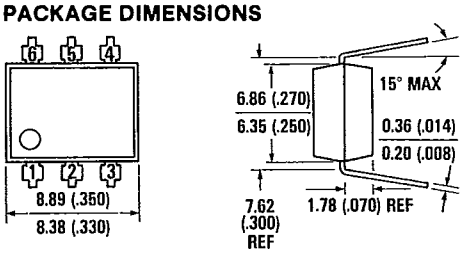
GENERAL INSTRUMENT

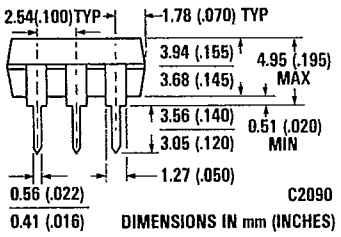
NON-ZERO-CROSSING TRIACS

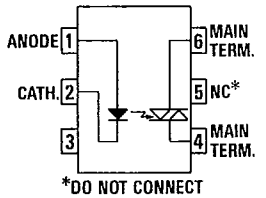
AlGaAs

NON-ZERO-CROSSING 5 mA MCP3012 MCP3023

PACKAGE DIMENSIONS







Equivalent Circuit

DESCRIPTION

The MCP3011A, MCP3012, MCP3022A and MCP3023 are optically isolated triac driver devices. These devices contain a very low degradation Aluminum Gallium Arsenide (AlGaAs) infrared emitting diode and a photosensitive 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 240 VAC operations.

FEATURES

- Low input current, I_{FT} = 5 mA MCP3012, MCP3023
- Minimum commutating dV/dt is specified at 0.1 V/μsec
- High isolation voltage—minimum 7500 VAC peak
- Underwriters Laboratory (UL) recognized—File E50151
- Excellent I_{FT} stability—IR emitting diode has very low degradation.

APPLICATIONS

- European applications for 240 VAC
- Triac driver
- Industrial control
- Traffic lights
- Motor control
- Solid state relay

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C Unless Otherwise Specified)

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
(LED plus detector) ..... 330 mW
Derate linearly from 25°C ..... 4.0 mW/°C
Surge isolation voltage ..... 7500 VAC Peak

INPUT DIODE

Forward DC current ..... 40 mA
Reverse voltage ..... 3 V
Peak forward current (1 μs pulse, 300 pps) ..... 3.0 A
Power dissipation ..... 100 mW
Derate linearly from 25°C ..... 1.33 mW/°C

OUTPUT DRIVER

Off-state output terminal voltage
MCP3012 ..... 250 V
MCP3023 ..... 400 V
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
(PW = 10 ms, DC = 10%) ..... 1.2 A
Total power dissipation ..... 300 mW
Derate above 25°C ..... 4.0 mW/°C

MCP3012 MCP3023

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

	TRANSFER CHARACTERISTICS						
	CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
DC	LED trigger current (current required to latch output) MCP3012, MCP3023	I_{FT}			5	mA	Main terminal voltage = 3 V
	Holding current	I_H		200		μA	Either direction
dv/dt RATING	Critical rate of rise of off-state voltage MCP3023	dV/dt		15		V/μs	Static dv/dt, T_A = 85°C (see Figure 6)
	MCP3012			10		V/μs	
	Critical rate of rise of commutating voltage	dV/dt	0.1	0.2		V/μs	Commutating dv/dt I_{LOAD} = 15 mA (see Figure 7)
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	1.5	V	I_F = 10 mA
	Forward voltage temperature coefficient			-1.8		mV/°C	
	Reverse voltage	V_R	3.0	25		V	I_R = 10 μA
	Junction capacitance	C_J		50		pF	V_F = 0 V, f = 1 MHz
OUTPUT DETECTOR	Peak blocking current, either direction MCP3012	I_{DRM}		10	100	nA	V_{DRM} = 250 V, Note 1
	MCP3023	I_{DRM}		10	100	nA	V_{DRM} = 400 V, Note 1
	Peak on-state voltage, either direction	V_{TM}		2.0	3.0	V	I_{TM} = 100 mA peak
	Note 1. Test voltage must be applied within dV/dt rating.						

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

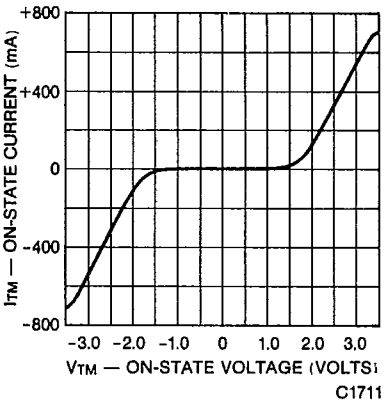


Fig. 1 On-State Characteristics

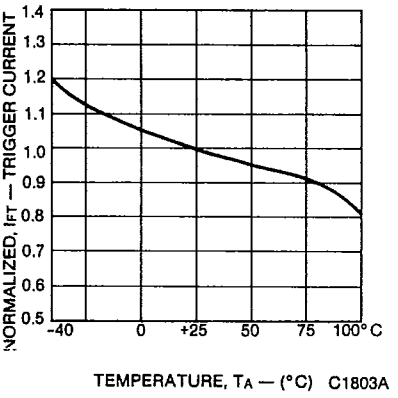


Fig. 2. Trigger Current vs. Temperature

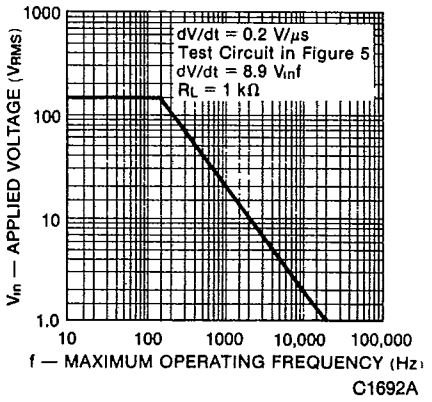


Fig. 3. Commutating dV/dt vs. Frequency

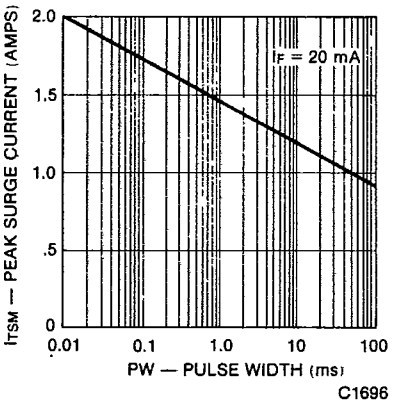


Fig. 4. Maximum Nonrepetitive Surge Current

TEST CIRCUITS FOR dV/dt MEASUREMENTS

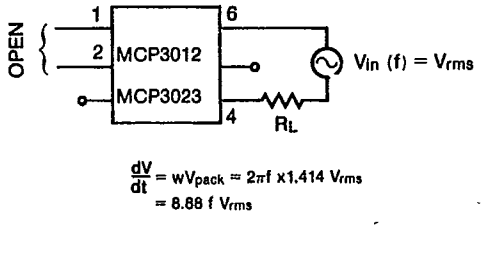


Fig. 5. Static dV/dt

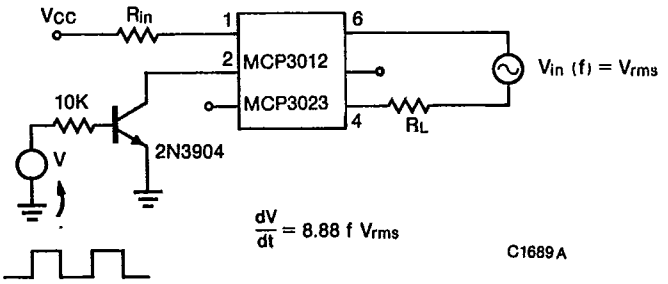


Fig. 6. Commutating dV/dt

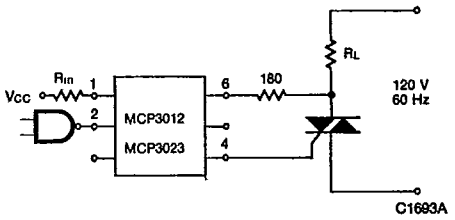


Fig. 7. Resistive Load

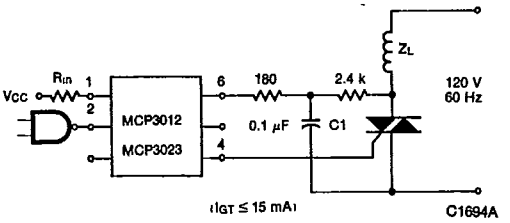


Fig. 8. Inductive Load With Sensitive Gate Triac

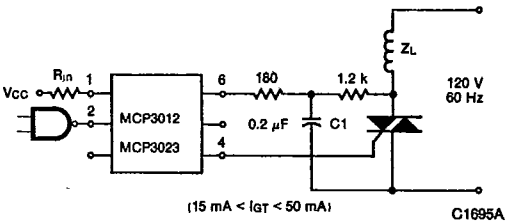


Fig. 9. Inductive Load With Non-Sensitive Gate Triac