

# MOC8021M, MOC8050M Photodarlington Optocoupler (No Base Connection)

## Features

- High  $BV_{CEO}$ 
  - Minimum 50V (MOC8021M)
  - Minimum 80V (MOC8050M)
- High current transfer ratio:
  - Minimum 1,000% (MOC8021M)
  - Minimum 500% (MOC8050M)
- 500%
- No base connection for improved noise immunity
- Underwriters Laboratory (UL) recognized  
File #E90700, Volume 2
- IEC 60747-5-2 approved (ordering option V)

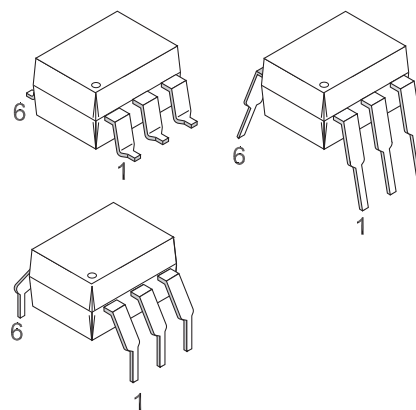
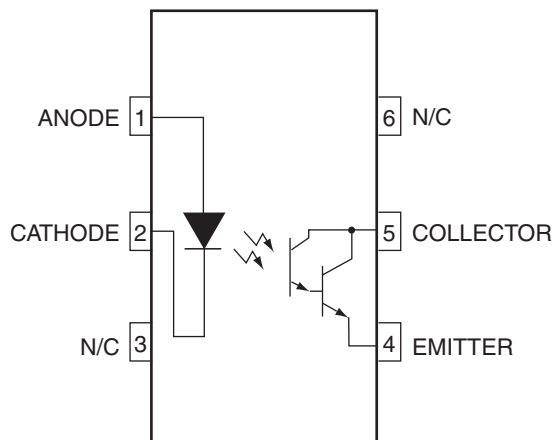
## Applications

- Appliances, measuring instruments
- I/O interface for computers
- Programmable controllers
- Portable electronics
- Interfacing and coupling systems of different potentials and impedance
- Solid state relays

## Description

The MOC8021M and MOC8050M are photodarlington-type optically coupled optocoupler. The devices have a gallium arsenide infrared emitting diode coupled with a silicon darlington phototransistor.

## Schematic



**Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

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	Parameter	Value	Units
<b>TOTAL DEVICE</b>			
$T_{STG}$	Storage Temperature	-55 to +150	$^\circ\text{C}$
$T_{OPR}$	Operating Temperature	-40 to +100	$^\circ\text{C}$
$T_{SOL}$	Lead Solder Temperature (Wave solder)	260 for 10 sec	$^\circ\text{C}$
$P_D$	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	250	mW
		2.94	mW/ $^\circ\text{C}$
<b>EMITTER</b>			
$I_F$	DC/Average Forward Input Current	60	mA
$V_R$	Reverse Input Voltage	3	V
$P_D$	LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	120	mW
		1.41	mW/ $^\circ\text{C}$
<b>DETECTOR</b>			
$V_{CEO}$	Collector-Emitter Voltage MOC8021M MOC8050M	50	V
		80	
$P_D$	Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	150	mW
		1.76	mW/ $^\circ\text{C}$
$I_C$	Continuous Collector Current	150	mA

**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)**Individual Component Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
<b>EMITTER</b>						
$V_F$	Input Forward Voltage	$I_F = 10\text{mA}$		1.18	2.00	V
$I_R$	Reverse Leakage Current	$V_R = 3.0\text{V}$		0.001	10	$\mu\text{A}$
<b>DETECTOR</b>						
$BV_{CEO}$	Collector-Emitter Breakdown Voltage MOC8021M MOC8050M	$I_C = 1.0\text{mA}, I_F = 0$	50 80	100 100		V
$BV_{ECO}$	Emitter-Collector Breakdown Voltage	$I_E = 100\mu\text{A}, I_F = 0$	5	10		V
$I_{CEO}$	Collector-Emitter Dark Current	$V_{CE} = 60\text{V}, I_F = 0$			1	$\mu\text{A}$
$C_{CE}$	Capacitance	$V_{CE} = 0\text{V}, f = 1\text{MHz}$		8		pF

**Transfer Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
<b>DC CHARACTERISTICS</b>						
CTR	Current Transfer Ratio, Collector to Emitter MOC8021M MOC8050M	$I_F = 10\text{mA}, V_{CE} = 5\text{V}$ $I_F = 10\text{mA}, V_{CE} = 1.5\text{V}$	1,000 500			%
<b>AC CHARACTERISTICS</b>						
$t_{on}$	Non-Saturated Turn-on Time	$I_F = 5\text{mA}, V_{CC} = 10\text{V},$ $R_L = 100\Omega$		8.5		$\mu\text{s}$
$t_{off}$	Turn-off Time	$I_F = 5\text{mA}, V_{CC} = 10\text{V},$ $R_L = 100\Omega$		95		$\mu\text{s}$

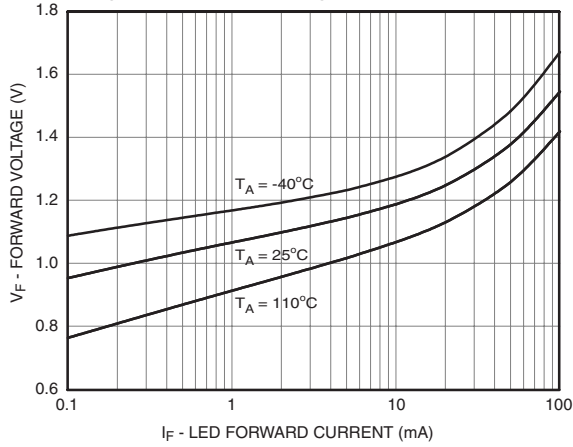
**Isolation Characteristics**

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Units
$V_{ISO}$	Input-Output Isolation Voltage	$f = 60\text{Hz}, t = 1 \text{ sec.}$	7500			Vac(pk)
$R_{ISO}$	Isolation Resistance	$V_{I-O} = 500\text{VDC}$	$10^{11}$			$\Omega$
$C_{ISO}$	Isolation Capacitance	$V_{I-O} = \emptyset, f = 1\text{MHz}$		0.2	2	pF

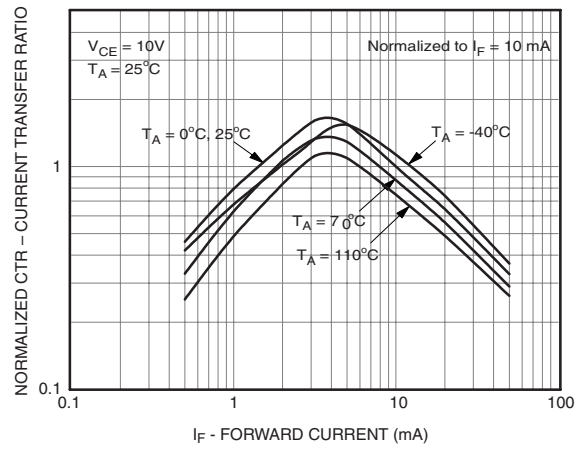
**Note:**\*Typical values at  $T_A = 25^\circ\text{C}$

## Typical Performance Curves

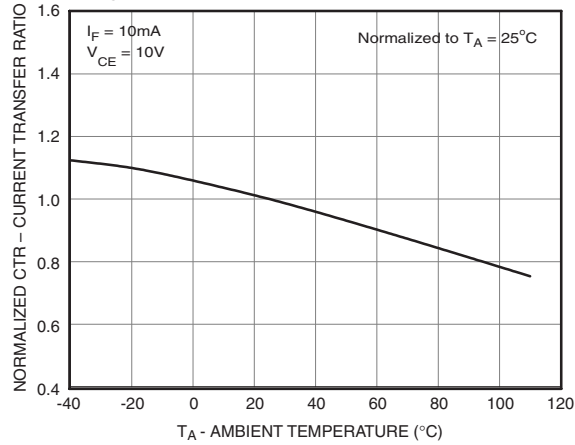
**Fig. 1 LED Forward Voltage vs. Forward Current**



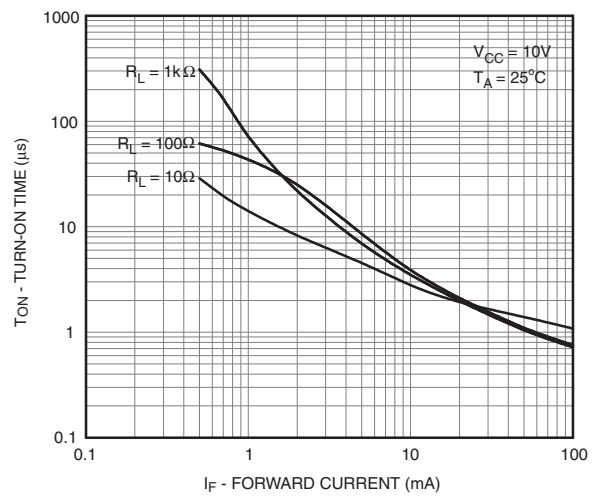
**Fig. 2 Normalized CTR vs. Forward Current**



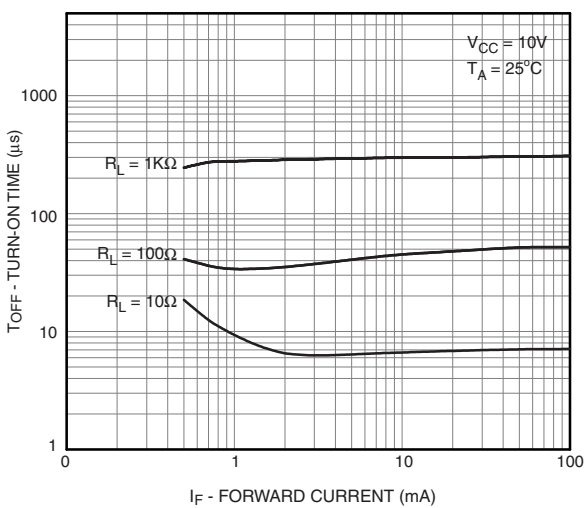
**Fig. 3 Normalized CTR vs. Ambient Temperature**



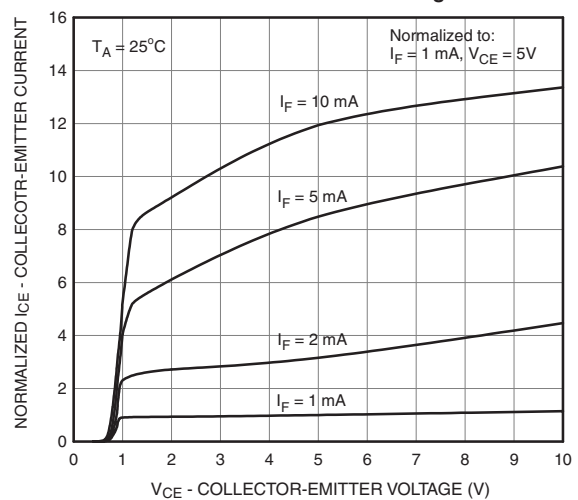
**Fig. 4 Turn-on Time vs. Forward Current**



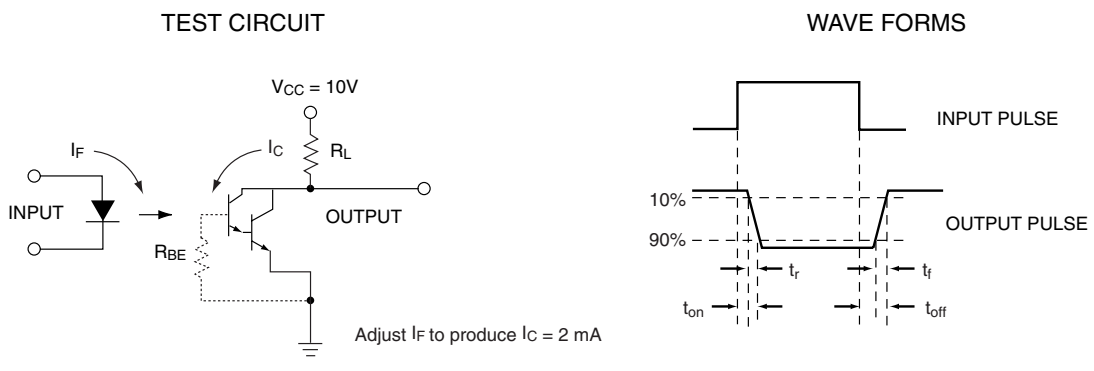
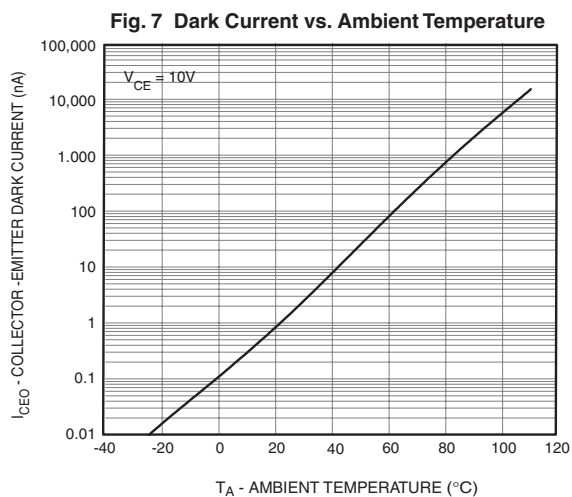
**Fig. 5 Turn-off Time vs. Forward Current**



**Fig. 6 Normalized Collector-Emitter Current vs. Collector-Emitter Voltage**



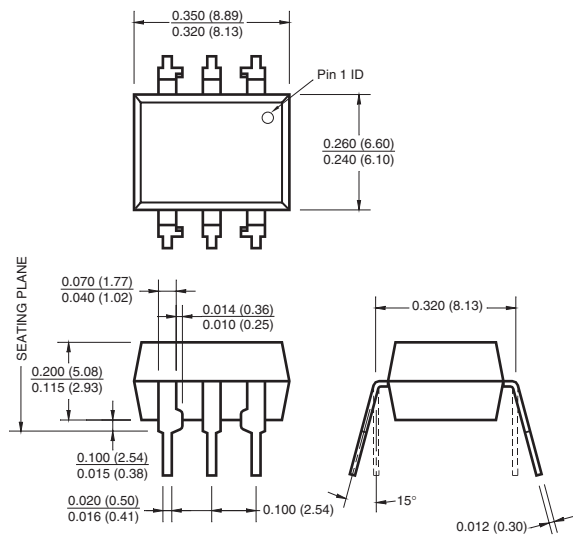
**Typical Performance Curves** (Continued)



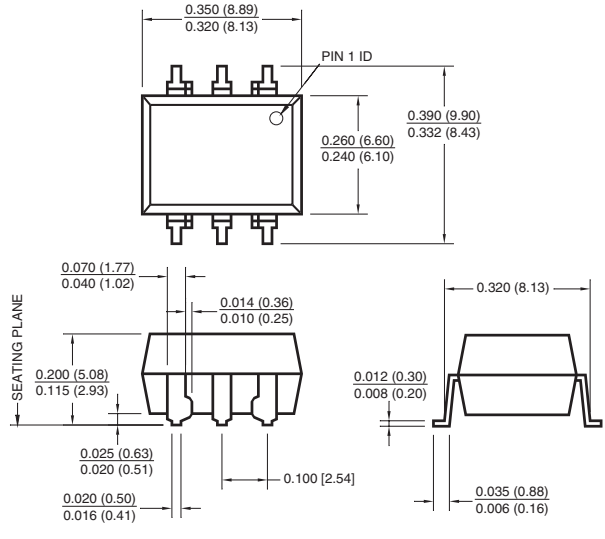
**Figure 8. Switching Time Test Circuit and Waveforms**

## Package Dimensions

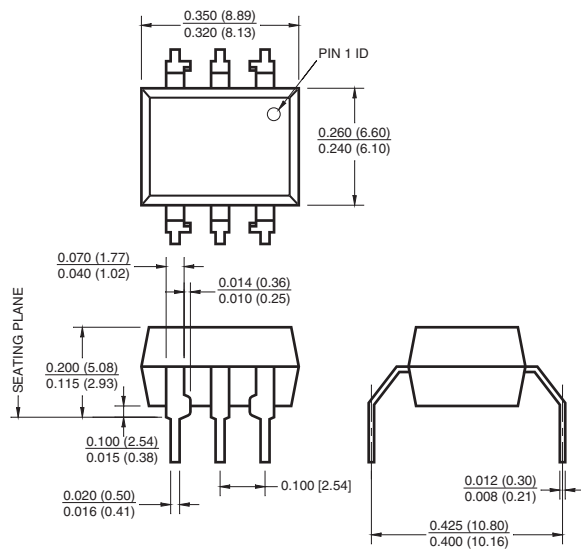
### Through Hole



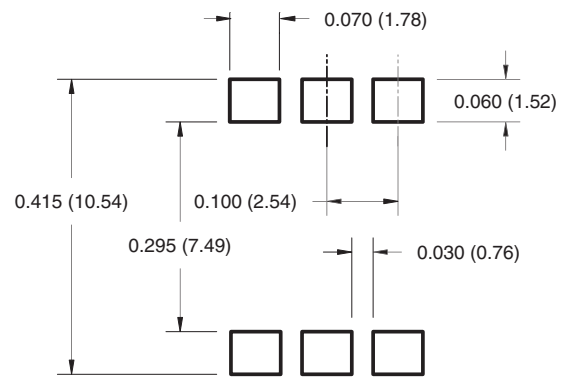
### Surface Mount



### 0.4" Lead Spacing



### Recommended Pad Layout for Surface Mount Leadform

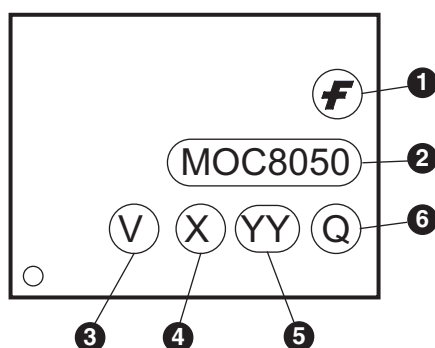


**Note:**  
All dimensions are in inches (millimeters).

## Ordering Information

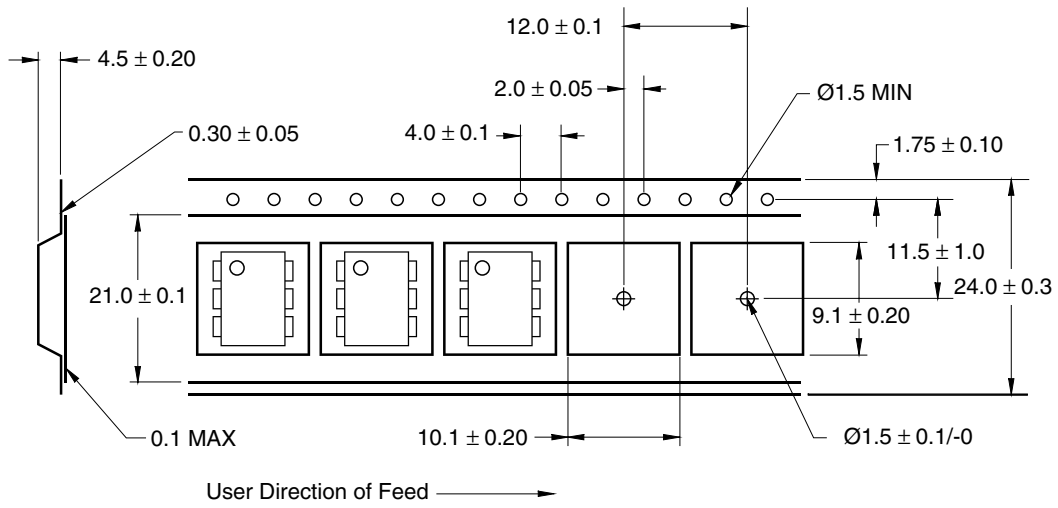
Option	Order Entry Identifier (Example)	Description
No suffix	MOC8050M	Standard Through Hole Device (50 parts per tube)
S	MOC8050SM	Surface Mount Lead Bend
SR2	MOC8050SR2M	Surface Mount; Tape and Reel
T	MOC8050TM	0.4" Lead Spacing
V	MOC8050VM	IEC60747-5-2
TV	MOC8050TVM	IEC60747-5-2, 0.4" Lead Spacing
SV	MOC8050SVM	IEC60747-5-2, Surface Mount
SR2V	MOC8050SR2VM	IEC60747-5-2, 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., '7'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

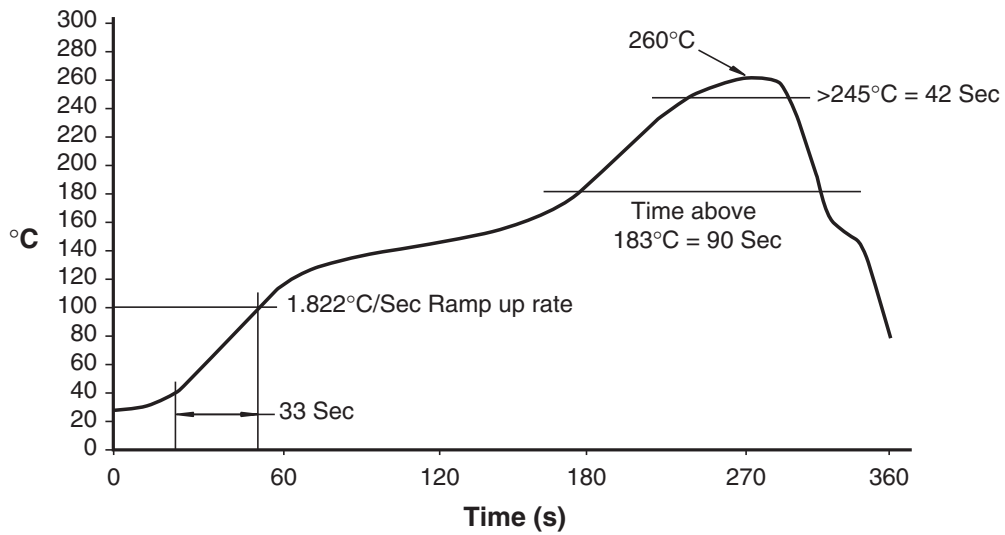
### Tape Dimensions



**Note:**

All dimensions are in millimeters.

### Reflow Soldering Profile







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## PRODUCT STATUS DEFINITIONS

### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This 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	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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