

GENERAL INSTRUMENT

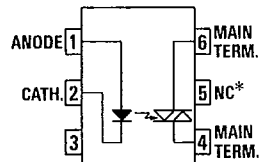
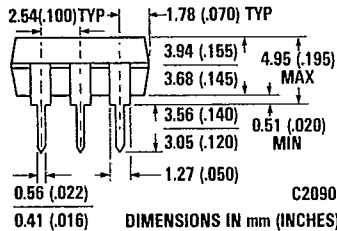
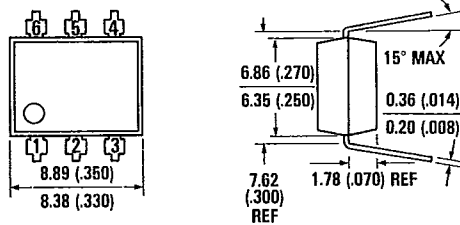
NON-ZERO-CROSSING TRIACS

Optocouplers

AlGaAs

NON-ZERO-CROSSING 5 mA MCP3012 MCP3023

PACKAGE DIMENSIONS



*DO NOT CONNECT (TRIAC SUBSTRATE) C2081
 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, $I_{FT} = 5 \text{ mA}$ MCP3012, MCP3023
- Minimum commutating dV/dt is specified at $0.1 \text{ V}/\mu\text{sec}$
- 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 ($T_A = 25^\circ\text{C}$ 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 $T_A = 25^\circ\text{C}$	100 mA
(Full cycle, 50 to 60 Hz) $T_A = 70^\circ\text{C}$	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	dV/dt		10		V/μs	
ISOLATION	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 Voltage	V _{ISO}	5300			V _{ACRMS}	Relative humidity ≤ 50%, I _{I-O} ≤ 10 μA, 5 seconds
		V _{ISO}	7500			V _{ACPEAK}	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 _{ORM} = 250 V, Note 1
	MCP3023	I _{DRM}		10	100	nA	V _{ORM} = 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.							

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

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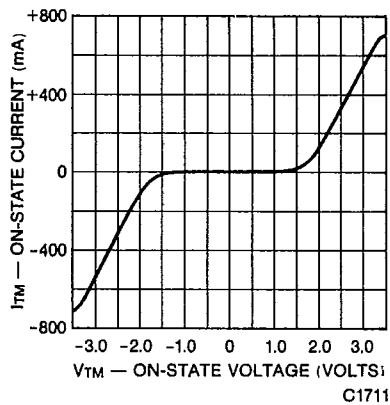


Fig. 1 On-State Characteristics

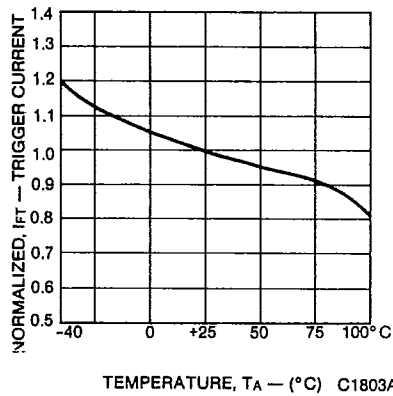


Fig. 2 Trigger Current vs. Temperature

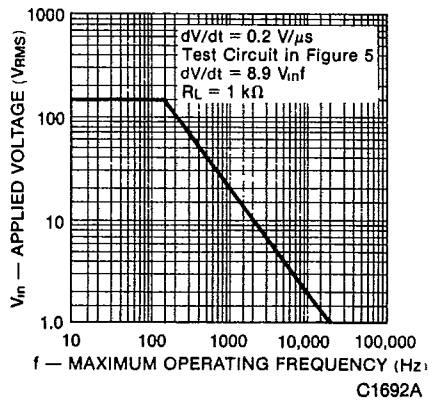


Fig. 3. Commutating dV/dt vs. Frequency

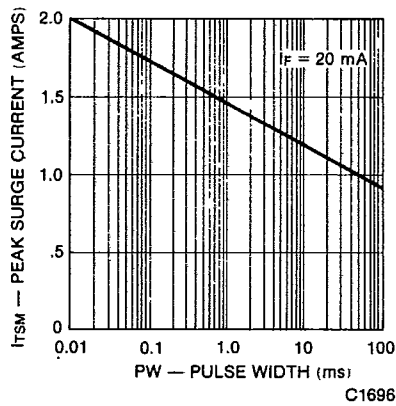


Fig. 4. Maximum Nonrepetitive Surge Current

MCP3012 MCP3023

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TEST CIRCUITS FOR dv/dt MEASUREMENTS

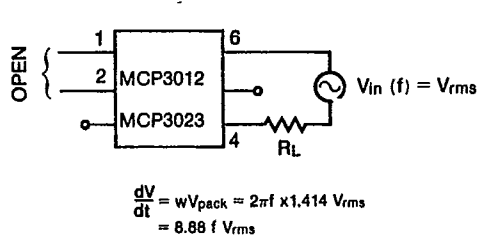


Fig. 5. Static dv/dt

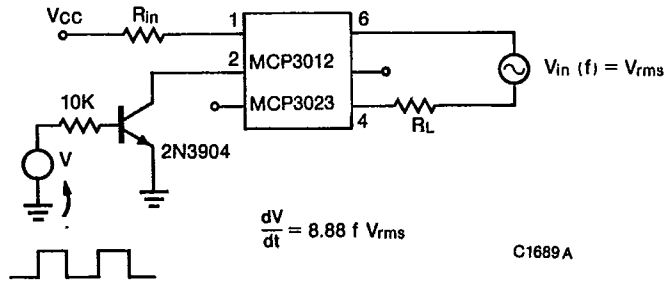


Fig. 6. Commutating dv/dt

C1689A

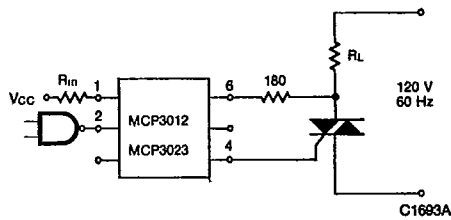


Fig. 7. Resistive Load

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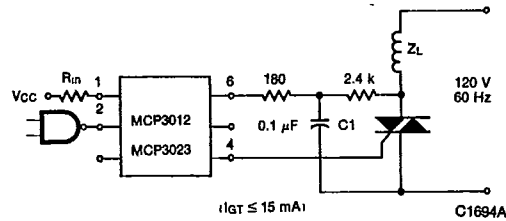


Fig. 8. Inductive Load With Sensitive Gate Triac

C1694A

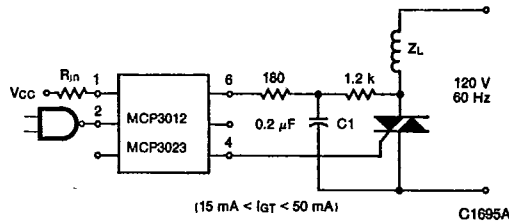


Fig. 9. Inductive Load With Non-Sensitive Gate Triac

C1695A