FAIRCHILD SEMICONDUCTOR®

April 2009

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 = 1mA
- 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

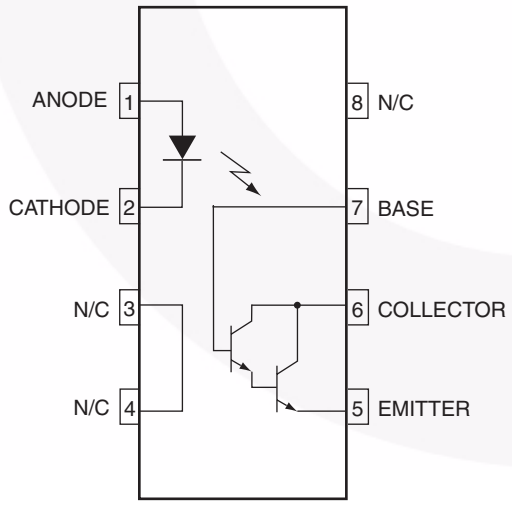
Applications

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

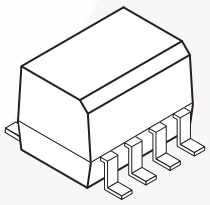
Description

The 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



Package Outline



Absolute Maximum Ratings (T_A = 25°C Unless otherwise specified)

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.

Symbol	Rating	Value	Unit
EMITTER			
I_F	Forward Current – Continuous	60	mA
I_F (pk)	Forward Current – Peak (PW = 100μs, 120pps)	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 = 60Hz, t = 1 min.)	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

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 = 1.0mA		1.08	1.3	V
I_R	Reverse Leakage Current	V_R = 6.0V		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 = 100µA	30	100		V
BV_{ECO}	Emitter-Collector Breakdown Voltage	I_E = 100µA	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 = 1.0mA, V_{CE} = 5.0V	500	1000		%
V_{ISO}	Isolation Surge Voltage(1,2)	f = 60Hz AC Peak, t = 1 min.	2500			Vac(rms)
R_{ISO}	Isolation Resistance(2)	V = 500V	10^{11}			Ω
$V_{CE\ (sat)}$	Collector-Emitter Saturation Voltage	I_C = 500µA, I_F = 1.0mA			1.0	V
C_{ISO}	Isolation Capacitance(2)	V_{I-O} = 0V, f = 1MHz		0.2		pF
t_{on}	Turn-On Time	I_F = 5.0mA, V_{CC} = 10V, R_L = 100Ω (Fig. 6)		10		µs
t_{off}	Turn-Off Time	I_F = 5.0mA, V_{CC} = 10V, R_L = 100Ω (Fig. 6)		125		ns
t_r	Rise Time	I_F = 5.0mA, V_{CC} = 10V, R_L = 100Ω (Fig. 6)		8		µs
t_f	Fall Time	I_F = 5.0mA, V_{CC} = 10V, R_L = 100Ω (Fig. 6)		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%.

Typical Performance Curves

Fig. 1 LED Forward Voltage vs. Forward Current

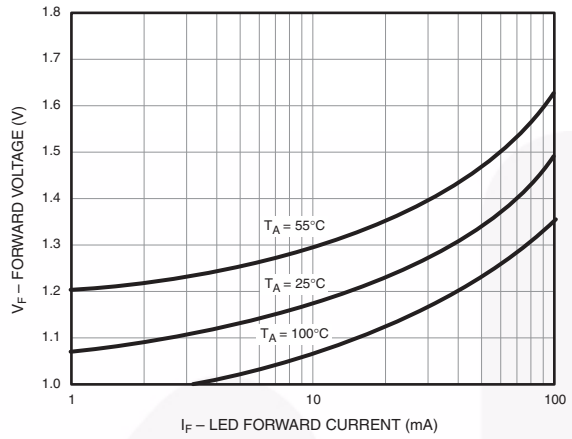


Fig. 2 Output Curent vs. Input Current

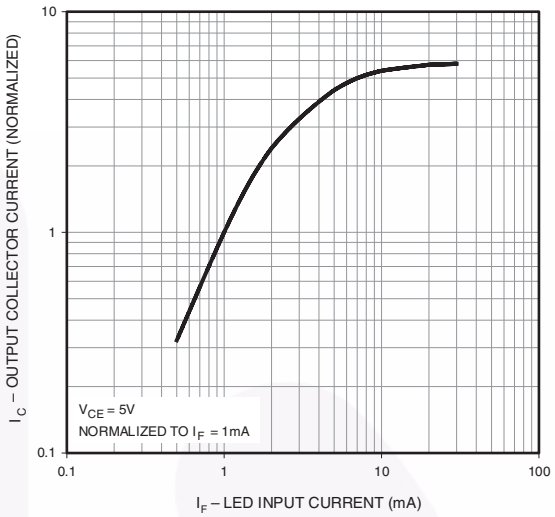


Fig. 3 Output Current vs. Ambient Temperature

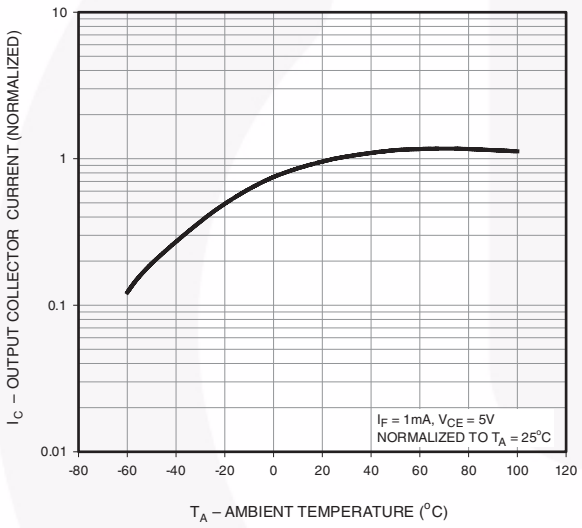


Fig. 4 Output Current vs. Collector - Emitter Voltage

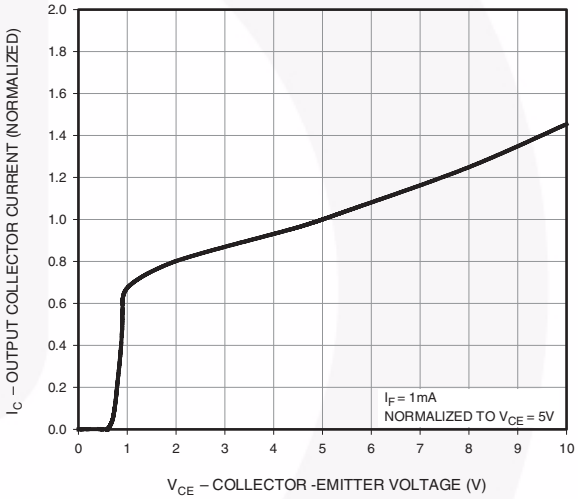
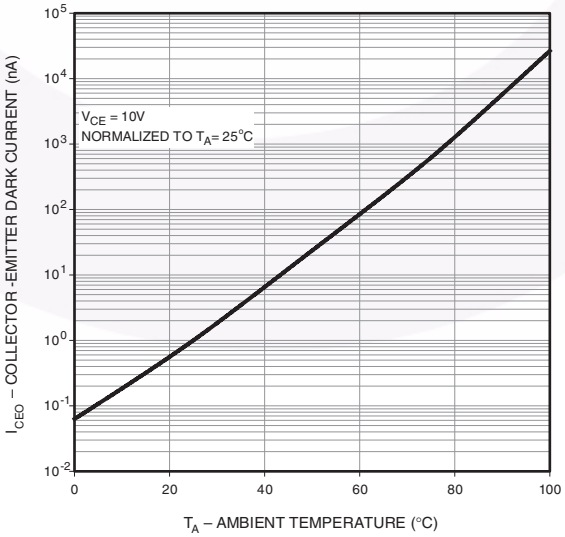


Fig. 5 Dark Current vs. Ambient Temperature



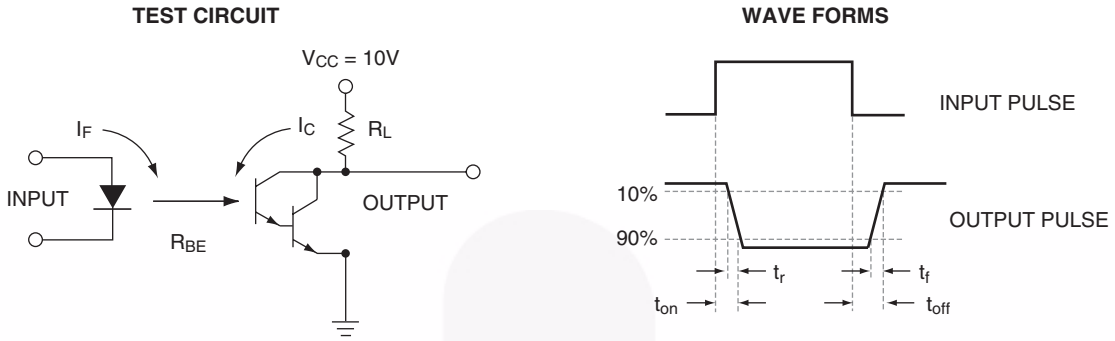
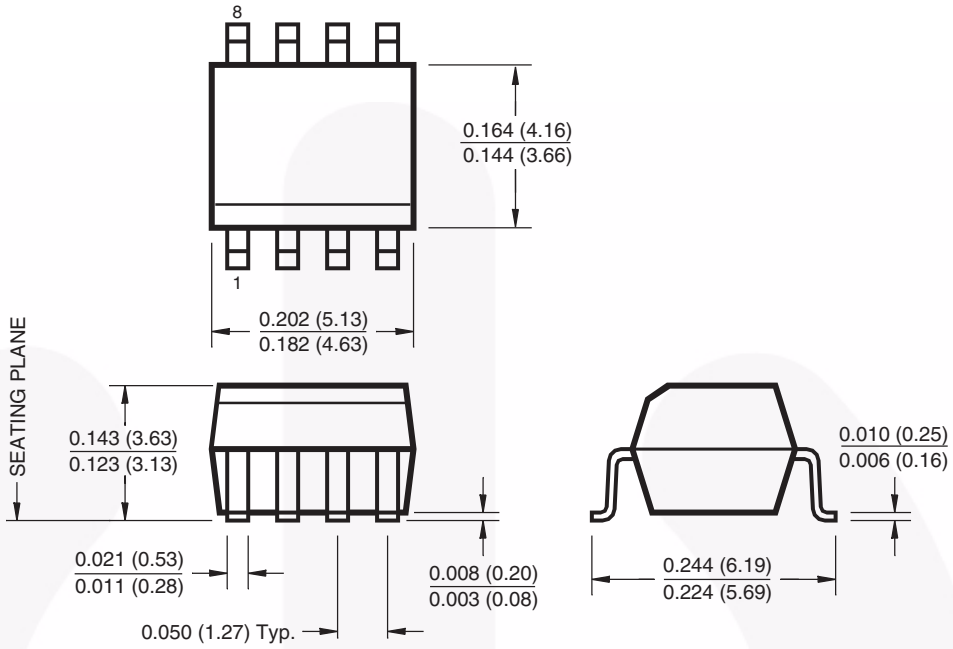


Figure 6. Switching Time Test Circuit and Waveform

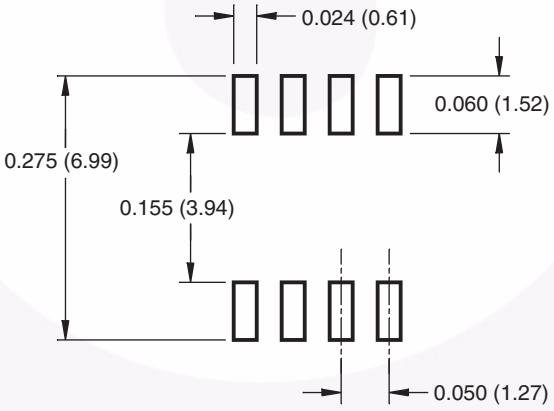
Package Dimensions

8-pin SOIC Surface Mount



Lead Coplanarity: 0.004 (0.10) MAX

Recommended Pad Layout



Dimensions in inches (mm).

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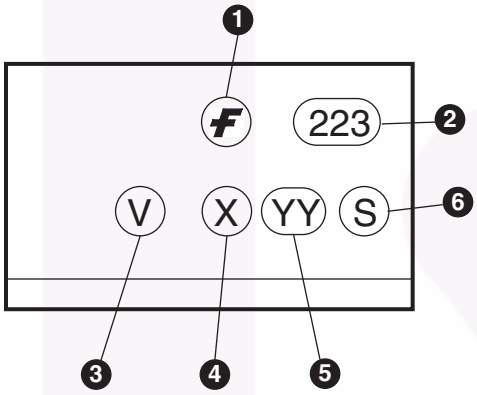
http://www.fairchildsemi.com/packaging/

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)

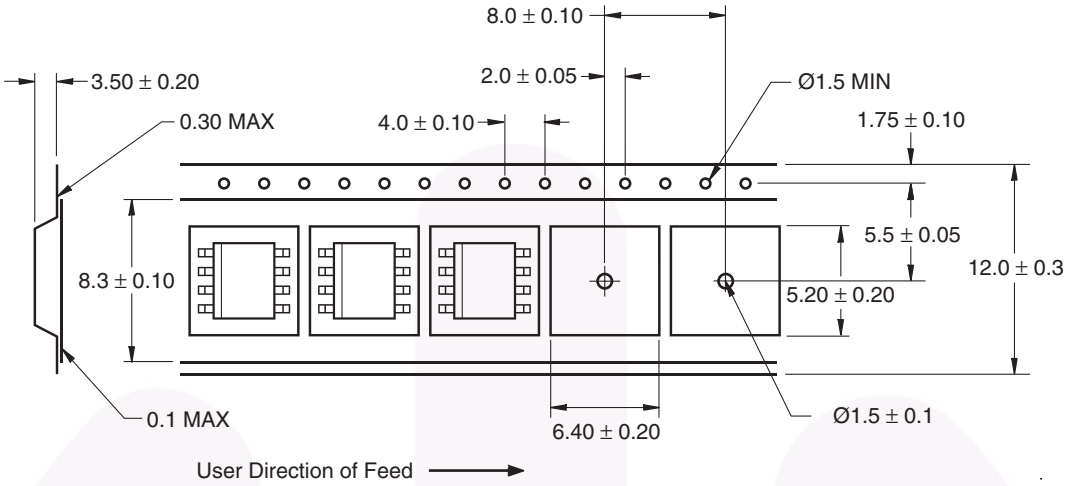
Marking Information



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

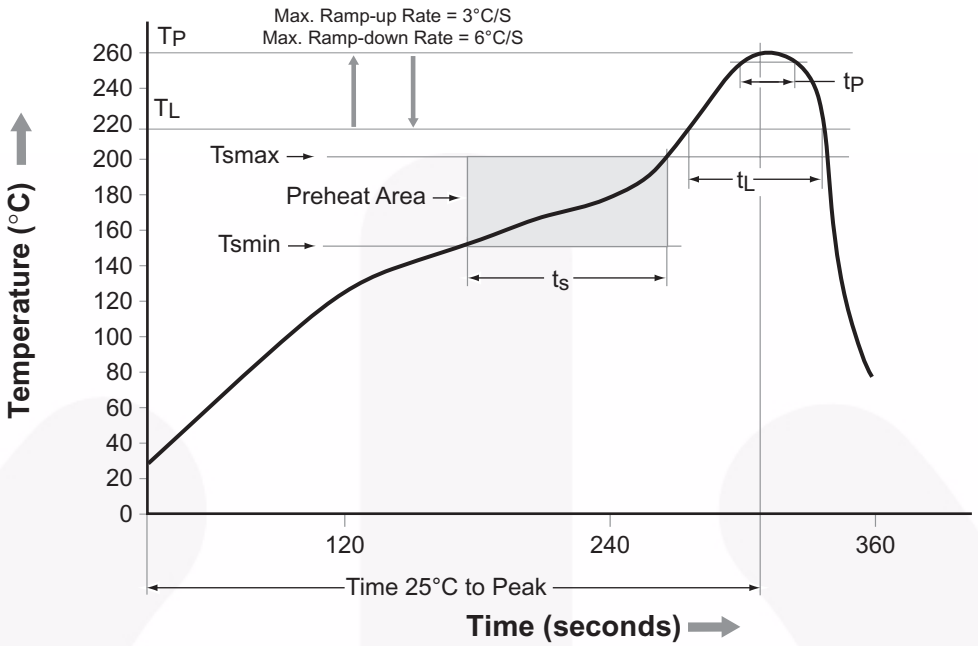
*Note – ‘V’ option parts marked with date code ‘325’ or earlier are marked in portrait format.

Carrier Tape Specifications



Dimensions in mm

Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	60–120 seconds
Ramp-up Rate (t_L to t_P)	3°C/second max.
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 max.
Time 25°C to Peak Temperature	8 minutes max.

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Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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Rev. I40

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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

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