

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)

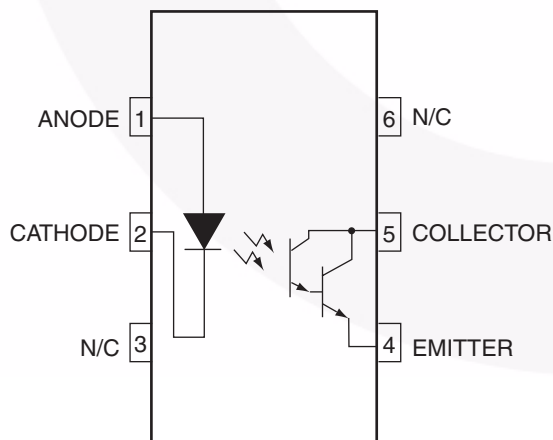
Applications

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

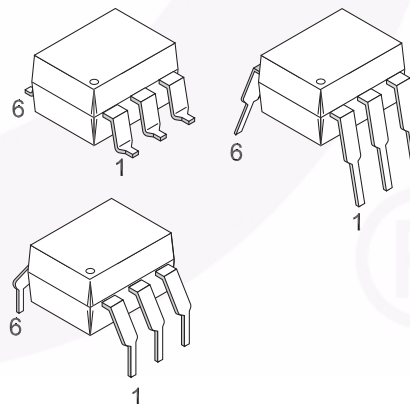
Description

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

Schematic



Package Outlines



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
TOTAL DEVICE			
T _{STG}	Storage Temperature	-40 to +150	°C
T _{OPR}	Operating Temperature	-40 to +100	°C
T _{SOL}	Lead Solder Temperature (Wave solder)	260 for 10 sec	°C
P _D	Total Device Power Dissipation @ T _A = 25°C Derate above 25°C	250	mW
		2.94	mW/°C
EMITTER			
I _F	DC/Average Forward Input Current	60	mA
V _R	Reverse Input Voltage	3	V
P _D	LED Power Dissipation @ T _A = 25°C Derate above 25°C	120	mW
		1.41	mW/°C
DETECTOR			
V _{CEO}	Collector-Emitter Voltage MOC8021M	50	V
	MOC8050M	80	
P _D	Detector Power Dissipation @ T _A = 25°C Derate above 25°C	150	mW
		1.76	mW/°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
EMITTER						
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	μA
DETECTOR						
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	μA
C_{CE}	Capacitance	$V_{CE} = 0\text{V}$, $f = 1\text{MHz}$		8		pF

Transfer Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
DC CHARACTERISTICS						
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			%
AC CHARACTERISTICS						
t_{on}	Non-Saturated Turn-on Time	$I_F = 5\text{mA}$, $V_{CC} = 10\text{V}$, $R_L = 100\Omega$		8.5		μs
t_{off}	Turn-off Time	$I_F = 5\text{mA}$, $V_{CC} = 10\text{V}$, $R_L = 100\Omega$		95		μs

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}			Ω
C_{ISO}	Isolation Capacitance	$V_{I-O} = \emptyset$, $f = 1\text{MHz}$		0.2	2	pF

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

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, $V_{IORM} \times 1.875 = V_{PR}$, 100% Production Test with $t_m = 1$ sec, Partial Discharge < 5pC	1594			V_{peak}
	Input to Output Test Voltage, Method a, $V_{IORM} \times 1.5 = V_{PR}$, Type and Sample Test with $t_m = 60$ 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 T_s , $V_{IO} = 500V$	10^9			Ω

Typical Performance Curves

Fig. 1 LED Forward Voltage vs. Forward Current

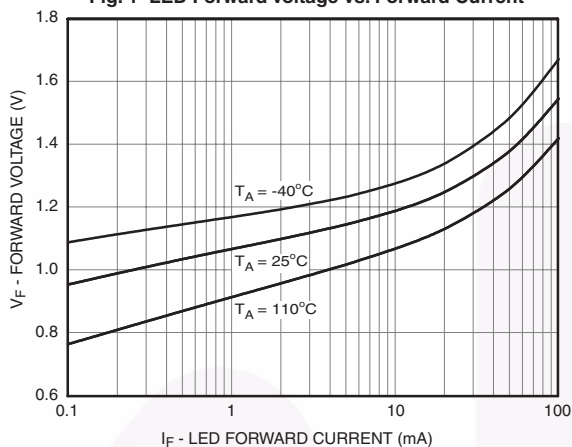


Fig. 2 Normalized CTR vs. Forward Current

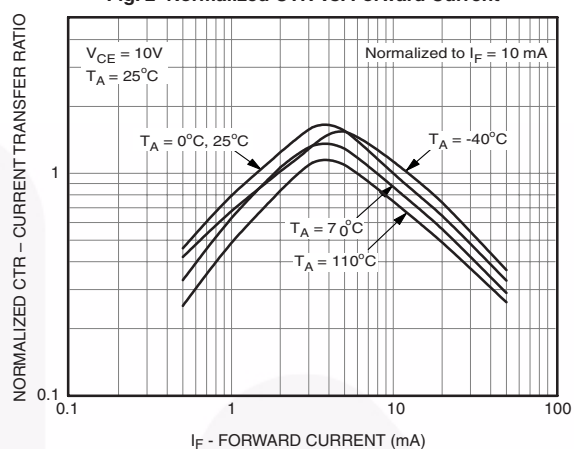


Fig. 3 Normalized CTR vs. Ambient Temperature

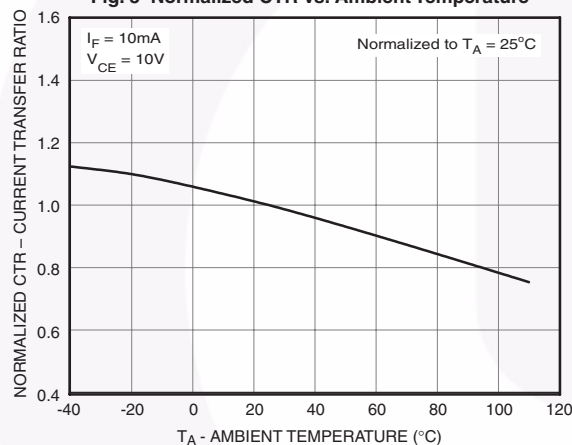


Fig. 4 Turn-on Time vs. Forward Current

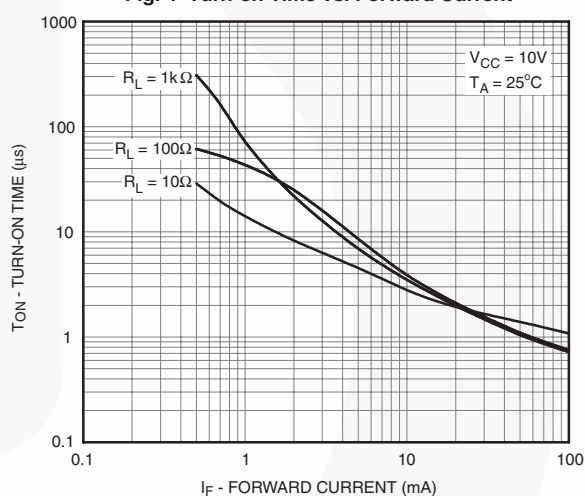


Fig. 5 Turn-off Time vs. Forward Current

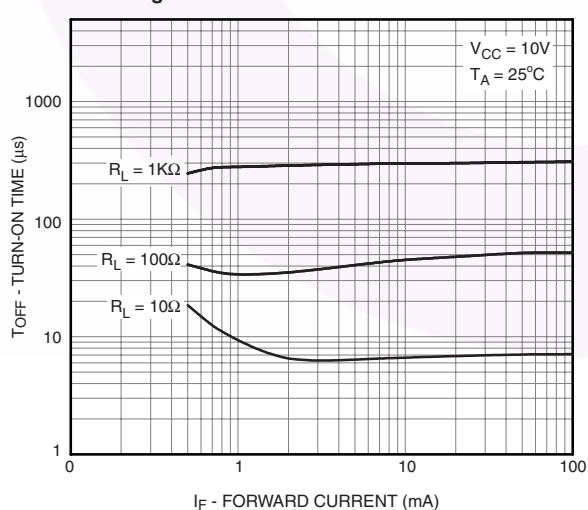
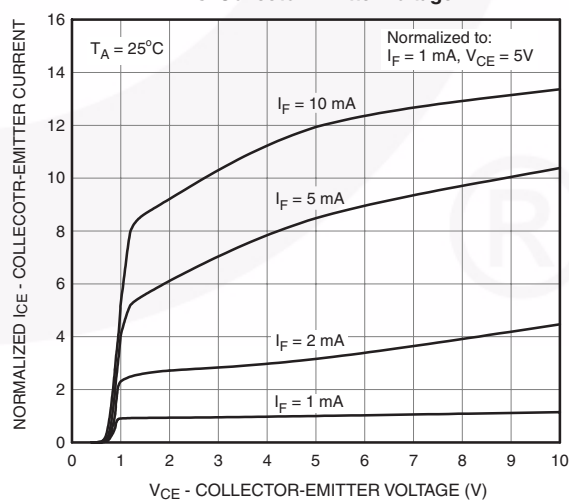
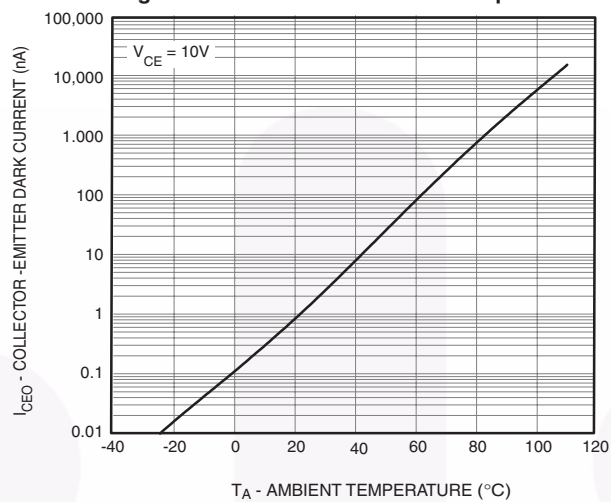


Fig. 6 Normalized Collector-Emitter Current vs. Collector-Emitter Voltage

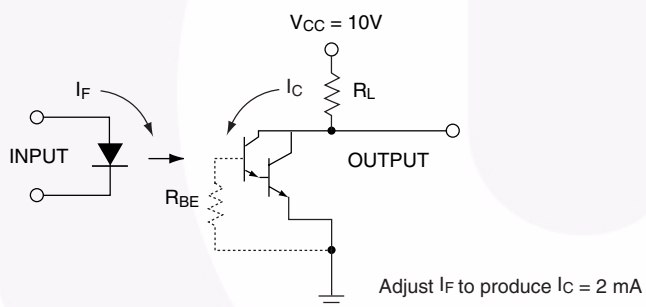


Typical Performance Curves (Continued)

Fig. 7 Dark Current vs. Ambient Temperature



TEST CIRCUIT



WAVE FORMS

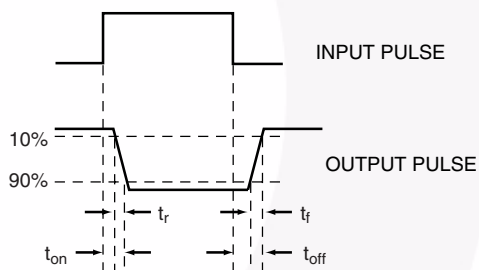
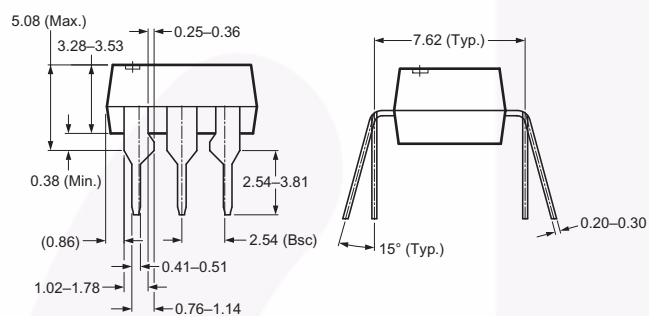
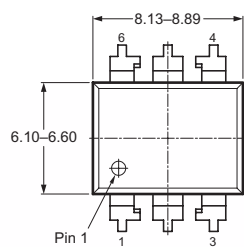


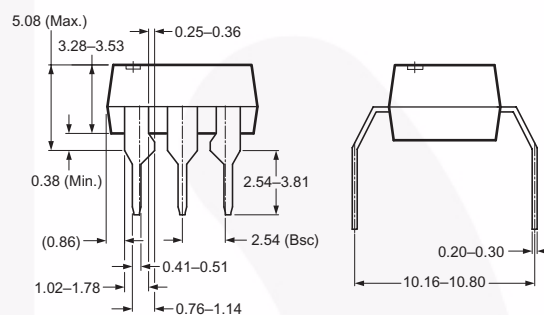
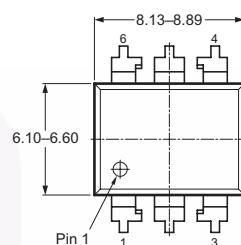
Figure 8. Switching Time Test Circuit and Waveforms

Package Dimensions

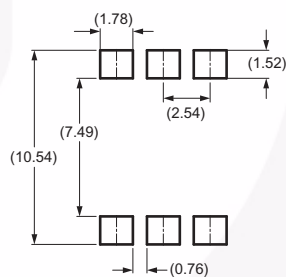
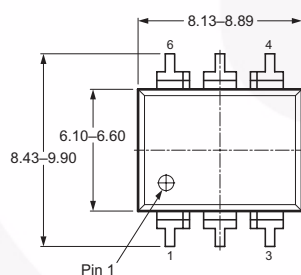
Through Hole



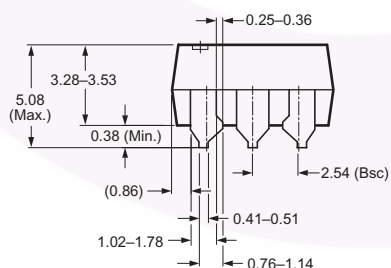
0.4" Lead Spacing



Surface Mount



Recommended Pad Layout

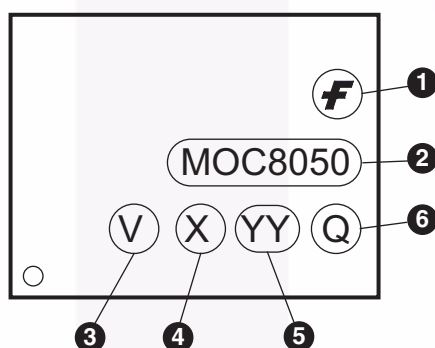


Note:
All dimensions in mm.

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

Note:
All dimensions are in millimeters.

The graph displays a thermal cycle with the following key features:

- Temperature (°C):** Y-axis ranging from 0 to 300.
- Time (s):** X-axis ranging from 0 to 360.
- Ramp Up Rate:** 1.822°C/Sec.
- Peak Temperature:** 260°C.
- Time to 100°C:** 33 Sec.
- Time above 183°C:** 90 Sec.
- Time above 245°C:** 42 Sec.





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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.
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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.
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