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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

July 2018

MOC223M, MOCD223M
8-pin SOIC Darlington Output Optocouplers

Features

- High Current Transfer Ratio of 500% Minimum at I_F = 1 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:
  - UL1577, 2,500 VAC_{RMS} for 1 Minute
  - DIN-EN/IEC60747-5-5, 565 V Peak Working Insulation Voltage

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. 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.

Package Outline

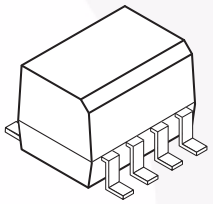


Figure 1. Package Outline

Schematics

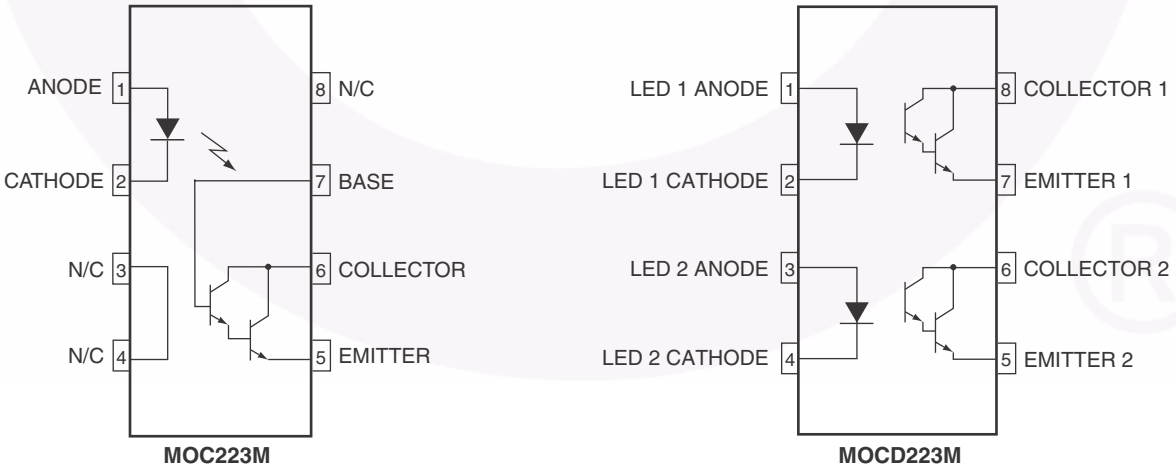


Figure 2. Schematics

Safety and Insulation Ratings

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.

Parameter		Characteristics
Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Mains Voltage	< 150 V_{RMS}	I–IV
	< 300 V_{RMS}	I–III
Climatic Classification		55/100/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V_{PR}	Input-to-Output Test Voltage, Method A, V_{IORM} x 1.6 = V_{PR}, Type and Sample Test with t_m = 10 s, Partial Discharge < 5 pC	904	V_{peak}
	Input-to-Output Test Voltage, Method B, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with t_m = 1 s, Partial Discharge < 5 pC	1060	V_{peak}
V_{IORM}	Maximum Working Insulation Voltage	565	V_{peak}
V_{IOTM}	Highest Allowable Over-Voltage	4000	V_{peak}
	External Creepage	≥ 4	mm
	External Clearance	≥ 4	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.4	mm
T_S	Case Temperature(1)	150	°C
$I_{S,INPUT}$	Input Current(1)	200	mA
$P_{S,OUTPUT}$	Output Power(1)	300	mW
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500 V(1)	> 10^9	Ω

Note:

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

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
TOTAL DEVICE			
T_{STG}	Storage Temperature	-40 to +125	°C
T_A	Ambient Operating Temperature	-40 to +100	°C
T_J	Junction Temperature	-40 to +125	°C
T_{SOL}	Lead Solder Temperature	260 for 10 seconds	°C
P_D	Total Device Power Dissipation @ T_A = 25°C	240	mW
	Derate Above 25°C	2.94	mW/°C
EMITTER			
I_F	Continuous Forward Current	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	90	mW
	Derate Above 25°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
V_{ECO}	Emitter-Collector Voltage	7	V
P_D	Detector Power Dissipation @ T_A = 25°C	150	mW
	Derate Above 25°C	1.76	mW/°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 = 1.0 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		1.0		µA
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_C = 100 µA	30	100		V
BV_{CBO}	Collector-Base Breakdown Voltage	I_C = 100 µA	70	120		V
BV_{ECO}	Emitter-Collector Breakdown Voltage	I_E = 100 µA	7	10		V
C_{CE}	Collector-Emitter Capacitance	f = 1.0 MHz, V_{CE} = 0		5.5		pF
COUPLED						
CTR	Current Transfer Ratio	I_F = 1.0 mA, V_{CE} = 5.0 V	500	1000		%
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 500 µA, I_F = 1.0 mA			1.0	V
t_{on}	Turn-On Time	I_F = 5.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 8)		10		µs
t_{off}	Turn-Off Time	I_F = 5.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 8)		55		µs
t_r	Rise Time	I_F = 5.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 8)		8		µs
t_f	Fall Time	I_F = 5.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 8)		45		µs

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
V_{ISO}	Input-Output Isolation Voltage	t = 1 Minute	2500			VAC_{RMS}
C_{ISO}	Isolation Capacitance	V_{I-O} = 0 V, f = 1 MHz		0.2		pF
R_{ISO}	Isolation Resistance	V_{I-O} = ±500 VDC, T_A = 25°C	10^{11}			Ω

Typical Performance Curves

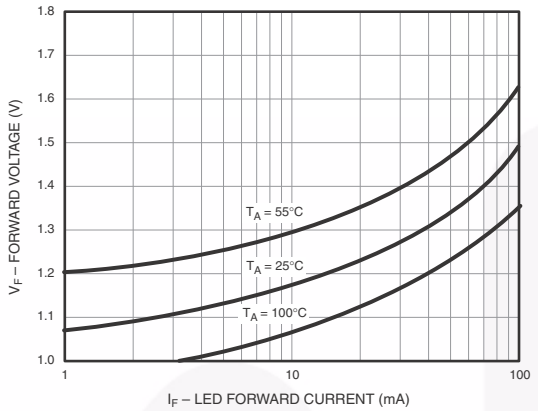


Figure 3. LED Forward Voltage vs. Forward Current

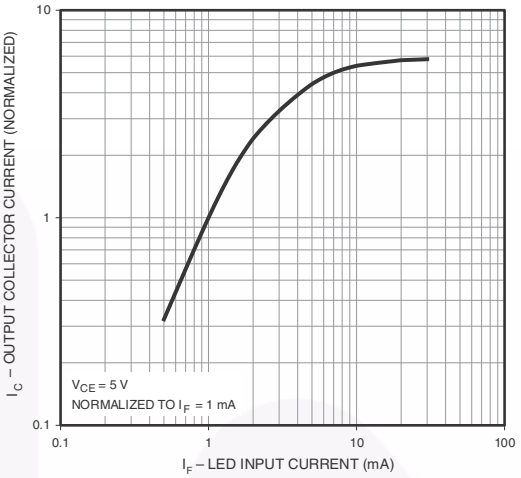


Figure 4. Output Curent vs. Input Current

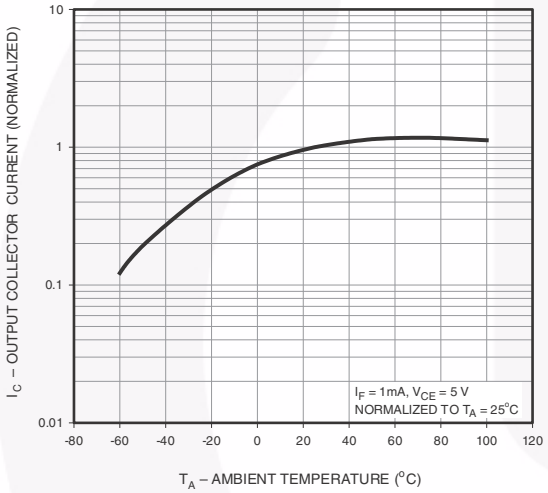


Figure 5. Output Current vs. Ambient Temperature

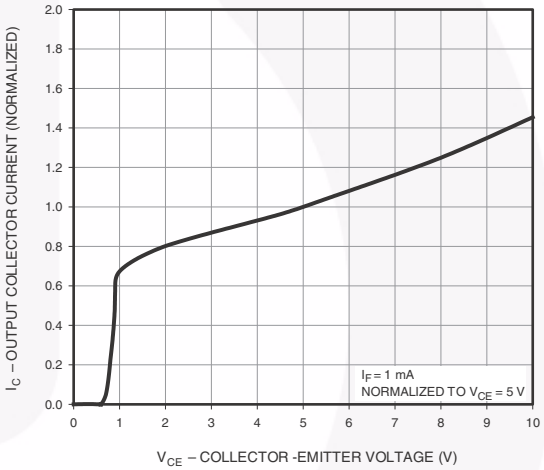


Figure 6. Output Current vs. Collector - Emitter Voltage

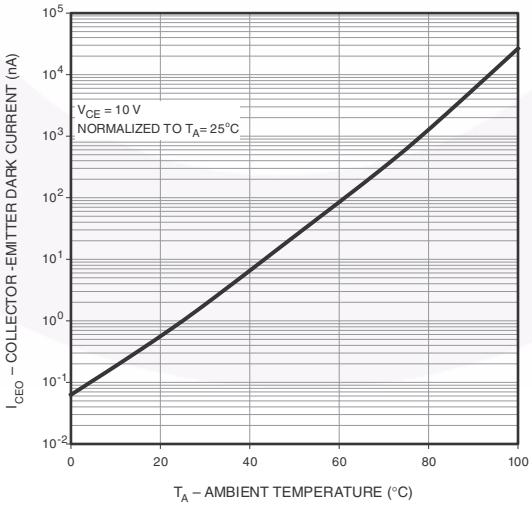


Figure 7. Dark Current vs. Ambient Temperature

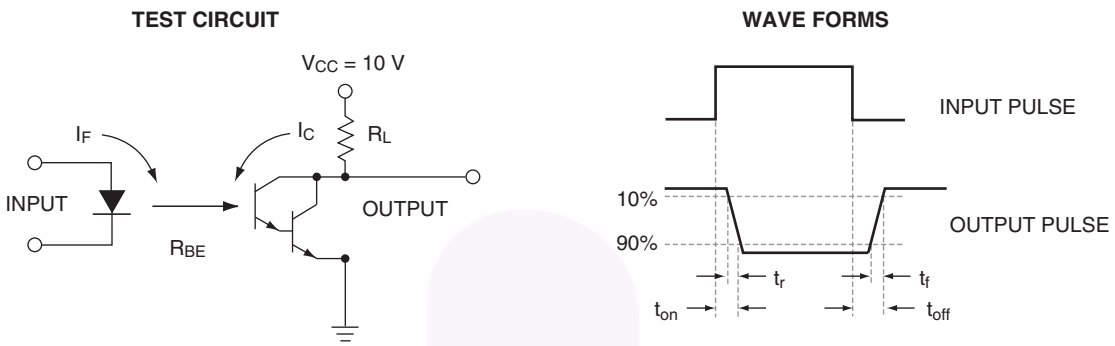


Figure 8. Switching Time Test Circuit and Waveform

Reflow Profile

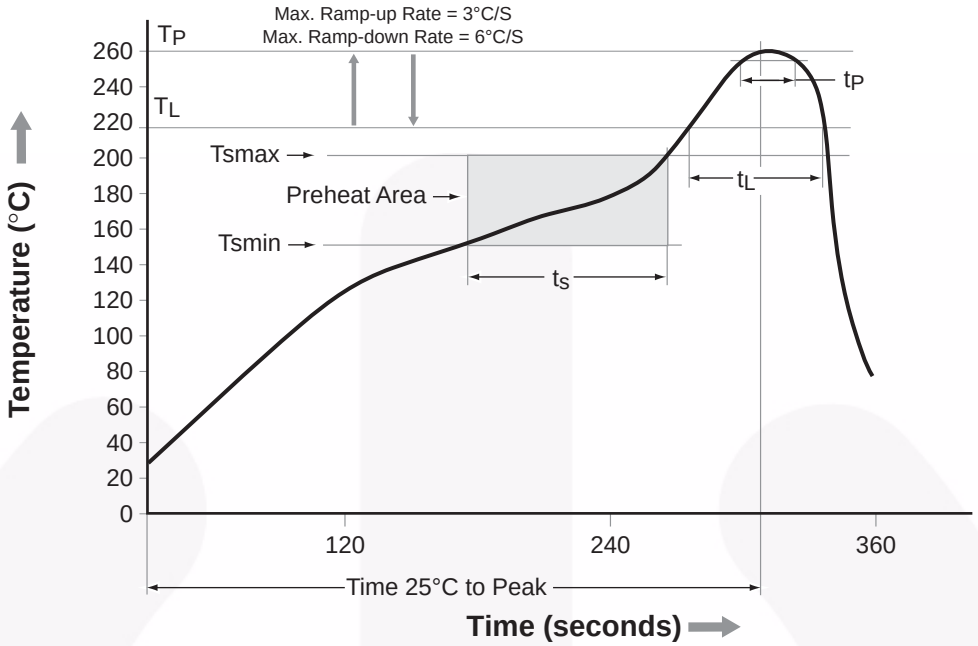


Figure 9. Reflow Profile

Profile Freature	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

Ordering Information

Part Number	Package	Packing Method
MOC223M	Small Outline 8-Pin	Tube (100 Units)
MOC223R2M	Small Outline 8-Pin	Tape and Reel (2500 Units)
MOC223VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	Tube (100 Units)
MOC223R2VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	Tape and Reel (2500 Units)
MOCD223M	Small Outline 8-Pin	Tube (100 Units)
MOCD223R2M	Small Outline 8-Pin	Tape and Reel (2500 Units)
MOCD223VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	Tube (100 Units)
MOCD223R2VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	Tape and Reel (2500 Units)

Marking Information

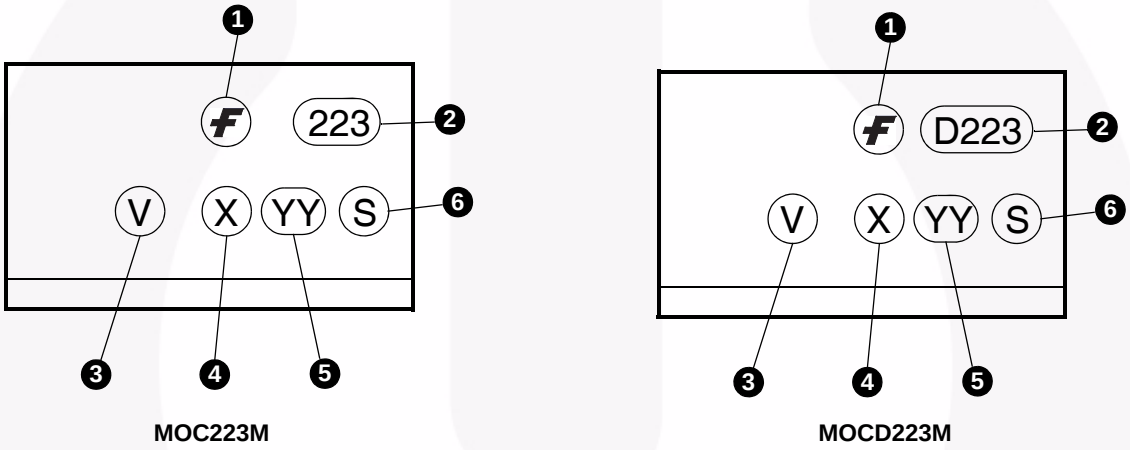
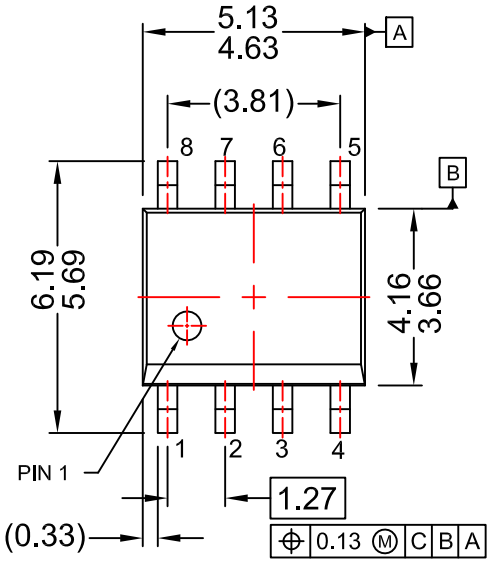
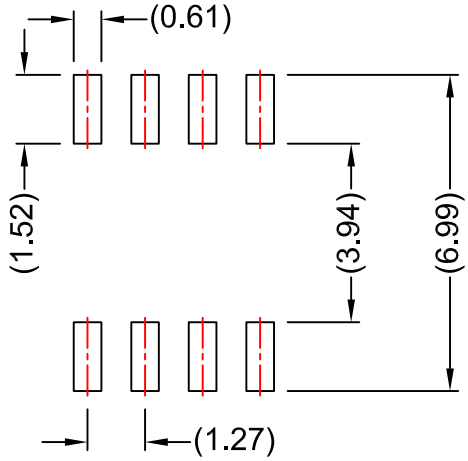


Figure 10. Top Marks

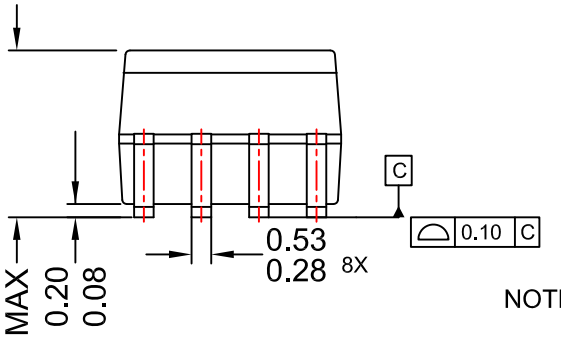
Table 1. Top Mark Definitions

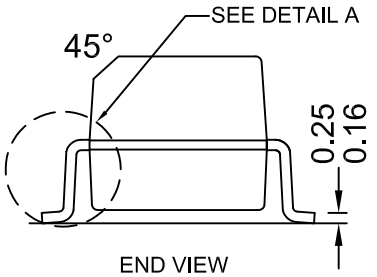
1	Fairchild Logo
2	Device Number
3	DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)
4	One-Digit Year Code, e.g., “4”
5	Digit Work Week, Ranging from “01” to “53”
6	Assembly Package Code



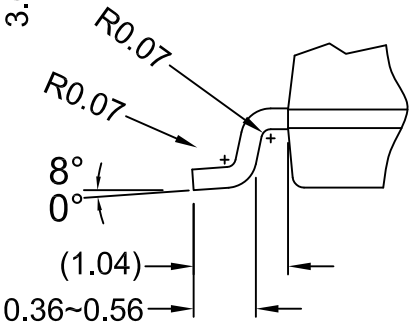


LAND PATTERN RECOMMENDATION





END VIEW



DETAIL A
SCALE: 2:1

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.
E) DRAWING FILENAME: MKT-M08Erev5

FAIRCHILD