

**GENERAL
INSTRUMENT**

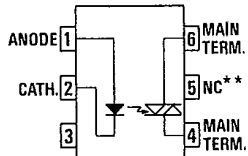
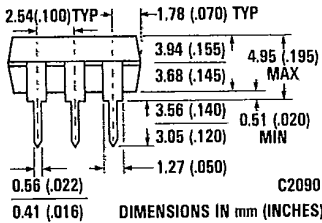
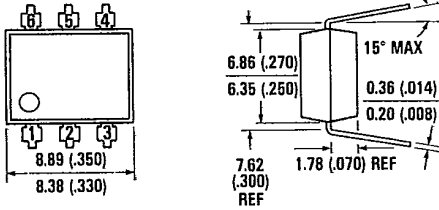
**VDE APPROVED
NON-ZERO-CROSSING TRIACS**

Optocouplers



30 mA MCP3020/OZ*
NON-ZERO-CROSSING 15 mA MCP3021/1Z
10 mA MCP3022/2Z

PACKAGE DIMENSIONS



*DO NOT CONNECT (TRIAC SUBSTRATE) C2081
Equivalent Circuit

DESCRIPTION

The MCP3020, MCP3021 and MCP3022 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 240 VAC operations.

FEATURES

- Minimum commutating dv/dt is specified at $0.1 V/\mu\text{sec}$
- Excellent I_{FT} stability—IR emitting diode has low degradation
- Pin for pin replacement for the MOC3020, MOC3021 and MOC3022
- High isolation voltage—minimum 7500 VAC peak
- Underwriters Laboratory (UL) recognized—File #E50151

APPLICATIONS

- European applications for 240 VAC
- 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
Surge Isolation voltage	.....	7500 VAC Peak

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	.....	400 Volts
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 @ $T_A = 25^\circ\text{C}$	300 mW
Derate above 25°C	4.0 mW/°C

MCP3020/OZ MCP3021/1Z MCP3022/2Z
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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)	MCP3020 MCP3021 MCP3022	I_{FT}	—	15 8 5	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	—	15	—	V/ μ s	Static dv/dt, $T_A = 85^\circ$C (see Figure 4)
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	pF	$V_F = 0$ V, f = 1 MHz	
	Reverse leakage current		I_R		.35	10	μ A	$V_F = 1$ V, f = 1 MHz $V_R = 3.0$ V
OUTPUT DETECTOR	Peak Blocking Current, Either Direction		I_{DRM}	—	10	100	nA	$V_{DRM} = 400$ 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)

Optocouplers

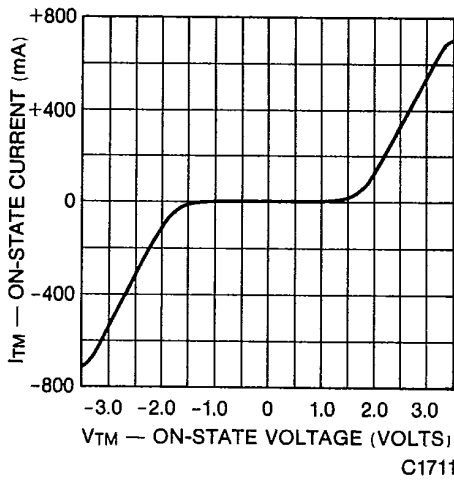


Fig. 1 On-State Characteristics

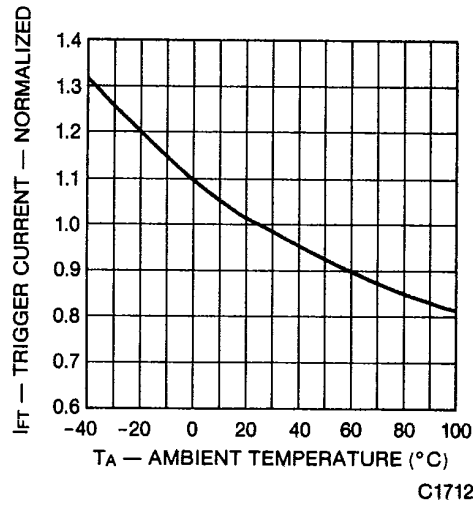
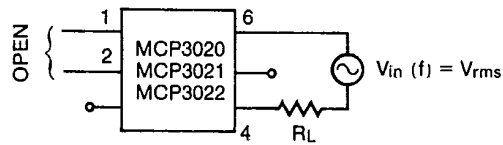


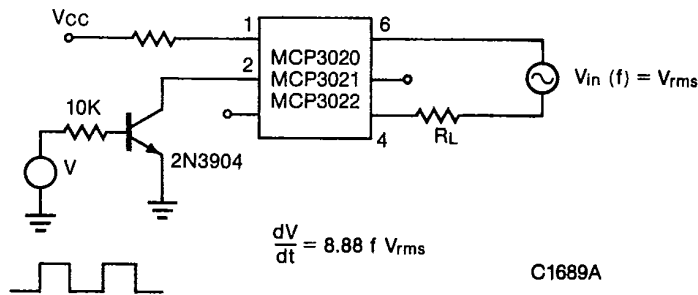
Fig. 2 Trigger Current vs. Temperature

TEST CIRCUITS FOR dV/dt MEASUREMENTS



$$\frac{dV}{dt} = \omega V_{\text{pack}} = 2\pi f \times 1.414 V_{\text{rms}} = 8.88 f V_{\text{rms}}$$

Fig. 3. Static dV/dt



$$\frac{dV}{dt} = 8.88 f V_{\text{rms}}$$

Fig. 4. Commutating dV/dt