DESCRIPTION
The MOC303XM and MOC304XM devices consist of an AlGaAs infrared emitting diode optically coupled to a monolithic silicon detector performing the function of a zero voltage crossing bilateral triac driver.
They are designed for use with a triac in the interface of logic systems to equipment powered from 115 VAC lines, such as teletypewriters, CRTs, solid-state relays, industrial controls, printers, motors, solenoids and consumer appliances, etc.

FEATURES
• Simplifies logic control of 115 VAC power
• Zero voltage crossing
• dv/dt of 2000 V/μs typical, 1000 V/μs guaranteed
• VDE recognized (File # 94766)
  -ordering option V (e.g., MOC3043VM)

APPLICATIONS
• Solenoid/valve controls
• Static power switches
• Temperature controls
• AC motor starters
• Lighting controls
• AC motor drives
• E.M. contactors
• AC motor starters
• Solid state relays

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbol</th>
<th>Device</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL DEVICE</td>
<td></td>
<td>All</td>
<td>-40 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>T_STG</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>T_OPR</td>
<td>All</td>
<td>-40 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Lead Solder Temperature</td>
<td>T_SOL</td>
<td>All</td>
<td>260 for 10 sec</td>
<td>°C</td>
</tr>
<tr>
<td>Junction Temperature Range</td>
<td>T_J</td>
<td>All</td>
<td>-40 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Isolation Surge Voltage (1) (peak AC voltage, 60Hz, 1 sec duration)</td>
<td>V_ISO</td>
<td>All</td>
<td>7500</td>
<td>Vac(pk)</td>
</tr>
<tr>
<td>Total Device Power Dissipation @ 25°C</td>
<td>P_D</td>
<td>All</td>
<td>250</td>
<td>mW</td>
</tr>
<tr>
<td>Derate above 25°C</td>
<td></td>
<td>All</td>
<td>2.94</td>
<td>mW/°C</td>
</tr>
<tr>
<td>EMMITTER</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Continuous Forward Current</td>
<td>I_F</td>
<td>All</td>
<td>60</td>
<td>mA</td>
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<tr>
<td>Reverse Voltage</td>
<td>V_R</td>
<td>All</td>
<td>6</td>
<td>V</td>
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<tr>
<td>Total Power Dissipation 25°C Ambient Derate above 25°C</td>
<td>P_D</td>
<td>All</td>
<td>120</td>
<td>mW</td>
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<tr>
<td>DETECTOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-State Output Terminal Voltage</td>
<td>V_DRM</td>
<td>MOC3031M/2M/3M</td>
<td>250</td>
<td>V</td>
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<tr>
<td></td>
<td></td>
<td>MOC3041M/2M/3M</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Peak Repetitive Surge Current (PW = 100 μs, 120 pps)</td>
<td>I_TSM</td>
<td>All</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>Total Power Dissipation 25°C Ambient Derate above 25°C</td>
<td>P_D</td>
<td>All</td>
<td>150</td>
<td>mW</td>
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</table>

Note
1. Isolation surge voltage, V_ISO, is an internal device dielectric breakdown rating. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
<table>
<thead>
<tr>
<th><strong>INDIVIDUAL COMPONENT CHARACTERISTICS</strong> (T&lt;sub&gt;A&lt;/sub&gt; = 25°C Unless otherwise specified)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameters</strong></td>
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<tr>
<td><strong>EMITTER</strong></td>
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<tr>
<td>Input Forward Voltage</td>
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<tr>
<td>Reverse Leakage Current</td>
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<tr>
<td><strong>DETECTOR</strong></td>
</tr>
<tr>
<td>Peak Blocking Current, Either Direction</td>
</tr>
<tr>
<td>Peak On-State Voltage, Either Direction</td>
</tr>
<tr>
<td>Critical Rate of Rise of Off-State Voltage</td>
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</tbody>
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<table>
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<tr>
<th><strong>TRANSFER CHARACTERISTICS</strong> (T&lt;sub&gt;A&lt;/sub&gt; = 25°C Unless otherwise specified.)</th>
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<tbody>
<tr>
<td><strong>DC Characteristics</strong></td>
</tr>
<tr>
<td>LED Trigger Current</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Holding Current, Either Direction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ZERO CROSSING CHARACTERISTICS</strong> (T&lt;sub&gt;A&lt;/sub&gt; = 25°C Unless otherwise specified.)</th>
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</thead>
<tbody>
<tr>
<td><strong>Characteristics</strong></td>
</tr>
<tr>
<td>Inhibit Voltage</td>
</tr>
<tr>
<td>Leakage in Inhibited State</td>
</tr>
</tbody>
</table>

**Note**
1. Test voltage must be applied within dv/dt rating.
2. All devices are guaranteed to trigger at an I<sub>F</sub> value less than or equal to max I<sub>FT</sub>. Therefore, recommended operating I<sub>F</sub> lies between max I<sub>FT</sub> (15 mA for MOC3031M & MOC3041M, 10 mA for MOC3032M & MOC3042M, 5 mA for MOC3033M & MOC3043M) and absolute max I<sub>F</sub> (60 mA).
3. This is static dv/dt. See Figure 9 for test circuit. Commutating dv/dt is a function of the load-driving thyristor(s) only.
Figure 1. LED Forward Voltage vs. Forward Current

Figure 2. On-State Characteristics

Figure 3. Trigger Current vs. Temperature

Figure 4. Leakage Current, $I_{DRM}$ vs. Temperature
Figure 5. $I_{DRM2}$ - Leakage in Inhibit State vs. Temperature

Figure 6. LED Current Required to Trigger vs. LED Pulse Width

Figure 7. Holding Current, $I_H$ vs. Temperature

Figure 8. Inhibit Voltage vs. Temperature

$IF = RATED I_{FT}$

NORMALIZED TO $PW_{IN} >> 100 \mu s$

NORMALIZED TO $T_A = 25^\circ C$

6-PIN DIP ZERO-CROSS
OPTOISOLATORS TRIAC DRIVER OUTPUT
(250/400 VOLT PEAK)

MOC3031M  MOC3032M  MOC3033M  MOC3041M  MOC3042M  MOC3043M
1. The mercury wetted relay provides a high speed repeated pulse to the D.U.T.
2. 100x scope probes are used, to allow high speeds and voltages.
3. The worst-case condition for static dv/dt is established by triggering the D.U.T. with a normal LED input current, then removing the current. The variable R_{TEST} allows the dv/dt to be gradually increased until the D.U.T. continues to trigger in response to the applied voltage pulse, even after the LED current has been removed. The dv/dt is then decreased until the D.U.T. stops triggering. $\tau_{RC}$ is measured at this point and recorded.

Typical circuit (Fig 12, 13) for use when hot line switching is required. In this circuit the “hot” side of the line is switched and the load connected to the cold or neutral side. The load may be connected to either the neutral or hot line.

$R_{in}$ is calculated so that $I_\text{F}$ is equal to the rated $I_{FT}$ of the part, 5 mA for the MOC3033M and MOC3043M, 10 mA for the MOC3032M and MOC3042M, or 15 mA for the MOC3031M and MOC3041M. The 39 ohm resistor and 0.01 $\mu$F capacitor are for snubbing of the triac and may or may not be necessary depending upon the particular triac and load used.
<table>
<thead>
<tr>
<th>MOC3031M</th>
<th>MOC3032M</th>
<th>MOC3033M</th>
<th>MOC3041M</th>
<th>MOC3042M</th>
<th>MOC3043M</th>
</tr>
</thead>
</table>

**Figure 14. Inverse-Parallel SCR Driver Circuit**  
(MOC3031M, MOC3032M, MOC3033M)

![Diagram](image1)

Suggested method of firing two, back-to-back SCR's with a Fairchild triac driver. Diodes can be 1N4001; resistors, R1 and R2, are optional 1 k ohm.

**Figure 15. Inverse-Parallel SCR Driver Circuit**  
(MOC3041M, MOC3042M, MOC3043M)

![Diagram](image2)

Suggested method of firing two, back-to-back SCR's with a Fairchild triac driver. Diodes can be 1N4001; resistors, R1 and R2, are optional 330 ohm.

Note: This optoisolator should not be used to drive a load directly. It is intended to be a trigger device only.
NOTE
All dimensions are in inches (millimeters)
ORDERING INFORMATION

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<tr>
<th>Option</th>
<th>Order Entry Identifier</th>
<th>Description</th>
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<tr>
<td>S</td>
<td>S</td>
<td>Surface Mount Lead Bend</td>
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<tr>
<td>SR2</td>
<td>SR2</td>
<td>Surface Mount; Tape and reel</td>
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<tr>
<td>T</td>
<td>T</td>
<td>0.4” Lead Spacing</td>
</tr>
<tr>
<td>V</td>
<td>V</td>
<td>VDE 0884</td>
</tr>
<tr>
<td>TV</td>
<td>TV</td>
<td>VDE 0884, 0.4” Lead Spacing</td>
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<tr>
<td>SV</td>
<td>SV</td>
<td>VDE 0884, Surface Mount</td>
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<tr>
<td>SR2V</td>
<td>SR2V</td>
<td>VDE 0884, Surface Mount, Tape &amp; Reel</td>
</tr>
</tbody>
</table>

**Carrier Tape Specifications (“D” Taping Orientation)**

NOTE
All dimensions are in inches (millimeters)
MARKING INFORMATION

Definitions

1. Fairchild logo
2. Device number
3. VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4. One digit year code, e.g., ‘3’
5. Two digit work week ranging from ‘01’ to ‘53’
6. Assembly package code

*Note – Parts that do not have the ‘V’ option (see definition 3 above) that are marked with date code ‘325’ or earlier are marked in portrait format.

Reflow Profile (White Package, -M Suffix)

- Peak reflow temperature: 245°C (package surface temperature)
- Time of temperature higher than 183°C for 120–180 seconds
- One time soldering reflow is recommended
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- FACT Quiet Series™
- Across the board. Around the world.™
- The Power Franchise®
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- ISOPLANAR™
- LittleFET™
- MICROCOUPLER™
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- GlobalOptoisolator™
- MICROWIRE™
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- QFET®
- QT Optoelectronics™
- Quiet Series™
- RapidConfigure™
- RapidConnect™
- µSerDes™
- SILENT SWITCHER®
- SMART START™
- SPM™
- Stealth™
- SuperFET™
- SuperSOT™-3
- SuperSOT™-6
- SuperSOT™-8
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2. A critical component is 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.

PRODUCT STATUS DEFINITIONS

Definition of Terms

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<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Advance Information</td>
<td>Formative or In Design</td>
<td>This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
</tr>
<tr>
<td>Preliminary</td>
<td>First Production</td>
<td>This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.</td>
</tr>
<tr>
<td>No Identification Needed</td>
<td>Full Production</td>
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</tr>
<tr>
<td>Obsolete</td>
<td>Not In Production</td>
<td>This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.</td>
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