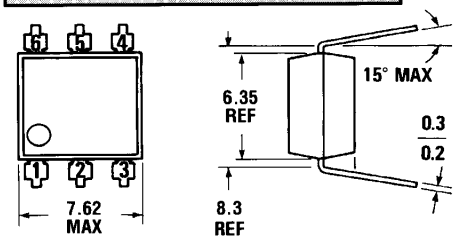
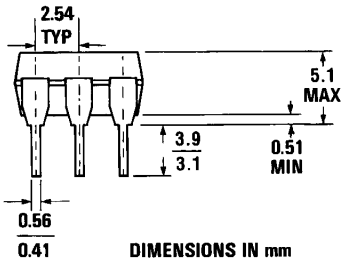
FAIRCHILD
SEMICONDUCTOR™

# NON-ZERO-CROSSING TRIACS

# MOC3020 MOC3021 MOC3022 MOC3023

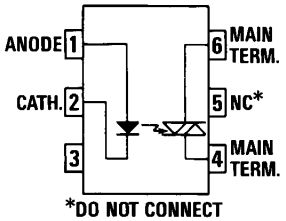
## PACKAGE DIMENSIONS




DIMENSIONS IN mm
PACKAGE CODE E

ST1603




*DO NOT CONNECT
(TRIAC SUBSTRATE)

C2081

*Equivalent Circuit*

## DESCRIPTION

The MOC3020, MOC3021, MOC3022 and MOC3023 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

- Excellent $I_{FT}$ stability—IR emitting diode has low degradation
- High isolation voltage—minimum 7500 VAC peak
- Underwriters Laboratory (UL) recognized—File #E90700

## 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 |

**INPUT DIODE**

| | |
|---|---|
| Forward DC current | 50 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 (above 25°C ambient) | 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 (25°C ambient) | | 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 | $V_F$ | | 1.2 | 1.50 | V | $I_F$=10 mA |
| Junction capacitance | $C_J$ | | 50 | | pF | $V_F$=0 V, f=1 MHz |
| Reverse leakage current | $I_R$ | | | 100 | 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 | $V_{TM}$ | — | 2.5 | 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) | MOC3020 | $I_{FT}$ | — | — | 30 | mA | Main terminal voltage=3.0 V, $R_L$=150Ω |
| | MOC3021 | $I_{FT}$ | — | — | 15 | mA | |
| | MOC3022 | $I_{FT}$ | — | — | 10 | mA | |
| | MOC3023 | $I_{FT}$ | — | — | 5 | mA | |
| Holding current | | $I_H$ | — | 100 | — | 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 | — | 12 | — | V/μs | Static dv/dt, $T_A$=85°C (see Fig. 3) |
| Critical rate of rise of commutating voltage | dv/dt | — | 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 | $I_{I-O}$ ≤1 μA, 1 Minute |
| | $V_{iso}$ | 7500 | | | $V_{AC}$PEAK | $I_{I-O}$ ≤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 |

Note 1: Ratings apply to either polarity of pin 6 — referenced to pin 4. Voltages must be applied within dv/dt rating.

## TYPICAL ELECTRICAL CHARACTERISTIC CURVES

(25°C Free Air Temperature Unless Otherwise Specified)

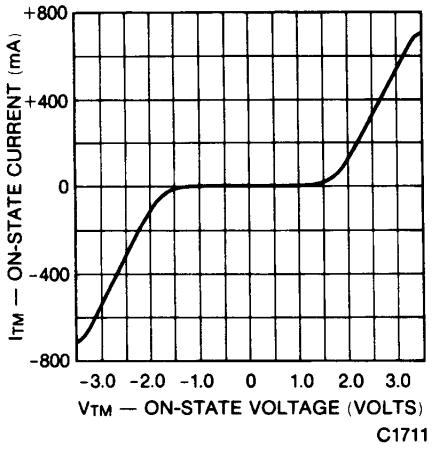



*Fig. 1. On-State Characteristics*

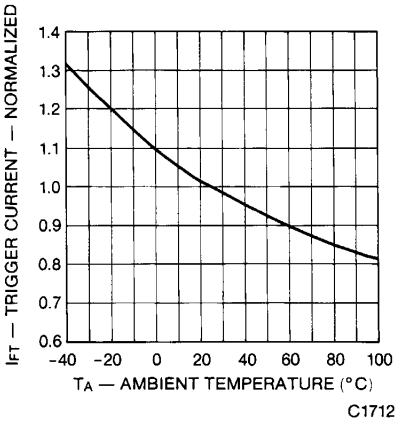
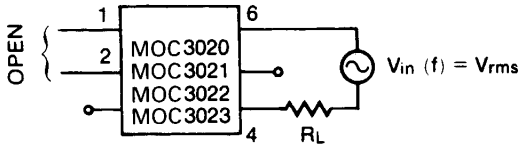



*Fig. 2. Trigger Current vs. Temperature*

## 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*

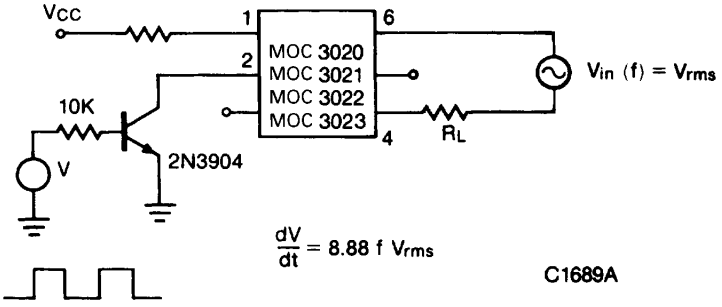



*Fig. 4. Commutating dV/dt*

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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.