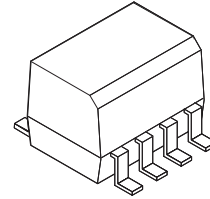


# 8-pin SOIC Darlington Output Optocouplers

## MOC223M, MOCD223M



SOIC8  
CASE 751DZ

### Description

The MOC223M consists of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon photodarlington detector, in a surface mountable, small outline, plastic package. The MOCD223M is a dual-channel version of the MOC223M. They are ideally suited for high density applications, and eliminates the need for through the board mounting.

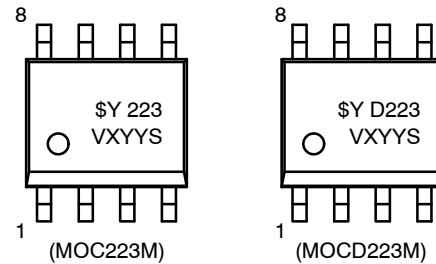
### Features

- High Current Transfer Ratio of 500% Minimum at  $I_F = 1 \text{ mA}$
- Minimum  $BV_{CEO}$  of 30 V Guaranteed
- Convenient Plastic SOIC-8 Surface Mountable Package Style, with 0.050" Lead Spacing
- Safety and Regulatory Approvals:
  - ◆ UL2688, 2,500  $V_{AC_{RMS}}$  for 1 Minute
  - ◆ DIN-EN/IEC60747-5-5, 565 V Peak Working Insulation Voltage
- These Devices are Pb-Free and Halogen Free

### Applications

- Low Power Logic Circuits
- Interfacing and Coupling Systems of Different Potentials and Impedances
- Telecommunications Equipment
- Portable Electronics
- Solid State Relays

### MARKING DIAGRAMS



- |          |                              |
|----------|------------------------------|
| \$Y      | = onsemi Logo                |
| 223/D223 | = Specific Device Code       |
| V        | = DIN EN/IEC60747-5-5 Option |
| X        | = One-Digit Year Code        |
| YY       | = Digit Work Week            |
| S        | = Assembly Package Code      |

### ORDERING INFORMATION

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

# MOC223M, MOCD223M

## SCHEMATICS

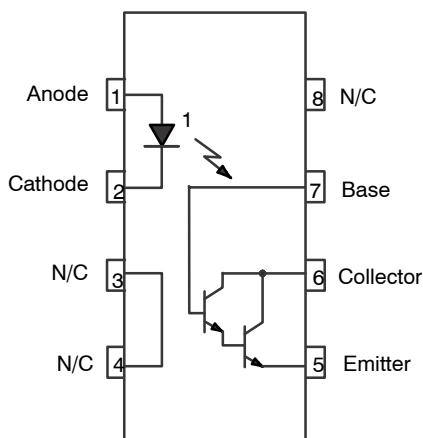


Figure 1. Schematic – MOC223M

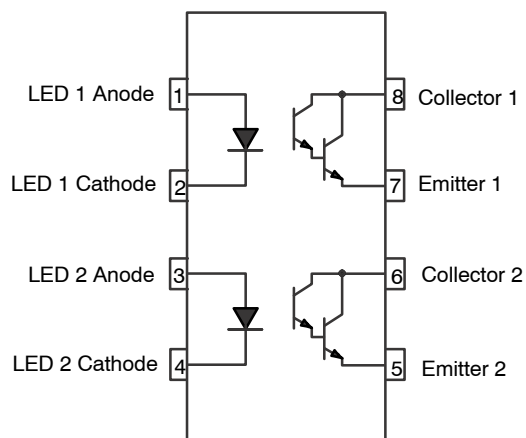


Figure 2. Schematic – MOCD223M

### SAFETY AND INSULATION RATINGS

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>IORM</sub>	Maximum Working Insulation Voltage	565	
V <sub>IOTM</sub>	Highest Allowable Over-Voltage	4000	
	External Creepage	≥ 4	mm
	External Clearance	≥ 4	
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.4	
T <sub>S</sub>	Case Temperature (Note 1)	150	°C
I <sub>S,INPUT</sub>	Input Current (Note 1)	200	mA
P <sub>S,OUTPUT</sub>	Output Power (Note 1)	300	mW
R <sub>IO</sub>	Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V (Note 1)	> 10 <sup>9</sup>	Ω

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.

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

# MOC223M, MOCD223M

**ABSOLUTE MAXIMUM RATINGS**  $T_A = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Value	Unit
<b>TOTAL DEVICE</b>			
$T_{STG}$	Storage Temperature	-40 to +125	°C
$T_A$	Ambient Operating Temperature	-40 to +100	
$T_J$	Junction Temperature	-40 to +125	
$T_{SOL}$	Lead Solder Temperature	260 for 10 s	
$P_D$	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$	240	mW
	Derate Above $25^\circ\text{C}$	2.94	mW/°C

## EMITTER

$I_F$	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/°C

## DETECTOR

$I_C$	Continuous Collector Current	150	mA
$V_{CEO}$	Collector–Emitter Voltage	30	V
$V_{CBO}$	Collector–Base Voltage, MOC223M	70	
$V_{ECO}$	Emitter–Collector Voltage	7	
$P_D$	Detector Power Dissipation @ $T_A = 25^\circ\text{C}$	150	mW
	Derate Above $25^\circ\text{C}$	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.

**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	$I_F = 1.0\text{ mA}$	–	1.08	1.3	V
$I_R$	Reverse Leakage Current	$V_R = 6.0\text{ V}$	–	0.001	100	$\mu\text{A}$
$C_{IN}$	Input Capacitance		–	18	–	pF

## DETECTOR

$I_{CEO1}$	Collector–Emitter Dark Current	$V_{CE} = 5.0\text{ V}, T_A = 25^\circ\text{C}$	–	1.0	50	nA
$I_{CEO2}$		$V_{CE} = 5.0\text{ V}, T_A = 100^\circ\text{C}$	–	1.0	–	$\mu\text{A}$
$BV_{CEO}$	Collector–Emitter Breakdown Voltage	$I_C = 100\ \mu\text{A}$	30	100	–	V
$BV_{CBO}$	Collector–Base Breakdown Voltage	$I_C = 100\ \mu\text{A}$	70	120	–	
$BV_{ECO}$	Emitter–Collector Breakdown Voltage	$I_E = 100\ \mu\text{A}$	7	10	–	
$C_{CE}$	Collector–Emitter Capacitance	$f = 1.0\text{ MHz}, V_{CE} = 0$	–	5.5	–	pF

## COUPLED

CTR	Current Transfer Ratio	$I_F = 1.0\text{ mA}, V_{CE} = 5.0\text{ V}$	500	1000	–	%
$V_{CE(sat)}$	Collector–Emitter Saturation Voltage	$I_C = 500\ \mu\text{A}, I_F = 1.0\text{ mA}$	–	–	1.0	V
$t_{on}$	Turn–On Time	$I_F = 5.0\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\ \Omega$ (Figure 8)	–	10	–	$\mu\text{s}$
$t_{off}$	Turn–Off Time		–	55	–	
$t_r$	Rise Time		–	8	–	
$t_f$	Fall Time		–	45	–	

# MOC223M, MOCD223M

**ELECTRICAL CHARACTERISTICS**  $T_A = 25^\circ\text{C}$  unless otherwise specified. (continued)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>ISOLATION CHARACTERISTICS</b>						
$V_{ISO}$	Input-Output Isolation Voltage	$t = 1 \text{ min}$	2500	-	-	$V_{AC_{RMS}}$
$C_{ISO}$	Isolation Capacitance	$V_{I-O} = 0, f = 1 \text{ MHz}$	-	0.2	-	pF
$R_{ISO}$	Isolation Resistance	$V_{I-O} = \pm 500 V_{DC}, T_A = 25^\circ\text{C}$	$10^{11}$	-	-	$\Omega$

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 PERFORMANCE CURVES

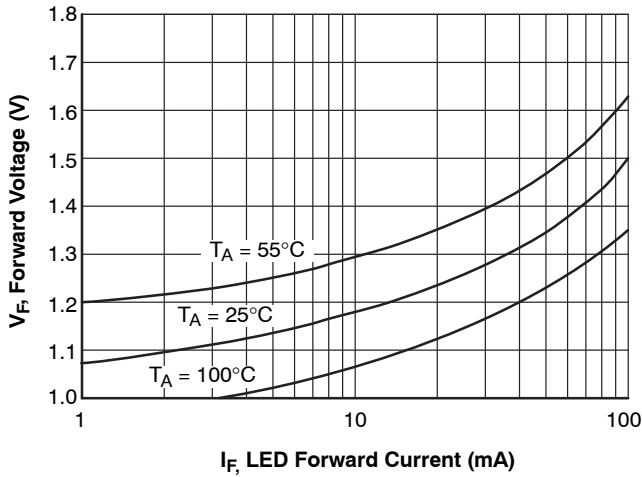


Figure 3. LED Forward Voltage vs. Forward Current

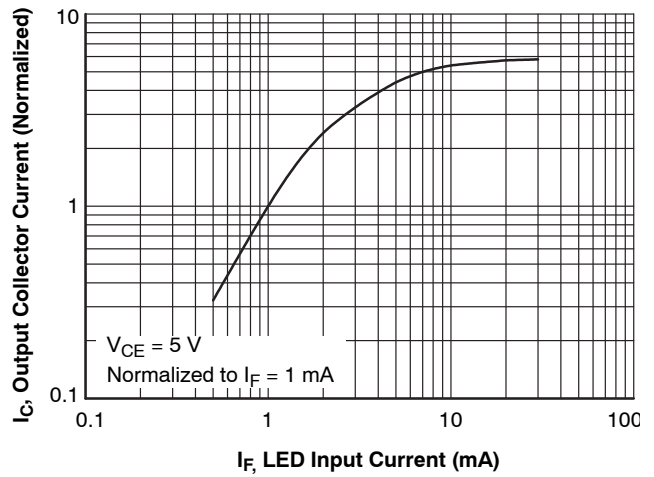


Figure 4. Output Current vs. Input Current

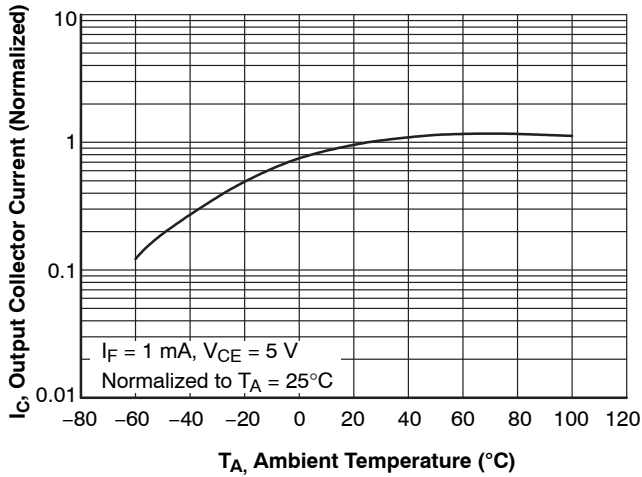


Figure 5. LED Forward Voltage vs. Forward Current

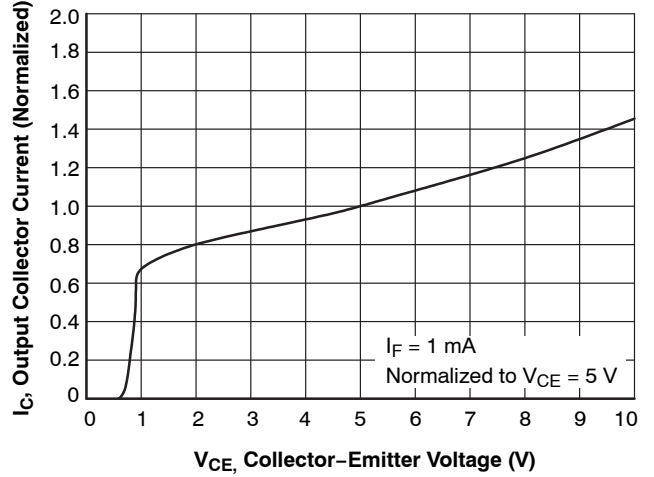


Figure 6. Output Current vs. Collector-Emitter Voltage

# MOC223M, MOCD223M

## TYPICAL PERFORMANCE CURVES

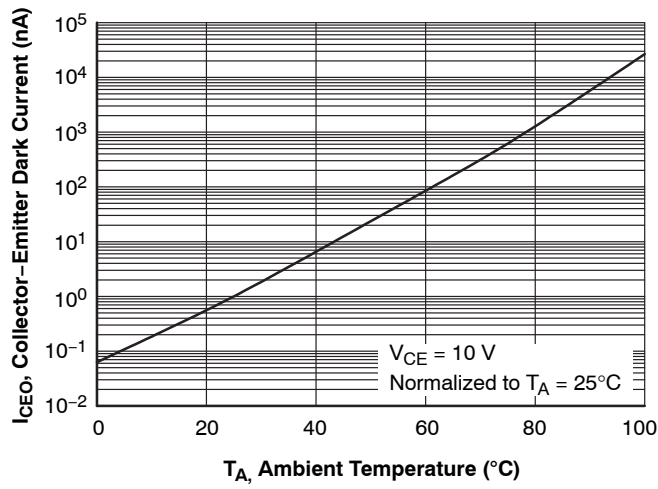


Figure 7. Dark Current vs. Ambient Temperature

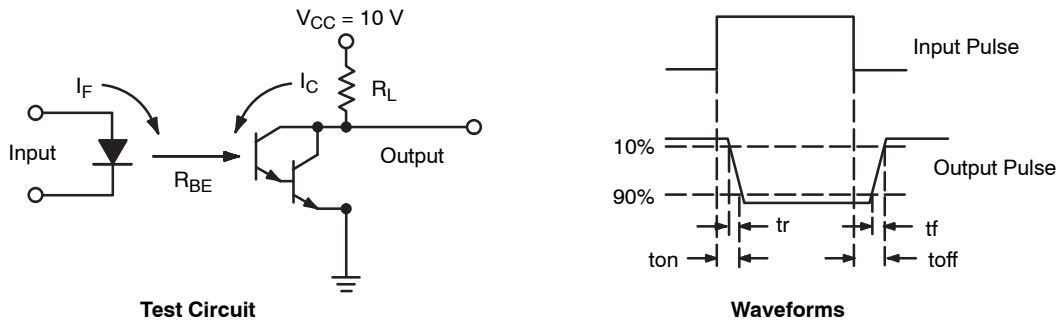


Figure 8. Switching Time Test Circuit and Waveforms

# MOC223M, MOCD223M

## REFLOW PROFILE

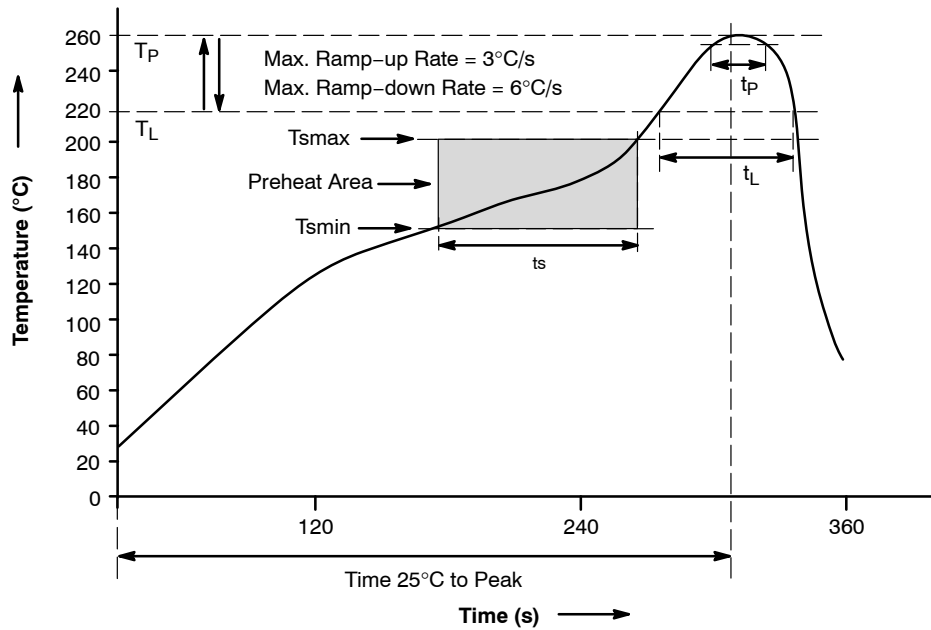


Figure 9. Reflow Profile

### REFLOW PROFILE

Profile Feature	Pb-Free Assembly Profile
Temperature Min. ( $T_{smin}$ )	150°C
Temperature Max. ( $T_{smax}$ )	200°C
Time ( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ )	60-120 s
Ramp-up Rate ( $t_L$ to $t_p$ )	3°C/s max.
Liquidous Temperature ( $T_L$ )	217°C
Time ( $t_L$ ) Maintained Above ( $T_L$ )	60-150 s
Peak Body Package Temperature	260°C +0°C / -5°C
Time ( $t_p$ ) within 5°C of 260°C	30 s
Ramp-down Rate ( $T_P$ to $T_L$ )	6°C/s max.
Time 25°C to Peak Temperature	8 min max.

## MOC223M, MOCD223M

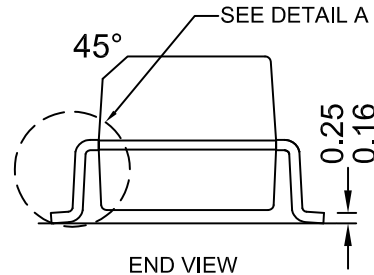
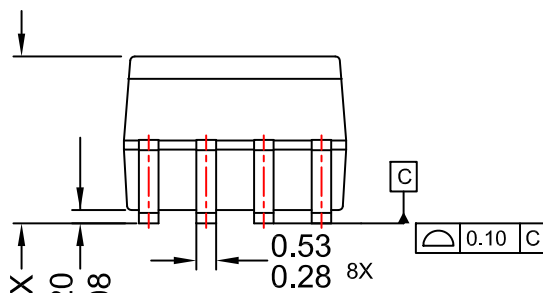
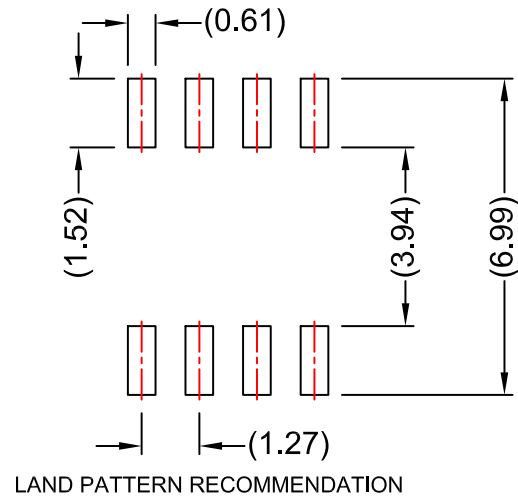
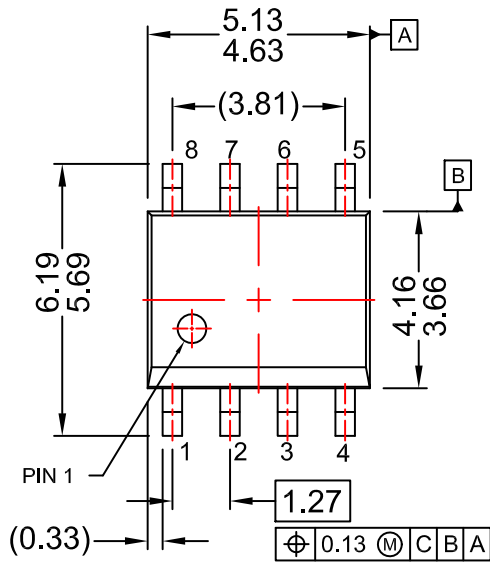
### ORDERING INFORMATION

Part Number	Package	Shipping†
MOC223M	Small Outline 8-Pin	50 Units / Tube
MOC223R2M	Small Outline 8-Pin	2500 Units / Tape and Reel
MOC223VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	50 Units / Tube
MOC223R2VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	2500 Units / Tape and Reel
MOCD223M	Small Outline 8-Pin	50 Units / Tube
MOCD223R2M	Small Outline 8-Pin	2500 Units / Tape and Reel
MOCD223VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	50 Units / Tube
MOCD223R2VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	2500 Units / Tape and Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

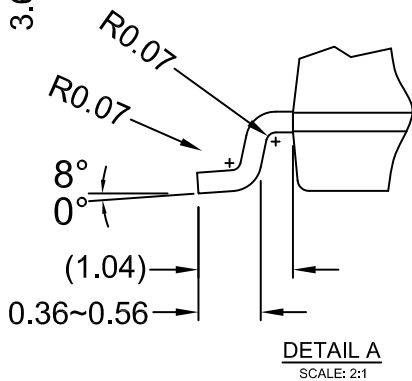
**SOIC8**  
**CASE 751DZ**  
**ISSUE O**

DATE 30 SEP 2016



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.



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