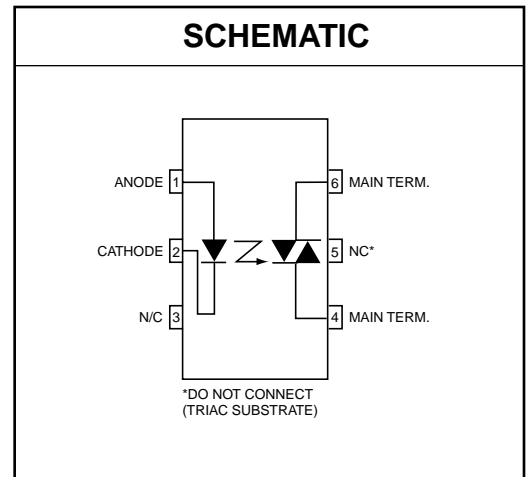
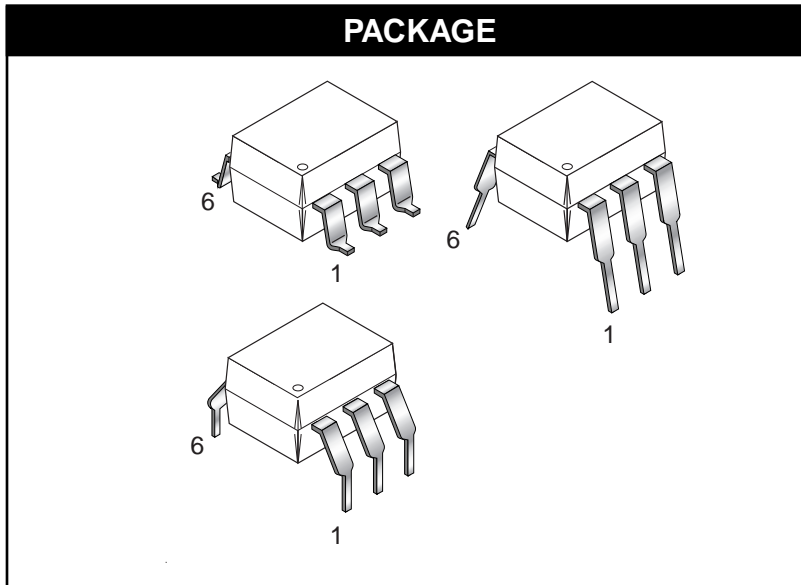


**MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M**



## DESCRIPTION

The MOC301XM and MOC302XM series 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. They are designed for interfacing between electronic controls and power triacs to control resistive and inductive loads for 115 VAC operations.

## FEATURES

- Excellent  $I_{FT}$  stability—IR emitting diode has low degradation
- High isolation voltage—minimum 5300 VAC RMS
- Underwriters Laboratory (UL) recognized—File #E90700
- Peak blocking voltage
  - 250V-MOC301XM
  - 400V-MOC302XM
- VDE recognized (File #94766)
  - Ordering option V (e.g. MOC3023VM)

## APPLICATIONS

- Industrial controls
- Traffic lights
- Vending machines
- Solid state relay
- Lamp ballasts
- Solenoid/valve controls
- Static AC power switch
- Incandescent lamp dimmers
- Motor control

**MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M**

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)				
Parameters	Symbol	Device	Value	Units
<b>TOTAL DEVICE</b>				
Storage Temperature	$T_{\text{STG}}$	All	-40 to +150	$^\circ\text{C}$
Operating Temperature	$T_{\text{OPR}}$	All	-40 to +85	$^\circ\text{C}$
Lead Solder Temperature	$T_{\text{SOL}}$	All	260 for 10 sec	$^\circ\text{C}$
Junction Temperature Range	$T_J$	All	-40 to +100	$^\circ\text{C}$
Isolation Surge Voltage <sup>(1)</sup> (peak AC voltage, 60Hz, 1 sec duration)	$V_{\text{ISO}}$	All	7500	Vac(pk)
Total Device Power Dissipation @ 25°C Derate above 25°C	$P_D$	All	330 4.4	mW mW/ $^\circ\text{C}$
<b>EMITTER</b>				
Continuous Forward Current	$I_F$	All	60	mA
Reverse Voltage	$V_R$	All	3	V
Total Power Dissipation 25°C Ambient Derate above 25°C	$P_D$	All	100 1.33	mW mW/ $^\circ\text{C}$
<b>DETECTOR</b>				
Off-State Output Terminal Voltage	$V_{\text{DRM}}$	MOC3010M/1M/2M MOC3020M/1M/2M/3M	250 400	V
Peak Repetitive Surge Current (PW = 1 ms, 120 pps)	$I_{\text{TSM}}$	All	1	A
Total Power Dissipation @ 25°C Ambient Derate above 25°C	$P_D$	All	300 4	mW mW/ $^\circ\text{C}$

**Note**

1. Isolation surge voltage,  $V_{\text{ISO}}$ , is an internal device dielectric breakdown rating. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.

**MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M**

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

Parameters	Test Conditions	Symbol	Device	Min	Typ	Max	Units
<b>EMITTER</b>							
Input Forward Voltage	$I_F = 10\text{ mA}$	$V_F$	All		1.15	1.5	V
Reverse Leakage Current	$V_R = 3\text{ V}, T_A = 25^\circ\text{C}$	$I_R$	All		0.01	100	$\mu\text{A}$
<b>DETECTOR</b>							
Peak Blocking Current, Either Direction	Rated $V_{DRM}$ , $I_F = 0$ (note 1)	$I_{DRM}$	All		10	100	nA
Peak On-State Voltage, Either Direction	$I_{TM} = 100\text{ mA peak}, I_F = 0$	$V_{TM}$	All		1.8	3	V

**TRANSFER CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

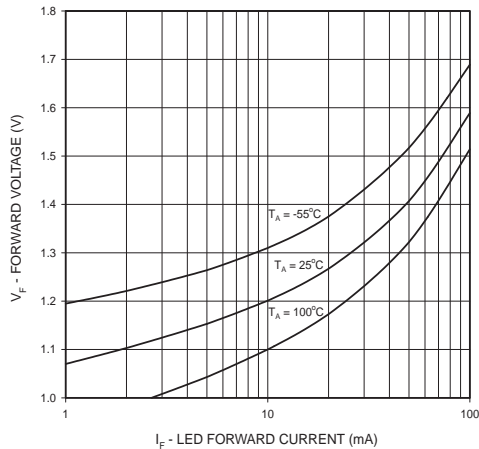
DC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
LED Trigger Current	Voltage = 3V (note 3)	$I_{FT}$	MOC3020M			30	mA
			MOC3010M			15	
			MOC3021M				
			MOC3011M			10	
			MOC3022M				
			MOC3012M			5	
			MOC3023M				
Holding Current, Either Direction		$I_H$	All		100		$\mu\text{A}$

**Note**

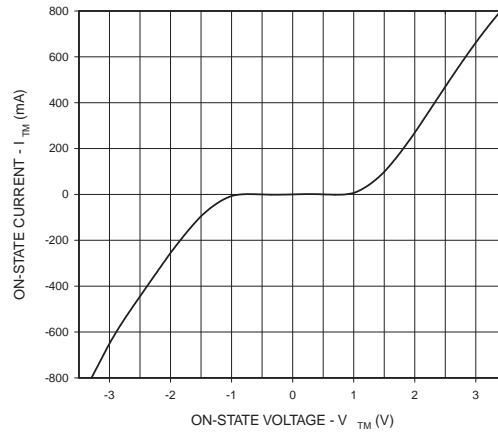
1. Test voltage must be applied within dv/dt rating.
2. This is static dv/dt. See Figure 5 for test circuit. Commutating dv/dt is a function of the load-driving thyristor(s) only.
3. All devices are guaranteed to trigger at an  $I_F$  value less than or equal to max  $I_{FT}$ . Therefore, recommended operating  $I_F$  lies between max  $I_{FT}$  (30 mA for MOC3020M, 15 mA for MOC3010M and MOC3021M, 10 mA for MOC3011M and MOC3022M, 5 mA for MOC3012M and MOC3023M) and absolute max  $I_F$  (60 mA).

**MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M**

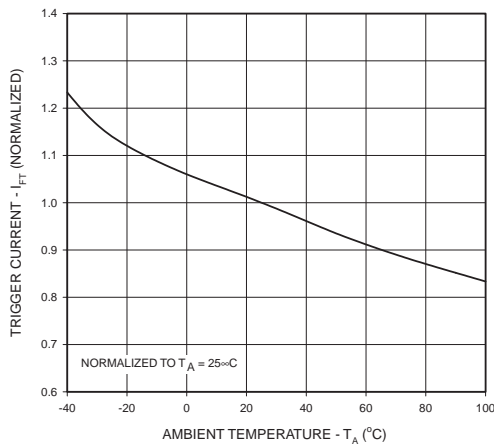
**Fig. 1 LED Forward Voltage vs. Forward Current**



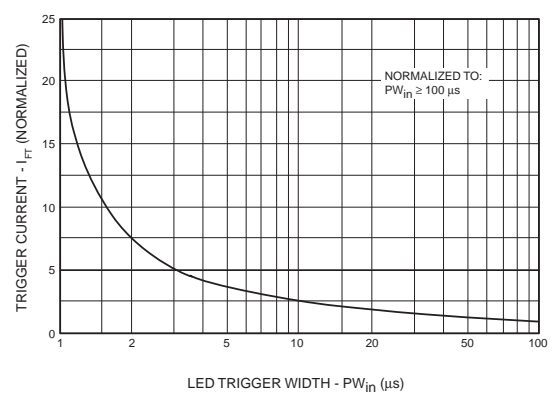
**Fig. 2 On-State Characteristics**



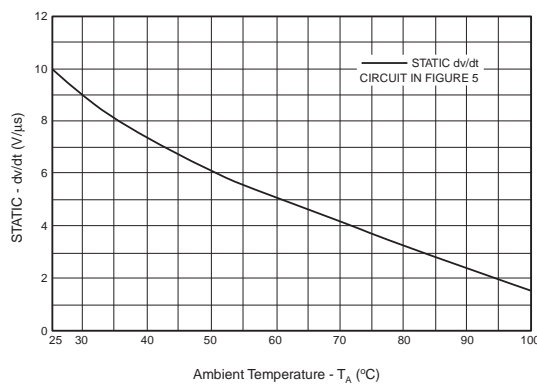
**Fig. 3 Trigger Current vs. Ambient Temperature**



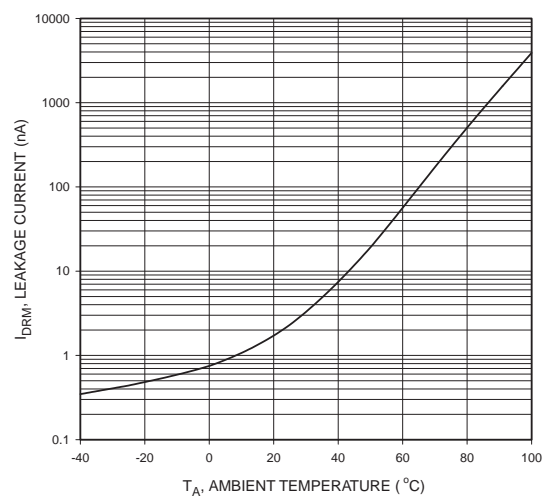
**Fig. 4 LED Current Required to Trigger vs. LED Pulse Width**



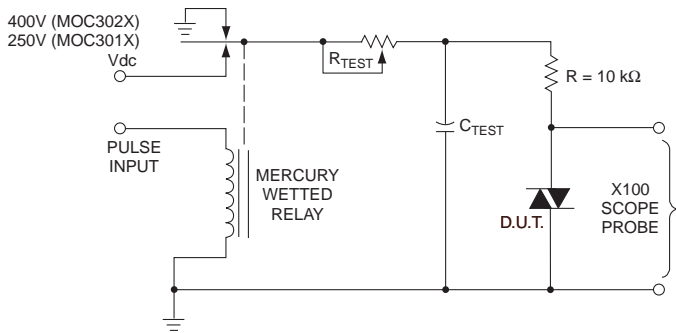
**Fig. 5 dv/dt vs. Temperature**



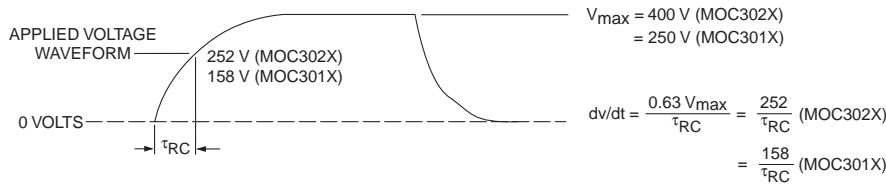
**Fig. 6 Leakage Current, I\_DRM vs. Temperature**



**MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M**

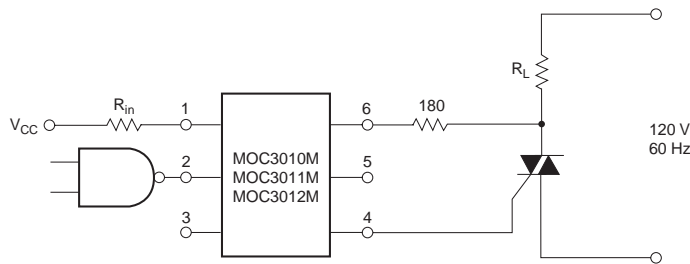


1. The mercury wetted relay provides a high speed repeated pulse to the D.U.T.
2. 100x scope probes are used, to allow high speeds and voltages.
3. The worst-case condition for static dv/dt is established by triggering the D.U.T. with a normal LED input current, then removing the current. The variable  $R_{TEST}$  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.

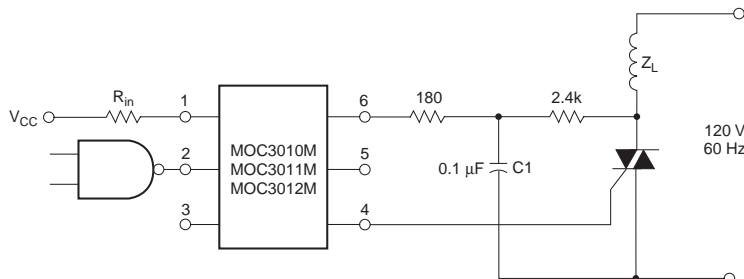


**Figure 5. Static dv/dt Test Circuit**

Note: This optoisolator should not be used to drive a load directly. It is intended to be a trigger device only.

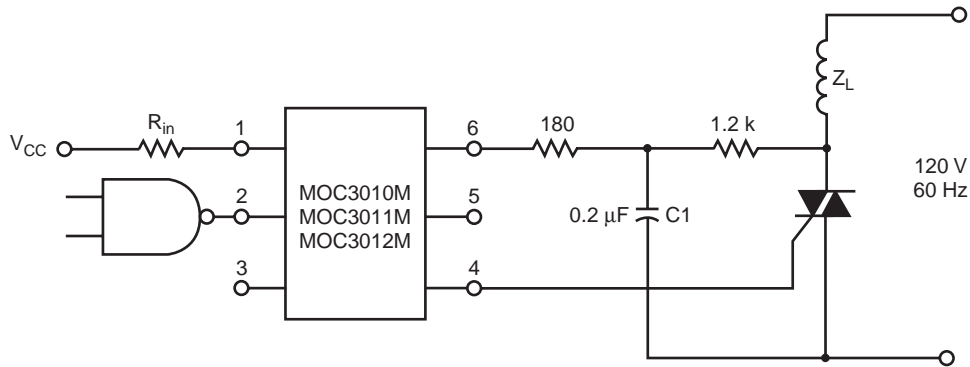


**Figure 6. Resistive Load**

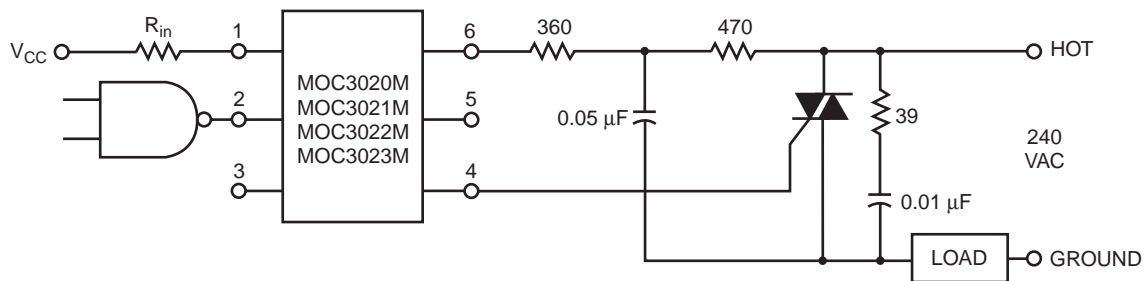


**Figure 7. Inductive Load with Sensitive Gate Triac ( $I_{GT} \leq 15 \text{ mA}$ )**

**MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M**



**Figure 8. Inductive Load with Sensitive Gate Triac ( $I_{GT} \leq 15 \text{ mA}$ )**



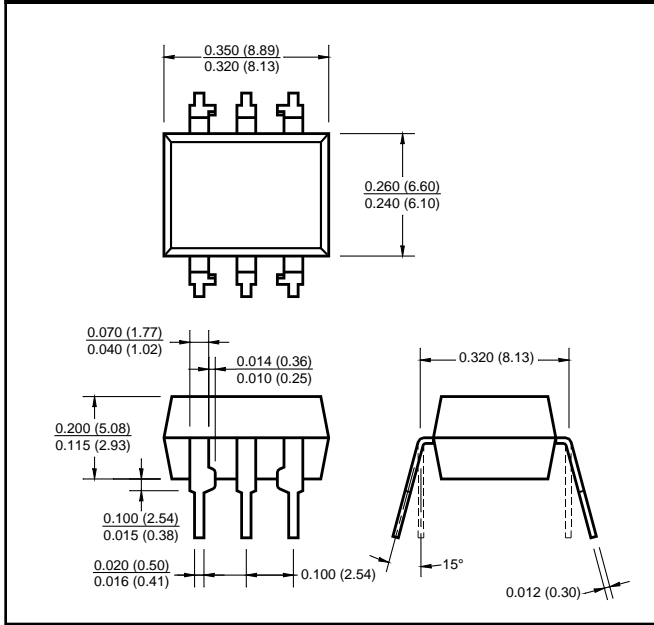
In this circuit the "hot" side of the line is switched and the load connected to the cold or ground side.

The 39 ohm resistor and 0.01  $\mu\text{F}$  capacitor are for snubbing of the triac, and the 470 ohm resistor and 0.05  $\mu\text{F}$  capacitor are for snubbing the coupler. These components may or may not be necessary depending upon the particular and load used.

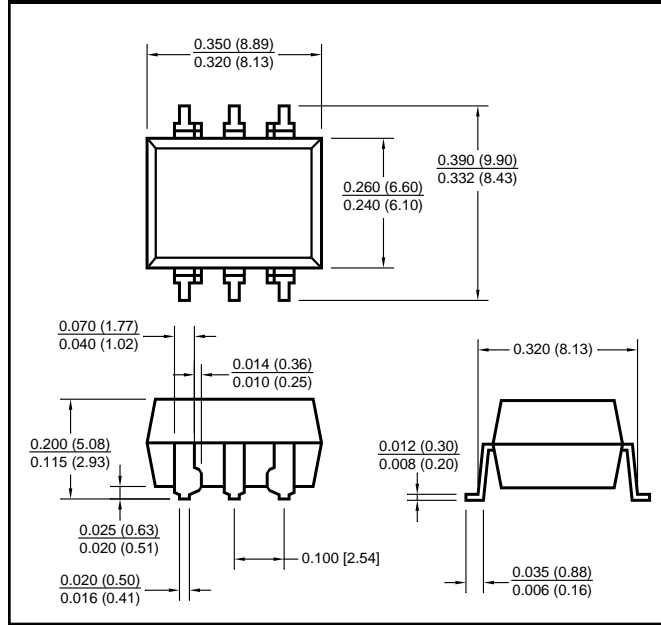
**Figure 9. Typical Application Circuit**

MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M

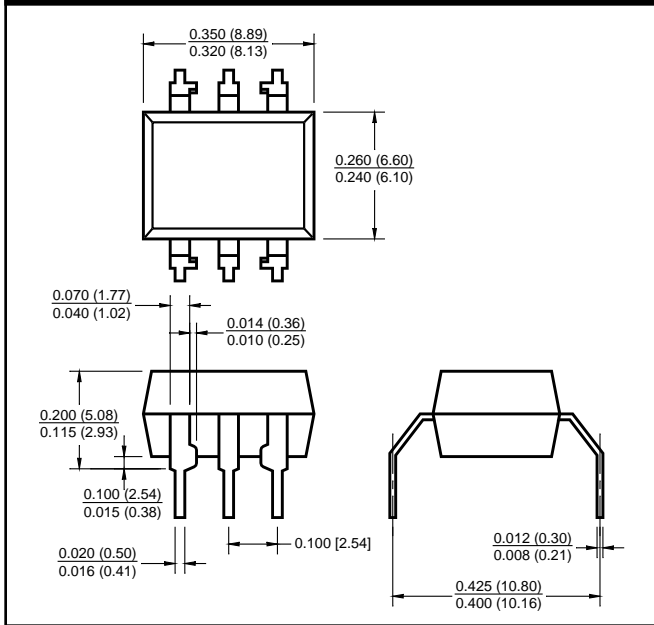
**Package Dimensions (Through Hole)**



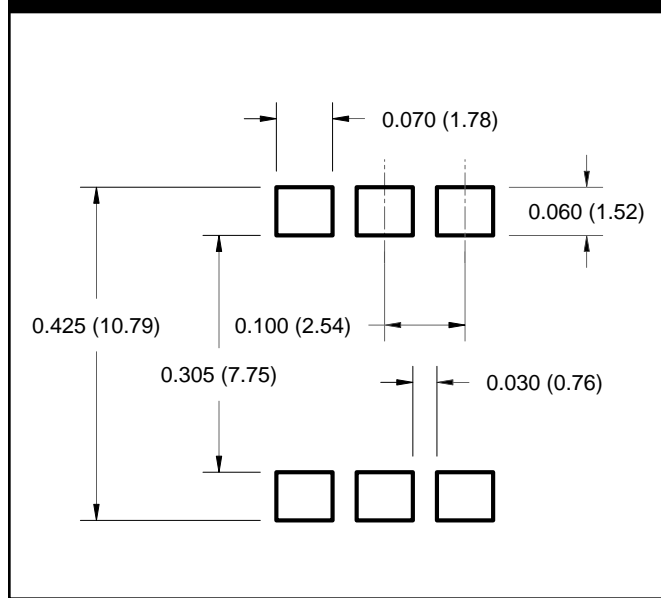
**Package Dimensions (Surface Mount)**



**Package Dimensions (0.4" Lead Spacing)**



**Recommended Pad Layout for  
Surface Mount Leadform**



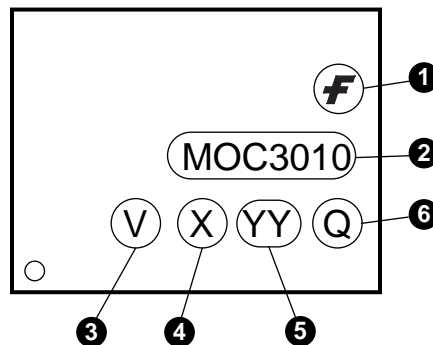
**NOTE**  
All dimensions are in inches (millimeters)

**MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M**

**ORDERING INFORMATION**

Option	Order Entry Identifier	Description
S	S	Surface Mount Lead Bend
SR2	SR2	Surface Mount; Tape and reel
T	T	0.4" Lead Spacing
V	V	VDE 0884
TV	TV	VDE 0884, 0.4" Lead Spacing
SV	SV	VDE 0884, Surface Mount
SR2V	SR2V	VDE 0884, Surface Mount, Tape & Reel

**MARKING INFORMATION**



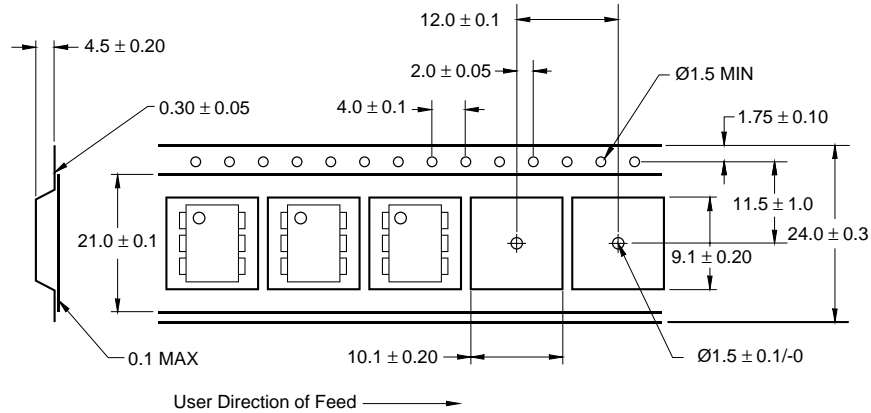
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '3'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

\*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.



MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M

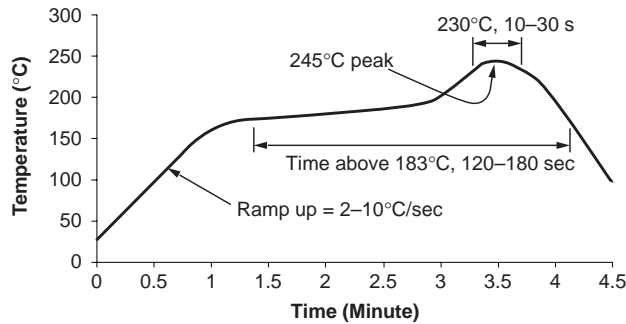
**Carrier Tape Specifications**



**NOTE**

All dimensions are in inches (millimeters)

**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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**MOC3010M MOC3011M MOC3012M MOC3020M MOC3021M MOC3022M MOC3023M**

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