



December 2014

# MOCD207M, MOCD208M, MOCD211M, MOCD213M, MOCD217M 8-pin SOIC Dual-Channel Phototransistor Output Optocoupler

## Features

- Closely Matched Current Transfer Ratios
- Minimum  $BV_{CEO}$  of 70 V Guaranteed
  - MOCD207M, MOCD208M
- Minimum  $BV_{CEO}$  of 30 V Guaranteed
  - MOCD211M, MOCD213M, MOCD217M
- Low LED Input Current Required for Easier Logic Interfacing
  - MOCD217M
- Convenient Plastic SOIC-8 Surface Mountable Package Style, with 0.050" Lead Spacing
- Safety and Regulatory Approvals:
  - UL1577, 2,500  $VAC_{RMS}$  for 1 Minute
  - DIN-EN/IEC60747-5-5, 565 V Peak Working Insulation Voltage

## Applications

- Feedback Control Circuits
- Interfacing and Coupling Systems of Different Potentials and Impedances
- General Purpose Switching Circuits
- Monitor and Detection Circuits

## Description

These devices consist of two gallium arsenide infrared emitting diodes optically coupled to two monolithic silicon phototransistor detectors, in a surface mountable, small outline, plastic package. They are ideally suited for high-density applications, and eliminate the need for through-the-board mounting.

## Schematic

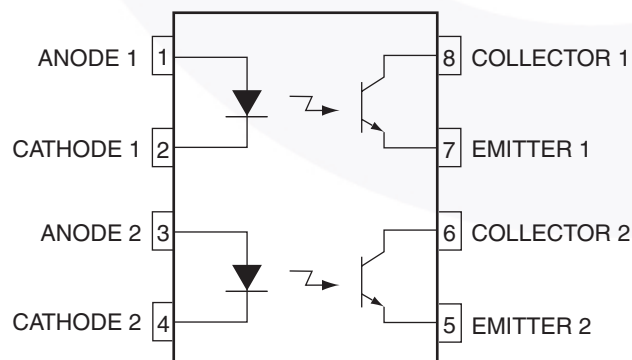


Figure 1. Schematic

## Package Outline

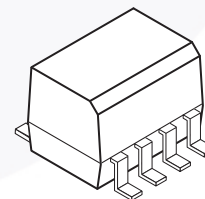


Figure 2. Package Outline

## 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, For Rated Mains Voltage	< 150 V <sub>RMS</sub>	I–IV
	< 300 V <sub>RMS</sub>	I–III
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> × 1.6 = V <sub>PR</sub> , Type and Sample Test with t <sub>m</sub> = 10 s, Partial Discharge < 5 pC	904	V <sub>peak</sub>
	Input-to-Output Test Voltage, Method B, V <sub>IORM</sub> × 1.875 = V <sub>PR</sub> , 100% Production Test with t <sub>m</sub> = 1 s, Partial Discharge < 5 pC	1060	V <sub>peak</sub>
V <sub>IORM</sub>	Maximum Working Insulation Voltage	565	V <sub>peak</sub>
V <sub>IOTM</sub>	Highest Allowable Over-Voltage	4000	V <sub>peak</sub>
	External Creepage	≥ 4	mm
	External Clearance	≥ 4	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.4	mm
T <sub>S</sub>	Case Temperature <sup>(1)</sup>	150	°C
I <sub>S,INPUT</sub>	Input Current <sup>(1)</sup>	200	mA
P <sub>S,OUTPUT</sub>	Output Power <sup>(1)</sup>	300	mW
R <sub>IO</sub>	Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V <sup>(1)</sup>	> 10 <sup>9</sup>	Ω

### Note:

1. Safety limit values – maximum values allowed in the event of a failure.

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

Symbol	Rating	Value	Unit
<b>TOTAL DEVICE</b>			
$T_{STG}$	Storage Temperature	-40 to +125	$^\circ\text{C}$
$T_A$	Ambient Operating Temperature	-40 to +100	$^\circ\text{C}$
$T_J$	Junction Temperature	-40 to +125	$^\circ\text{C}$
$T_{SOL}$	Lead Solder Temperature	260 for 10 seconds	$^\circ\text{C}$
$P_D$	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$	240	mW
	Derate Above $25^\circ\text{C}$	2.94	mW/ $^\circ\text{C}$
<b>EMITTER</b>			
$I_F$	Continuous Forward Current	60	mA
$I_F$ (pk)	Forward Current – Peak (PW = 100 $\mu\text{s}$ , 120 pps)	1.0	A
$V_R$	Reverse Voltage	6.0	V
$P_D$	LED Power Dissipation @ $T_A = 25^\circ\text{C}$	90	mW
	Derate Above $25^\circ\text{C}$	0.8	mW/ $^\circ\text{C}$
<b>DETECTOR</b>			
$I_C$	Continuous Collector Current	150	mA
$V_{CEO}$	Collector-Emitter Voltage		
	MOCD207M, MOCD208M, MOCD213M	70	V
	MOCD211M, MOCD217M	30	V
$V_{ECO}$	Emitter-Collector Voltage	7	V
$P_D$	Detector Power Dissipation @ $T_A = 25^\circ\text{C}$	150	mW
	Derate Above $25^\circ\text{C}$	1.76	mW/ $^\circ\text{C}$

## Electrical Characteristics

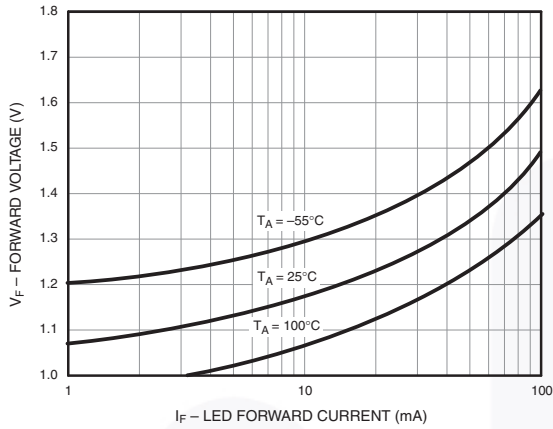
$T_A = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>EMITTER</b>						
$V_F$	Input Forward Voltage MOCD217M	$I_F = 1\text{ mA}$		1.05	1.3	V
	MOCD213M	$I_F = 10\text{ mA}$		1.15	1.5	V
	MOCD207M, MOCD208M, MOCD211M	$I_F = 30\text{ mA}$		1.25	1.5	V
$I_R$	Reverse Leakage Current	$V_R = 6\text{ V}$		0.001	100	$\mu\text{A}$
$C_{IN}$	Input Capacitance			18		pF
<b>DETECTOR</b>						
$I_{CEO}$	Collector-Emitter Dark Current	$V_{CE} = 10\text{ V}, T_A = 25^\circ\text{C}$		1.0	50	nA
		$V_{CE} = 10\text{ V}, T_A = 100^\circ\text{C}$		1.0		$\mu\text{A}$
$BV_{CEO}$	Collector-Emitter Breakdown Voltage MOCD211M, MOCD217M	$I_C = 100\text{ }\mu\text{A}$	30	100		V
	MOCD207M, MOCD208M, MOCD213M	$I_C = 100\text{ }\mu\text{A}$	70	100		V
$BV_{ECO}$	Emitter-Collector Breakdown Voltage	$I_E = 100\text{ }\mu\text{A}$	7	10		V
$C_{CE}$	Collector-Emitter Capacitance	$f = 1.0\text{ MHz}, V_{CE} = 0$		7		pF
<b>COUPLED</b>						
CTR	Collector-Output Current MOCD207M	$I_F = 10\text{ mA}, V_{CE} = 5\text{ V}$	100		200	%
	MOCD208M	$I_F = 10\text{ mA}, V_{CE} = 5\text{ V}$	40		125	%
	MOCD211M	$I_F = 10\text{ mA}, V_{CE} = 5\text{ V}$	20			%
	MOCD213M	$I_F = 10\text{ mA}, V_{CE} = 5\text{ V}$	100			%
	MOCD217M	$I_F = 1\text{ mA}, V_{CE} = 5\text{ V}$	100			%
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$I_C = 2\text{ mA}, I_F = 10\text{ mA}$			0.4	V
$t_{on}$	Turn-On Time	$I_C = 2\text{ mA}, V_{CC} = 10\text{ V},$ $R_L = 100\text{ }\Omega$ (Figure 8)		7.5		$\mu\text{s}$
$t_{off}$	Turn-Off Time	$I_C = 2\text{ mA}, V_{CC} = 10\text{ V},$ $R_L = 100\text{ }\Omega$ (Figure 8)		5.7		$\mu\text{s}$
$t_r$	Rise Time	$I_C = 2\text{ mA}, V_{CC} = 10\text{ V},$ $R_L = 100\text{ }\Omega$ (Figure 8)		3.2		$\mu\text{s}$
$t_f$	Fall Time	$I_C = 2\text{ mA}, V_{CC} = 10\text{ V},$ $R_L = 100\text{ }\Omega$ (Figure 8)		4.7		$\mu\text{s}$

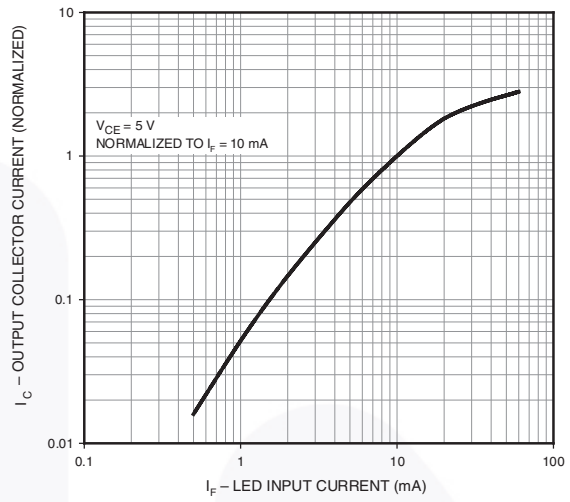
## Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
$V_{ISO}$	Input-Output Isolation Voltage	$t = 1\text{ Minute}$	2500			$V_{AC_{RMS}}$
$C_{ISO}$	Isolation Capacitance	$V_{I-O} = 0\text{ V}, f = 1\text{ MHz}$		0.2		pF
$R_{ISO}$	Isolation Resistance	$V_{I-O} = \pm 500\text{ VDC}, T_A = 25^\circ\text{C}$	$10^{11}$			$\Omega$

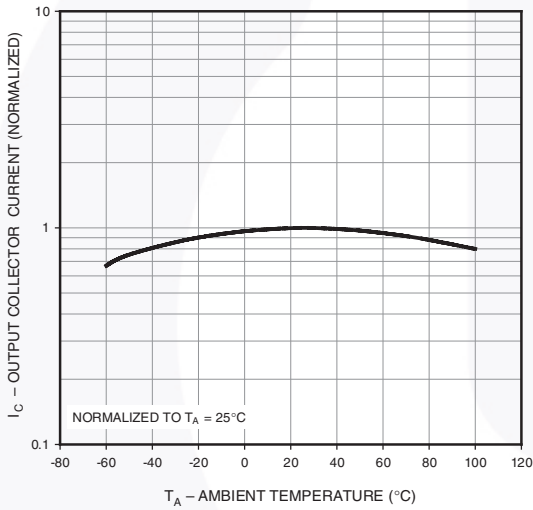
### Typical Performance Curves



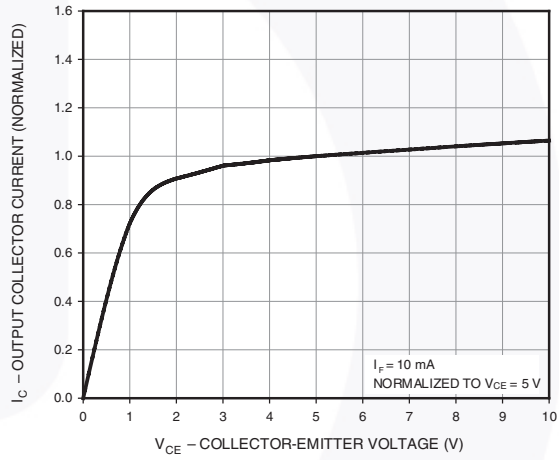
**Figure 3. LED Forward Voltage vs. Forward Current**



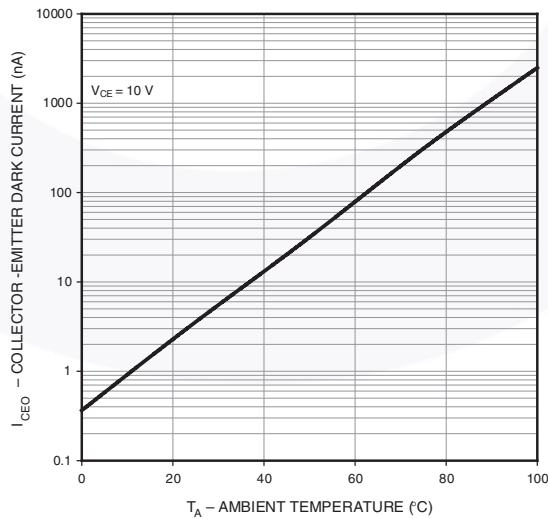
**Figure 4. Output Current vs. Input Current**



**Figure 5. Output Current vs. Ambient Temperature**



**Figure 6. Output Current vs. Collector-Emitter Voltage**



**Figure 7. Dark Current vs. Ambient Temperature**

### Switching Time Test Circuit and Waveforms

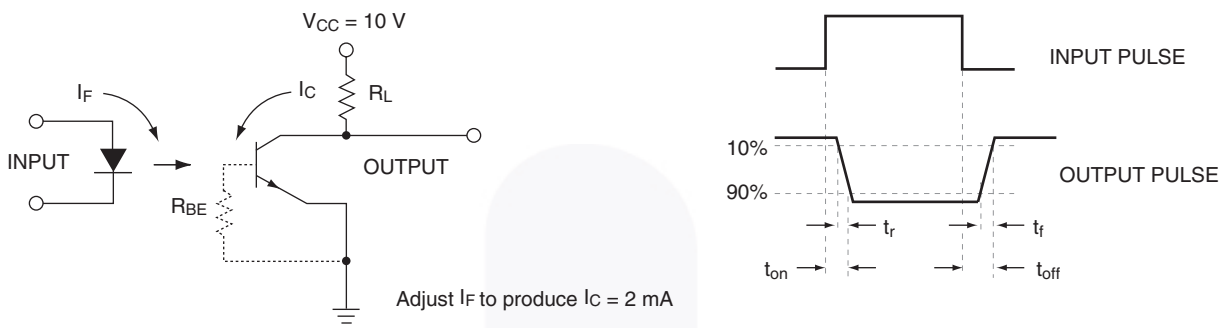


Figure 8. Switching Time Test Circuit and Waveforms



## Reflow Profile

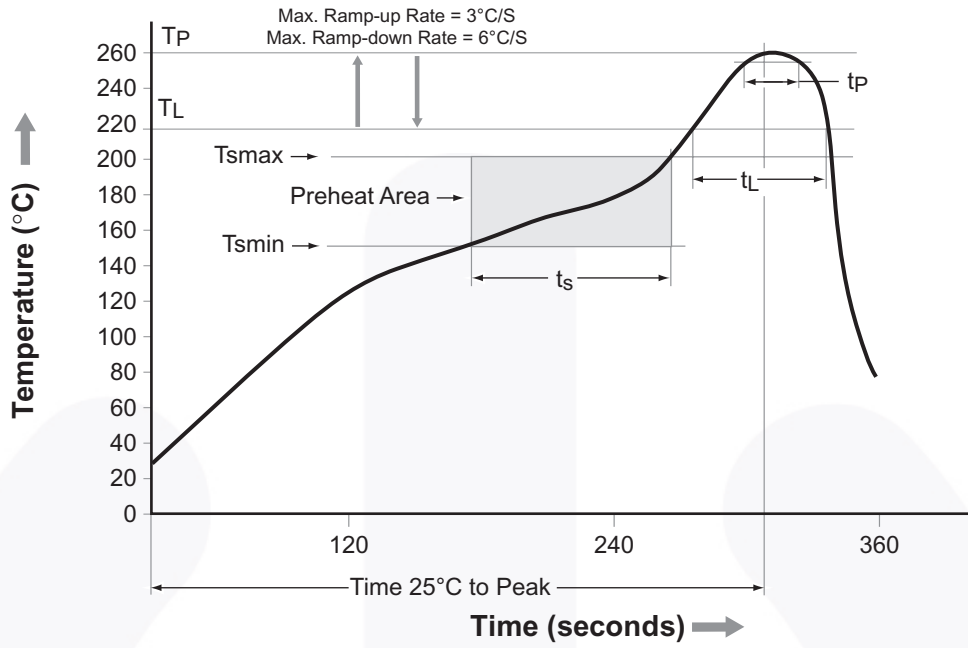


Figure 9. Reflow Profile

Profile Feature	Pb-Free Assembly Profile
Temperature Minimum (T <sub>min</sub> )	150°C
Temperature Maximum (T <sub>max</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>min</sub> to T <sub>max</sub> )	60–120 seconds
Ramp-up Rate (t <sub>L</sub> to t <sub>p</sub> )	3°C/second maximum
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 maximum
Time 25°C to Peak Temperature	8 minutes maximum

## Ordering Information

Part Number	Package	Packing Method
MOCD207M	Small Outline 8-Pin	Tube (100 Units)
MOCD207R2M	Small Outline 8-Pin	Tape and Reel (1000 Units)
MOCD207VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	Tube (100 Units)
MOCD207R2VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	Tape and Reel (1000 Units)

**Note:**

2. The product orderable part number system listed in this table also applies to the MOCD208M, MOCD211M, MOCD213M, and MOCD217M products.

## Marking Information

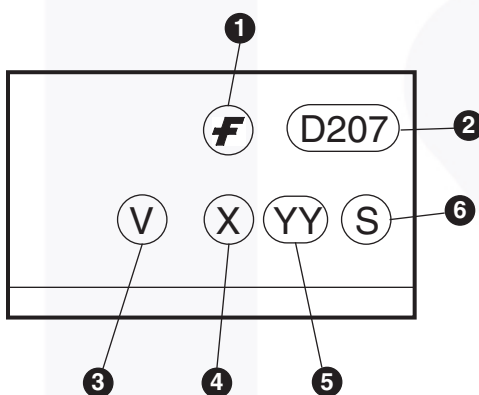


Figure 10. Top Mark

Table 1. Top Mark Definitions

1	Fairchild Logo
2	Device Number
3	DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)
4	One-Digit Year Code, e.g., “4”
5	Digit Work Week, Ranging from “01” to “53”
6	Assembly Package Code





NOTES:






- A) NO STANDARD APPLIES TO THIS PACKAGE
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
- D) LANDPATTERN STANDARD: SOIC127P600X175-8M.
- E) DRAWING FILENAME: MKT-M08Erev5





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