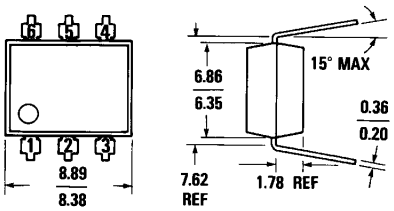
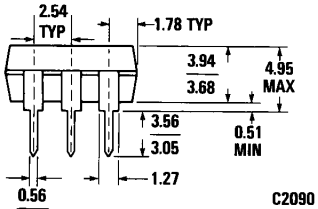
FAIRCHILD
SEMICONDUCTOR™

NON-ZERO-CROSSING TRIACS

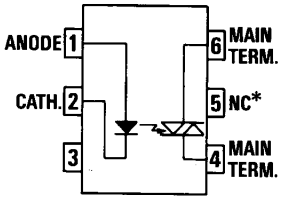
MCP3020 MCP3021 MCP3022

PACKAGE DIMENSIONS





DIMENSIONS IN mm
PACKAGECODE R1



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/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 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 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)

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 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 μA
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	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.

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	—	μA	Either direction

TRANSFER CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
dv/dt RATING						
Critical rate of rise of off-state voltage	dv/dt	—	15	—	V/μs	Static dv/dt, T_A=85°C (see Fig. 3)
Critical rate of rise of commutating voltage	dv/dt	0.1	0.2	—	V/μs	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	$I_{I-O} \leq 1$ μA, 1 minute
	V_{iso}	7500			V_{AC}PEAK	$I_{I-O} \leq 1$ μA, 1 minute
Isolation resistance	R_{iso}	10^{11}			ohms	V_{I-O}=500 VDC
Isolation capacitance	C_{iso}		0.5		pF	f=1 MHz

TYPICAL ELECTRICAL CHARACTERISTIC CURVES

(25°C Free Air Temperature Unless Otherwise Specified)

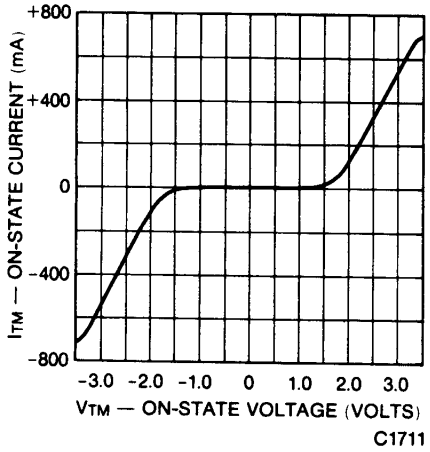


Fig. 1. On-State Characteristics

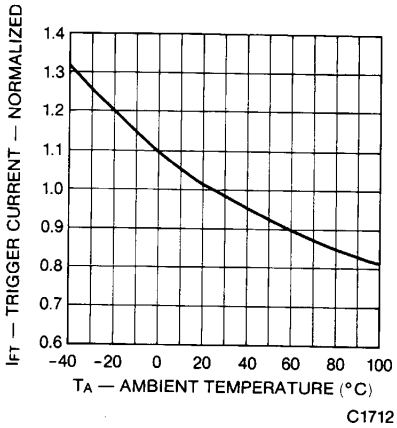
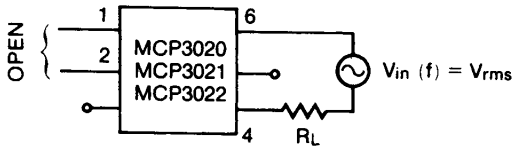


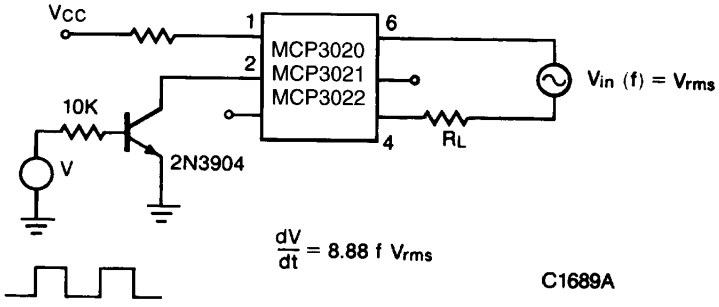
Fig. 2. Trigger Current vs. Temperature

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



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

C1689A

Fig. 4. Commutating dV/dt

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.