# 6-Pin DIP Photodarlington Optocoupler (No Base Connection)

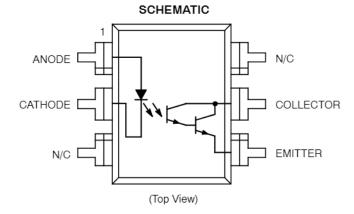
The MOC8021M and MOC8050M are photodarlington—type optically coupled optocouplers. The devices have a gallium arsenide infrared emitting diode coupled with a silicon darlington phototransistor.

#### **Features**

- High BVCEO:
  - Minimum 50 V (MOC8021M)
  - Minimum 80 V (MOC8050M)
- High Current Transfer Ratio:
  - Minimum 1000% (MOC8021M)
  - Minimum 500% (MOC8050M)
- · No Base Connection for Improved Noise Immunity
- · Safety and Regulatory Approvals:
  - UL1577, 4,170 VAC<sub>RMS</sub> for 1 Minute
  - DIN-EN/IEC60747-5-5, 850 V Peak Working Insulation Voltage

#### **Applications**

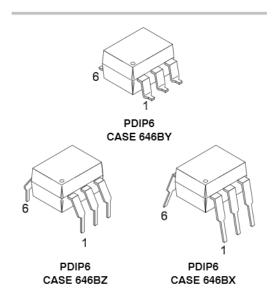
- · Appliances, Measuring Instruments
- I/O Interface for Computers
- Programmable Controllers
- Portable Electronics
- Interfacing and Coupling Systems of Different Potentials and Impedance
- Solid State Relays



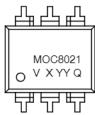


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### MARKING DIAGRAM



MOC8021 = Device Code

/ = DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)

X = One-Digit Year Code, e.g., "5"

YY = Digit Work Week,

Ranging from "01" to "53"

Q = Assembly Package Code

#### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 7 of this data sheet.

### Table 1. SAFETY AND INSULATION RATINGS

As per DIN EN/IEC 60747-5-5, 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.

Parameter	Characteristics	
Installation Classifications per DIN VDE 0110/1.89 Table 1,	< 150 V <sub>RMS</sub>	I–IV
For Rated Mains Voltage	< 300 V <sub>RMS</sub>	I–IV
Climatic Classification	55/100/21	
Pollution Degree (DIN VDE 0110/1.89)	2	
Comparative Tracking Index	175	

Symbol	Parameter	Value	Unit
V <sub>PR</sub>	Input-to-Output Test Voltage, Method A, V <sub>IORM</sub> x 1.6 = V <sub>PR</sub> , Type and Sample Test with t <sub>m</sub> = 10 s, Partial Discharge < 5 pC	1360	V <sub>peak</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	V <sub>peak</sub>
V <sub>IORM</sub>	Maximum Working Insulation Voltage	850	V <sub>peak</sub>
V <sub>IOTM</sub>	Highest Allowable Over-Voltage	6,000	V <sub>peak</sub>
	External Creepage	≥7	mm
	External Clearance	≥7	mm
	External Clearance (for Option TV, 0.4" Lead Spacing)	≥ 10	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.5	mm
T <sub>S</sub>	Case Temperature (Note 1)	175	°C
I <sub>S,INPUT</sub>	Input Current (Note 1)	350	mA
P <sub>S,OUTPUT</sub>	Output Power (Note 1)	800	mW
R <sub>IO</sub>	Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V (Note 1)	> 109	Ω

<sup>1.</sup> Safety limit values - maximum values allowed in the event of a failure.

#### Table 2. ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Units
TOTAL DEVICE	•	·	•
T <sub>STG</sub>	Storage Temperature	-40 to +125	°C
T <sub>OPR</sub>	Operating Temperature	-40 to +100	°C
TJ	Junction Temperature	-40 to +125	°C
T <sub>SOL</sub>	Lead Solder Temperature	260 for 10 seconds	°C
P <sub>D</sub>	Total Device Power Dissipation @ T <sub>A</sub> = 25°C	270	mW
	Derate above 25°C	2.94	mW/°C
EMITTER		•	
IF	DC/Average Forward Input Current	60	mA
V <sub>R</sub>	Reverse Input Voltage	3	V
P <sub>D</sub>	LED Power Dissipation @ T <sub>A</sub> = 25°C	120	mW
	Derate Above 25°C	1.41	mW/°C
DETECTOR		•	
I <sub>C</sub>	Continuous Collector Current	150	mA
V <sub>CEO</sub>	Collector-Emitter Voltage - MOC8021M	50	V
	Collector-Emitter Voltage - MOC8050M	80	V
P <sub>D</sub>	Detector Power Dissipation @ T <sub>A</sub> = 25°C	150	mW
	Derate Above 25°C	1.76	mW/°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Table 3. ELECTRICAL CHARACTERISTICS  $T_A = 25^{\circ}\text{C}$  unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
EMITTER	EMITTER					
V <sub>F</sub>	Input Forward Voltage	I <sub>F</sub> = 10 mA		1.18	2.00	V
I <sub>R</sub>	Reverse Leakage Current	V <sub>R</sub> = 3.0 V		0.001	10	μΑ
DETECTOR						
BV <sub>CEO</sub>	Collector-Emitter Breakdown Voltage (MOC8021M)	I <sub>C</sub> = 1.0 mA, I <sub>F</sub> = 0	50	100		V
	(MOC8050M)		80	100		V
BV <sub>ECO</sub>	Emitter-Collector Breakdown Voltage	I <sub>E</sub> = 100 μA, I <sub>F</sub> = 0	5	10		V
I <sub>CEO</sub>	Collector-Emitter Dark Current	V <sub>CE</sub> = 60 V, I <sub>F</sub> = 0			1	μΑ
C <sub>CE</sub>	Capacitance	V <sub>CE</sub> = 0 V, f = 1 MHz		8		pF

## Table 4. TRANSFER CHARACTERISTICS $T_A = 25$ °C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
DC CHARACT	DC CHARACTERISTICS					
CTR	Current Transfer Ratio, Collector-to-Emitter (MOC8021M)	I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 5 V	1,000			%
	(MOC8050M)	I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 1.5 V	500			%
AC CHARACT	ERISTICS	•				
t <sub>on</sub>	Turn-on Time	$I_F = 5 \text{ mA}, V_{CC} = 10 \text{ V},$ $R_L = 100 \Omega$		8.5		μS
t <sub>off</sub>	Turn-off Time	$I_F$ = 5 mA, $V_{CC}$ = 10 V, $R_L$ = 100 $\Omega$		95		μs

### **Table 5. ISOLATION CHARACTERISTICS**

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
V <sub>ISO</sub>	Input-Output Isolation Voltage	t = 1 Minute	4170			VAC <sub>RMS</sub>
C <sub>ISO</sub>	Isolation Capacitance	V <sub>I-O</sub> = 0 V, f = 1 MHz		0.2		pF
R <sub>ISO</sub>	Isolation Resistance	V <sub>I-O</sub> = ±500 VDC, T <sub>A</sub> = 25°C	10 <sup>11</sup>			Ω

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### TYPICAL CHARACTERISTICS

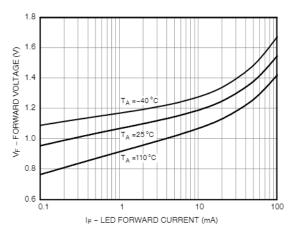


Figure 1. LED Forward Voltage vs. Forward Current

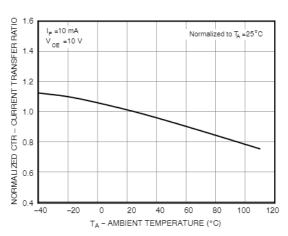


Figure 3. Normalized CTR vs. Ambient Temperature

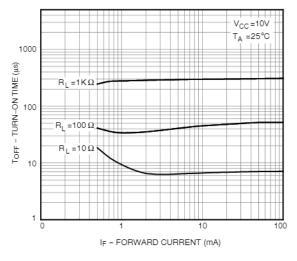


Figure 5. Turn-off Time vs. Forward Current

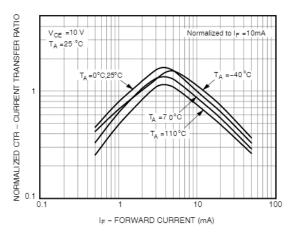


Figure 2. Normalized CTR vs. Forward Current

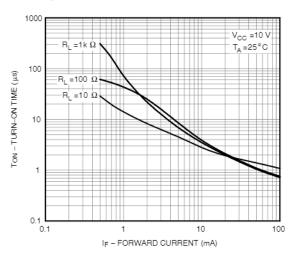


Figure 4. Turn-on Time vs. Forward Current

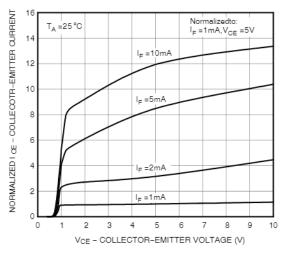


Figure 6. Normalized Collector-Emitter Current vs. Collector-Emitter Voltage

# Typical Performance Curves (Continued)

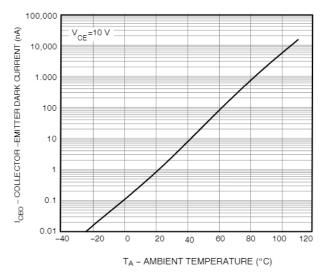


Figure 7. Dark Current vs. Ambient Temperature

# **Switching Time Test Circuit and Waveform**

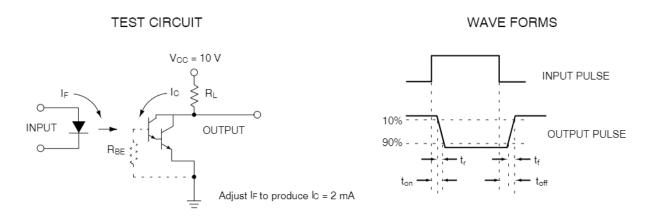


Figure 8. Switching Time Test Circuit and Waveform

### **REFLOW PROFILE**

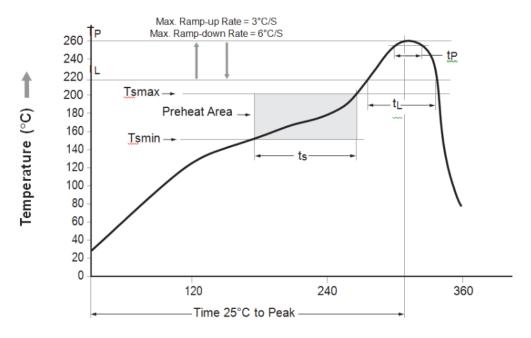


Figure 9. Reflow Profile

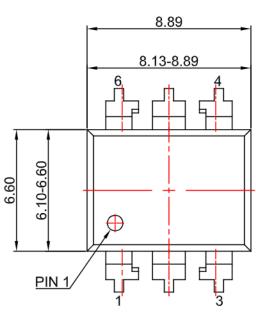
Profile Freature	Pb – Free Assembly Profile	
Temperature Min. (Tsmin)	150°C	
Temperature Max. (Tsmax)	200°C	
Time (t <sub>S</sub> ) from (Tsmin to Tsmax)	60-120 seconds	
Ramp – up Rate (tto t <sub>P</sub> )	3°C/second max.	
Liquidous Temperature (T <sub>L</sub> )	217°C	
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60-150 seconds	
Peak Body Package Temperature	260°C +0°C / -5°C	
Time (t <sub>P</sub> ) within 5°C of 260°C	30 seconds	
Ramp – down Rate (T <sub>P</sub> to T <sub>L</sub> )	6°C / second max.	
Time 25°C to Peak Temperature	8 minutes max.	

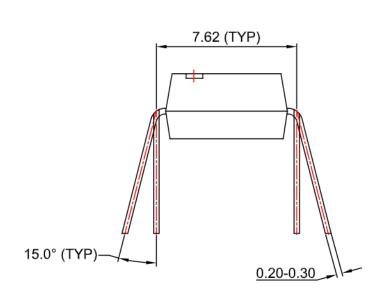
### ORDERING INFORMATION

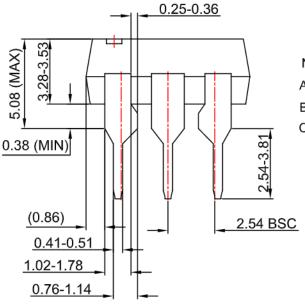
Part Number	Package	Packing Method
MOC8021M	DIP 6-Pin	Tube (50 Units)
MOC8021SM	SMT 6-Pin (Lead Bend)	Tube (50 Units)
MOC8021SR2M	SMT 6-Pin (Lead Bend)	Tape and Reel (1000 Units)
MOC8021VM	DIP 6-Pin, DIN EN/IEC60747-5-5 Option	Tube (50 Units)
MOC8021SVM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tube (50 Units)
MOC8021SR2VM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tape and Reel (1000 Units)
MOC8021TVM	DIP 6-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-5 Option	Tube (50 Units)
MOC8050M	DIP 6-Pin	Tube (50 Units)
MOC8050SM	SMT 6-Pin (Lead Bend)	Tube (50 Units)
MOC8050SR2M	SMT 6-Pin (Lead Bend)	Tape and Reel (1000 Units)
MOC8050VM	DIP 6-Pin, DIN EN/IEC60747-5-5 Option	Tube (50 Units)
MOC8050SVM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tube (50 Units)
MOC8050SR2VM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tape and Reel (1000 Units)
MOC8050TVM	DIP 6-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-5 Option	Tube (50 Units)

### PACKAGE DIMENSIONS

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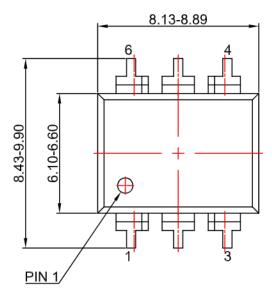


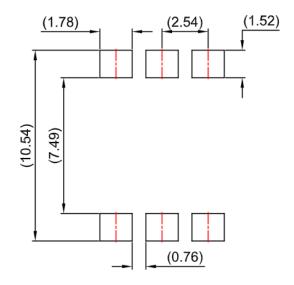
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- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION

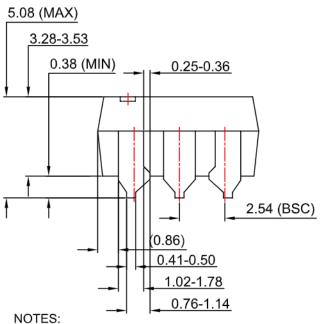
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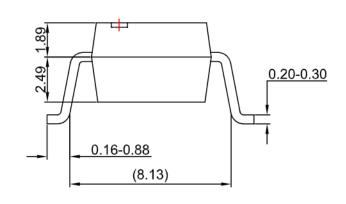
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LAND PATTERN RECOMMENDATION

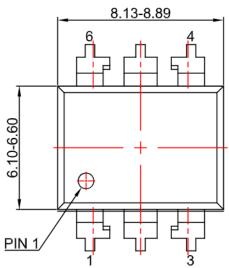


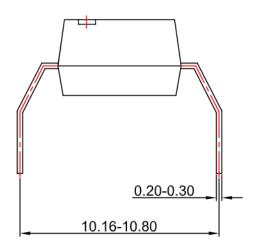


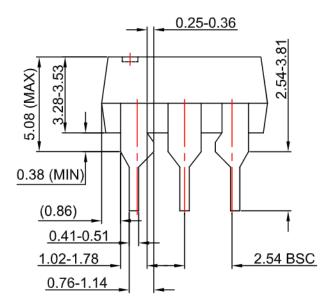
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