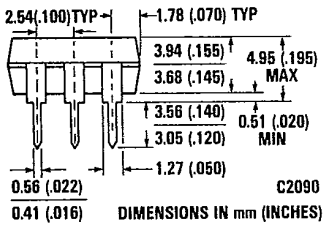
NON-ZERO-CROSSING TRIACS

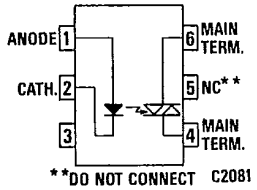
Optocouplers

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

PACKAGE DIMENSIONS







Equivalent Circuit

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	I_{FT}	–	15.0	30	mA	Main terminal voltage = 3.0 V
	MCP3010		–	10.0	15		
	MCP3011		–	5.0	10		
	Holding Current	I_H	–	200	–	μA	Either direction
dv/dt RATING	Critical Rate of Rise of Off-State Voltage	dv/dt	–	10.0	–	V/μs	Static dv/dt (see Figure 5)
	Critical Rate of Rise of Commutating Voltage	dv/dt	0.1	0.2	–	V/μS	Commutating dv/dt I_{LOAD} = 15 mA (see Figure 5)
ISOLATION	Isolation Voltage	V_{iso}	5300			V_{AC}RMS	Relative humidity < 50%, I_{I-O} < 10 μA, 5 seconds
		V_{iso}	7500			V_{AC}PEAK	Relative humidity < 50%, I_{I-O} < 10 μA, 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/°C	
	Reverse breakdown voltage	BV_R	3.0	25		V	I_R = 10 μA
	Junction capacitance	C_J		50		pF	V_F = 0 V, f = 1 MHz
				65		pF	V_F = 1 V, f = 1 MHz
	Reverse leakage current	I_R		.35	10	μA	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)

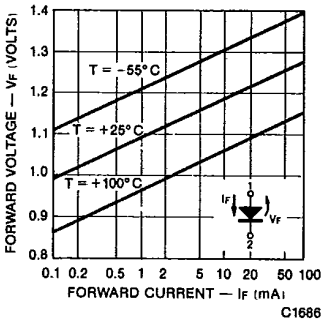


Fig. 1. Forward Voltage Drop vs. Forward Current

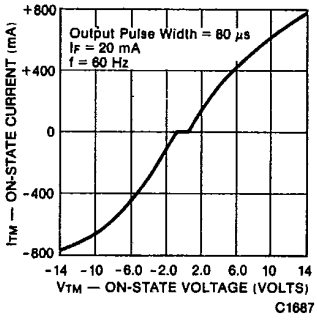


Fig. 2. On-State Characteristics

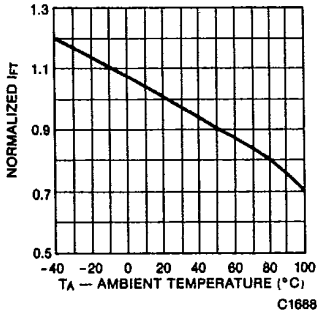


Fig. 3. Trigger Current vs. Temperature

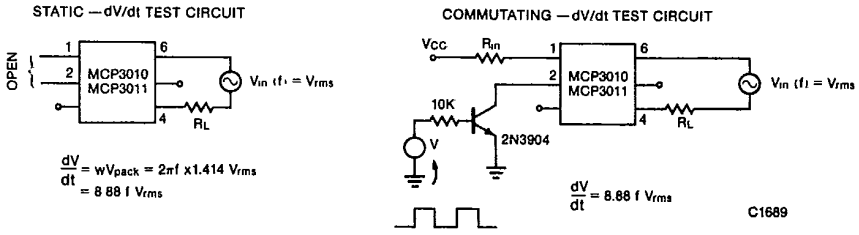


Fig. 4. dV/dt Test Circuits

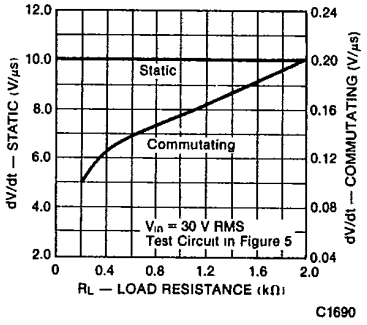


Fig. 5. dV/dt vs. Load Resistance

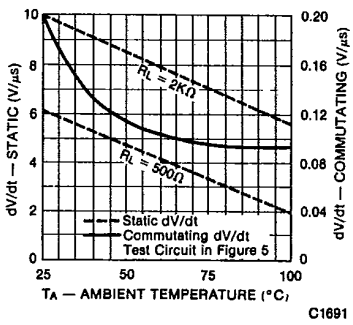


Fig. 6. dV/dt vs. Temperature

MCP3009 MCP3010 MCP3011

TYPICAL ELECTRICAL CHARACTERISTIC CURVES

(25° C Temperature Unless Otherwise Specified)

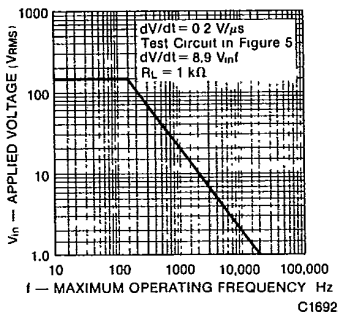


Fig. 7. Commutating dV/dt vs Frequency

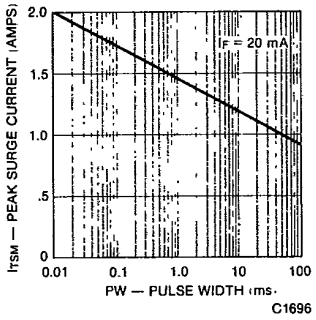


Fig. 8. Maximum Nonrepetitive Surge Current

TYPICAL APPLICATION CIRCUITS

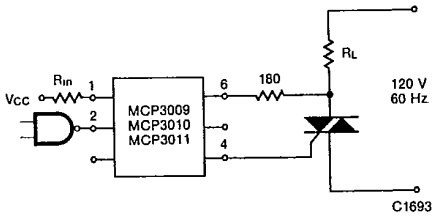


Fig. 9. Resistive Load

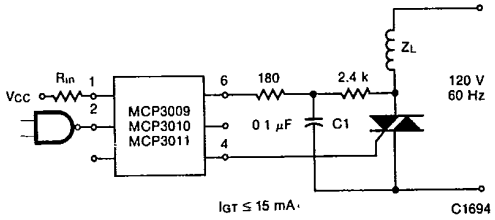


Fig. 10. Inductive Load With Sensitive Gate Triac

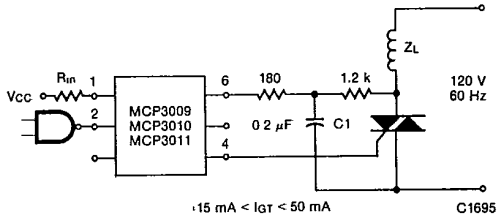


Fig. 11. Inductive Load With Non-Sensitive Gate Triac