FAIRCHILD SEMICONDUCTOR®

April 2013

MOC211M, MOC212M, MOC213M
Small Ouline Optocouplers Transistor Output

Features

- UL Recognized (File #E90700, Volume 2)
- VDE Recognized (File #136616) (add option 'V' for VDE approval, e.g., MOC211VM)
- Convenient Plastic SOIC-8 Surface Mountable Package Style
- Standard SOIC-8 Footprint, with 0.050" Lead Spacing
- High Input-Output Isolation of 2500 $V_{AC(rms)}$ Guaranteed
- Minimum BV_{CEO} of 30V Guaranteed

Applications

- General Purpose Switching Circuits
- Interfacing and Coupling Systems of Different Potentials and Impedances
- Regulation Feedback 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

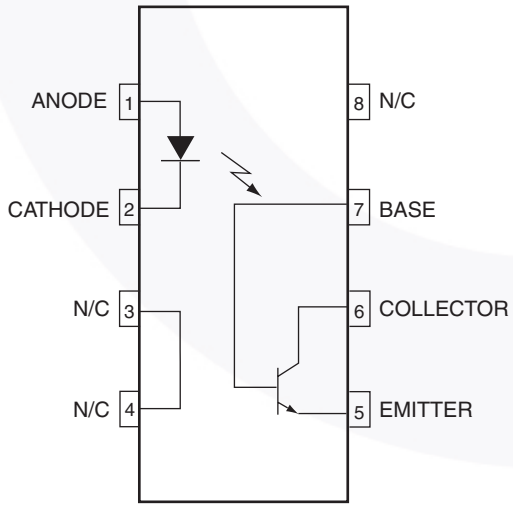


Figure 1. Schematic

Package Outline

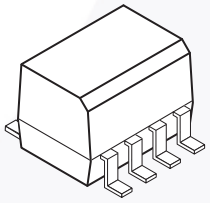


Figure 2. Package Outline

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)[1][2][3]	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
T_L	Lead Soldering Temperature (1/16" from case, 10 second duration)	260	°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. V_{ISO} rating of 2500 $V_{AC(rms)}$ for t = 1 minute is equivalent to a rating of 3,000 $V_{AC(rms)}$ for t = 1 second.

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 = 10 mA		1.15	1.5	V
I_R	Reverse Leakage Current	V_R = 6.0 V		0.001	100	µA
C_{IN}	Input Capacitance			18		pF
Detector						
I_{CEO1} I_{CEO2}	Collector-Emitter Dark Current	V_{CE} = 10 V, T_A = 25°C V_{CE} = 10 V, T_A = 100°C		1.0 1.0	50	nA 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		7.0		pF
Coupled						
CTR	Collector-Output Current[4] MOC211M MOC212M MOC213M	I_F = 10 mA, V_{CE} = 10 V	 20 50 100			 %
V_{ISO}	Isolation Surge Voltage[1][2][3]	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 = 2.0 mA, I_F = 10 mA			0.4	V
C_{ISO}	Isolation Capacitance[2]	V = 0 V, f = 1 MHz		0.2		pF
t_{on}	Turn-On Time	I_C = 2.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Fig. 12)		7.5		µs
t_{off}	Turn-Off Time	I_C = 2.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Fig. 12)		5.7		µs
t_r	Rise Time	I_C = 2.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Fig. 12)		3.2		µs
t_f	Fall Time	I_C = 2.0 mA, V_{CC} = 10 V, R_L = 100 Ω (Fig. 12)		4.7		µs

*Typical values 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. V_{ISO} rating of 2500 $V_{AC(rms)}$ for t = 1 minute is equivalent to a rating of 3,000 $V_{AC(rms)}$ for t = 1 second.
4. Current Transfer Ratio (CTR) = I_C / I_F x 100 %.

Typical Performance Curves

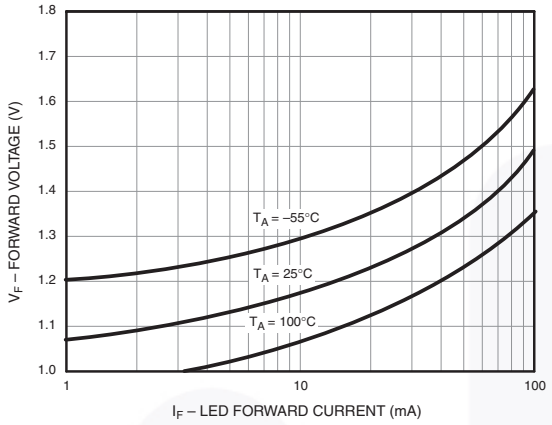


Figure 3. LED Forward Voltage vs. Forward Current

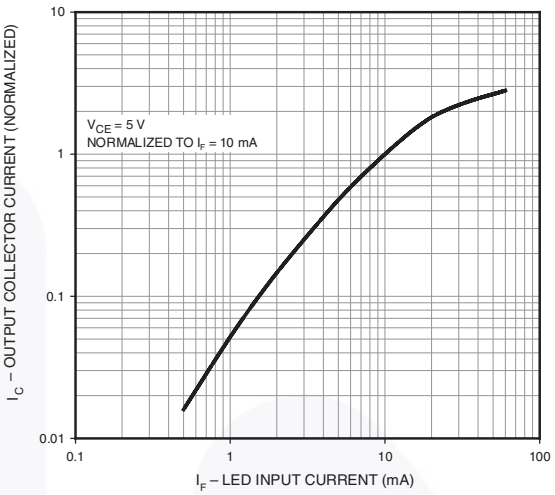


Figure 4. Output Curent vs. Input Current

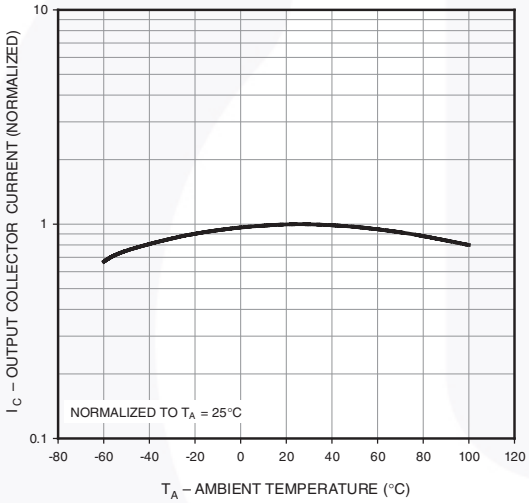


Figure 5. Output Current vs. Ambient Temperature

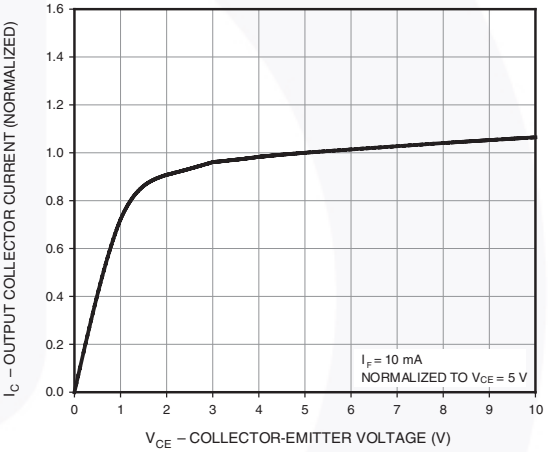


Figure 6. Output Current vs. Collector-Emitter Voltage

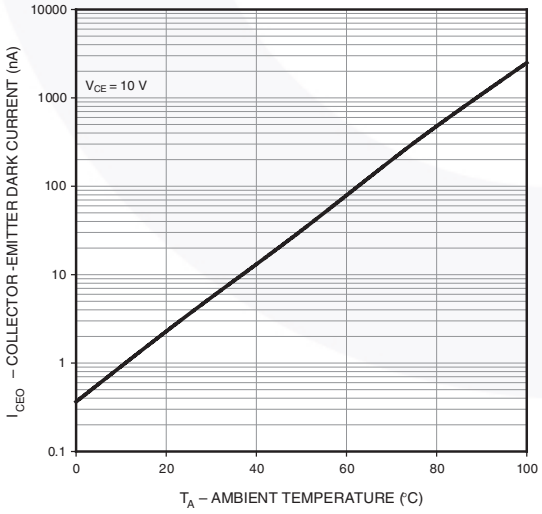


Figure 7. Dark Current vs. Ambient Temperature

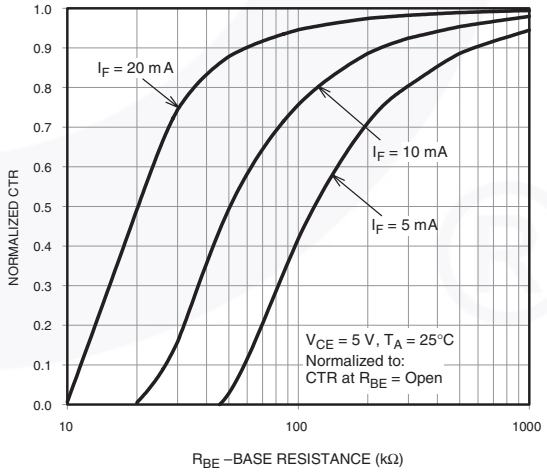


Figure 8. CTR vs. R_{BE} (Unsaturated)

Typical Performance Curves (Continued)

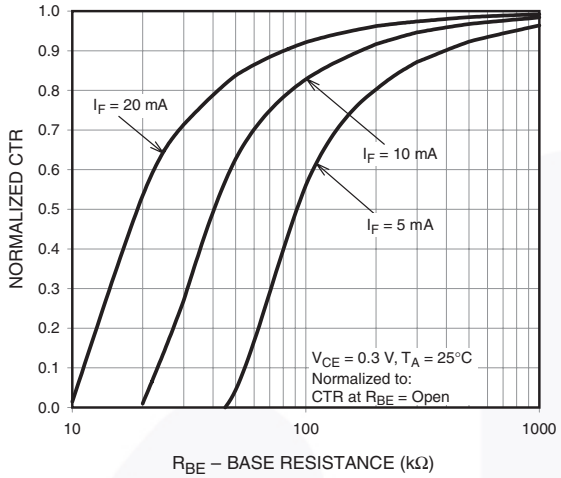


Figure 9. CTR vs. R_{BE} (Saturated)

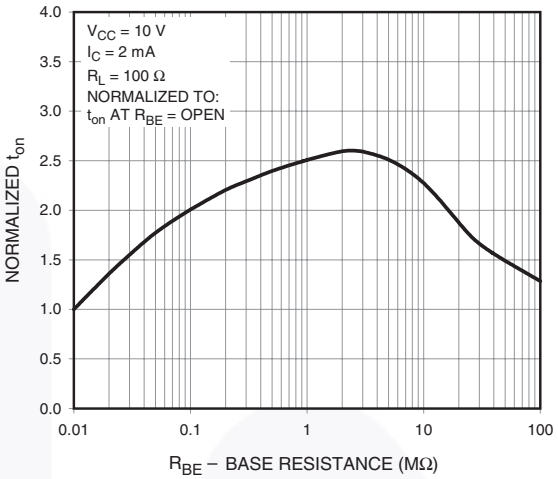


Figure 10. Normalized t_{on} vs. R_{BE}

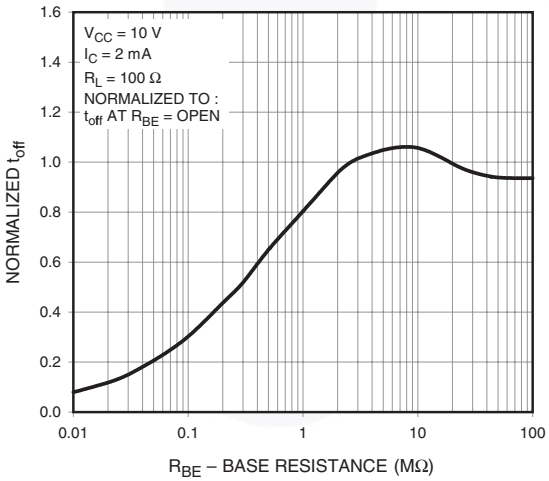


Figure 11. Normalized t_{off} vs. R_{BE}

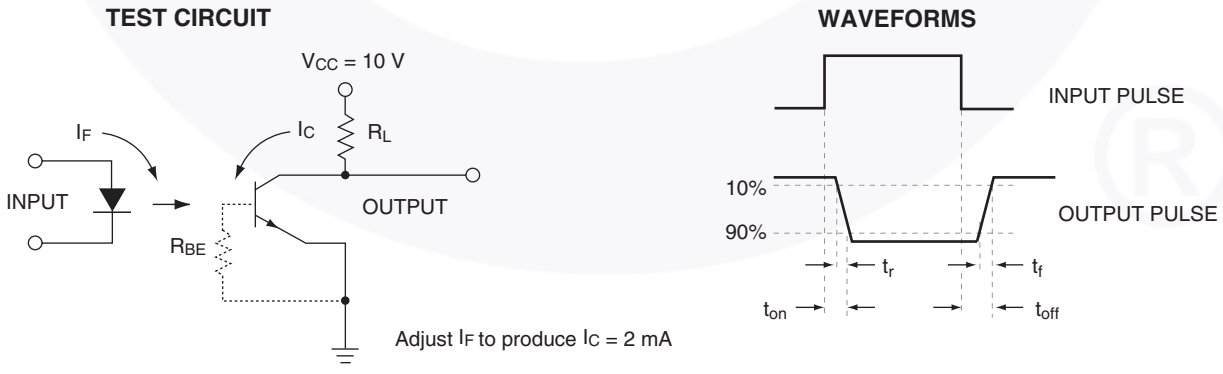
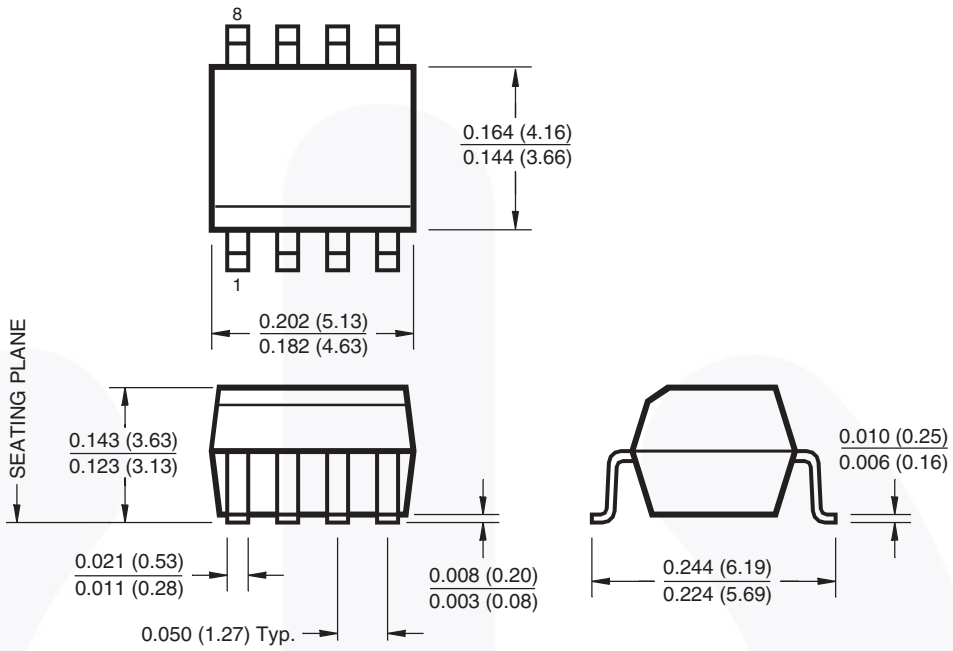


Figure 12. Switching Time Test Circuit and Waveforms

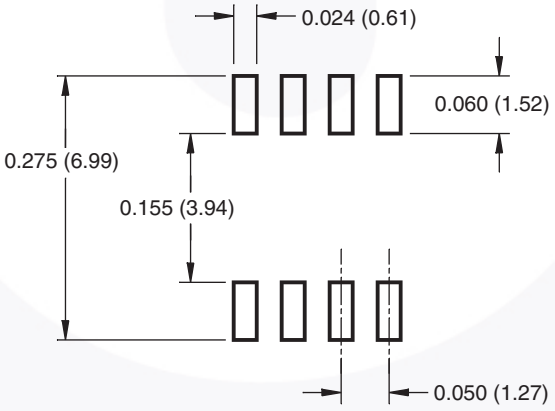
Package Dimensions

8-pin SOIC Surface Mount



Lead Coplanarity: 0.004 (0.10) MAX

Recommended Pad Layout



Dimensions in inches (mm).

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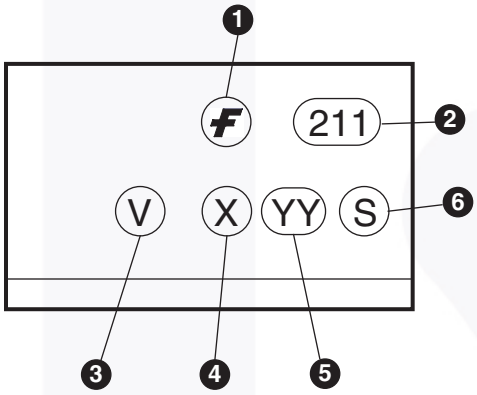
Ordering Information

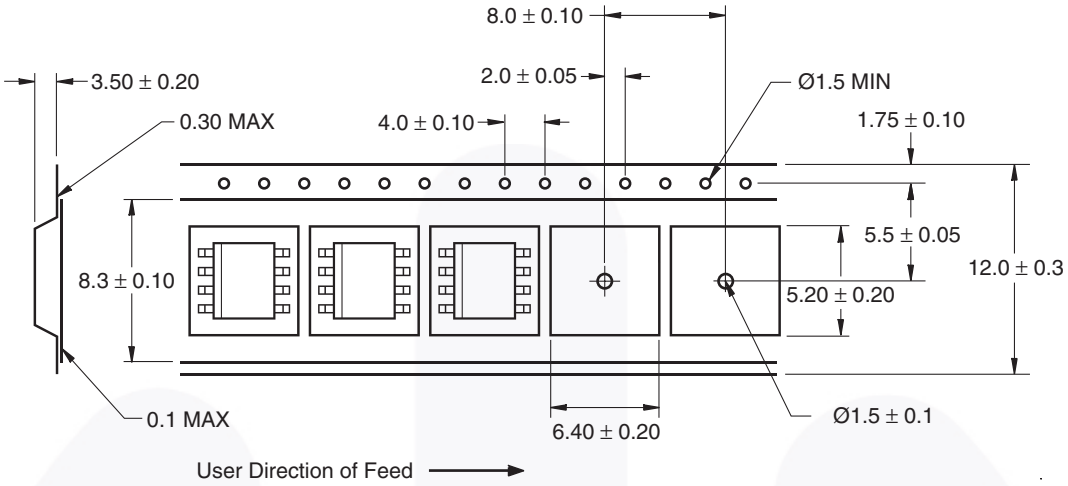
Option	Order Entry Identifier	Description
V	V	VDE 0884
R2	R2	Tape and Reel (2500 units per reel)
R2V	R2V	VDE 0884, Tape and Reel (2500 units per reel)

Marking Information



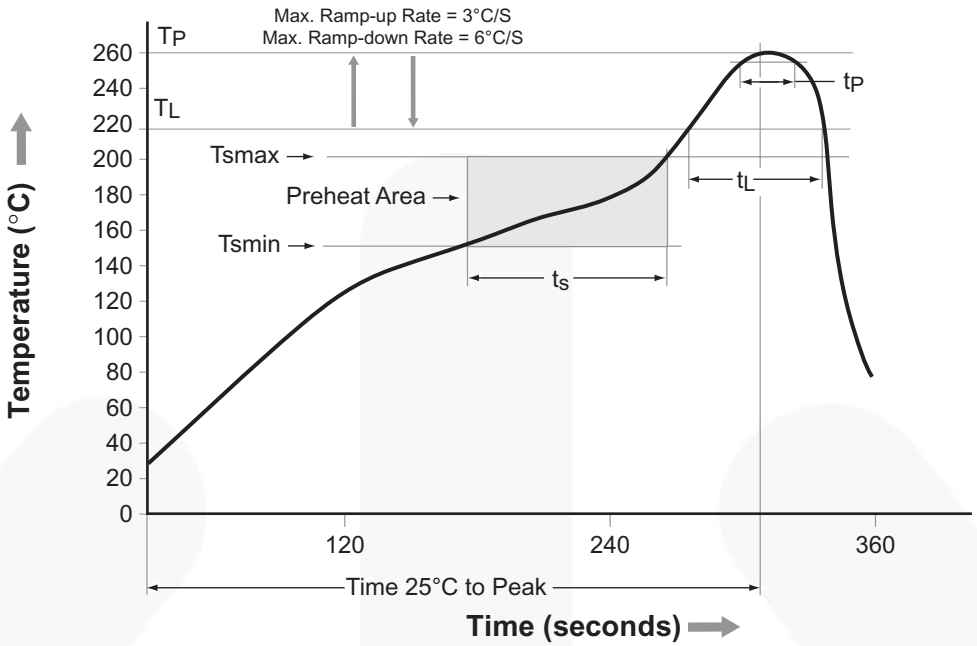
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., ‘8’
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

Carrier Tape Specifications



Dimensions in mm

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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Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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Rev. I64

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