FAIRCHILD SEMICONDUCTOR®

September 2010

MOC3081M, MOC3082M, MOC3083M
6-Pin Zero-Cross Optoisolators Triac Driver Output (800 Volt Peak)

Features

- Underwriters Laboratories (UL) recognized – file #E90700, Volume 2
- VDE recognized – file #102497 – add option V (e.g., MOC3083VM)
- Simplifies logic control of 240 VAC power
- Zero voltage crossing
- dv/dt of 1500V/μs typical, 600V/μs guaranteed
- Compatible with Fairchild's FKPF12N80 discrete power triac

Applications

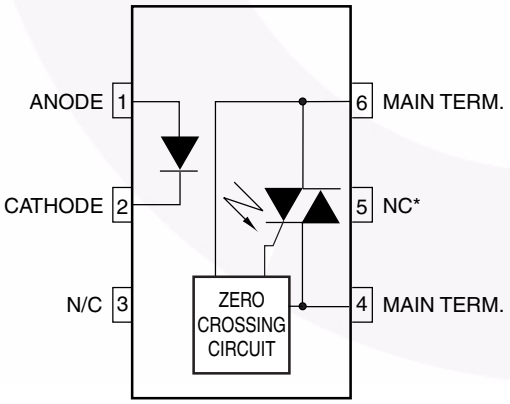
- Solenoid/valve controls
- Lighting controls
- Static power switches
- AC motor drives
- Temperature controls
- E.M. contactors
- AC motor starters
- Solid state relays

Description

The MOC3081M, MOC3082M and MOC3083M 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.

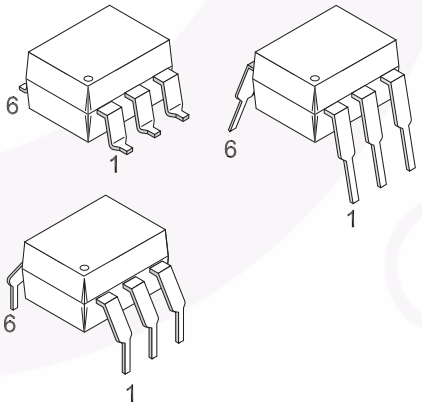
They are designed for use with a discrete power triac in the interface of logic systems to equipment powered from 240 VAC lines, such as solid-state relays, industrial controls, motors, solenoids and consumer appliances, etc.

Schematic



*DO NOT CONNECT
(TRIAC SUBSTRATE)

Package Outlines



Absolute Maximum Ratings (T_A = 25°C unless otherwise noted)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameters	Value	Units
TOTAL DEVICE			
T_{STG}	Storage Temperature	-40 to +150	°C
T_{OPR}	Operating Temperature	-40 to +85	°C
T_{SOL}	Lead Solder Temperature	260 for 10 sec	°C
T_J	Junction Temperature Range	-40 to +100	°C
V_{ISO}	Isolation Surge Voltage[1] (peak AC voltage, 60Hz, 1 sec. duration)	7500	Vac(pk)
P_D	Total Device Power Dissipation @ 25°C Ambient	250	mW
	Derate above 25°C	2.94	mW/°C
EMITTER			
I_F	Continuous Forward Current	60	mA
V_R	Reverse Voltage	6	V
P_D	Total Power Dissipation @ 25°C Ambient	120	mW
	Derate above 25°C	1.41	mW/°C
DETECTOR			
V_{DRM}	Off-State Output Terminal Voltage	800	V
I_{TSM}	Peak Repetitive Surge Current (PW = 100μs, 120pps)	1	A
P_D	Total Power Dissipation @ 25°C Ambient	150	mW
	Derate above 25°C	1.76	mW/°C

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.

Electrical Characteristics (T_A = 25°C Unless otherwise specified)

Individual Component Characteristics

Symbol	Parameters	Test Conditions	Min.	Typ.*	Max.	Units
EMITTER						
V_F	Input Forward Voltage	I_F = 30mA		1.3	1.5	V
I_R	Reverse Leakage Current	V_R = 6V		0.005	100	µA
DETECTOR						
I_{DRM1}	Peak Blocking Current, Either Direction	V_{DRM} = 800V, I_F = 0(2)		10	500	nA
dv/dt	Critical Rate of Rise of Off-State Voltage	I_F = 0 (Figure 9)(4)	600	1500		V/µs

Transfer Characteristics

Symbol	DC Characteristics	Test Conditions	Device	Min.	Typ.*	Max.	Units
I_{FT}	LED Trigger Current	Main Terminal Voltage = 3V(3)	MOC3081M			15	mA
			MOC3082M			10	
			MOC3083M			5	
V_{TM}	Peak On-State Voltage, Either Direction	I_{TM} = 100mA peak, I_F = rated I_{FT}	All		1.8	3	V
I_H	Holding Current, Either Direction		All		500		µA

Zero Crossing Characteristics

Symbol	Characteristics	Test Conditions	Min.	Typ.*	Max.	Units
V_{INH}	Inhibit Voltage (MT1–MT2 voltage above which device will not trigger)	I_F = Rated I_{FT}		12	20	V
I_{DRM2}	Leakage in Inhibited State	I_F = Rated I_{FT}, V_{DRM} = 800V, off state			2	mA

Isolation Characteristics

Symbol	Characteristics	Test Conditions	Min.	Typ.*	Max.	Units
V_{ISO}	Input-Output Isolation Voltage(5)	f = 60Hz, t = 1 sec.	7500			Vac(pk)

*Typical values at T_A = 25°C

Notes:

2. Test voltage must be applied within dv/dt rating.
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} (15mA for MOC3081M, 10mA for MOC3082M, 5mA for MOC3083M) and absolute max I_F (60mA).
4. This is static dv/dt. See Figure 9 for test circuit. Commutating dv/dt is a function of the load-driving thyristor(s) only.
5. 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.

Safety and Insulation Ratings

As per IEC 60747-5-2, this optocoupler is suitable for “safe electrical insulation” only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.

Symbol	Parameter	Min.	Typ.	Max.	Unit
	Installation Classifications per DIN VDE 0110/1.89 Table 1				
	For Rated Main Voltage < 150Vrms		I-IV		
	For Rated Main voltage < 300Vrms		I-IV		
	Climatic Classification		55/100/21		
	Pollution Degree (DIN VDE 0110/1.89)		2		
CTI	Comparative Tracking Index	175			
V_{PR}	Input to Output Test Voltage, Method b, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with tm = 1 sec, Partial Discharge < 5pC	1594			V_{peak}
	Input to Output Test Voltage, Method a, V_{IORM} x 1.5 = V_{PR}, Type and Sample Test with tm = 60 sec, Partial Discharge < 5pC	1275			V_{peak}
V_{IORM}	Max. Working Insulation Voltage	850			V_{peak}
V_{IOTM}	Highest Allowable Over Voltage	6000			V_{peak}
	External Creepage	7			mm
	External Clearance	7			mm
	Insulation Thickness	0.5			mm
RIO	Insulation Resistance at Ts, V_{IO} = 500V	10^9			Ω

Typical Performance Curves

Figure 1. LED Forward Voltage vs. Forward Current

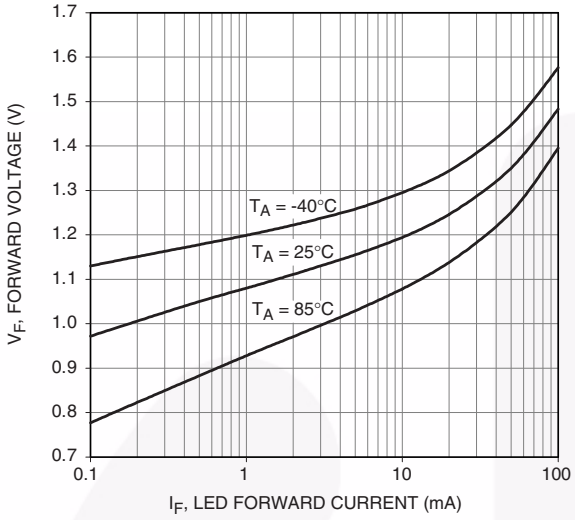


Figure 2. Trigger Current Vs. Temperature

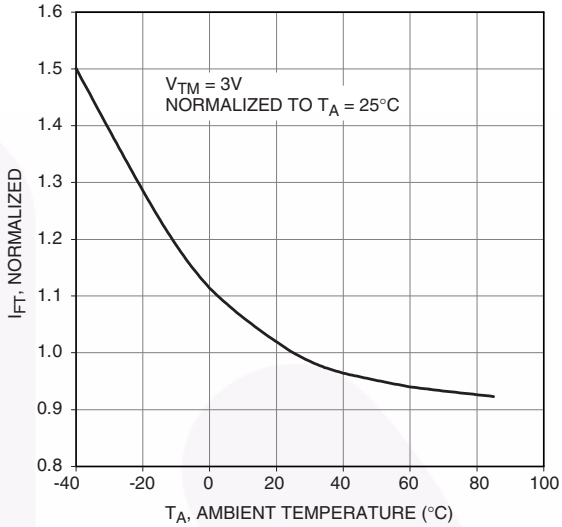


Figure 3. LED Current Required to Trigger vs. LED Pulse Width

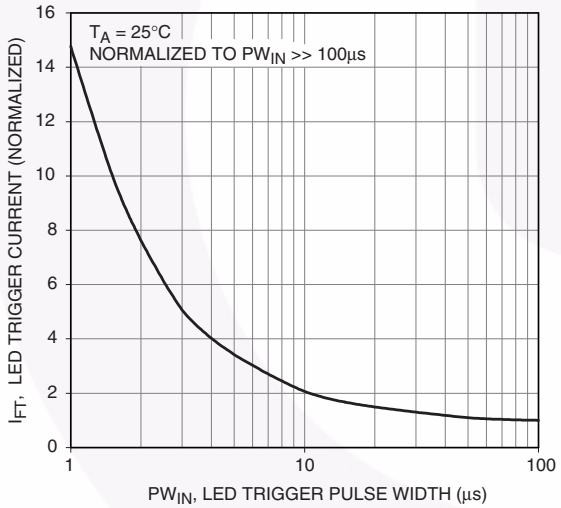
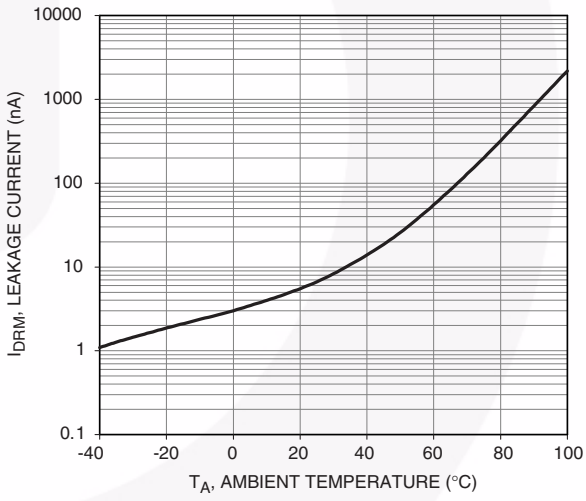


Figure 4. Leakage Current, I_{DRM} vs. Temperature



Typical Performance Curves (Continued)

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

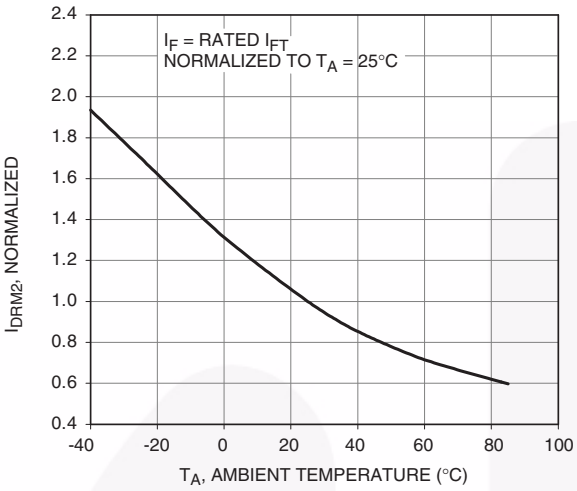


Figure 6. On-State Characteristics

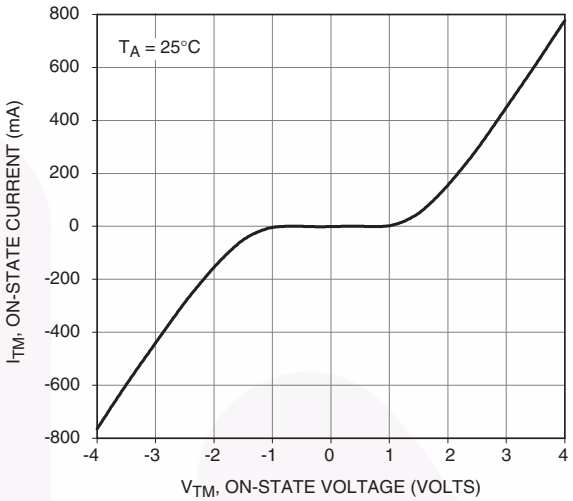


Figure 7. I_H, Holding Current vs. Temperature

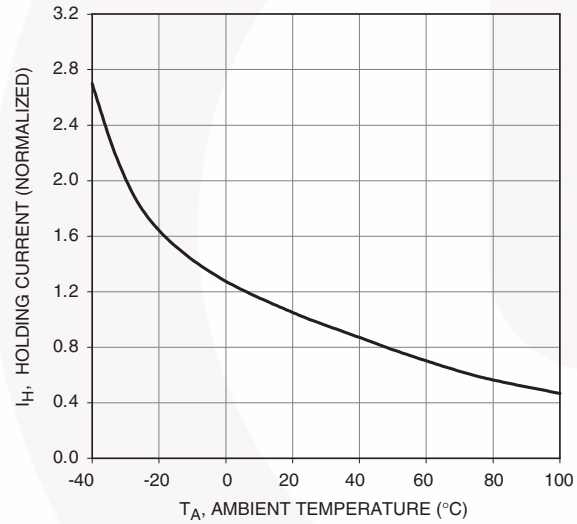
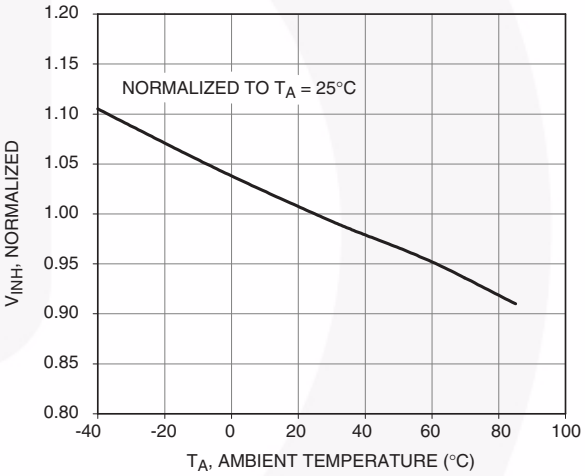


Figure 8. Inhibit Voltage vs. Temperature



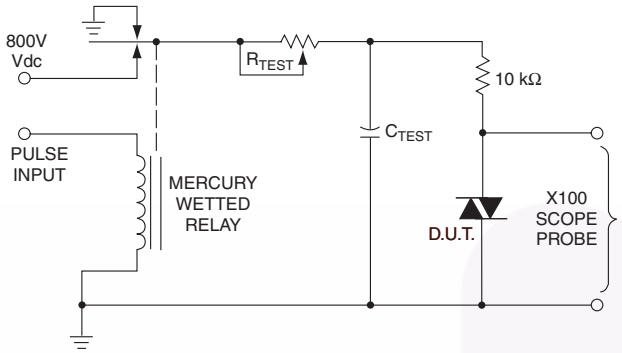


Figure 9. Static dv/dt Test Circuit

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. τ_{RC} is measured at this point and recorded.

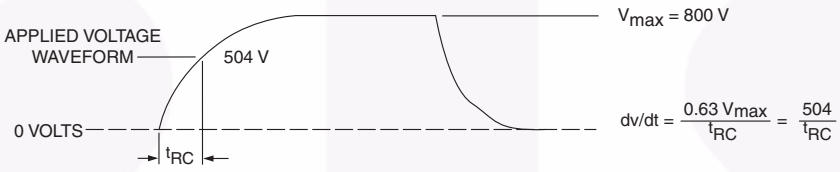
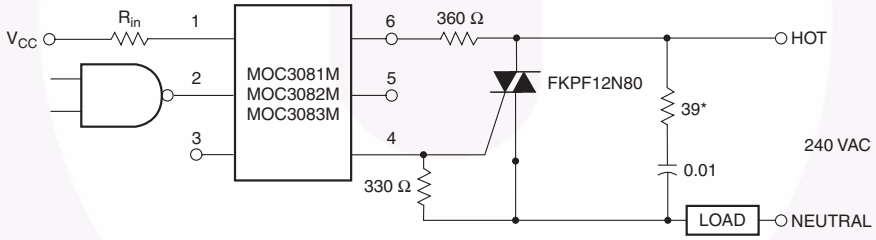


Figure 10. Static dv/dt Test Waveform

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, 15mA for the MOC3081M, 10mA for the MOC3082M, and 5mA for the MOC3083M. The 39Ω resistor and 0.01μF capacitor are for snubbing of the triac and may or may not be necessary depending upon the particular triac and load use.



* For highly inductive loads (power factor < 0.5), change this value to 360Ω.

Figure 11. Hot-Line Switching Application Circuit

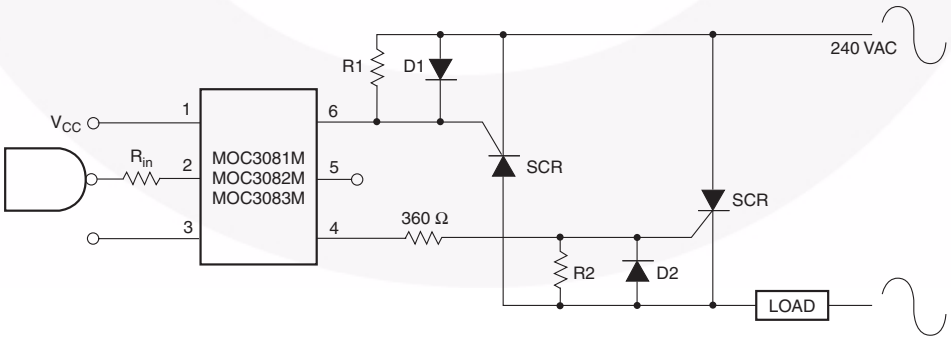


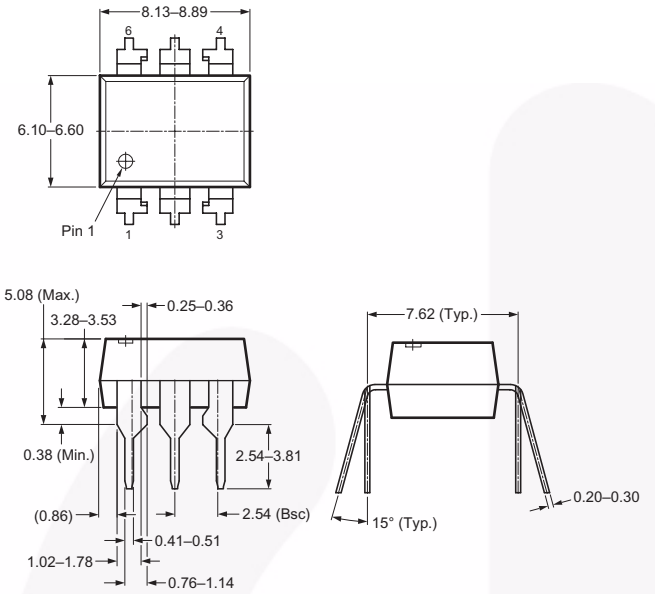
Figure 12. Inverse-Parallel SCR Driver Circuit

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 330Ω.

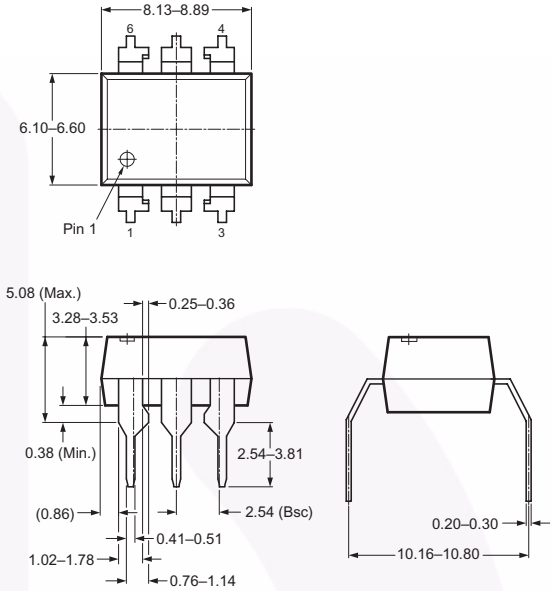
Note: This optoisolator should not be used to drive a load directly. It is intended to be a trigger device only.

Package Dimensions

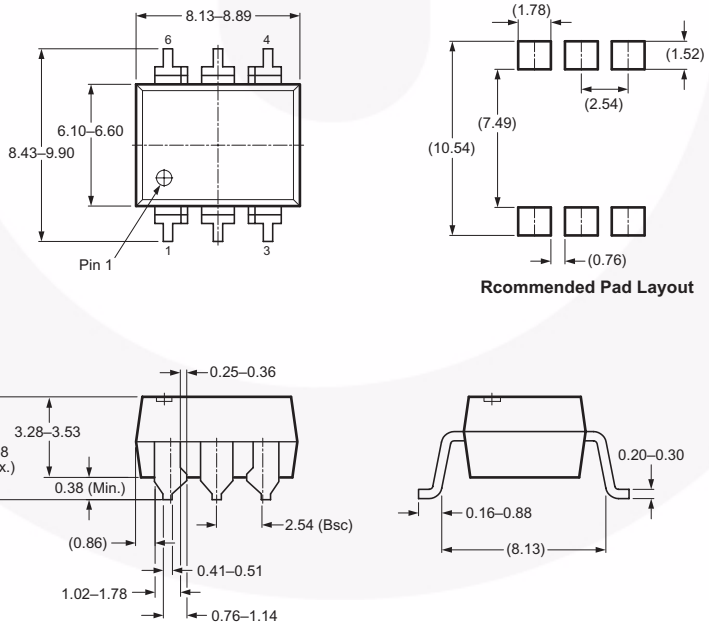
Through Hole



0.4" Lead Spacing



Surface Mount

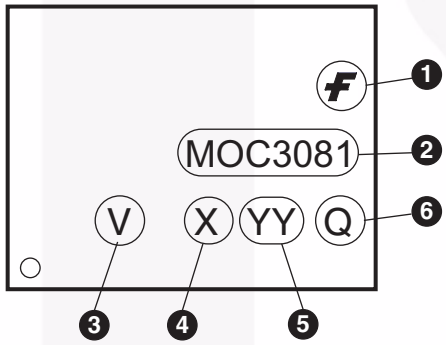


Note:
All dimensions in mm.

Ordering Information

Option	Order Entry Identifier (Example)	Description
No option	MOC3081M	Standard Through Hole Device
S	MOC3081SM	Surface Mount Lead Bend
SR2	MOC3081SR2M	Surface Mount; Tape and Reel
T	MOC3081TM	0.4" Lead Spacing
V	MOC3081VM	VDE 0884
TV	MOC3081TVM	VDE 0884, 0.4" Lead Spacing
SV	MOC3081SVM	VDE 0884, Surface Mount
SR2V	MOC3081SR2VM	VDE 0884, Surface Mount, Tape and Reel

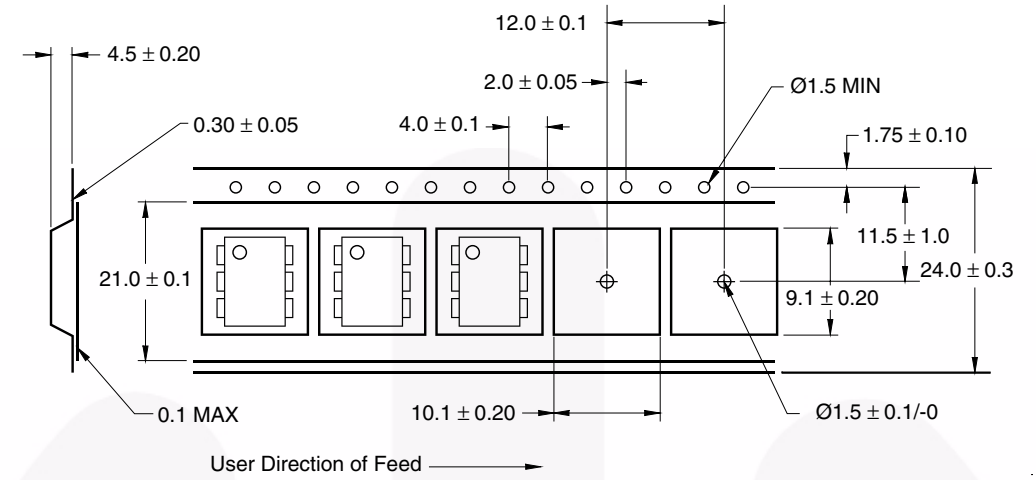
Marking Information



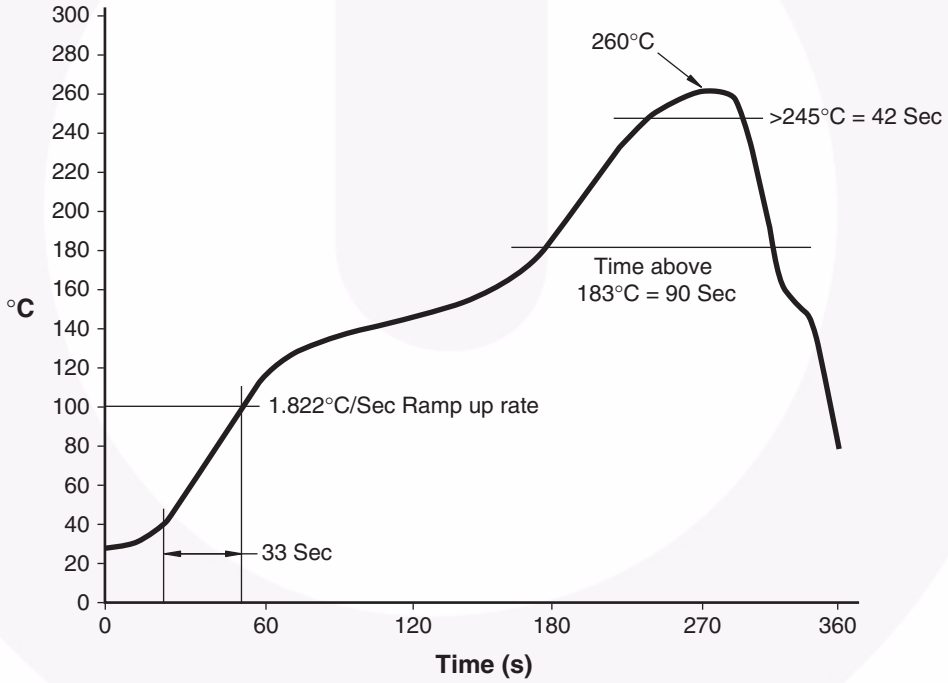
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '3'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

*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 Specification



Reflow Profile



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TinyCalc™
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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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