

# MOC223-M

## Small Outline Optocouplers Darlington Output

### Features

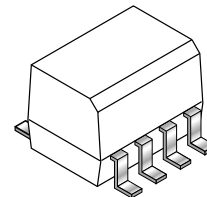
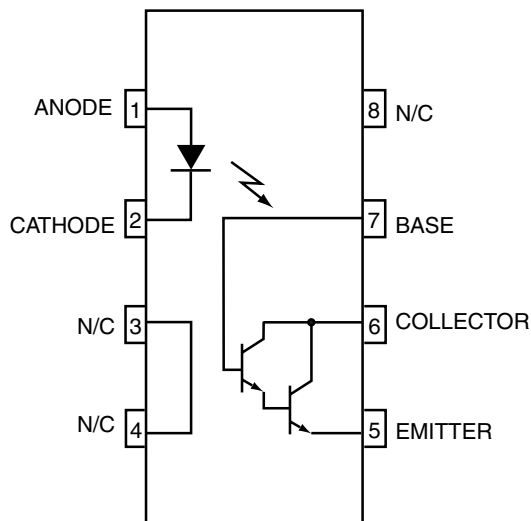
- U.L. Recognized (File #E90700, Volume 2)
- VDE Recognized (File #136616) (add option "V" for VDE approval, i.e. MOC223V-M)
- Industry Standard SOIC-8 Surface Mountable Package with 0.050" lead spacing
- High Current Transfer Ratio of 500% Minimum at  $I_F = 1\text{mA}$
- Standard SOIC-8 Footprint, with 0.050" Lead Spacing
- Compatible with Dual Wave, Vapor Phase and IR Reflow Soldering
- High Input-Output Isolation Voltage of 2500  $V_{AC(rms)}$  Guaranteed

### Applications

- Low power logic circuits
- Interfacing and coupling systems of different potentials and impedances
- Telecommunications equipment
- Portable electronics
- Solid state relays

### Description

The MOC223-M consists of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon photodarlington detector, in a surface mountable, small outline, plastic package. It is ideally suited for high density applications, and eliminates the need for through the board mounting.



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

Symbol	Rating	Value	Unit
<b>EMITTER</b>			
$I_F$	Forward Current – Continuous	60	mA
$I_F$ (pk)	Forward Current – Peak (PW = 100 $\mu$ s, 120pps)	1.0	A
$V_R$	Reverse Voltage	6.0	V
$P_D$	LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	90	mW
		0.8	mW/ $^\circ\text{C}$
<b>DETECTOR</b>			
$V_{CEO}$	Collector-Emitter Voltage	30	V
$V_{ECO}$	Emitter-Collector Voltage	7.0	V
$V_{CBO}$	Collector-Base Voltage	70	V
$I_C$	Collector Current-Continuous	150	mA
$P_D$	Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	150	mW
		1.76	mW/ $^\circ\text{C}$
<b>TOTAL DEVICE</b>			
$V_{ISO}$	Input-Output Isolation Voltage (f = 60Hz, t = 1 min.)	2500	Vac(rms)
$P_D$	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	250	mW
		2.94	mW/ $^\circ\text{C}$
$T_A$	Ambient Operating Temperature Range	-40 to +100	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-40 to +150	$^\circ\text{C}$

**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

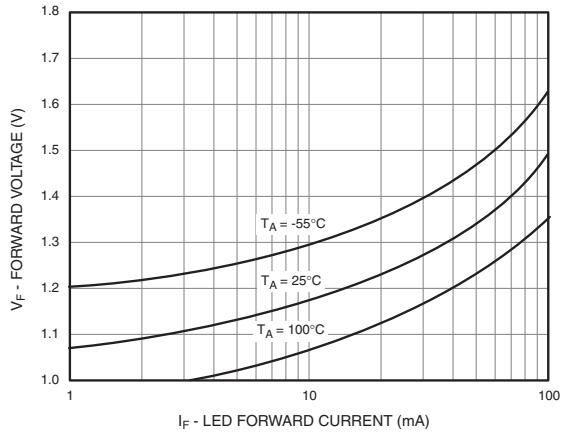
Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
<b>EMITTER</b>						
$V_F$	Input Forward Voltage	$I_F = 1.0\text{mA}$		1.08	1.3	V
$I_R$	Reverse Leakage Current	$V_R = 6.0\text{V}$		0.001	100	$\mu\text{A}$
$C_{IN}$	Input Capacitance			18		pF
<b>DETECTOR</b>						
$I_{CE01}$	Collector-Emitter Dark Current	$V_{CE} = 5.0\text{V}, T_A = 25^\circ\text{C}$		1.0	50	nA
$I_{CE02}$		$V_{CE} = 5.0\text{V}, T_A = 100^\circ\text{C}$		10		$\mu\text{A}$
$BV_{CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 100\mu\text{A}$	30	100		V
$BV_{ECO}$	Emitter-Collector Breakdown Voltage	$I_E = 100\mu\text{A}$	7.0	10		V
$C_{CE}$	Collector-Emitter Capacitance	$f = 1.0\text{MHz}, V_{CE} = 0$		5.5		pF
<b>COUPLED</b>						
CTR	Current Transfer Ratio <sup>(3)</sup>	$I_F = 1.0\text{mA}, V_{CE} = 5.0\text{V}$	500	1000		%
$V_{ISO}$	Isolation Surge Voltage <sup>(1,2)</sup>	$f = 60\text{Hz AC Peak}, t = 1\text{min.}$	2500			Vac(rms)
$R_{ISO}$	Isolation Resistance <sup>(2)</sup>	$V = 500\text{V}$	$10^{11}$			$\Omega$
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 500\mu\text{A}, I_F = 1.0\text{mA}$			1.0	V
$C_{ISO}$	Isolation Capacitance <sup>(2)</sup>	$V_{I-O} = 0\text{V}, f = 1\text{MHz}$		0.2		pF
$t_{on}$	Turn-On Time	$I_F = 5.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$ (Fig. 6)		10		$\mu\text{s}$
$t_{off}$	Turn-Off Time	$I_F = 5.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$ (Fig. 6)		125		ns
$t_r$	Rise Time	$I_F = 5.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$ (Fig. 6)		8		$\mu\text{s}$
$t_f$	Fall Time	$I_F = 5.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$ (Fig. 6)		110		$\mu\text{s}$

\*All typicals at  $T_A = 25^\circ\text{C}$ **Notes:**

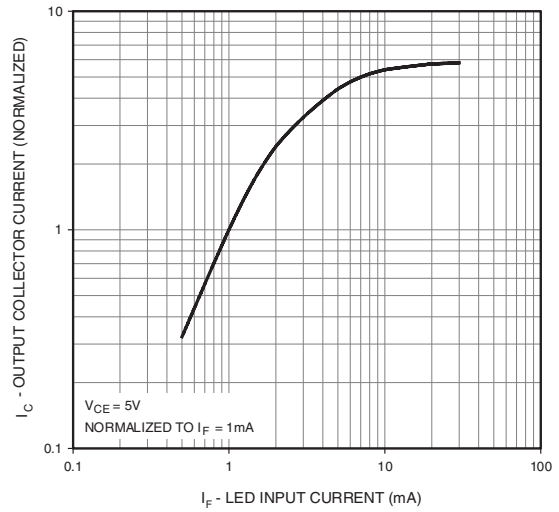
1. Isolation Surge Voltage,  $V_{ISO}$ , is an internal device dielectric breakdown rating.
2. For this test, Pins 1 and 2 are common and Pins 5, 6 and 7 are common.
3. Current Transfer Ratio (CTR) =  $I_C / I_F \times 100\%$ .

## Typical Performance Curves

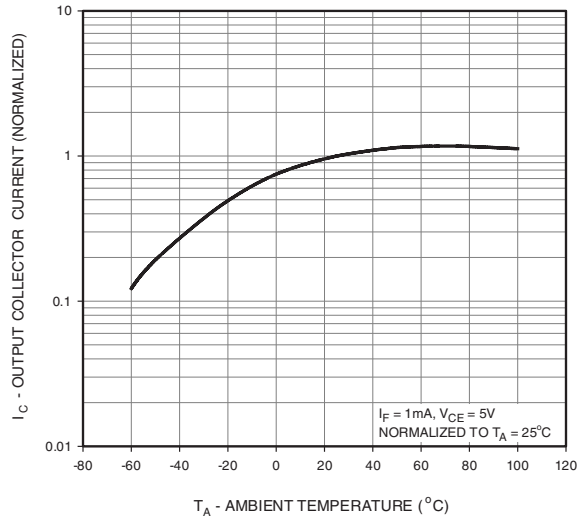
**Fig. 1 LED Forward Voltage vs. Forward Current**



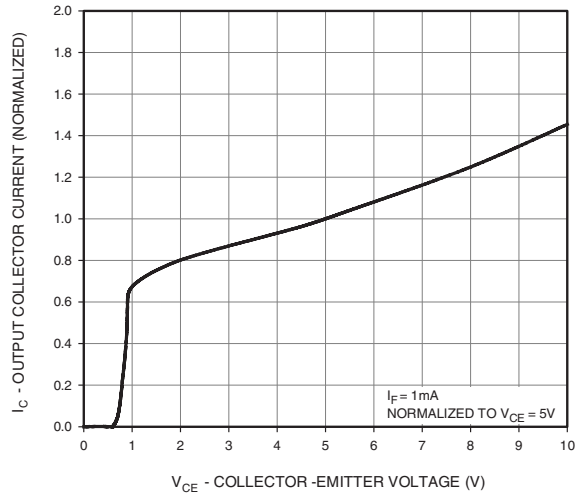
**Fig. 2 Output Current vs. Input Current**



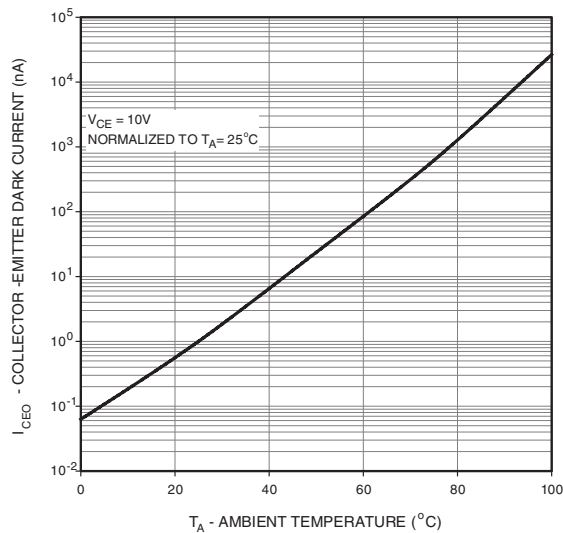
**Fig. 3 Output Current vs. Ambient Temperature**



**Fig. 4 Output Current vs. Collector - Emitter Voltage**



**Fig. 5 Dark Current vs. Ambient Temperature**



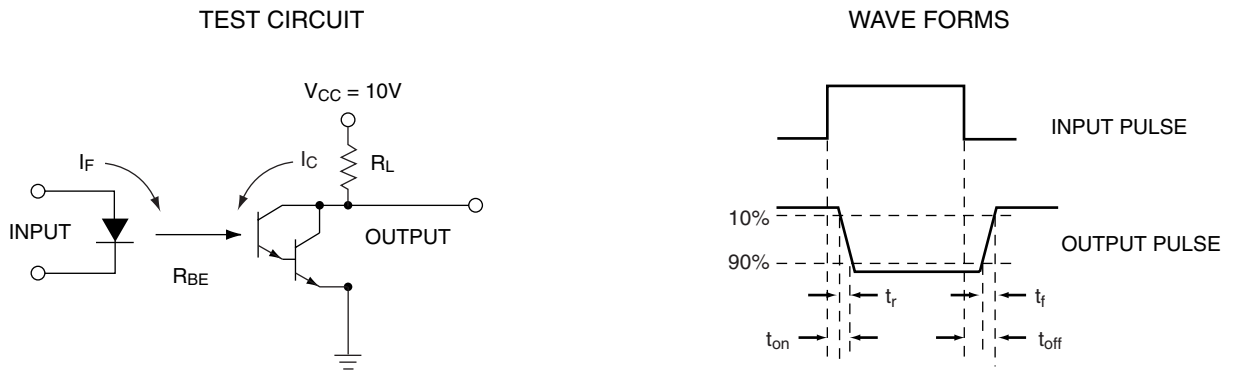
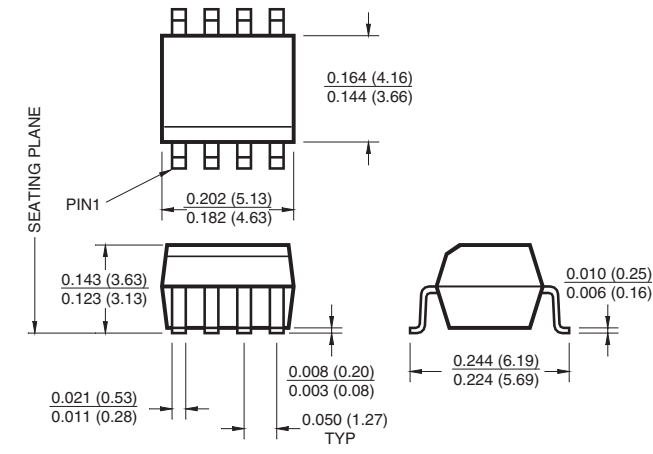


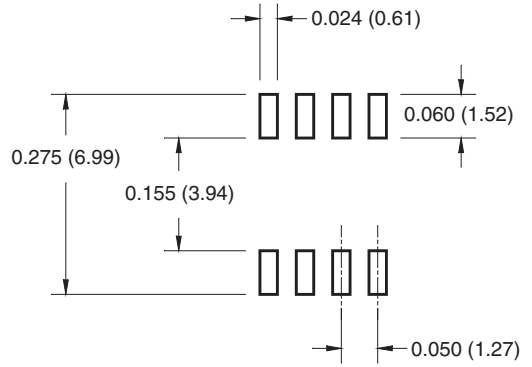
Figure 6. Switching Time Test Circuit and Waveforms

## Package Dimensions

### Surface Mount



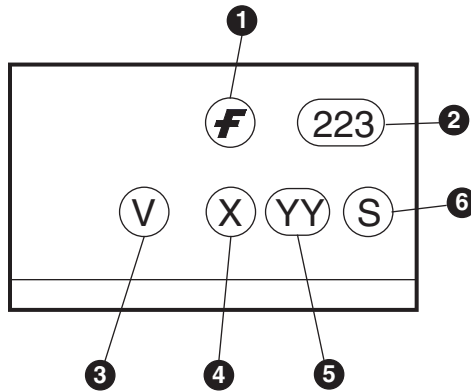
### 8-Pin Small Outline



### Ordering Information

Option	Order Entry Identifier	Description
V	V	VDE 0884
R1	R1	Tape and reel (500 units per reel)
R1V	R1V	VDE 0884, Tape and reel (500 units per reel)
R2	R2	Tape and reel (2500 units per reel)
R2V	R2V	VDE 0884, Tape and reel (2500 units per reel)

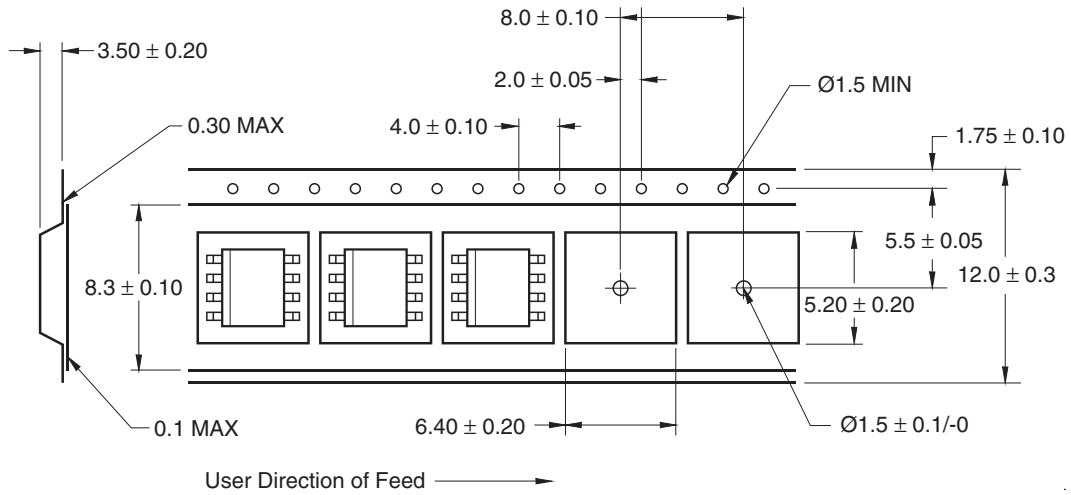
### Marking Information



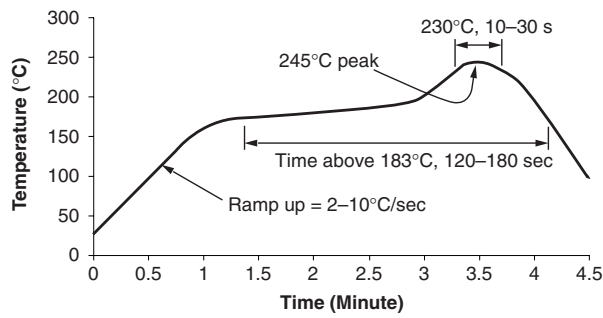
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '3'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

\*Note – 'V' option parts marked with date code '325' or earlier are marked in portrait format.

### Carrier Tape Specifications



### Reflow Profile



- Peak reflow temperature: 245°C (package surface temperature)
- Time of temperature higher than 183°C for 120–180 seconds
- One time soldering reflow is recommended



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CoolFET™	I <sup>2</sup> C™	PACMAN™	SuperFET™	
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Programmable Active Droop™				

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