

MOC223M

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., MOC223VM)
- 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
- 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 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. It is ideally suited for high density applications, and eliminates the need for through the board mounting.

Schematic

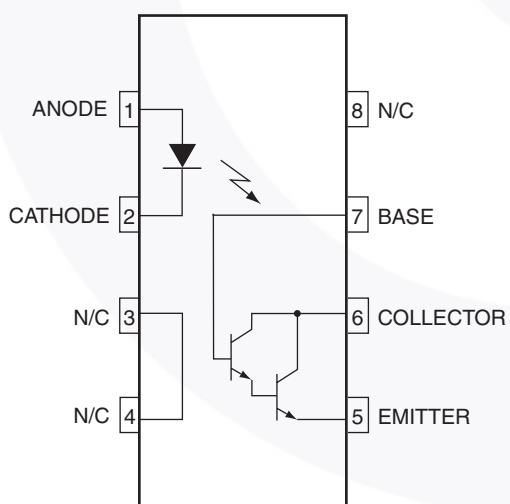


Figure 1. Schematic

Package Outline

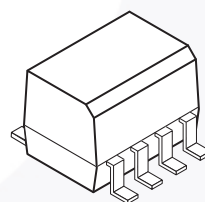


Figure 2. Package Outline

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
Emitter			
I_F	Forward Current – Continuous	60	mA
I_F (pk)	Forward Current – Peak (PW = 100 μs , 120 pps)	1.0	A
V_R	Reverse Voltage	6.0	V
P_D	LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	90 0.8	mW mW/ $^\circ\text{C}$
Detector			
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°C	150 1.76	mW mW/ $^\circ\text{C}$
Total Device			
V_{ISO}	Input-Output Isolation Voltage (f = 60 Hz, t = 1 minute)	2500	Vac(rms)
P_D	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	250 2.94	mW 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
Emitter						
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	μA
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}		$V_{CE} = 5.0\text{ V}, T_A = 100^\circ\text{C}$		10		μA
BV_{CEO}	Collector-Emitter Breakdown Voltage	$I_C = 100\text{ }\mu\text{A}$	30	100		V
BV_{ECO}	Emitter-Collector Breakdown Voltage	$I_E = 100\text{ }\mu\text{A}$	7.0	10		V
C_{CE}	Collector-Emitter Capacitance	$f = 1.0\text{ MHz}, V_{CE} = 0$		5.5		pF
Coupled						
CTR	Current Transfer Ratio ⁽³⁾	$I_F = 1.0\text{ mA}, V_{CE} = 5.0\text{ V}$	500	1000		%
V_{ISO}	Isolation Surge Voltage ⁽¹⁾⁽²⁾	$f = 60\text{ Hz AC Peak}, t = 1\text{ minute}$	2500			Vac(rms)
R_{ISO}	Isolation Resistance ⁽²⁾	$V = 500\text{ V}$	10^{11}			Ω
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 500\text{ }\mu\text{A}, I_F = 1.0\text{ mA}$			1.0	V
C_{ISO}	Isolation Capacitance ⁽²⁾	$V_{I-O} = 0\text{ V}, f = 1\text{ MHz}$		0.2		pF
t_{on}	Turn-On Time	$I_F = 5.0\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\text{ }\Omega$ (Fig. 8)		10		μs
t_{off}	Turn-Off Time	$I_F = 5.0\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\text{ }\Omega$ (Fig. 8)		125		ns
t_r	Rise Time	$I_F = 5.0\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\text{ }\Omega$ (Fig. 8)		8		μs
t_f	Fall Time	$I_F = 5.0\text{ mA}, V_{CC} = 10\text{ V}, R_L = 100\text{ }\Omega$ (Fig. 8)		110		μs

*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

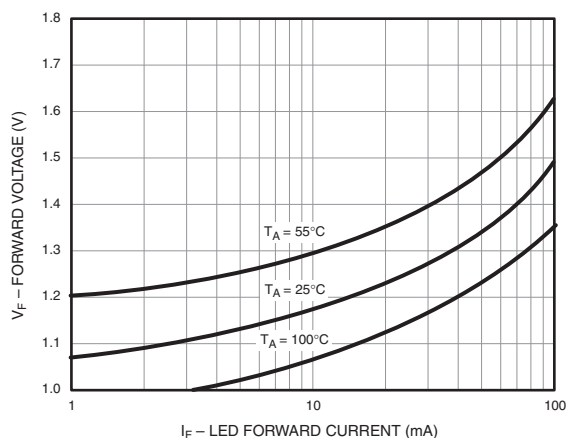


Figure 3. LED Forward Voltage vs. Forward Current

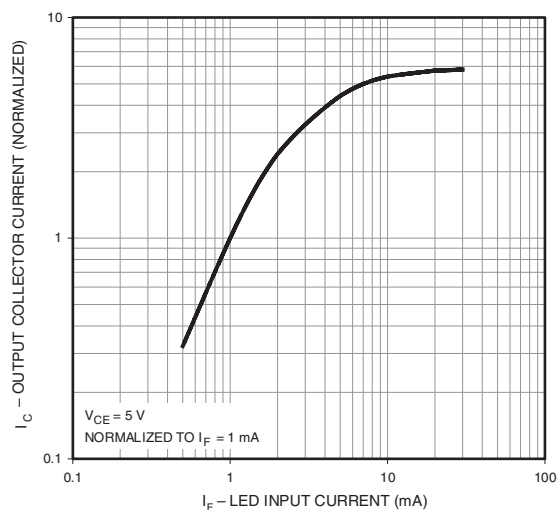


Figure 4. Output Current vs. Input Current

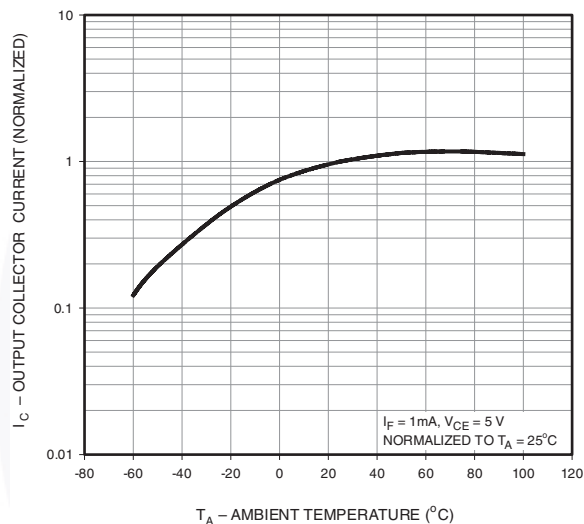


Figure 5. Output Current vs. Ambient Temperature

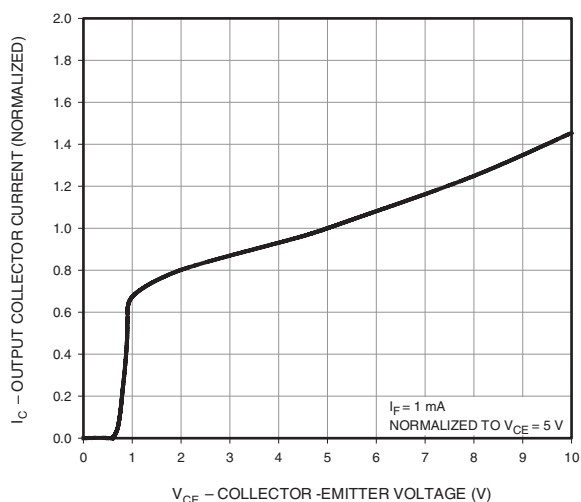


Figure 6. Output Current vs. Collector - Emitter Voltage

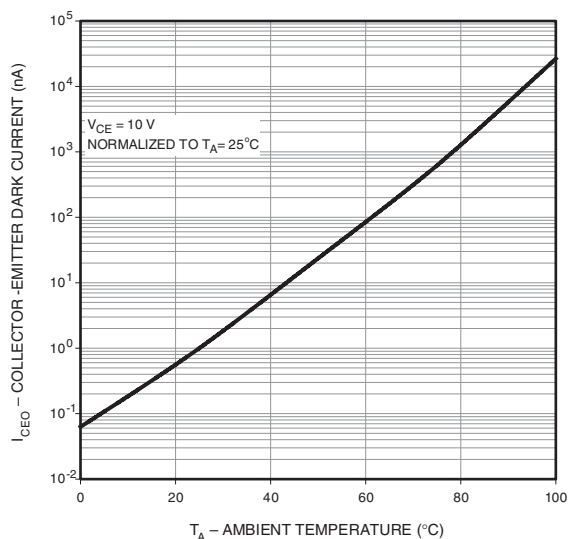


Figure 7. Dark Current vs. Ambient Temperature

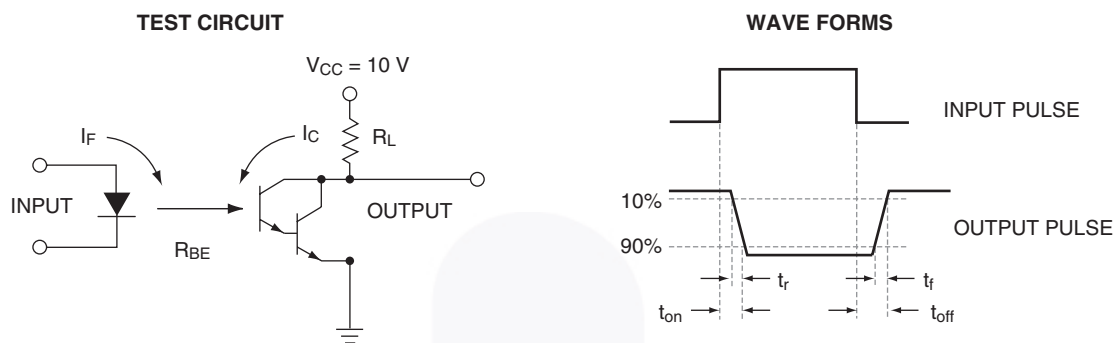
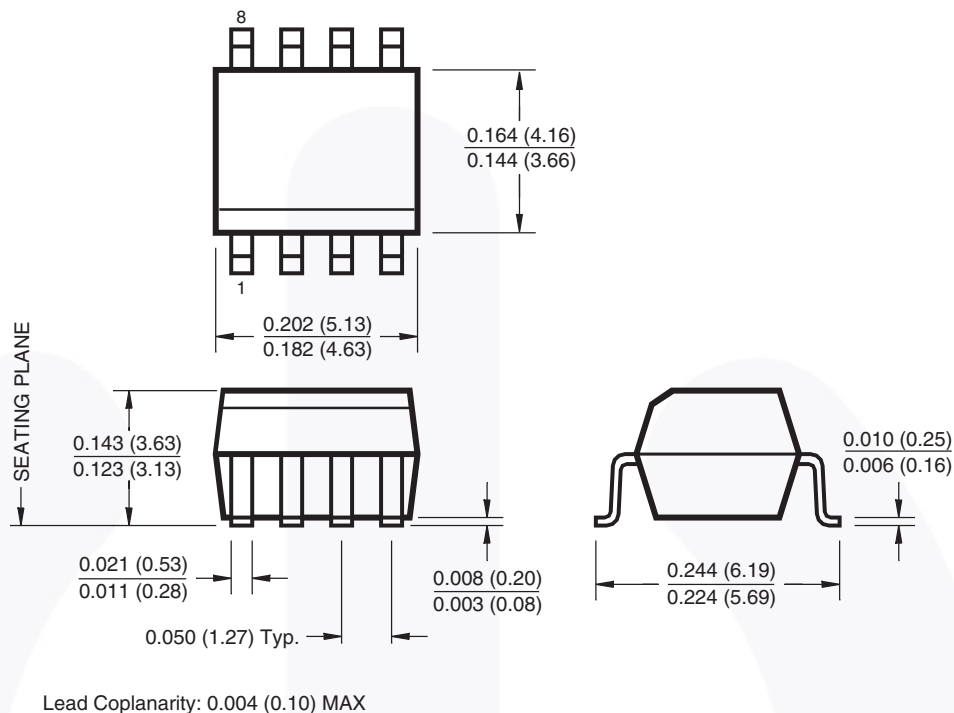


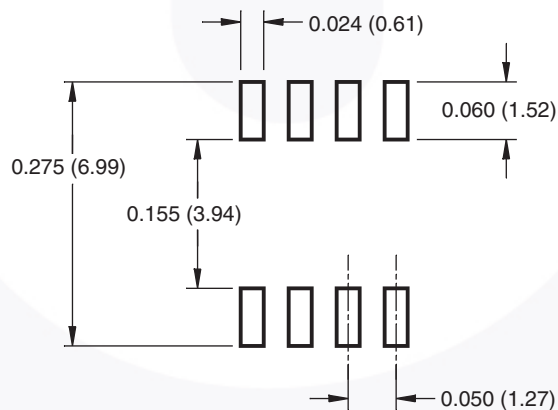
Figure 8. Switching Time Test Circuit and Waveform

Package Dimensions

8-pin SOIC Surface Mount



Recommended Pad Layout



Dimensions in inches (mm).

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

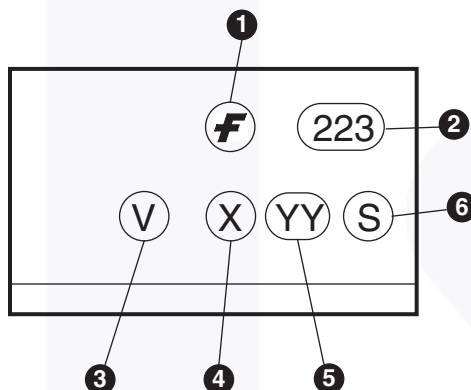
Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

<http://www.fairchildsemi.com/packaging/>

Ordering Information

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

Marking Information

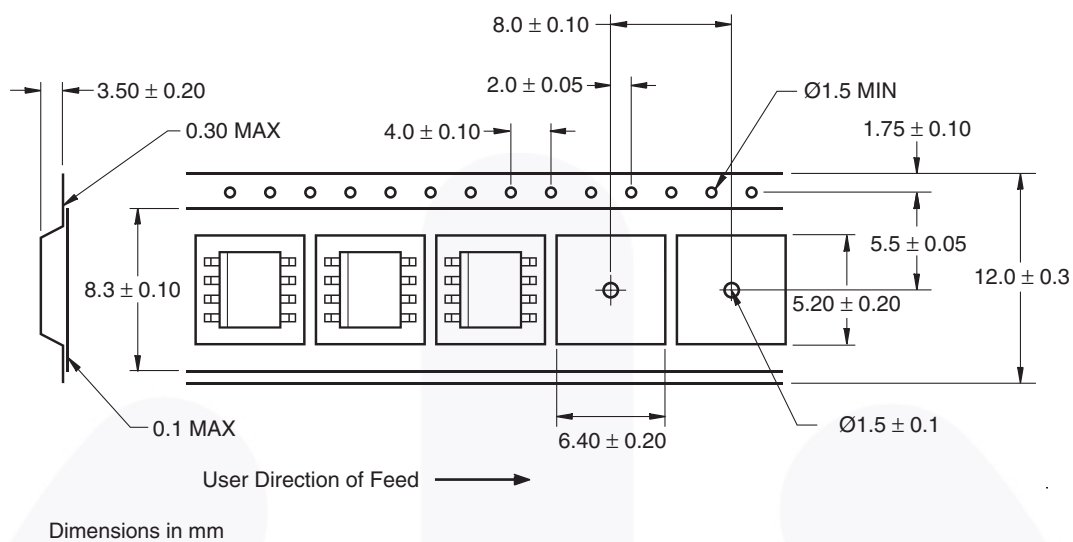


Definitions

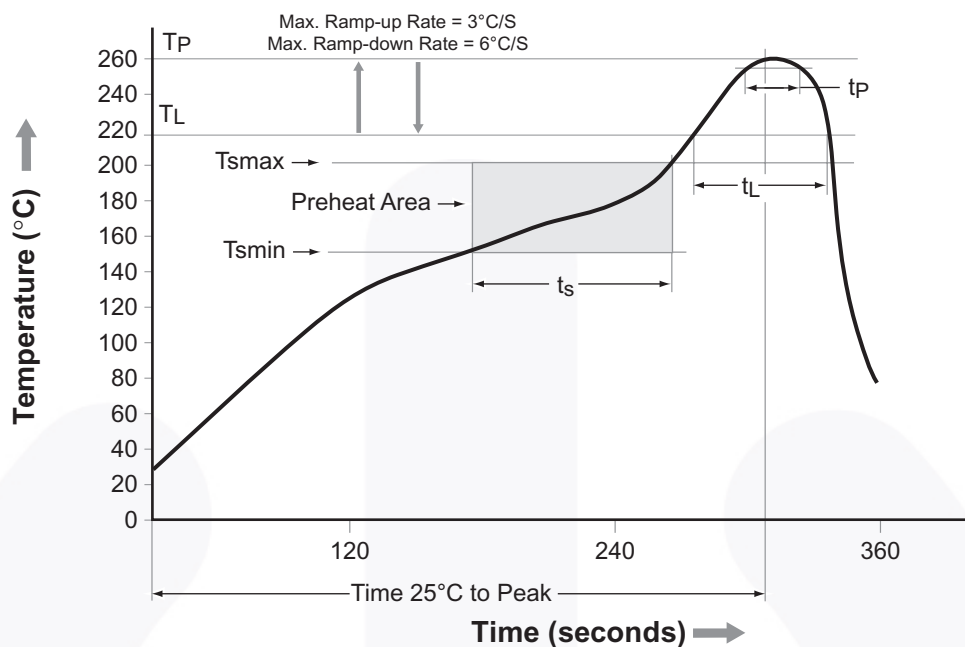
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '3'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

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

Carrier Tape Specifications



Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Minimum (T_{smin})	150°C
Temperature Maximum (T_{smax})	200°C
Time (t_s) from (T_{smin} to T_{smax})	60–120 seconds
Ramp-up Rate (t_L to t_P)	3°C/second maximum
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (t_P) within 5°C of 260°C	30 seconds
Ramp-down Rate (T_P to T_L)	6°C/second maximum
Time 25°C to Peak Temperature	8 minutes maximum



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