October 2014

MOC205M, MOC206M, MOC207M, MOC211M, MOC212M, MOC213M, MOC216M, MOC217M 8-pin SOIC Single-Channel Phototransistor Output Optocoupler

Features

- Closely Matched Current Transfer Ratios
- Minimum BV_{CEO} of 70 V Guaranteed
  - MOC205M, MOC206M, MOC207M
- Minimum BV_{CEO} of 30 V Guaranteed
  - MOC211M, MOC212M, MOC213M, MOC216M, MOC217M
- Low LED Input Current Required for Easier Logic Interfacing
  - MOC216M, MOC217M
- 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

- Feedback Control Circuits
- Interfacing and Coupling Systems of Different Potentials and Impedances
- General Purpose Switching Circuits
- Monitor and Detection Circuits

Description

These devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector, in a surface mountable, small outline, plastic package. They are ideally suited for high-density applications, and eliminate the need for through-the-board mounting.

Schematic

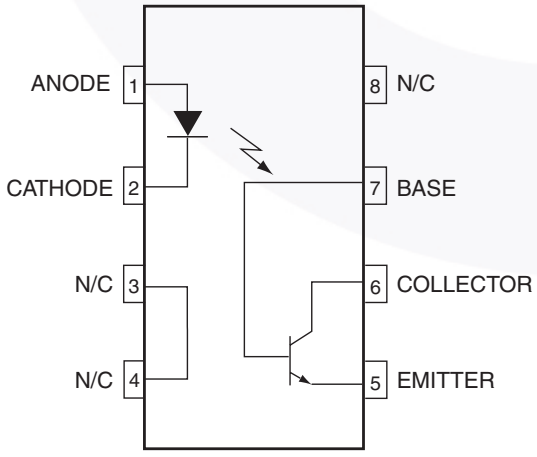


Figure 1. Schematic

Package Outline

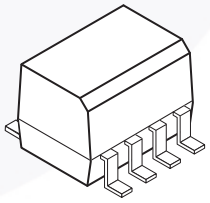


Figure 2. Package Outline

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_{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 MOC216M, MOC217M	I_F = 1 mA		1.07	1.3	V
	MOC205M, MOC206M, MOC207M MOC211M, MOC212M, MOC213M	I_F = 10 mA		1.15	1.5	V
I_R	Reverse Leakage Current	V_R = 6 V		0.001	100	µA
C_{IN}	Input Capacitance			18		pF
DETECTOR						
I_{CEO1}	Collector-Emitter Dark Current	V_{CE} = 10 V, T_A = 25°C		1.0	50	nA
I_{CEO2}		V_{CE} = 10 V, T_A = 100°C		1.0		µA
BV_{CEO}	Collector-Emitter Breakdown Voltage MOC205M, MOC206M, MOC207M	I_C = 100 µA	70	100		V
	MOC211M, MOC212M, MOC213M, MOC216M, MOC217M	I_C = 100 µA	30	100		V
BV_{CBO}	Collector-Base Breakdown Voltage	I_C = 10 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		7		pF
COUPLED						
CTR	Collector-Output Current MOC205M	I_F = 10 mA, V_{CE} = 10 V	40		80	%
	MOC206M	I_F = 10 mA, V_{CE} = 10 V	63		125	%
	MOC207M	I_F = 10 mA, V_{CE} = 10 V	100		200	%
	MOC211M	I_F = 10 mA, V_{CE} = 10 V	20			%
	MOC212M	I_F = 10 mA, V_{CE} = 10 V	50			%
	MOC213M	I_F = 10 mA, V_{CE} = 10 V	100			%
	MOC216M	I_F = 1 mA, V_{CE} = 5 V	50			%
	MOC217M	I_F = 1 mA, V_{CE} = 5 V	100			%
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage MOC205M, MOC206M, MOC207M MOC211M, MOC212M, MOC213M	I_C = 2 mA, I_F = 10 mA			0.4	V
	MOC216M, MOC217M	I_C = 100 µA, I_F = 1 mA			0.4	V
t_{on}	Turn-On Time	I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 12)		7.5		µs
t_{off}	Turn-Off Time	I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 12)		5.7		µs
t_r	Rise Time	I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 12)		3.2		µs
t_f	Fall Time	I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 12)		4.7		µs

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Units
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

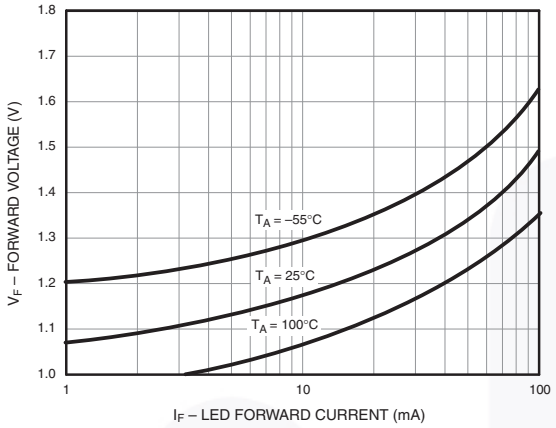


Figure 3. LED Forward Voltage vs. Forward Current

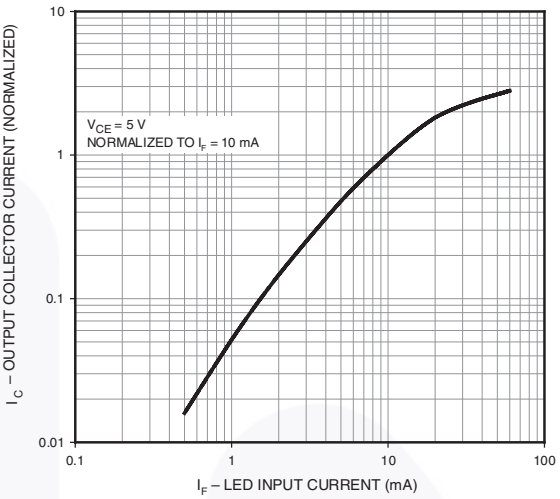


Figure 4. Output Curent vs. Input Current

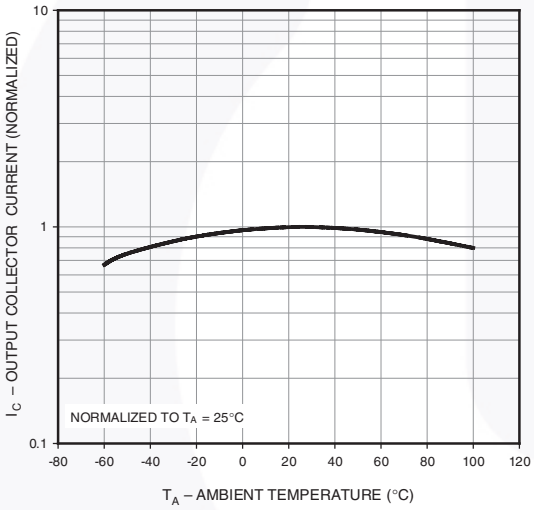


Figure 5. Output Current vs. Ambient Temperature

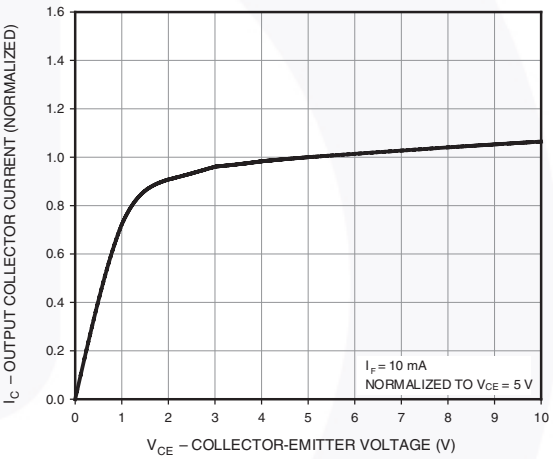


Figure 6. Output Current vs. Collector-Emitter Voltage

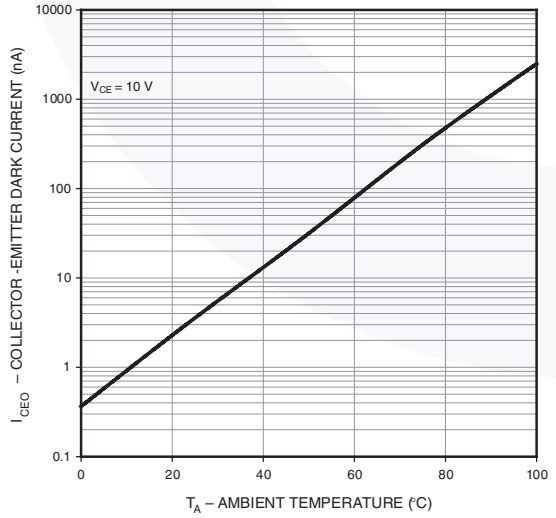


Figure 7. Dark Current vs. Ambient Temperature

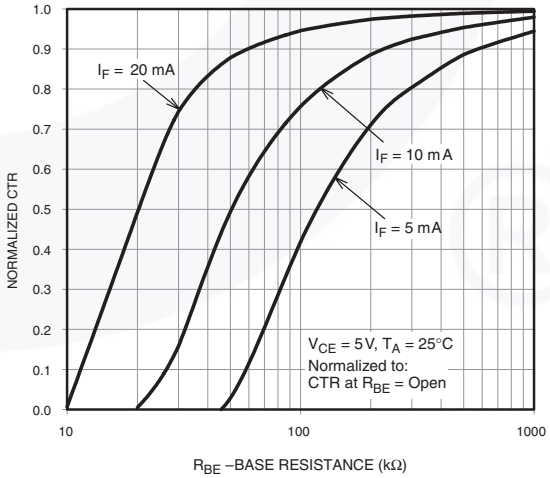


Figure 8. CTR vs. R_{BE} (Unsaturated)

Typical Performance Curves (Continued)

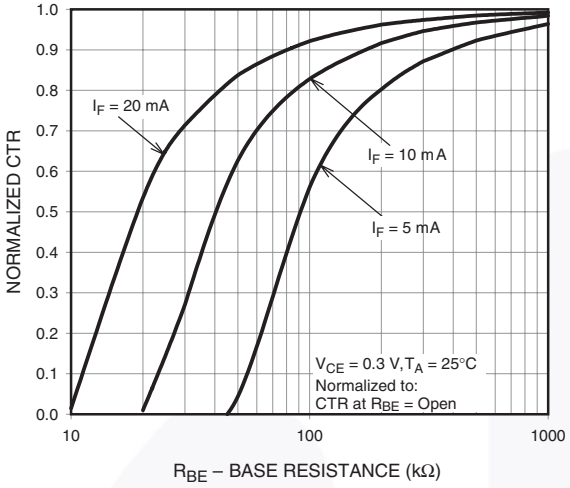


Figure 9. CTR vs. R_{BE} (Saturated)

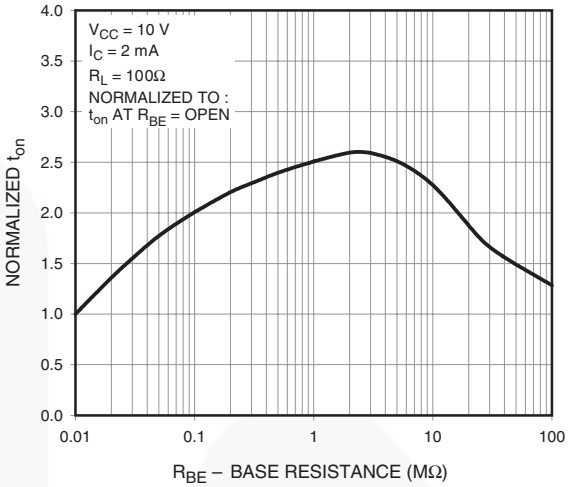


Figure 10. Normalized t_{on} vs. R_{BE}

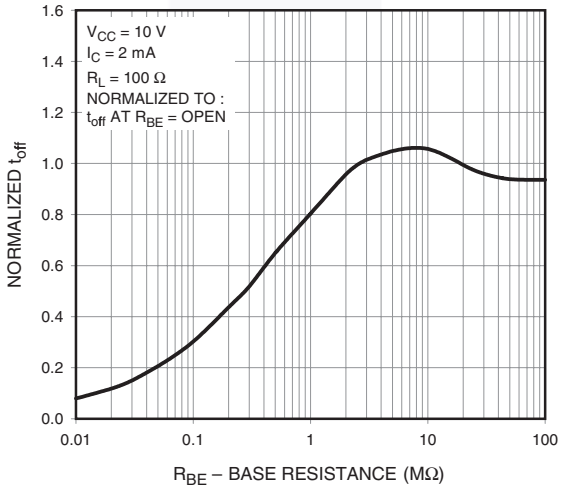


Figure 11. Normalized t_{off} vs. R_{BE}

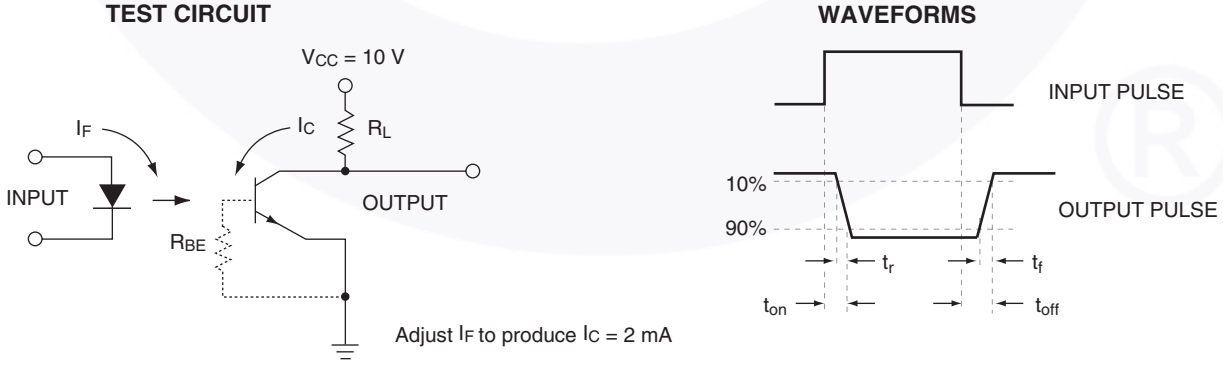


Figure 12. Switching Time Test Circuit and Waveforms

Reflow Profile

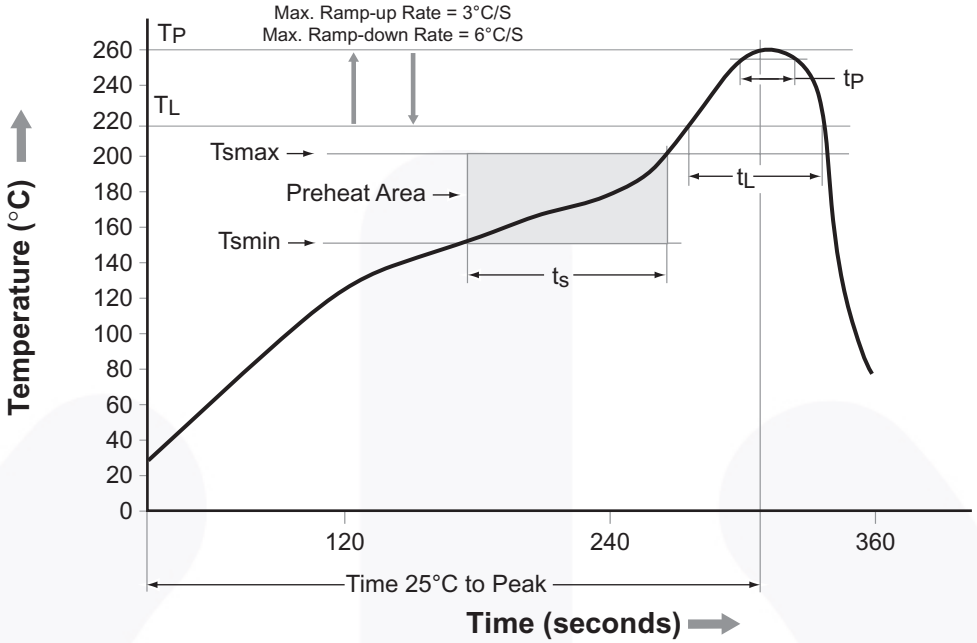


Figure 13. Reflow Profile

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
MOC205M	Small Outline 8-Pin	Tube (100 Units)
MOC205R2M	Small Outline 8-Pin	Tape and Reel (1000 Units)
MOC205VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	Tube (100 Units)
MOC205R2VM	Small Outline 8-Pin, DIN EN/IEC60747-5-5 Option	Tape and Reel (1000 Units)

Note:

2. The product orderable part number system listed in this table also applies to the MOC20XM and MOC21XM products.

Marking Information

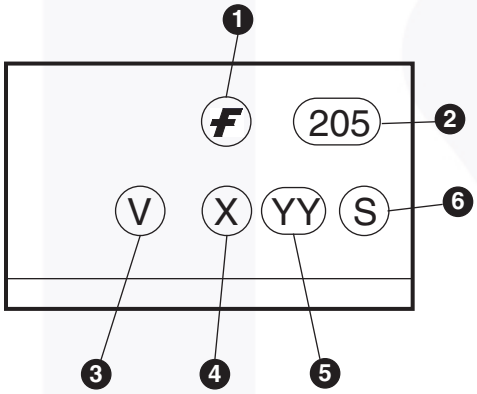
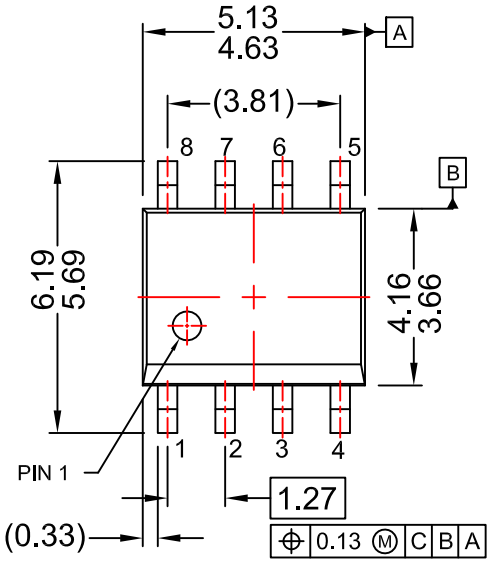
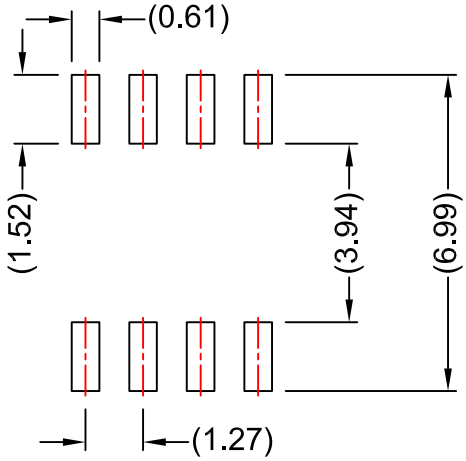


Figure 14. Top MarkTop Mark

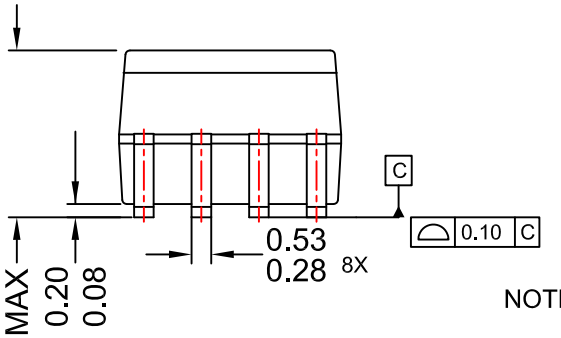
Table 1. Top Mark Definitions

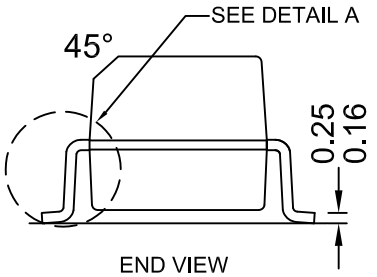
1	Fairchild Logo
2	Device Number
3	DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)
4	One-Digit Year Code, e.g., “4”
5	Digit Work Week, Ranging from “01” to “53”
6	Assembly Package Code



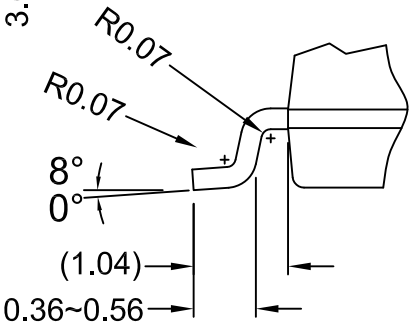


LAND PATTERN RECOMMENDATION





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

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Definition of Terms

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.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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