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FAIRCHILD SEMICONDUCTOR®

April 2013

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 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

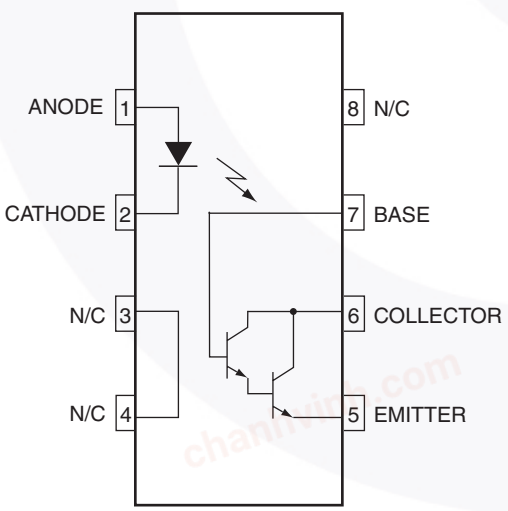


Figure 1. Schematic

Package Outline

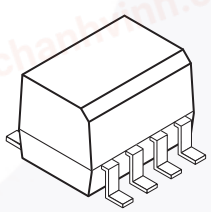


Figure 2. Package Outline

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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°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°C Derate above 25°C	90 0.8	mW mW/°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°C Derate above 25°C	150 1.76	mW mW/°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°C Derate above 25°C	250 2.94	mW mW/°C
T_A	Ambient Operating Temperature Range	-40 to +100	°C
T_{stg}	Storage Temperature Range	-40 to +150	°C

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Electrical Characteristics

T_A = 25°C unless otherwise specified.

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
Emitter						
V_F	Input Forward Voltage	I_F = 1.0 mA		1.08	1.3	V
I_R	Reverse Leakage Current	V_R = 6.0 V		0.001	100	µA
C_{IN}	Input Capacitance			18		pF
Detector						
I_{CEO1}	Collector-Emitter Dark Current	V_{CE} = 5.0 V, T_A = 25°C		1.0	50	nA
I_{CEO2}		V_{CE} = 5.0 V, T_A = 100°C		10		µA
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_C = 100 µA	30	100		V
BV_{ECO}	Emitter-Collector Breakdown Voltage	I_E = 100 µA	7.0	10		V
C_{CE}	Collector-Emitter Capacitance	f = 1.0 MHz, V_{CE} = 0		5.5		pF
Coupled						
CTR	Current Transfer Ratio(3)	I_F = 1.0 mA, V_{CE} = 5.0 V	500	1000		%
V_{ISO}	Isolation Surge Voltage(1)(2)	f = 60 Hz AC Peak, t = 1 minute	2500			Vac(rms)
R_{ISO}	Isolation Resistance(2)	V = 500 V	10^{11}			Ω
$V_{CE\ (sat)}$	Collector-Emitter Saturation Voltage	I_C = 500 µA, I_F = 1.0 mA			1.0	V
C_{ISO}	Isolation Capacitance(2)	V_{I-O} = 0 V, f = 1 MHz		0.2		pF
t_{on}	Turn-On Time	I_F = 5.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Fig. 8)		10		µs
t_{off}	Turn-Off Time	I_F = 5.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Fig. 8)		125		ns
t_r	Rise Time	I_F = 5.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Fig. 8)		8		µs
t_f	Fall Time	I_F = 5.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Fig. 8)		110		µs

*All typicals at T_A = 25°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 x 100%.

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Typical Performance Curves

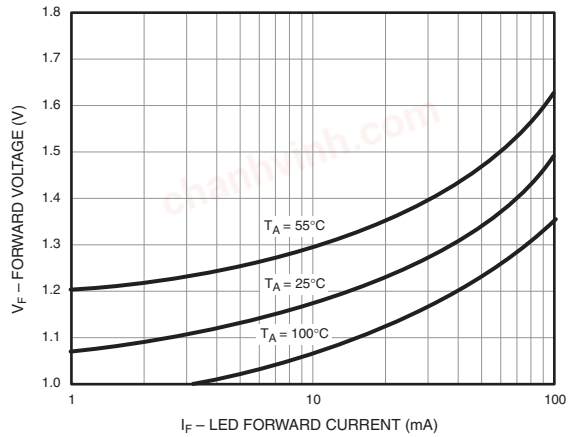


Figure 3. LED Forward Voltage vs. Forward Current

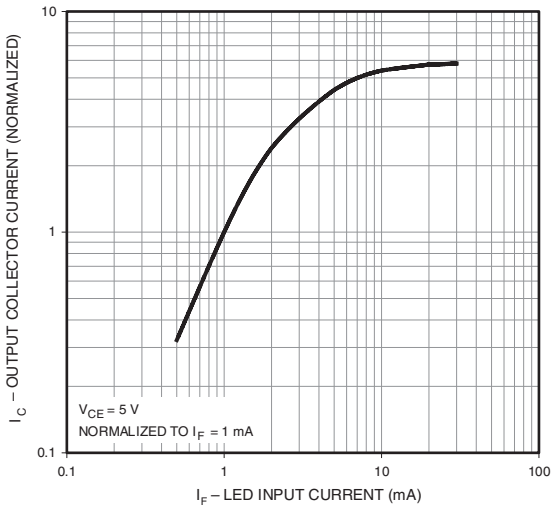


Figure 4. Output Curent vs. Input Current

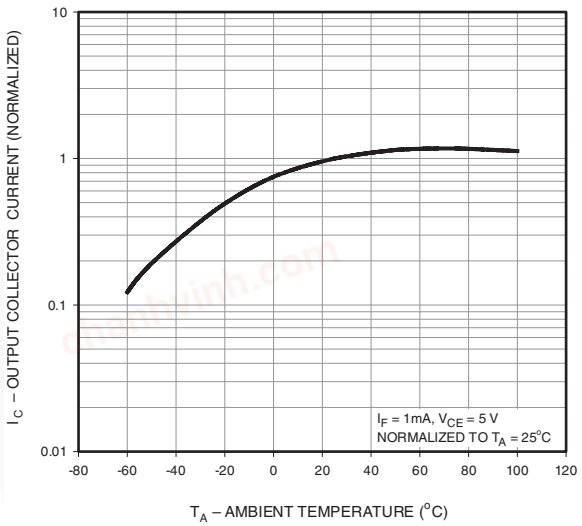


Figure 5. Output Current vs. Ambient Temperature

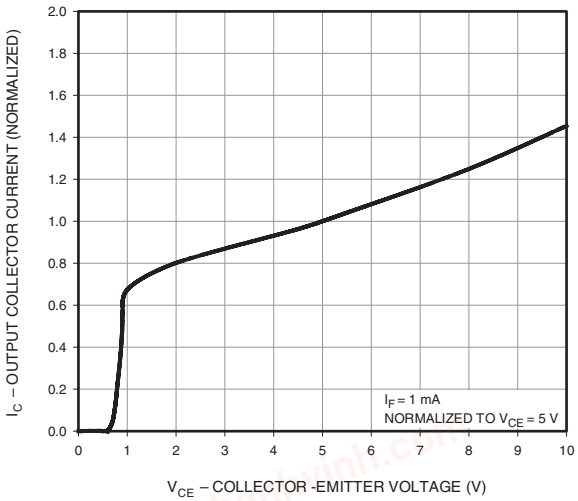


Figure 6. Output Current vs. Collector - Emitter Voltage

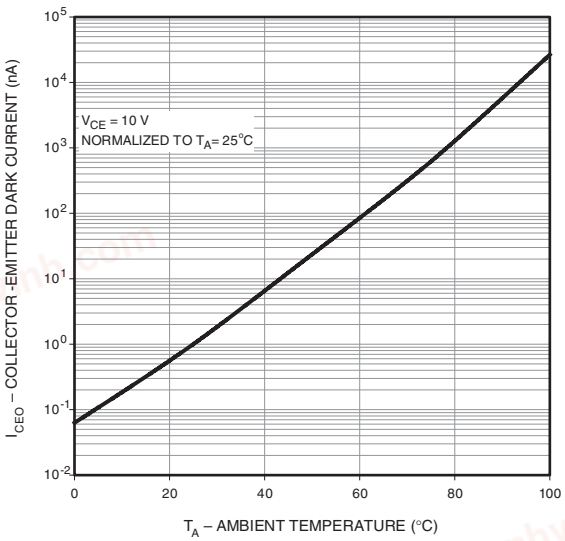


Figure 7. Dark Current vs. Ambient Temperature

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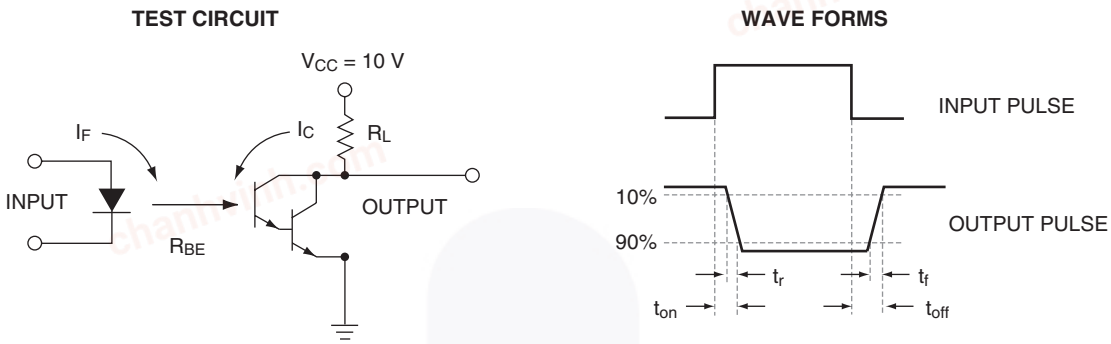
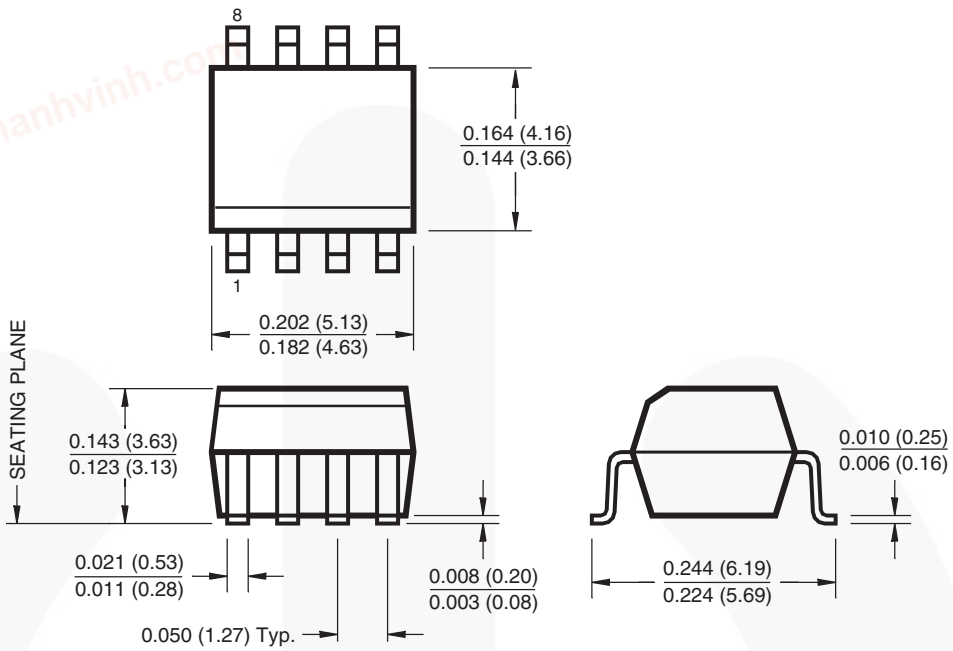


Figure 8. Switching Time Test Circuit and Waveform

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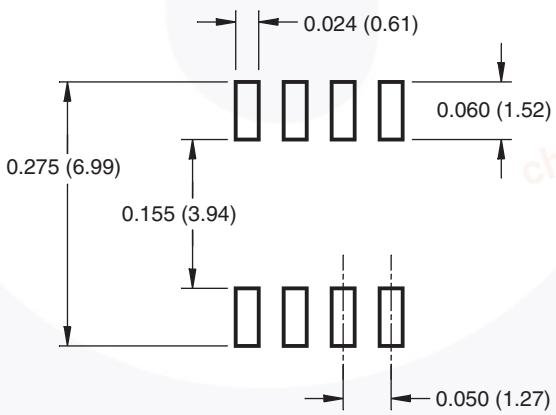
Package Dimensions

8-pin SOIC Surface Mount



Lead Coplanarity: 0.004 (0.10) MAX

Recommended Pad Layout



Dimensions in inches (mm).

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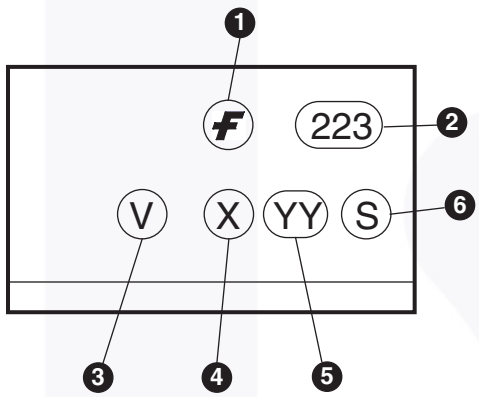
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Ordering Information

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

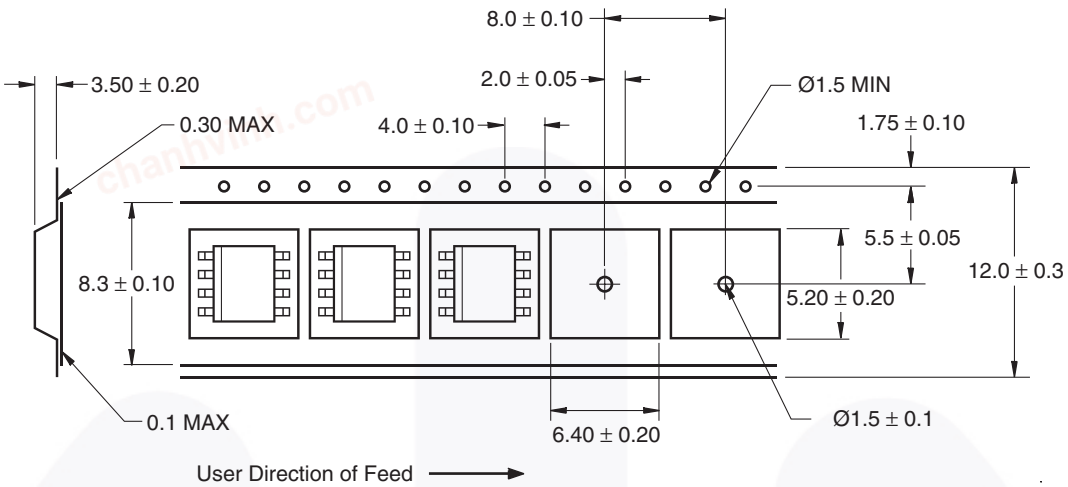


Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., ‘3’
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

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

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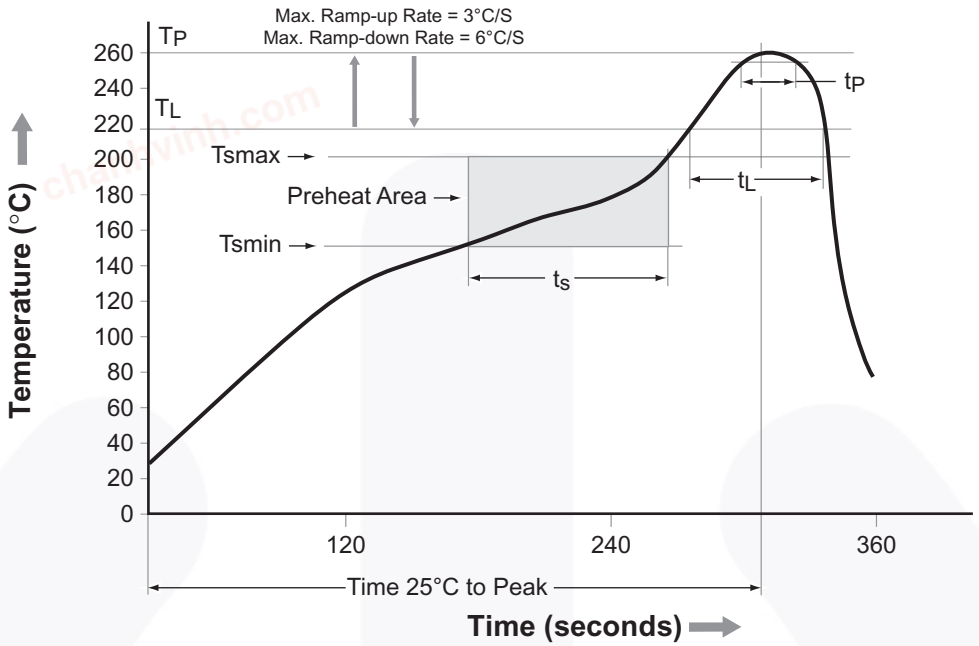
Carrier Tape Specifications



Dimensions in mm

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Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Minimum (Tsmin)	150°C
Temperature Maximum (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	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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