

March 2014

# MOC3010M, MOC3011M, MOC3012M, MOC3020M, MOC3021M, MOC3022M, MOC3023M 6-Pin DIP Random-Phase Optoisolators Triac Driver Output (250/400 Volt Peak)

### **Features**

- Excellent I<sub>FT</sub> Stability—IR Emitting Diode Has Low Degradation
- High Isolation Voltage—Minimum 5300 V<sub>AC(RMS)</sub>
- Underwriters Laboratory (UL) Recognized— File #E90700
- Peak Blocking Voltage
  - 250 V, MOC301XM
  - 400 V, MOC302XM
- VDE Recognized (File #94766)
  - Ordering Option V (e.g., MOC3023VM)

## **Applications**

- Industrial Controls
- Solenoid/Valve Controls
- Traffic Lights
- Static AC Power Switch
- Vending Machines
- Incandescent Lamp Dimmers
- Solid State Relay
- Motor Control
- Lamp Ballasts

### Schematic

## 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 V<sub>AC</sub> operations.



## Safety and Insulation Ratings

As per DIN EN/IEC60747-5-2. This optocoupler is suitable for "safe electrical insulation" only within the safety limit data. Compliance with the safety ratings is ensured by means of protective circuits.

Symbol	Parameter	Min.	Тур.	Max.	Unit
	Installation Classifications per DIN VDE 0110/1.89 see Table 1				
	For Rated Mains Voltage < 150 V <sub>RMS</sub>		I–IV		
	For Rated Mains Voltage < 300 V <sub>RMS</sub>		I–IV		
	Climatic Classification		40/85/21		
	Pollution Degree (DIN VDE 0110/1.89)		2		
CTI	Comparative Tracking Index	175			
V <sub>PR</sub>	Input to Output Test Voltage, Method b, $V_{IORM} \times 1.875 = V_{PR}$ , 100% Production Test with $t_m = 1$ s, Partial Discharge < 5 pC	1594			
	Input to Output Test Voltage, Method a, $V_{IORM} \times 1.5 = V_{PR}$ , Type and Sample Test with $t_m = 60$ s, Partial Discharge < 5 pC	1275			
V <sub>IORM</sub>	Maximum Working Insulation Voltage	850			V <sub>peak</sub>
V <sub>IOTM</sub>	Highest Allowable Over Voltage	6000			V <sub>peak</sub>
	External Creepage	7			mm
	External Clearance	7			mm
	External Clearance (for Option T, 0.4" Lead Spacing)	10.16			mm
	Insulation Thickness	0.5			mm
R <sub>IO</sub>	Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V	10 <sup>9</sup>			Ω

## **Absolute Maximum Ratings**

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.  $T_A = 25^{\circ}C$  unless otherwise specified.

Symbol	Parameters	Device	Value	Units	
TOTAL DEV	ICE				
T <sub>STG</sub>	Storage Temperature	All	-40 to +150	°C	
T <sub>OPR</sub>	Operating Temperature	All	-40 to +85	°C	
T <sub>SOL</sub>	Lead Solder Temperature	All	260 for 10 seconds	°C	
TJ	Junction Temperature Range	All	-40 to +100	°C	
V <sub>ISO</sub>	Isolation Surge Voltage <sup>(1)</sup> (Peak AC Voltage, 60 Hz, 1 Second Duration)	All	7500	Vac(pk)	
PD	Total Device Power Dissipation at 25°C Ambient	All	330	mW	
	Derate Above 25°C		4.4	mW/°C	
EMITTER					
١ <sub>F</sub>	Continuous Forward Current	All	60	mA	
V <sub>R</sub>	Reverse Voltage	All	3	V	
PD	Total Power Dissipation at 25°C Ambient	All	100	mW	
	Derate Above 25°C		1.33	mW/°C	
DETECTOR	È contra				
V <sub>DRM</sub>	Off-State Output Terminal Voltage	MOC3010M/1M/2M	250	V	
		MOC3020M/1M/2M/3M	400		
I <sub>TSM</sub>	Peak Repetitive Surge Current (PW = 100 µs, 120 pps)	All	1	A	
PD	Total Power Dissipation at 25°C Ambient	All	300	mW	
	Derate Above 25°C		4	mW/°C	

#### Note:

1. Isolation surge voltage, V<sub>ISO</sub>, 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**

 $T_A = 25^{\circ}C$  unless otherwise specified.

### **Individual Component Characteristics**

Symbol	Parameters	Test Conditions	Device	Min.	Тур.	Max.	Units
EMITTER			•			•	
V <sub>F</sub>	Input Forward Voltage	I <sub>F</sub> = 10 mA	All		1.15	1.50	V
I <sub>R</sub>	Reverse Leakage Current	V <sub>R</sub> = 3 V, T <sub>A</sub> = 25°C	All		0.01	100	μA
DETECTO	OR						
I <sub>DRM</sub>	Peak Blocking Current, Either Direction	Rated V <sub>DRM</sub> , I <sub>F</sub> = $0^{(2)}$	All		10	100	nA
V <sub>TM</sub>	Peak On-State Voltage, Either Direction	$I_{TM}$ = 100 mA peak, $I_F$ = 0	All		1.8	3.0	V

### **Transfer Characteristics**

Symbol	DC Characteristics	Test Conditions	Device	Min.	Тур.	Max.	Units
I <sub>FT</sub>	LED Trigger Current	Voltage = 3 V <sup>(3)</sup>	MOC3020M			30	mA
			MOC3010M			15	1
			MOC3021M				
			MOC3011M			10	]
			MOC3022M				
			MOC3012M			5	]
			MOC3023M				
Ι <sub>Η</sub>	Holding Current, Either Direction		All		100		μA

### Notes:

- 2. Test voltage must be applied within dv/dt rating.
- 3. 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> (30 mA for MOC3020M, 15 mA for MOC3010M and MOC3021M, 10 mA for MOC3011M and MOC3022M, 5 mA for MOC3012M and MOC3023M) and absolute maximum I<sub>F</sub> (60 mA).



![](_page_5_Figure_1.jpeg)

![](_page_6_Figure_0.jpeg)

![](_page_7_Figure_0.jpeg)

## **Ordering Information**

Option	Order Entry Identifier (Example)	Description
No option	MOC3010M	Standard Through Hole Device
S	S MOC3010SM Surface Mount Lead Bend	
SR2	MOC3010SR2M	Surface Mount; Tape and Reel
т	T MOC3010TM 0.4" Lead Spacing	
V	MOC3010VM	VDE 0884
TV	MOC3010TVM	VDE 0884, 0.4" Lead Spacing
SV	V MOC3010SVM VDE 0884, Surface Mount	
SR2V	MOC3010SR2VM VDE 0884, Surface Mount, Tape and Ree	

## **Marking Information**

![](_page_8_Figure_3.jpeg)

Definiti	ons
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.

![](_page_9_Figure_0.jpeg)

MOC301XM, MOC302XM — 6-Pin DIP Random-Phase Optoisolators Triac Driver Output (250/400 Volt Peak)

![](_page_10_Figure_0.jpeg)

![](_page_11_Figure_0.jpeg)

![](_page_11_Figure_1.jpeg)

0.20-0.30

![](_page_12_Figure_0.jpeg)

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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.
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		Rev. 166

MOC301XM, MOC302XM — 6-Pin DIP Random-Phase Optoisolators Triac Driver Output (250/400 Volt Peak)

![](_page_14_Picture_0.jpeg)

# Authorized Distribution Brand :

![](_page_14_Picture_2.jpeg)

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