

MOC215M, MOC216M, MOC217M

Small Outline Surface Mount Phototransistor Optocouplers

Features

- U.L. recognized (File #E90700, Volume 2)
- VDE recognized (File #136616)
(add option "V" for VDE approval, i.e., MOC205VM)
- Convenient plastic SOIC-8 surface mountable package style
- Low LED input current required for easier logic interfacing
- Standard SOIC-8 footprint, with 0.050" lead spacing
- Compatible with dual wave, vapor phase and IR reflow soldering
- High input-output isolation of 2500 V_{AC(rms)} guaranteed

Applications

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

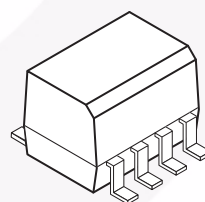
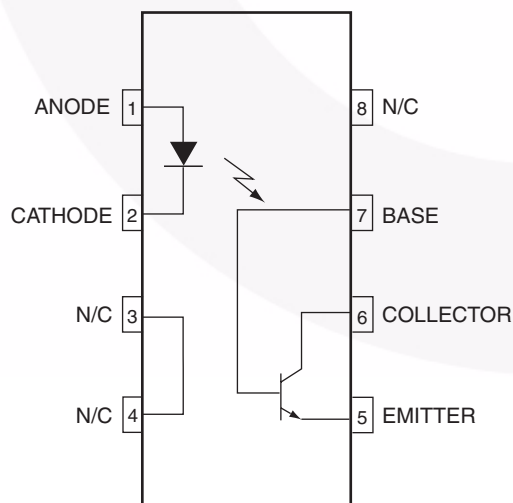
Description

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.

Marking Information

- MOC215M = 215
- MOC216M = 216
- MOC217M = 217

Schematic



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ 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	mW
		0.8	mW/°C
DETECTOR			
V _{CEO}	Collector-Emitter Voltage	30	V
V _{CBO}	Collector-Base Voltage	70	V
V _{ECO}	Emitter-Collector Voltage	7.0	V
I _C	Collector Current-Continuous	150	mA
P _D	Detector Power Dissipation @ T _A = 25°C Derate above 25°C	150	mW
		1.76	mW/°C
TOTAL DEVICE			
V _{ISO}	Input-Output Isolation Voltage (f = 60Hz, t = 1 min.) ⁽¹⁾⁽²⁾	2500	Vac(rms)
P _D	Total Device Power Dissipation @ T _A = 25°C Derate above 25°C	250	mW
		2.94	mW/°C
T _A	Ambient Operating Temperature Range	-40 to +100	°C
T _{stg}	Storage Temperature Range	-40 to +125	°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.

Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Test Conditions	Min.	Typ.*	Max.	Unit
EMITTER						
V_F	Forward Voltage	$I_F = 1.0\text{mA}$		1.07	1.3	V
I_R	Reverse Leakage Current	$V_R = 6.0\text{V}$		0.001	100	μA
C	Capacitance			18		pF
DETECTOR						
I_{CEO}	Collector-Emitter Dark Current	$V_{CE} = 5.0\text{V}, T_A = 25^\circ\text{C}$		1.0	50	nA
		$V_{CE} = 5.0\text{V}, T_A = 100^\circ\text{C}$		1.0		μA
BV_{CEO}	Collector-Emitter Breakdown Voltage	$I_C = 100\mu\text{A}$	30	100		V
BV_{ECO}	Emitter-Collector Breakdown Voltage	$I_E = 100\mu\text{A}$	7.0	10		V
C_{CE}	Collector-Emitter Capacitance	$f = 1.0\text{MHz}, V_{CE} = 0$		7.0		pF
COUPLED						
CTR	Output Collector Current ⁽⁴⁾ MOC215M MOC216M MOC217M	$I_F = 1.0\text{mA}, V_{CE} = 5.0\text{V}$				%
			20			
			50			
			100			
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 100\mu\text{A}, I_F = 1.0\text{mA}$			0.4	V
t_{on}	Turn-On Time	$I_C = 2.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$ (Fig. 10)		4.0		μs
t_{off}	Turn-Off Time	$I_C = 2.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$ (Fig. 10)		4.0		μs
t_r	Rise Time	$I_C = 2.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$ (Fig. 10)		3.0		μs
t_f	Fall Time	$I_C = 2.0\text{mA}, V_{CC} = 10\text{V}, R_L = 100\Omega$ (Fig. 10)		3.0		μs
V_{ISO}	Input-Output Isolation Voltage ⁽¹⁾⁽²⁾⁽³⁾	$f = 60\text{Hz}, t = 1.0\text{min.}$	2500			Vac(rms)
R_{ISO}	Isolation Resistance ⁽²⁾	$V_{I-O} = 500\text{V}$	10^{11}			Ω
C_{ISO}	Isolation Capacitance ⁽²⁾	$V_{I-O} = 0, f = 1.0\text{MHz}$		0.2		pF

*Typical values at $T_A = 25^\circ\text{C}$ **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 Vac(rms) for $t = 1\text{min.}$ is equivalent to a rating of 3,000 Vac(rms) for $t = 1\text{sec.}$
4. Current Transfer Ratio (CTR) = $I_C/I_F \times 100\%$.

Typical Performance Curves

Fig. 1 LED Forward Voltage vs. Forward Current

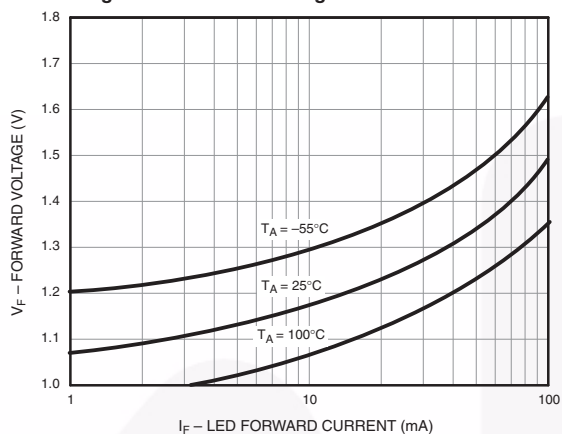


Fig. 2 Output Current vs. Input Current

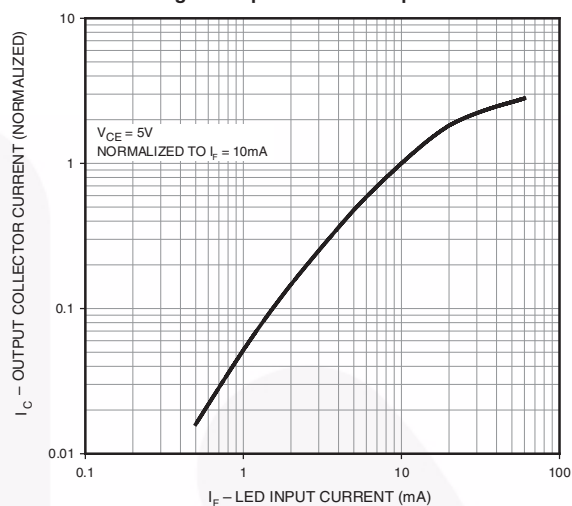


Fig. 3 Output Current vs. Ambient Temperature

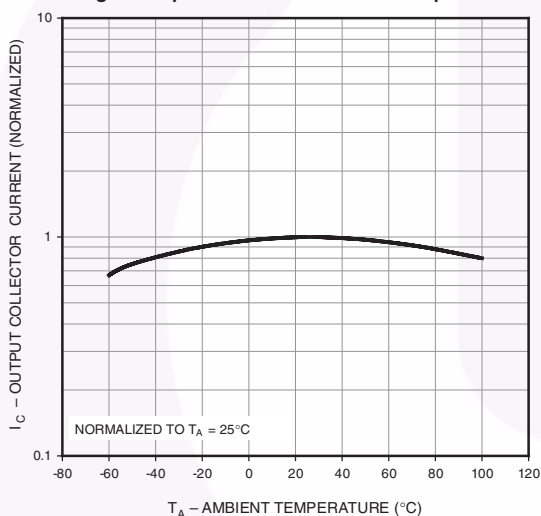


Fig. 4 Output Current vs. Collector-Emitter Voltage

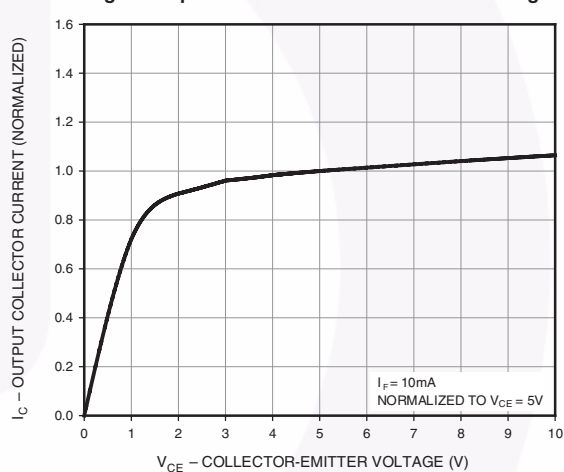


Fig. 5 Dark Current vs. Ambient Temperature

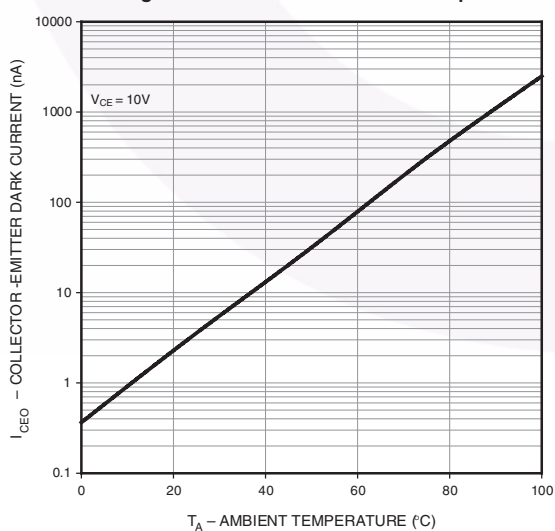
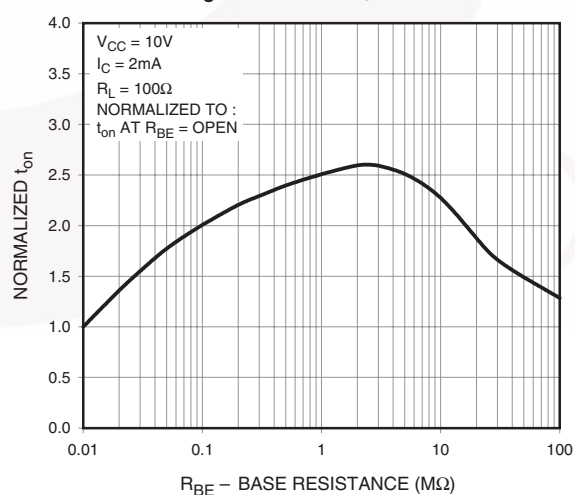


Fig. 6 Normalized t_{on} vs. RBE



Typical Performance Curves (Continued)

Fig. 7 Normalized t_{off} vs. R_{BE}

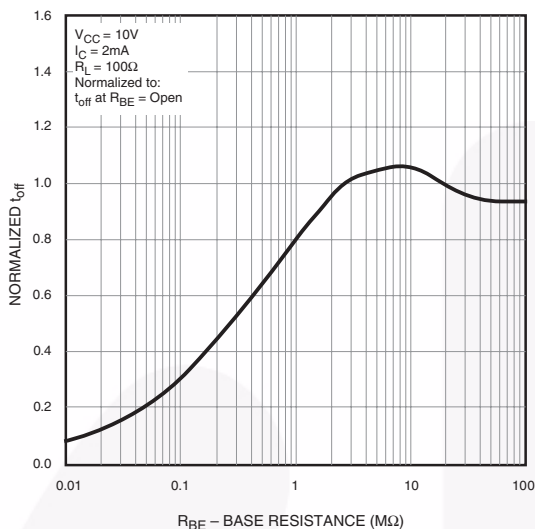


Fig. 8 CTR vs. R_{BE} (Saturated)

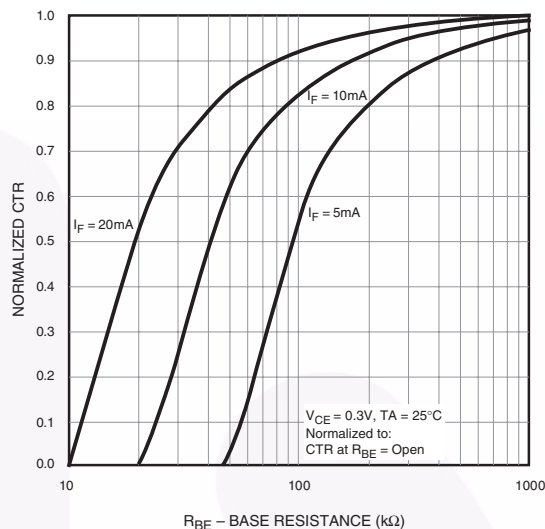
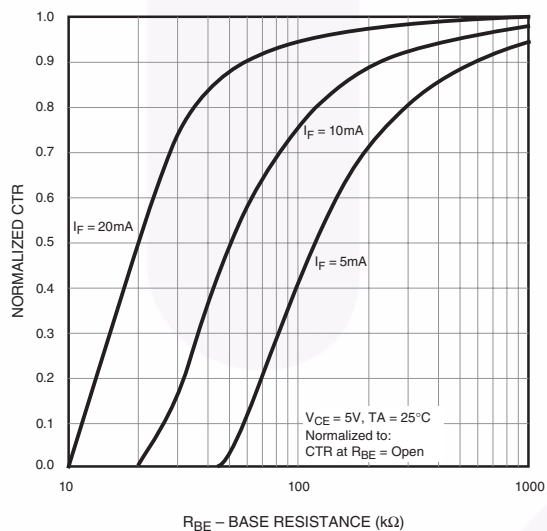
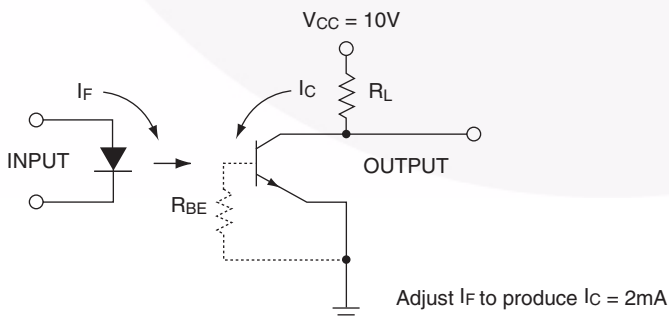


Fig. 9 CTR vs. R_{BE} (Unsaturated)



TEST CIRCUIT



WAVEFORMS

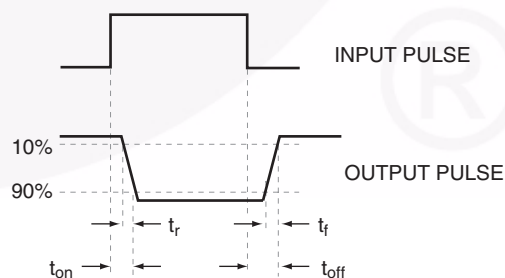
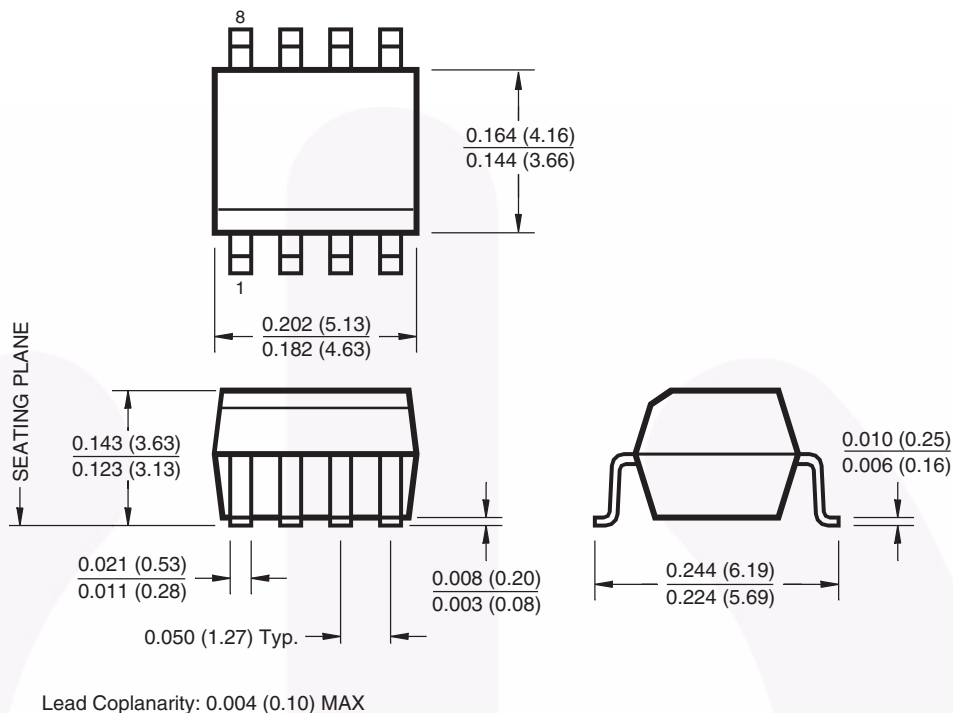


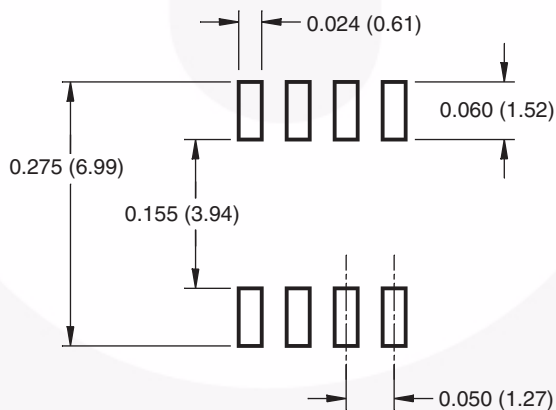
Figure 10. Switching Time Test Circuit and Waveforms

Package Dimensions

8-pin SOIC Surface Mount



Recommended Pad Layout



Dimensions in inches (mm).

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

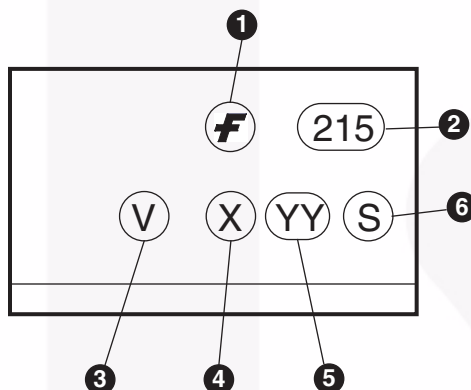
Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

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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)

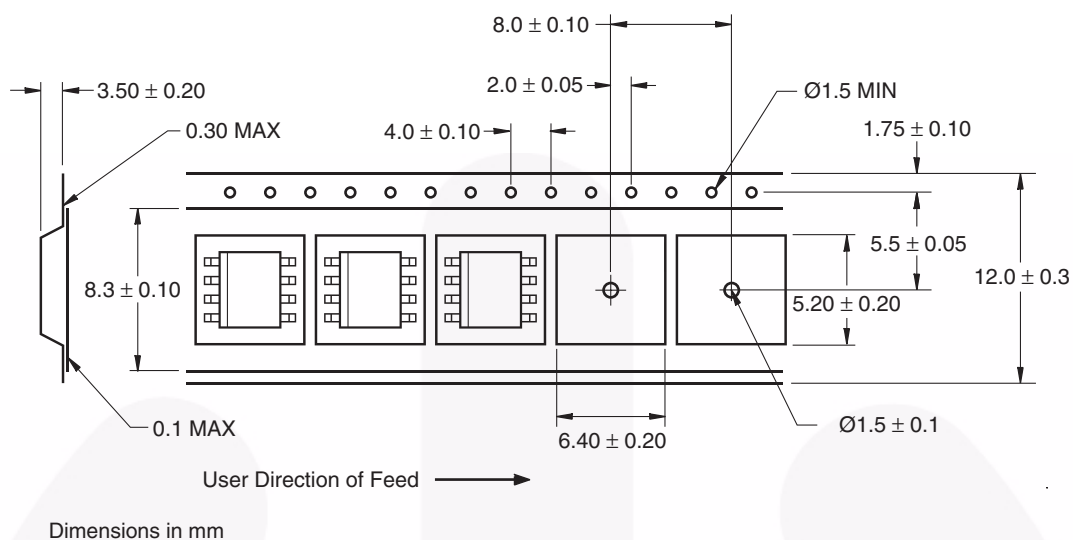
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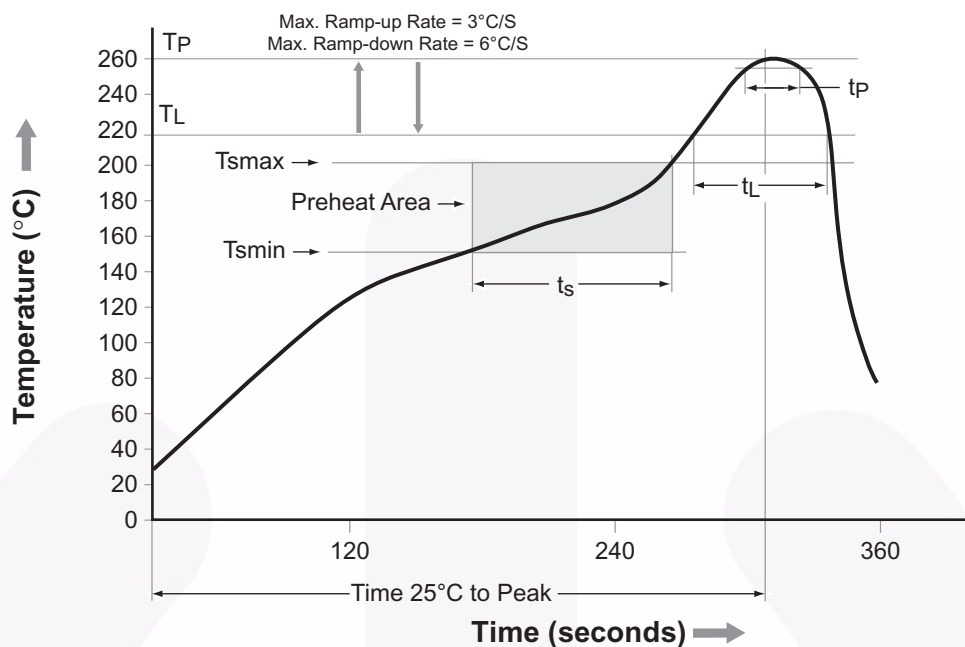
Definitions

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



Reflow Profile





Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T _{smin})	150°C
Temperature Max. (T _{smax})	200°C
Time (t _s) from (T _{smin} to T _{smax})	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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