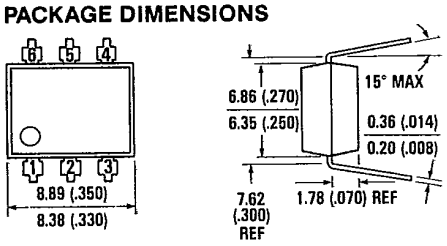
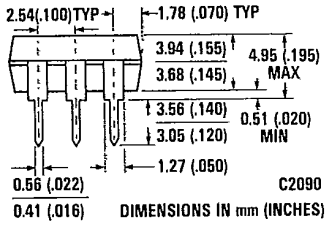
GENERAL INSTRUMENT

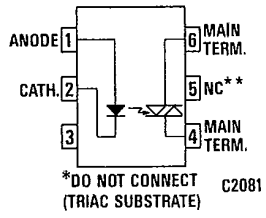
VDE APPROVED NON-ZERO-CROSSING TRIACS

NON-ZERO-CROSING 30 mA MCP3020/0Z*
15 mA MCP3021/1Z
10 mA MCP3022/2Z

PACKAGE DIMENSIONS







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/μsec
- 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 Laboaratory (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°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 @ T_A = 25°C	300 mW
Derate above 25°C	4.0 mW/°C

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	I_{FT}	–	15	30	mA	Main terminal voltage = 3.0 V
	MCP3021		–	8	15		
	MCP3022		–	5	10		
	Holding Current	I_H	–	200	–	μA	Either direction
dv/dt RATING	Critical Rate of Rise of Off-State Voltage	dv/dt	–	15	–	V/μs	Static dv/dt, T_A = 85°C (see Figure 4)
	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} = 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)

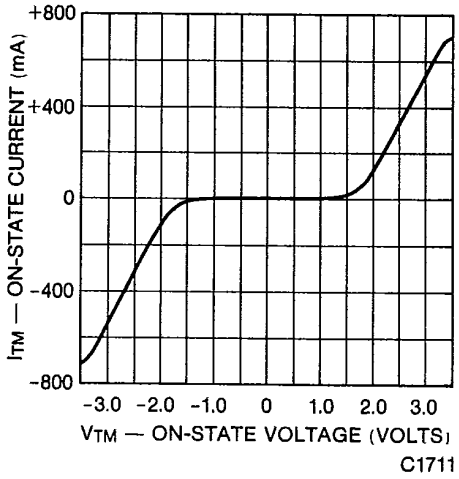


Fig. 1 On-State Characteristics

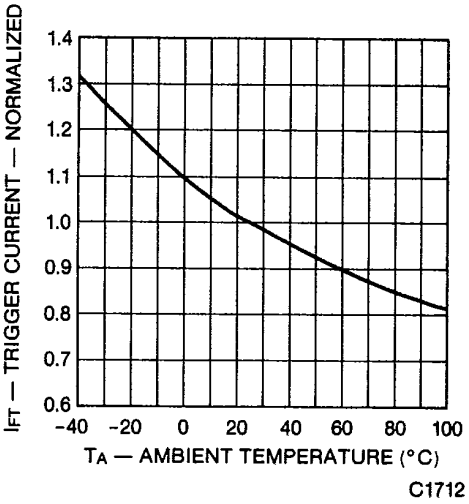
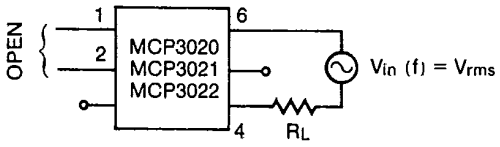


Fig. 2 Trigger Current vs. Temperature

TEST CIRCUITS FOR dV/dt MEASUREMENTS



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

Fig. 3. Static dV/dt

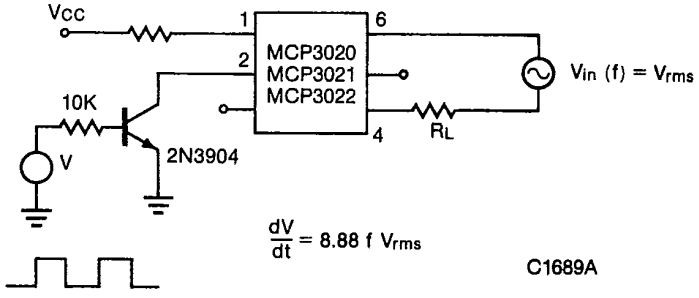


Fig. 4. Commutating dV/dt