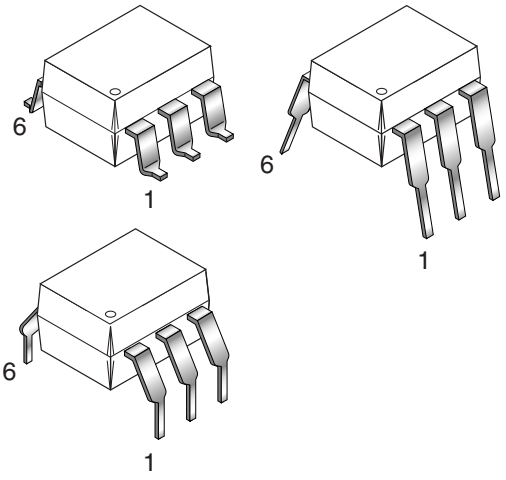
FAIRCHILD
SEMICONDUCTOR®

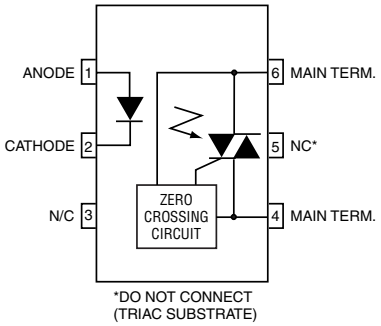
6-PIN DIP ZERO-CROSS PHOTOTRIAC DRIVER OPTOCOUPLER (600V PEAK)

MOC3061-M MOC3062-M MOC3063-M MOC3162-M MOC3163-M

PACKAGE



SCHEMATIC



DESCRIPTION

The MOC306X-M and MOC316X-M devices consist of a GaAs 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 115/240 VAC lines, such as solid-state relays, industrial controls, motors, solenoids and consumer appliances, etc.

FEATURES

- Simplifies logic control of 115/240 VAC power
- Zero voltage crossing
- dv/dt of 1000 V/µs guaranteed (MOC316X-M),
  – 600 V/µs guaranteed (MOC306X-M)
- VDE recognized (File # 94766)
  – ordering option V (e.g., MOC3063V-M)
- Underwriters Laboratories (UL) recognized (File #E90700, volume 2)

APPLICATIONS

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

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

Parameters	Symbol	Device	Value	Units
TOTAL DEVICE				
Storage Temperature	T_{STG}	All	-40 to +150	°C
Operating Temperature	T_{OPR}	All	-40 to +85	°C
Lead Solder Temperature	T_{SOL}	All	260 for 10 sec	°C
Junction Temperature Range	T_J	All	-40 to +100	°C
Isolation Surge Voltage(4) (peak AC voltage, 60Hz, 1 sec duration)	V_{ISO}	All	7500	Vac(pk)
Total Device Power Dissipation @ 25°C	P_D	All	250	mW
Derate above 25°C			2.94	mW/°C
EMITTER				
Continuous Forward Current	I_F	All	60	mA
Reverse Voltage	V_R	All	6	V
Total Power Dissipation 25°C Ambient	P_D	All	120	mW
Derate above 25°C			1.41	mW/°C
DETECTOR				
Off-State Output Terminal Voltage	V_{DRM}	All	600	V
Peak Repetitive Surge Current (PW = 100 µs, 120 pps)	I_{TSM}	All	1	A
Total Power Dissipation @ 25°C Ambient	P_D	All	150	mW
Derate above 25°C			1.76	mW/°C

ELECTRICAL CHARACTERISTICS (TA = 25°C Unless otherwise specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameters	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
EMITTER							
Input Forward Voltage	I_F = 30 mA	V_F	All		1.3	1.5	V
Reverse Leakage Current	V_R = 6 V	I_R	All		0.005	100	µA
DETECTOR							
Peak Blocking Current, Either Direction	V_{DRM} = 600V, I_F = 0 (note 1)	I_{DRM1}	MOC316X-M		10	100	nA
			MOC306X-M		10	500	
Critical Rate of Rise of Off-State Voltage	I_F = 0 (figure 9, note 3)	dv/dt	MOC306X-M	600	1500		V/µs
			MOC316X-M	1000			

TRANSFER CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
LED Trigger Current (rated I_{FT})	main terminal Voltage = 3V (note 2)	I_{FT}	MOC3061-M			15	mA
			MOC3062-M/ MOC3162-M			10	
			MOC3063-M/ MOC3163-M			5	
Peak On-State Voltage, Either Direction	I_{TM} = 100 mA peak, I_F = rated I_{FT}	V_{TM}	All		1.8	3	V
Holding Current, Either Direction		I_H	All		500		µA

ZERO CROSSING CHARACTERISTICS

Characteristics	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
Inhibit Voltage (MT1-MT2 voltage above which device will not trigger)	I_F = Rated I_{FT}	V_{INH}	MOC3061-M/2M/3M		12	20	V
			MOC3162-M/3M		12	15	
Leakage in Inhibited State	I_F = Rated I_{FT}, V_{DRM} = 600V, off state	I_{DRM2}	All		150	500	µA

ISOLATION CHARACTERISTICS

Characteristics	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
Isolation Voltage	f = 60 Hz, t = 1 sec	V_{ISO}	All	7500			V

*Typical values at T_A = 25°C

Notes

1. Test voltage must be applied within dv/dt rating.
2. 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} (15 mA for MOC3061-M, 10 mA for MOC3062-M & MOC3162-M, 5 mA for MOC3063-M & MOC3163-M) and absolute max I_F (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.
4. 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.

Figure 1. LED Forward Voltage vs. Forward Current

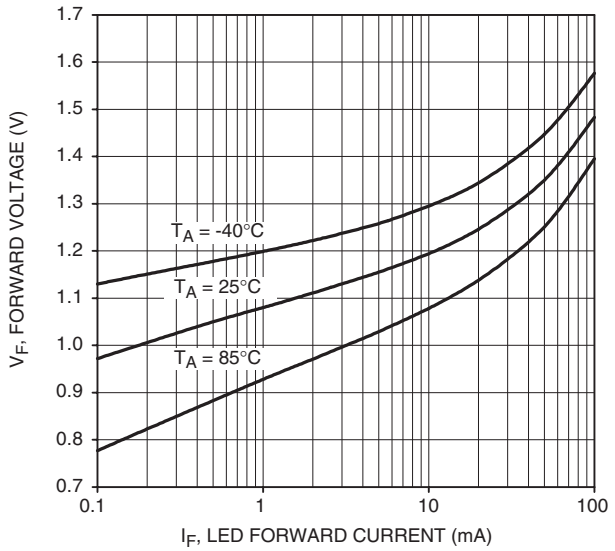


Figure 2. Trigger Current Vs. Temperature

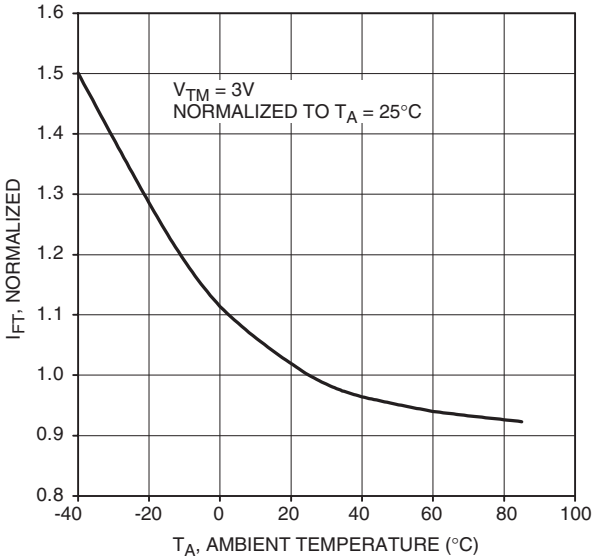


Figure 3. LED Current Required to Trigger vs. LED Pulse Width

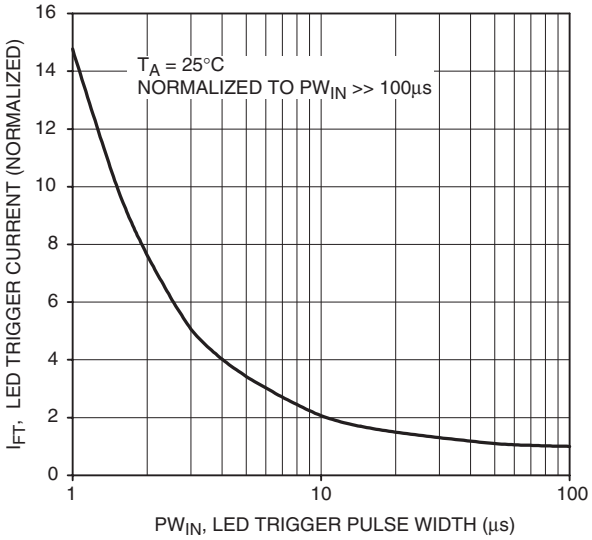


Figure 4. Leakage Current, I_{DRM} vs. Temperature

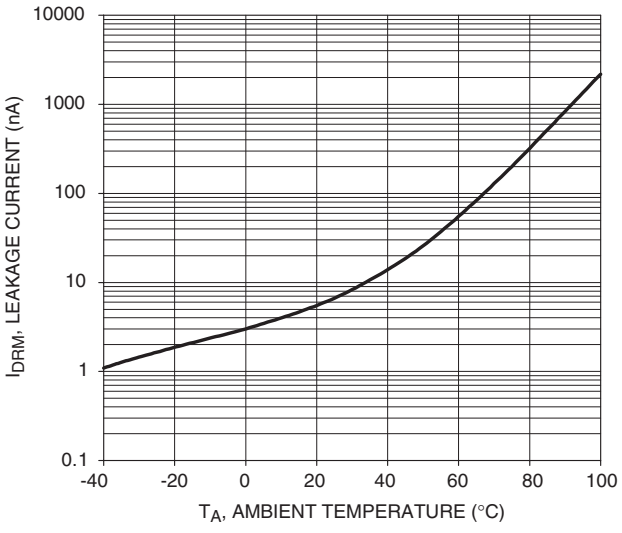


Figure 5. I_{DRM2}, Leakage in Inhibit State vs. Temperature

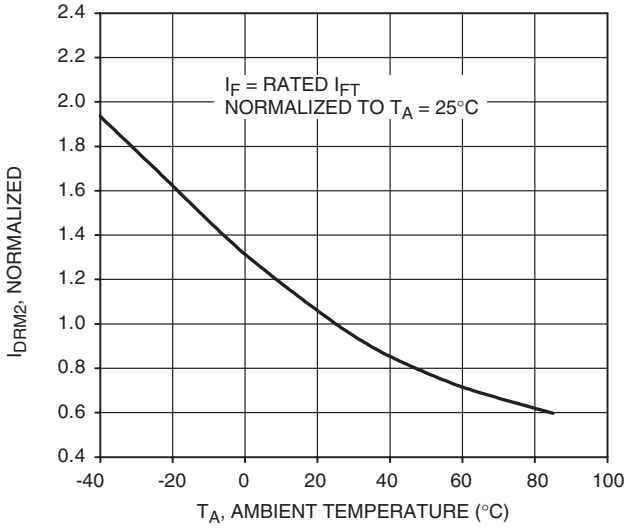


Figure 6. On-State Characteristics

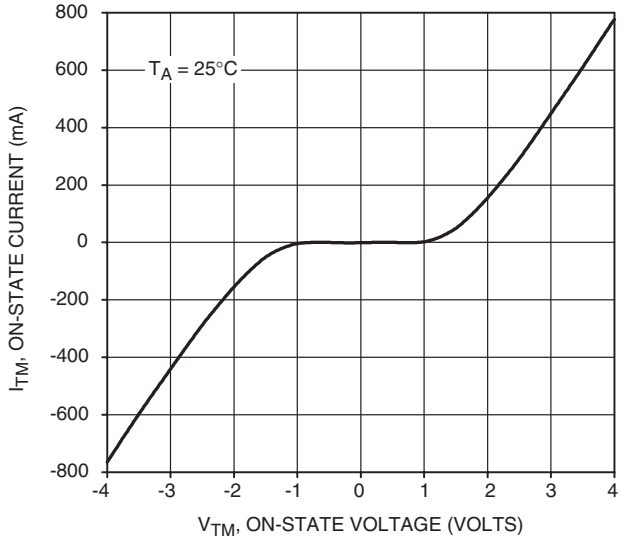


Figure 7. I_H, Holding Current vs. Temperature

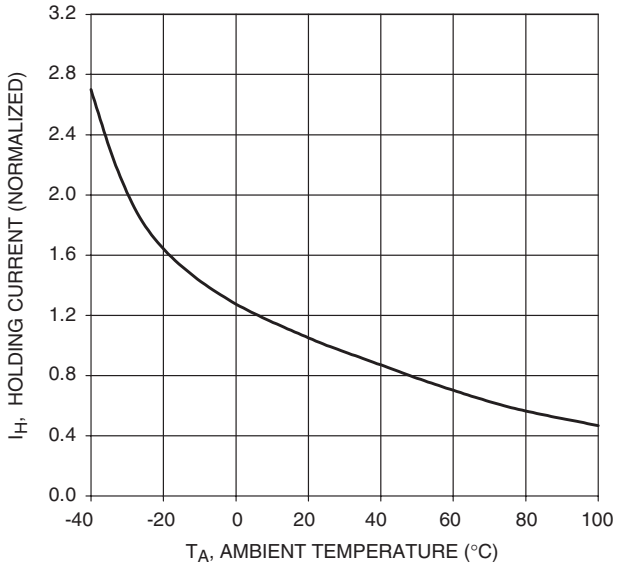
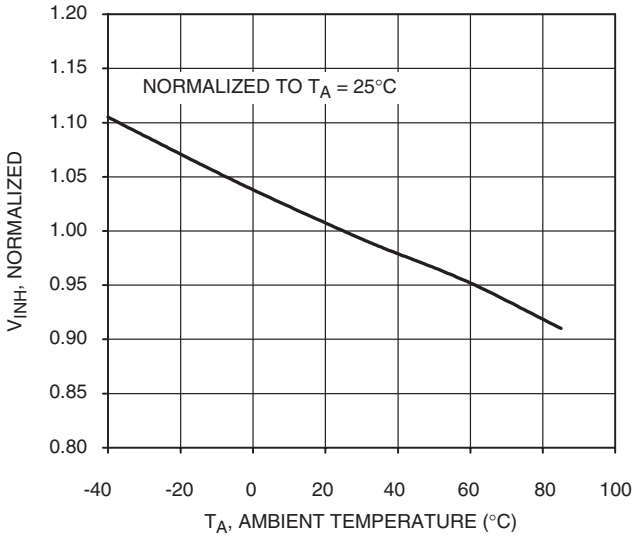


Figure 8. Inhibit Voltage vs. Temperature



1. 100x scope probes are used, to allow high speeds and voltages.
2. 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 vernier resistor combined with various capacitor combinations 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. τ_{RC} is measured at this point and recorded.

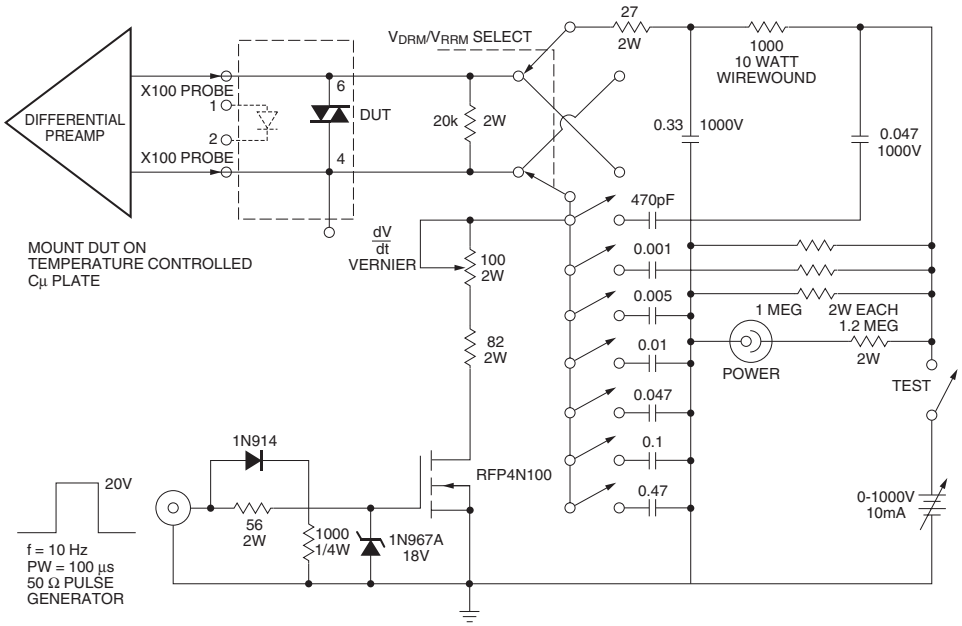


Figure 9. Circuit for Static $\frac{dV}{dt}$ Measurement of Power Thyristors

BASIC APPLICATIONS

Typical circuit 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_F is equal to the rated I_{FT} of the part, 15 mA for the MOC3061-M, 10 mA for the MOC3062-M, or 5 mA for the MOC3063-M. The 39 ohm resistor and 0.01 μF capacitor are for snubbing of the triac and is often, but not always, necessary depending upon the particular triac and load used.

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.

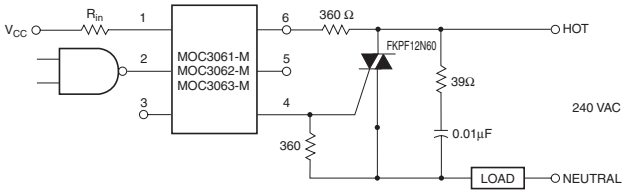


Figure 10. Hot-Line Switching Application Circuit

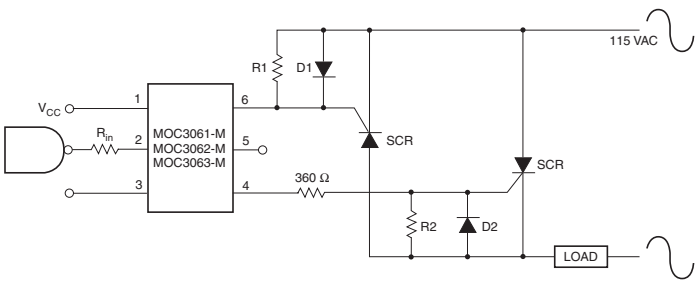


Figure 11. Inverse-Parallel SCR Driver Circuit

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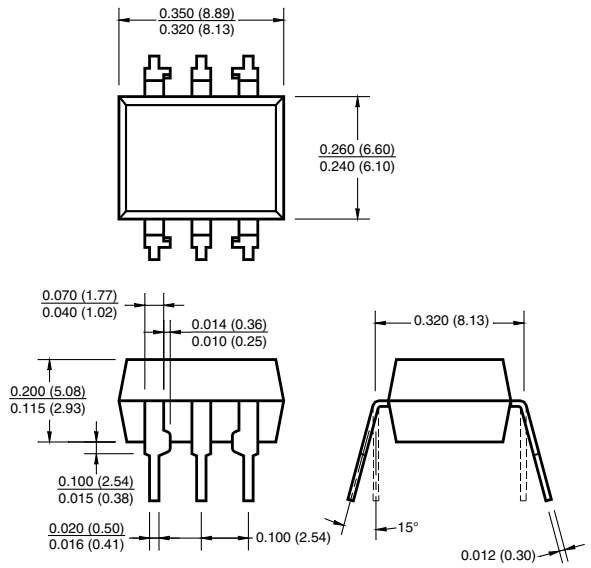
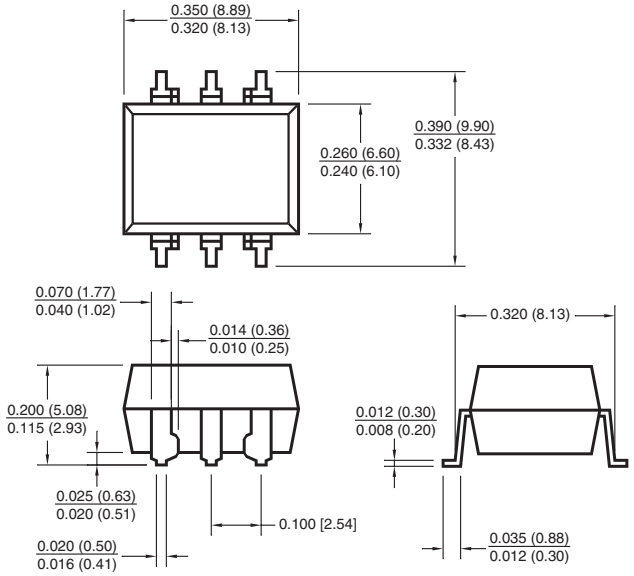
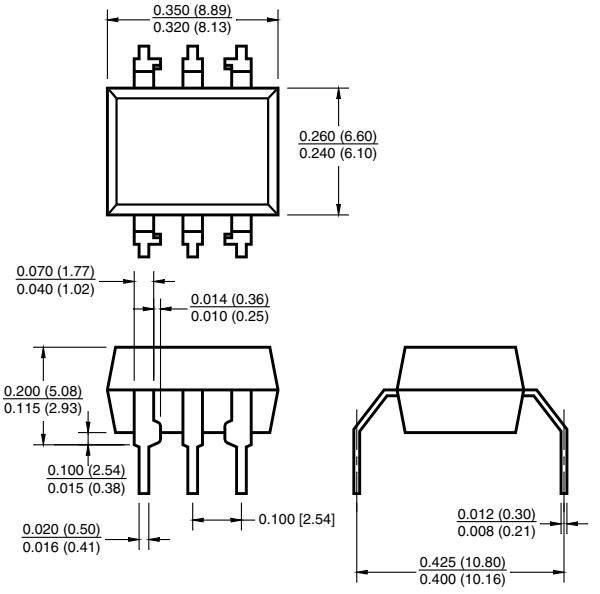
Package Dimensions (Through Hole)



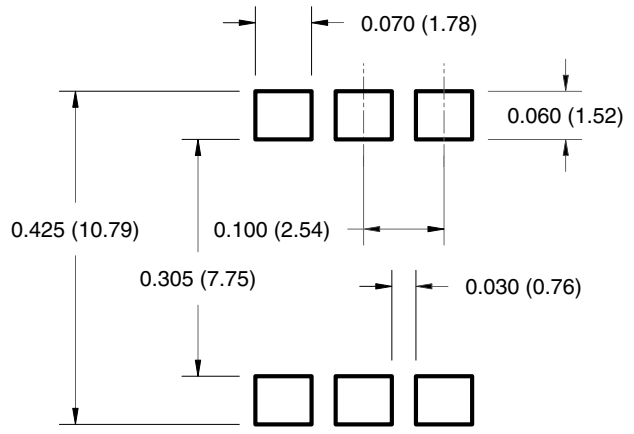
Package Dimensions (Surface Mount)



Package Dimensions (0.4” Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform

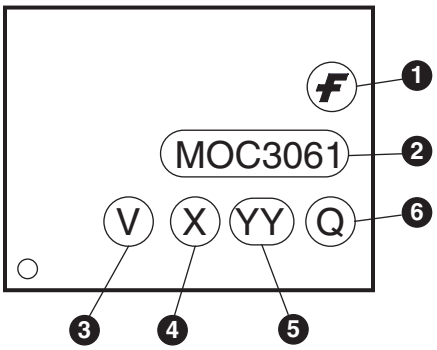


NOTE
All dimensions are in inches (millimeters)

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

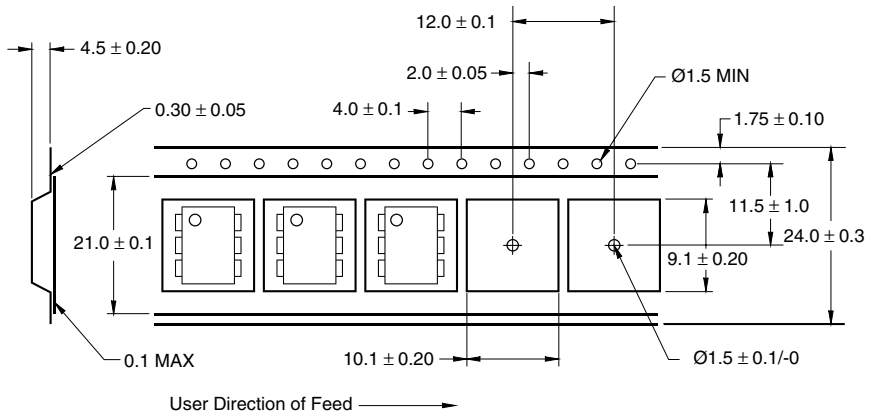
MARKING INFORMATION



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

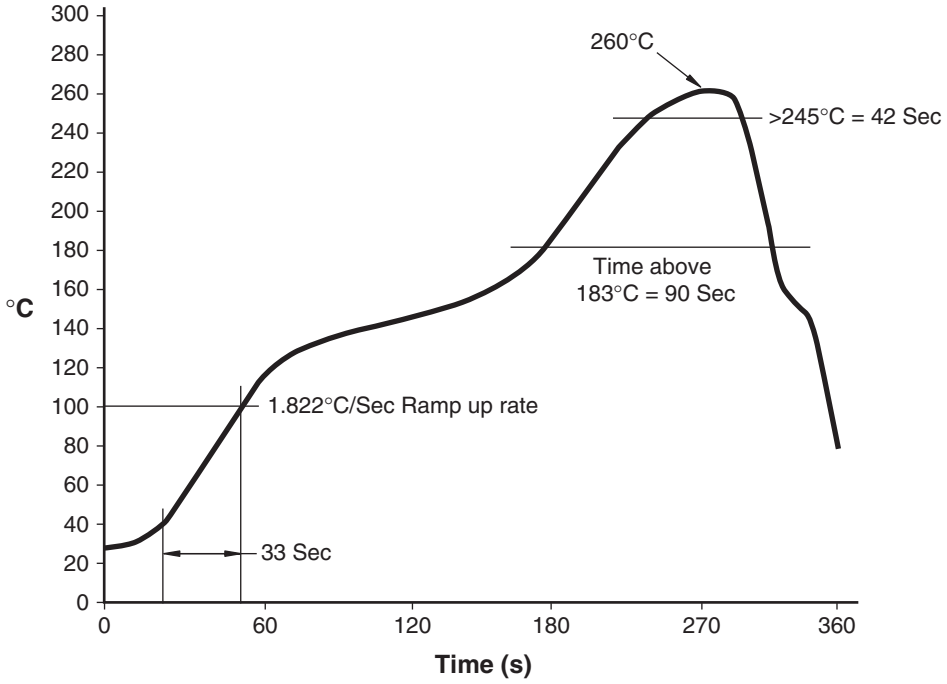
*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

Carrier Tape Specifications



NOTE
All dimensions are in inches (millimeters)

Reflow Profile (White Package, -M Suffix)



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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.