

4N25M, 4N26M, 4N27M, 4N28M, 4N35M, 4N36M, 4N37M, H11A1M, H11A2M, H11A3M, H11A4M, H11A5M General Purpose 6-Pin Phototransistor Optocouplers

Features

- UL recognized (File # E90700, Volume 2)
- VDE recognized (File # 102497)
 - Add option V (e.g., 4N25VM)

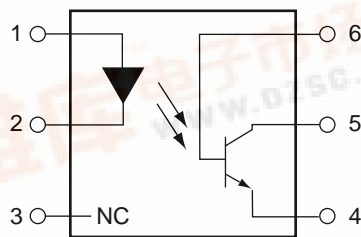
Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

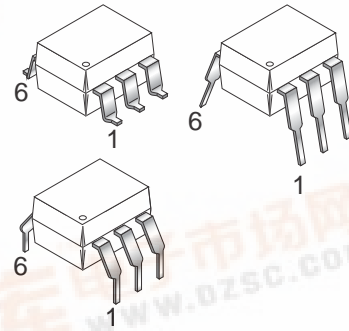
Description

The general purpose optocouplers consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6-pin dual in-line package.

Functional Block Diagram



- PIN 1. ANODE
2. CATHODE
3. NO CONNECTION
4. EMITTER
5. COLLECTOR
6. BASE



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Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Units
TOTAL DEVICE			
T_{STG}	Storage Temperature	-55 to +150	$^\circ\text{C}$
T_{OPR}	Operating Temperature	-55 to +100	$^\circ\text{C}$
T_{SOL}	Wave solder temperature (see page 8 for reflow solder profile)	260 for 10 sec	$^\circ\text{C}$
P_D	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	250	mW
		2.94	
EMITTER			
I_F	DC/Average Forward Input Current	60	mA
V_R	Reverse Input Voltage	6	V
$I_F(\text{pk})$	Forward Current – Peak (300 μs , 2% Duty Cycle)	3	A
P_D	LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	120	mW
		1.41	mW/ $^\circ\text{C}$
DETECTOR			
V_{CEO}	Collector-Emitter Voltage	30	V
V_{CBO}	Collector-Base Voltage	70	V
V_{ECO}	Emitter-Collector Voltage	7	V
P_D	Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	150	mW
		1.76	mW/ $^\circ\text{C}$

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

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
EMITTER						
V_F	Input Forward Voltage	$I_F = 10\text{mA}$		1.18	1.50	V
I_R	Reverse Leakage Current	$V_R = 6.0\text{V}$		0.001	10	μA
DETECTOR						
BV_{CEO}	Collector-Emitter Breakdown Voltage	$I_C = 1.0\text{mA}$, $I_F = 0$	30	100		V
BV_{CBO}	Collector-Base Breakdown Voltage	$I_C = 100\mu\text{A}$, $I_F = 0$	70	120		V
BV_{ECO}	Emitter-Collector Breakdown Voltage	$I_E = 100\mu\text{A}$, $I_F = 0$	7	10		V
I_{CEO}	Collector-Emitter Dark Current	$V_{CE} = 10\text{V}$, $I_F = 0$		1	50	nA
I_{CBO}	Collector-Base Dark Current	$V_{CB} = 10\text{V}$			20	nA
C_{CE}	Capacitance	$V_{CE} = 0\text{V}$, $f = 1\text{MHz}$		8		pF

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.*	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	$f = 60\text{Hz}$, $t = 1\text{sec}$	7500			Vac(pk)
R_{ISO}	Isolation Resistance	$V_{I-O} = 500\text{VDC}$	10^{11}			Ω
C_{ISO}	Isolation Capacitance	$V_{I-O} = \&$, $f = 1\text{MHz}$		0.2	2	pF

*Typical values at $T_A = 25^\circ\text{C}$

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

Transfer Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.*	Max.	Unit
DC CHARACTERISTICS							
CTR	Current Transfer Ratio, Collector to Emitter	$I_F = 10\text{mA}$, $V_{CE} = 10\text{V}$	4N35M, 4N36M, 4N37M	100			%
			H11A1M	50			
			H11A5M	30			
			4N25M, 4N26M H11A2M, H11A3M	20			
			4N27M, 4N28M H11A4M	10			
		$I_F = 10\text{mA}$, $V_{CE} = 10\text{V}$, $T_A = -55^\circ\text{C}$	4N35M, 4N36M, 4N37M	40			
		$I_F = 10\text{mA}$, $V_{CE} = 10\text{V}$, $T_A = +100^\circ\text{C}$	4N35M, 4N36M, 4N37M	40			
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$I_C = 2\text{mA}$, $I_F = 50\text{mA}$	4N25M, 4N26M, 4N27M, 4N28M,			0.5	V
		$I_C = 0.5\text{mA}$, $I_F = 10\text{mA}$	4N35M, 4N36M, 4N37M			0.3	
			H11A1M, H11A2M, H11A3M, H11A4M, H11A5M			0.4	
AC CHARACTERISTICS							
T_{ON}	Non-Saturated Turn-on Time	$I_F = 10\text{mA}$, $V_{CC} = 10\text{V}$, $R_L = 100\Omega$ (Fig. 11)	4N25M, 4N26M, 4N27M, 4N28M, H11A1M, H11A2M, H11A3M, H11A4, H11A5M		2		μs
		$I_C = 2\text{mA}$, $V_{CC} = 10\text{V}$, $R_L = 100\Omega$ (Fig. 11)	4N35M, 4N36M, 4N37M		2	10	μs
T_{OFF}	Turn-off Time	$I_F = 10\text{mA}$, $V_{CC} = 10\text{V}$, $R_L = 100\Omega$ (Fig. 11)	4N25M, 4N26M, 4N27M, 4N28M, H11A1M, H11A2M, H11A3M, H11A4M, H11A5M		2		μs
		$I_C = 2\text{mA}$, $V_{CC} = 10\text{V}$, $R_L = 100\Omega$ (Fig. 11)	4N35M, 4N36M, 4N37M		2	10	

* Typical values at $T_A = 25^\circ\text{C}$

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Typical Performance Curves

Fig. 1 LED Forward Voltage vs. Forward Current

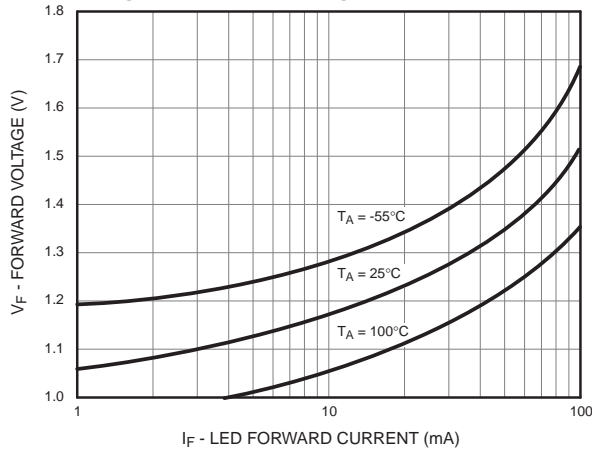


Fig.2 Normalized CTR vs. Forward Current

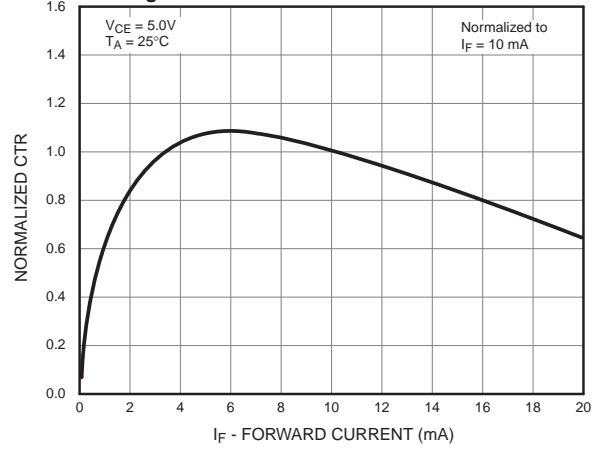


Fig. 3 Normalized CTR vs. Ambient Temperature

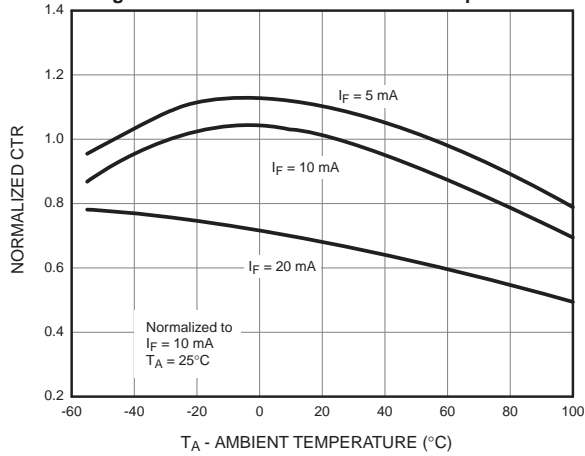


Fig. 4 CTR vs. RBE (Unsaturated)

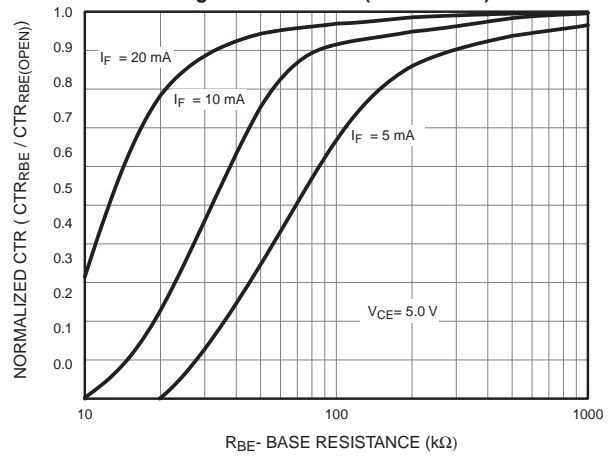


Fig. 5 CTR vs. RBE (Saturated)

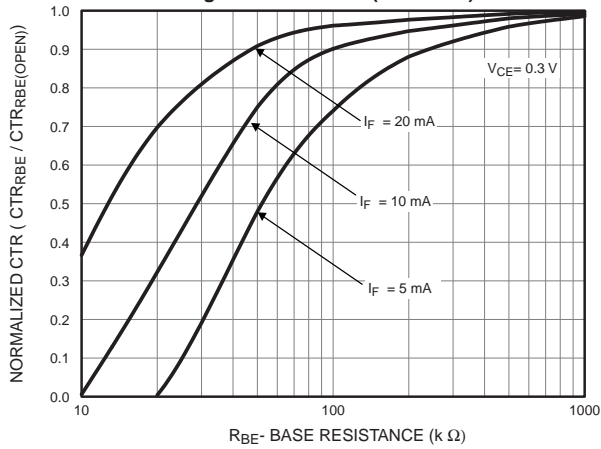
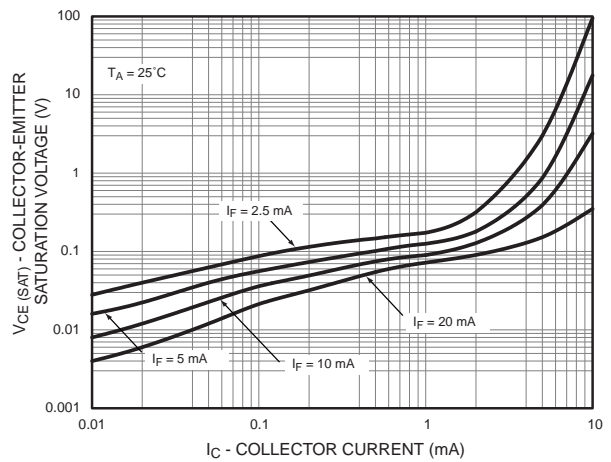


Fig. 6 Collector-Emitter Saturation Voltage vs. Collector Current



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Fig. 7 Switching Speed vs. Load Resistor

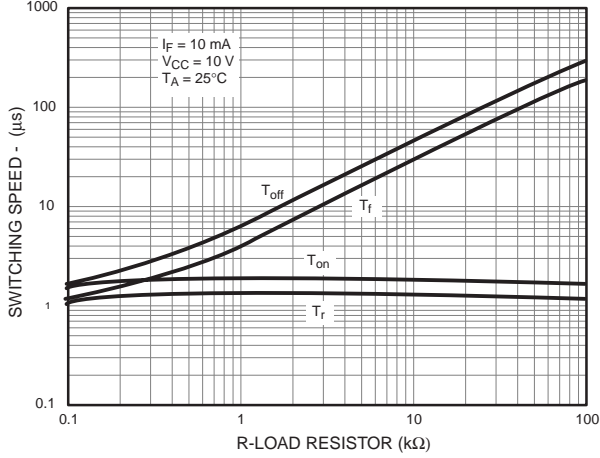


Fig. 8 Normalized t_{on} vs. R_{BE}

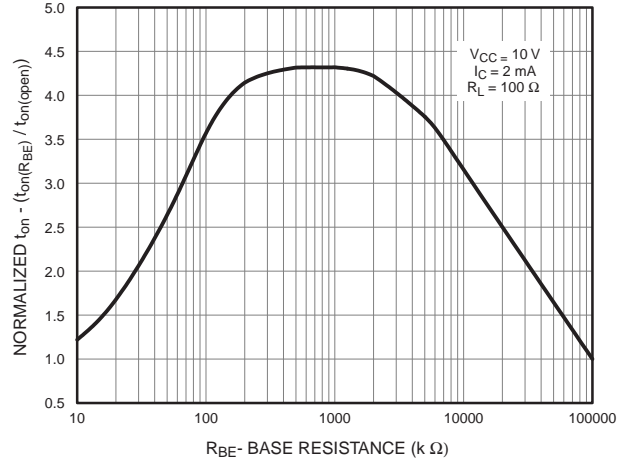


Fig. 9 Normalized t_{off} vs. R_{BE}

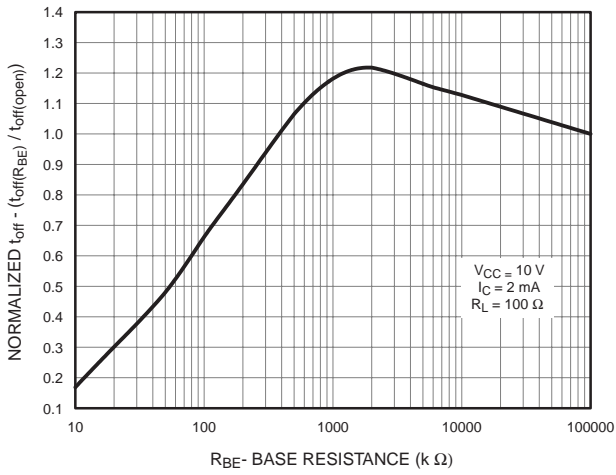
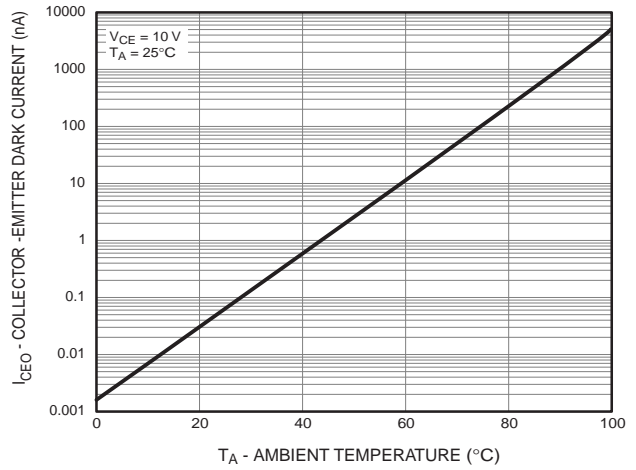
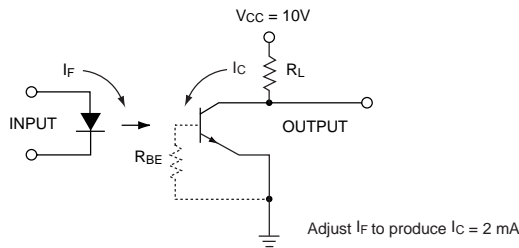


Fig. 10 Dark Current vs. Ambient Temperature



TEST CIRCUIT



WAVE FORMS

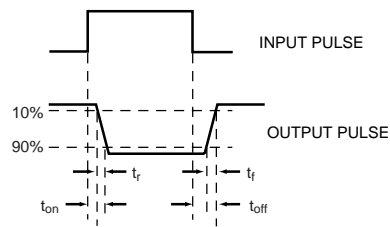
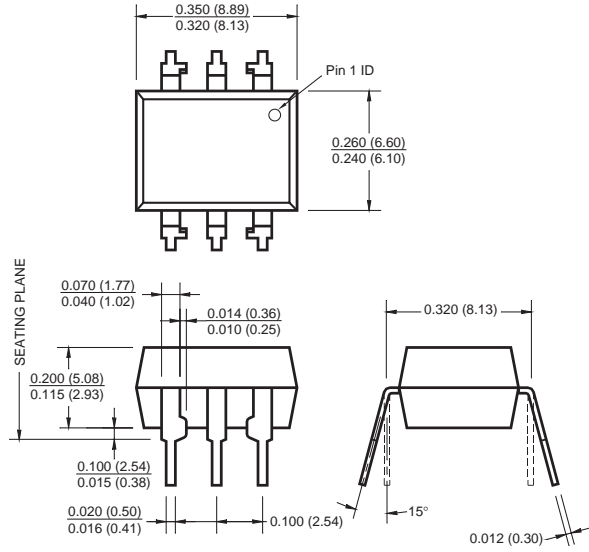


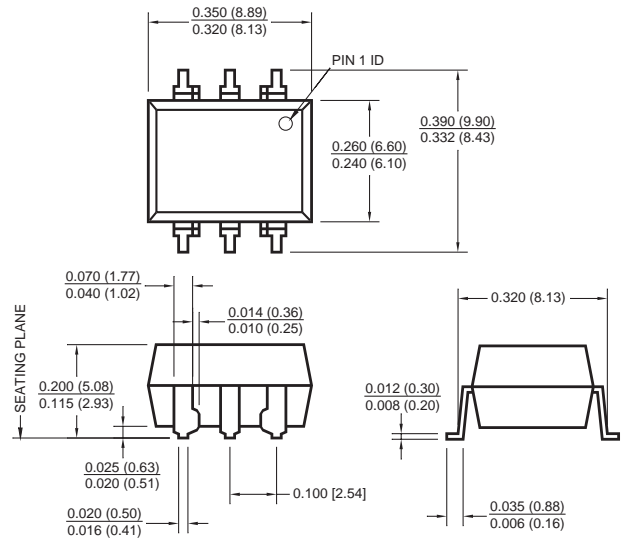
Figure 11. Switching Time Test Circuit and Waveforms

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Package Dimensions

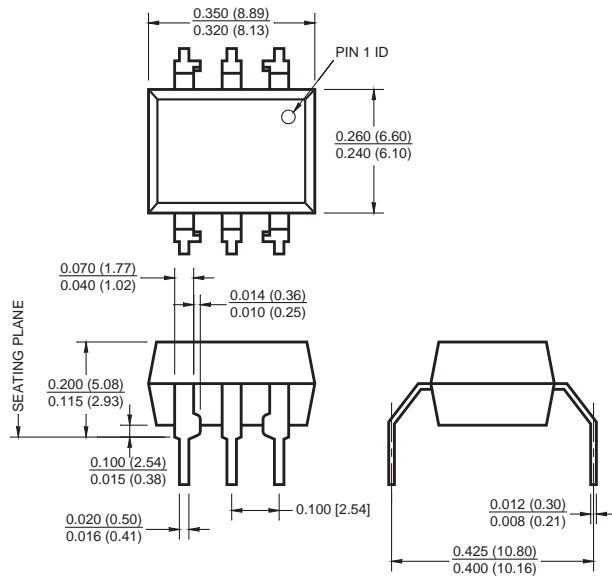
Through Hole



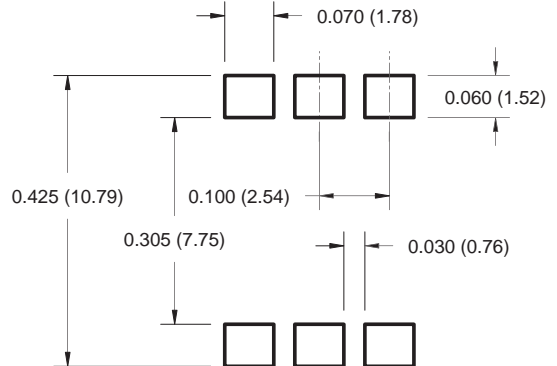
Surface Mount



0.4" Lead Spacing



Recommended Pad Layout for Surface Mount Leadform



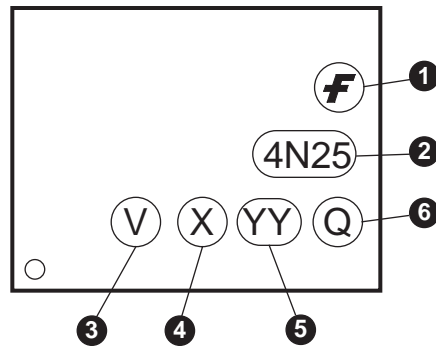
Note:
 All dimensions are in inches (millimeters)

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Ordering Information

Option	Order Entry Identifier (Example)	Description
No option	4N25M	Standard Through Hole Device
S	4N25SM	Surface Mount Lead Bend
SR2	4N25SR2M	Surface Mount; Tape and Reel
T	4N25TM	0.4" Lead Spacing
V	4N25VM	VDE 0884
TV	4N25TVM	VDE 0884, 0.4" Lead Spacing
SV	4N25SVM	VDE 0884, Surface Mount
SR2V	4N25SR2VM	VDE 0884, Surface Mount, Tape and Reel

Marking Information

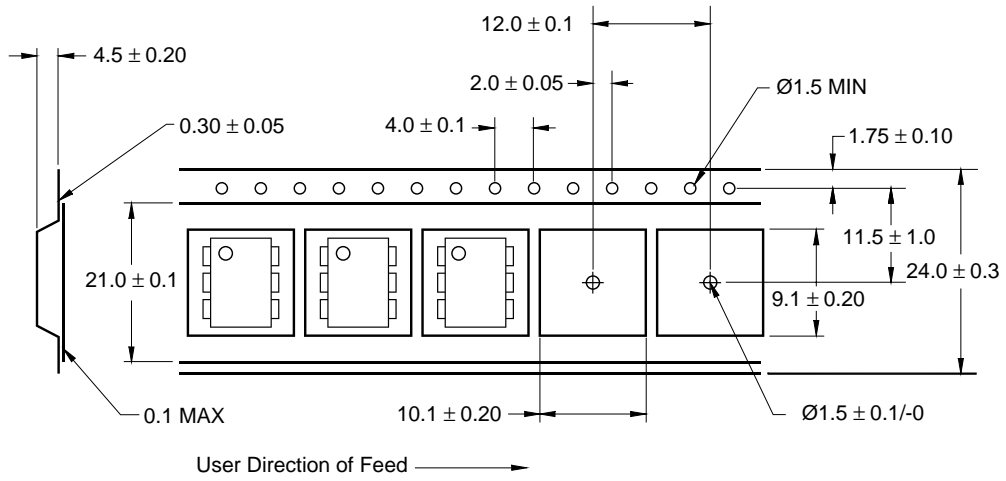


Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '7'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

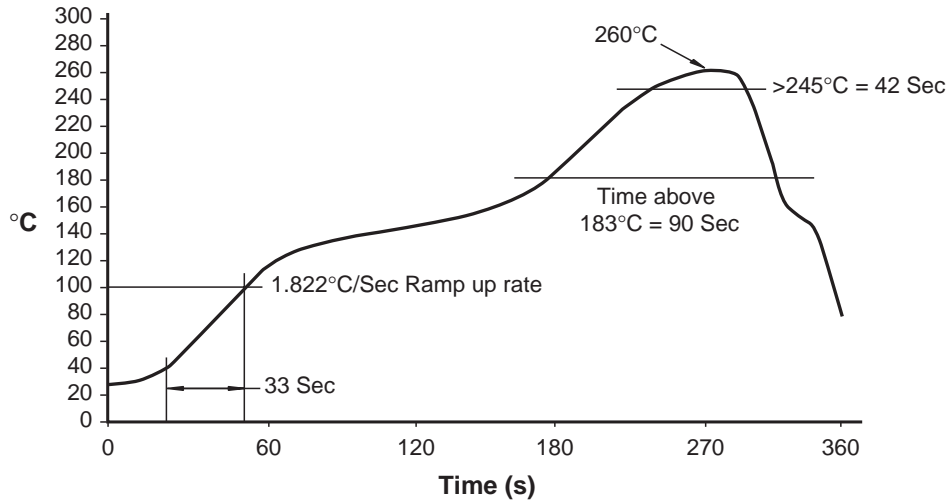
*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

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Carrier Tape Specification




Reflow Profile





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