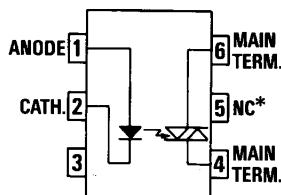
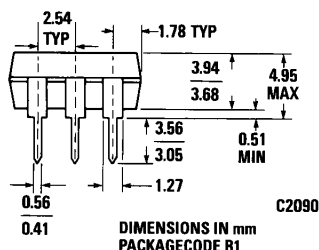
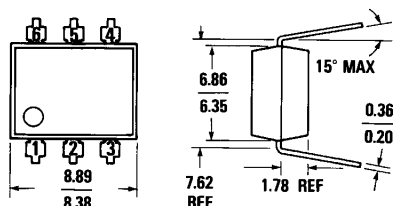


**MCP3020 MCP3021  
MCP3022**

**PACKAGE DIMENSIONS**



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 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/ $\mu$ sec
- Excellent  $I_T$  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

**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 $\mu$ s 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 (Full cycle, 50 to 60 Hz)	$T_A=25^\circ\text{C}$ 100 mA $T_A=70^\circ\text{C}$ 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

**ELECTRO-OPTICAL CHARACTERISTICS** (25°C Temperature Unless Otherwise Specified)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
<b>INPUT DIODE</b>						
Forward voltage	$V_F$		1.3	1.50	V	$I_F=30$ mA
Forward voltage temperature coefficient	$\frac{\Delta V_F}{\Delta T_A}$		-1.8		mV/°C	
Reverse breakdown voltage	$BV_R$	3.0	25		V	$I_R=10$ $\mu$ A
Junction capacitance	$C_J$		50 65		pF pF	$V_F=0$ V, $f=1$ MHz $V_F=1$ V, $f=1$ MHz
Reverse leakage current	$I_R$		.35	10	$\mu$ A	$V_R=3.0$ V
<b>OUTPUT DETECTOR</b>						
Peak blocking current, either direction	$I_{ORM}$	—	10	100	nA	$V_{ORM}=400$ 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.

**TRANSFER CHARACTERISTICS**

DC CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
LED trigger current (current required to latch output)	MCP3020 $I_{FT}$	—	15	30	mA	Main terminal voltage=3.0 V
	MCP3021 $I_{FT}$	—	8	15	mA	
	MCP3022 $I_{FT}$	—	5	10	mA	
Holding current	$I_H$	—	200	—	$\mu$ A	Either direction

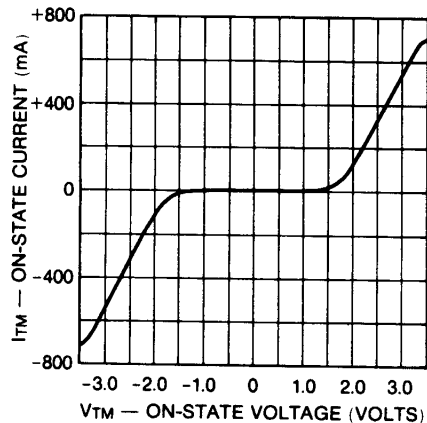
**TRANSFER CHARACTERISTICS**

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
<b>dv/dt RATING</b>						
Critical rate of rise of off-state voltage	dv/dt	—	15	—	V/ $\mu$ s	Static dv/dt, $T_A=85^\circ$ C (see Fig. 3)
Critical rate of rise of commutating voltage	dv/dt	0.1	0.2	—	V/ $\mu$ s	Commutating dv/dt $I_{LOAD}=15$ mA (see Fig. 4)

**ISOLATION CHARACTERISTICS**

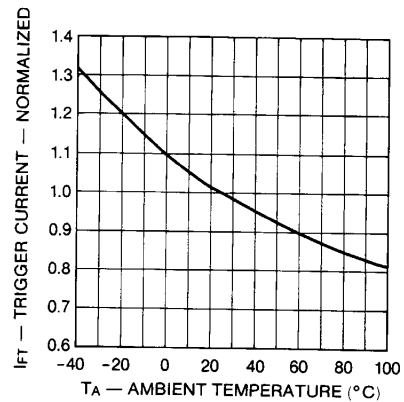
CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Isolation voltage	$V_{ISO}$	5300			$V_{AC,RMS}$	$I_{IO} \leq 1$ $\mu$ A, 1 minute
	$V_{ISO}$	7500			$V_{AC,PEAK}$	$I_{IO} \leq 1$ $\mu$ A, 1 minute
Isolation resistance	$R_{ISO}$	$10^{11}$			ohms	$V_{IO}=500$ VDC
Isolation capacitance	$C_{ISO}$		0.5		pF	$f=1$ MHz

**TYPICAL ELECTRICAL CHARACTERISTIC CURVES**  
(25°C Free Air Temperature Unless Otherwise Specified)



C1711

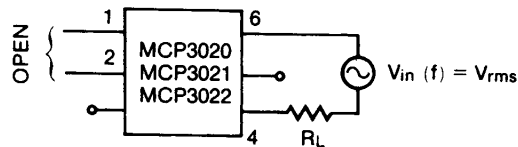
Fig. 1. On-State Characteristics



C1712

Fig. 2. Trigger Current vs. Temperature

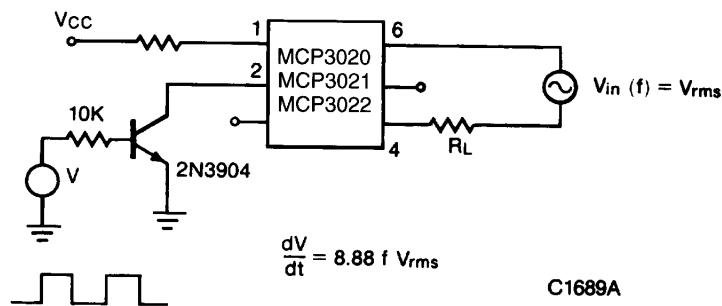
**TEST CIRCUITS FOR dV/dt MEASUREMENTS**



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

$$= 8.88 f V_{rms}$$

Fig. 3. Static  $dV/dt$



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

C1689A

Fig. 4. Commutating  $dV/dt$

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