FAIRCHILD SEMICONDUCTOR®

September 2009

H11AV1M, H11AV1AM, H11AV2M, H11AV2AM Phototransistor Optocouplers

Features

- H11AV1M and H11AV2M feature 0.3" input-output lead spacing
- H11AV1AM and H11AV2AM feature 0.4" input-output lead spacing
- UL recognized (File #E90700, Vol. 2)
- VDE recognized (File #102497)
- Add option V (e.g., H11AV1AVM)

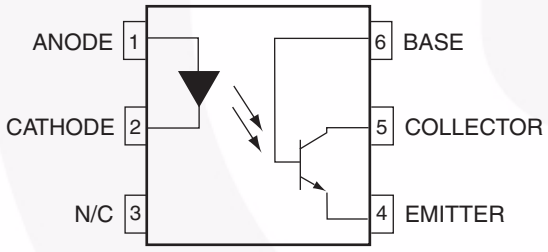
Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

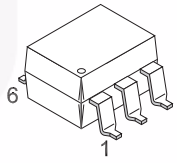
Description

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

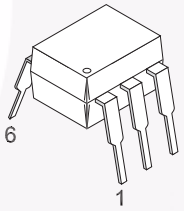
Schematic



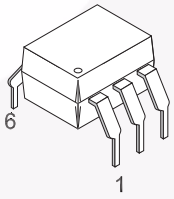
Package Outlines



H11AV1SM, H11AV2SM



H11AV1M, H11AV2M



H11AV1AM, H11AV2AM

Absolute Maximum Ratings (T_A = 25°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	Parameter	Value	Units
TOTAL DEVICE			
T_{STG}	Storage Temperature	-40 to +150	°C
T_{OPR}	Operating Temperature	-40 to +100	°C
T_{SOL}	Wave Solder Temperature (see page 8 for reflow solder profiles)	260 for 10 sec	°C
P_D	Total Device Power Dissipation @ T_A = 25°C	250	mW
	Derate above 25°C	2.94	mW/°C
EMITTER			
I_F	DC / Average Forward Input Current	60	mA
V_R	Reverse Input Voltage	6	V
P_D	LED Power Dissipation @ T_A = 25°C	120	mW
	Derate above 25°C	1.41	mW/°C
DETECTOR			
V_{CEO}	Collector-Emitter Voltage	70	V
V_{CBO}	Collector-Base Voltage	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.)

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
EMITTER						
V_F	Input Forward Voltage (I_F = 10mA)	T_A = 25°C	0.8	1.18	1.5	V
		T_A = -55°C	0.9	1.28	1.7	
		T_A = 100°C	0.7	1.05	1.4	
I_R	Reverse Leakage Current	V_R = 6.0V			10	µA
DETECTOR						
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_C = 1.0mA, I_F = 0	70	100		V
BV_{CBO}	Collector-Base Breakdown Voltage	I_C = 100µA, I_F = 0	70	120		V
BV_{ECO}	Emitter-Collector Breakdown Voltage	I_E = 100µA, I_F = 0	7	10		V
I_{CEO}	Collector-Emitter Dark Current	V_{CE} = 10V, I_F = 0		1	50	nA
I_{CBO}	Collector-Base Dark Current	V_{CB} = 10V		0.5		nA
C_{CE}	Capacitance	V_{CE} = 0V, f = 1MHz		8		pF

Transfer Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.*	Max.	Unit
DC CHARACTERISTIC							
CTR	Current Transfer Ratio, Collector to Emitter	I_F = 10mA, V_{CE} = 10V	H11AV1M H11AV1AM	100		300	%
			H11AV2M H11AV2AM	50			
$V_{CE\ (SAT)}$	Collector-Emitter Saturation Voltage	I_C = 2mA, I_F = 20mA	All			0.4	V
AC CHARACTERISTIC							
T_{ON}	Non-Saturated Turn-on Time	I_C = 2mA, V_{CC} = 10V, R_L = 100Ω (Fig. 11)	All			15	µs
T_{ON}	Non Saturated Turn-off Time	I_C = 2mA, V_{CC} = 10V, R_L = 100Ω (Fig. 11)	All			15	µs

Isolation Characteristics

Symbol	Parameters	Test Conditions	Min.	Typ.*	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	f = 60Hz, t = 1 sec.	7500			$V_{AC(pk)}$
C_{ISO}	Isolation Capacitance	V_{I-O} = 0V, f = 1MHz		0.2	2	pF
R_{ISO}	Isolation Resistance	V_{I-O} = 500 VDC	10^{11}			Ω

*Typical values at T_A = 25°C

Safety and Insulation Ratings

As per IEC 60747-5-2, 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.

Symbol	Parameter	Min.	Typ.	Max.	Unit
	Installation Classifications per DIN VDE 0110/1.89 Table 1				
	For Rated Main Voltage < 150Vrms		I-IV		
	For Rated Main voltage < 300Vrms		I-IV		
	Climatic Classification		55/100/21		
	Pollution Degree (DIN VDE 0110/1.89)		2		
CTI	Comparative Tracking Index	175			
V_{PR}	Input to Output Test Voltage, Method b, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with tm = 1 sec, Partial Discharge < 5pC	1594			V_{peak}
	Input to Output Test Voltage, Method a, V_{IORM} x 1.5 = V_{PR}, Type and Sample Test with tm = 60 sec, Partial Discharge < 5pC	1275			V_{peak}
V_{IORM}	Max. Working Insulation Voltage	850			V_{peak}
V_{IOTM}	Highest Allowable Over Voltage	6000			V_{peak}
	External Creepage	7			mm
	External Clearance	7			mm
	Insulation Thickness	0.5			mm
RIO	Insulation Resistance at Ts, V_{IO} = 500V	10^9			Ω

Typical Performance Curves

Fig. 1 LED Forward Voltage vs. Forward Current

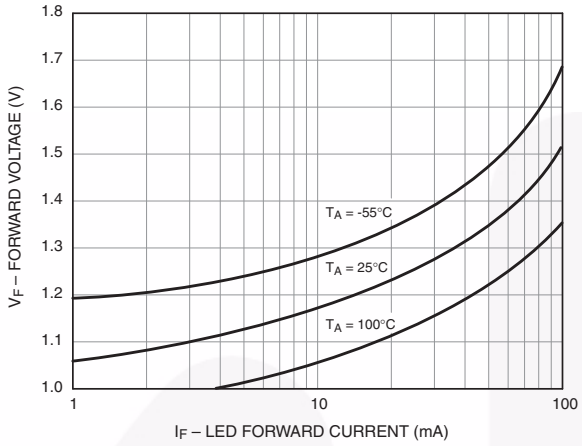


Fig. 2 Normalized CTR vs. Forward Current

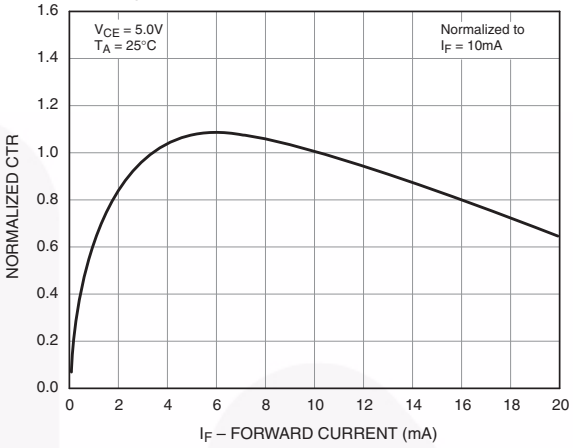


Fig. 3 Normalized CTR vs. Ambient Temperature

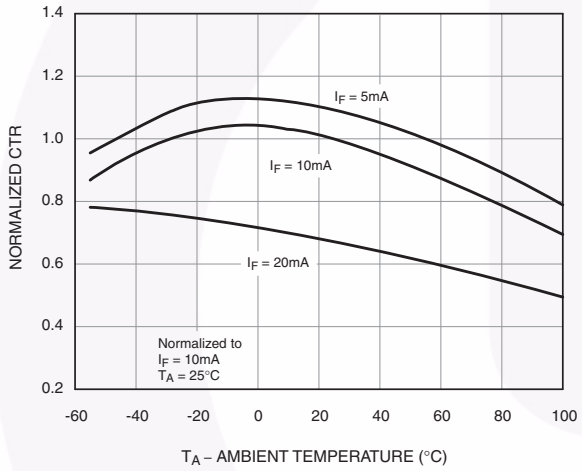


Fig. 4 CTR vs. RBE (Unsaturated)

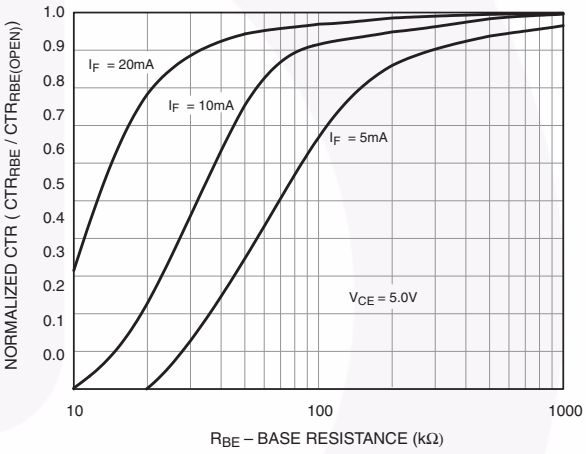


Fig. 5 CTR vs. RBE (Saturated)

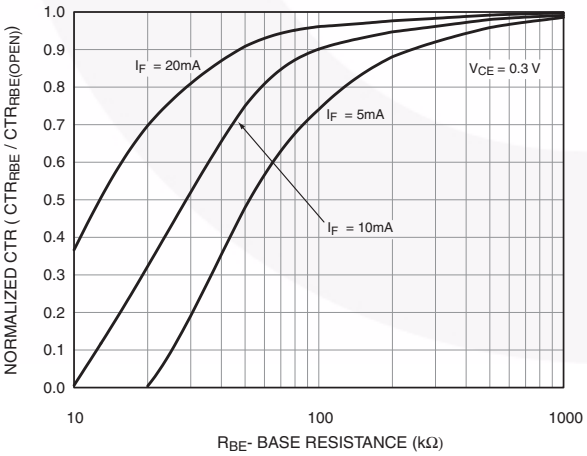
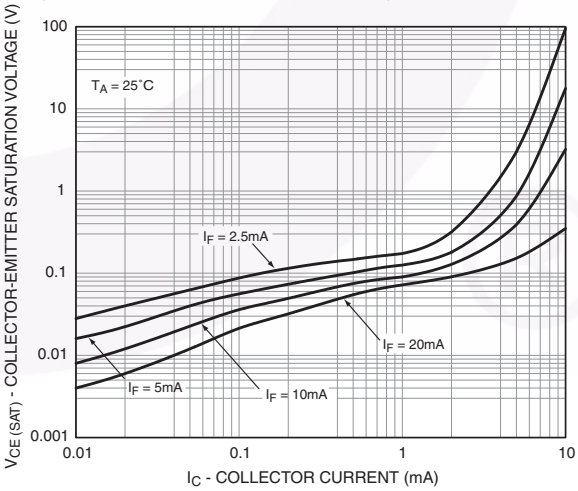


Fig. 6 Collector-Emitter Saturation Voltage vs Collector Current



Typical Performance Curves (Continued)

Fig. 7 Switching Speed vs. Load Resistor

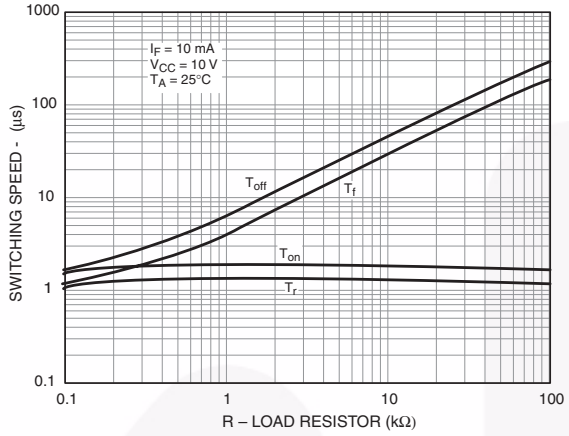


Fig. 8 Normalized t_{on} vs. R_{BE}

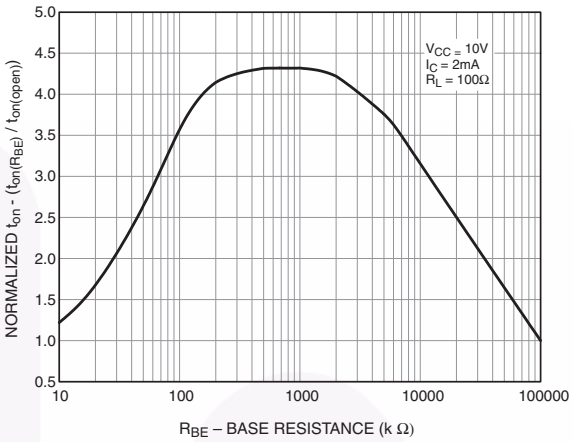


Fig. 9 Normalized t_{off} vs. R_{BE}

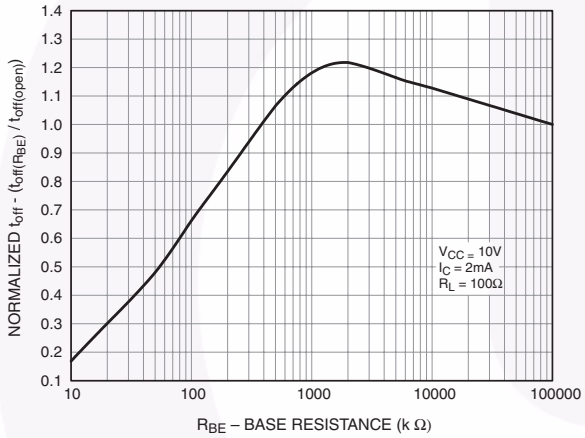
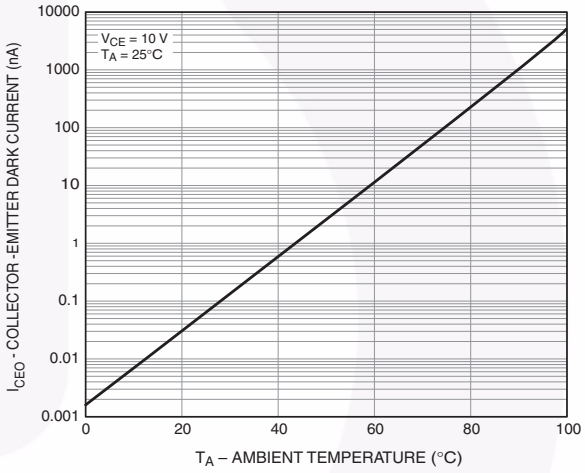
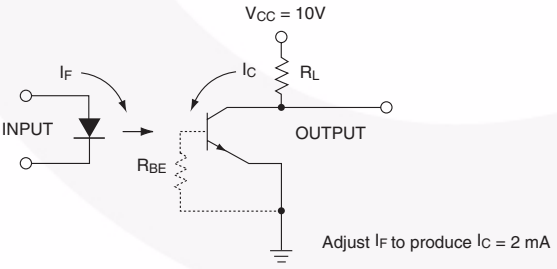


Fig. 10 Dark Current vs. Ambient Temperature



TEST CIRCUIT



WAVE FORMS

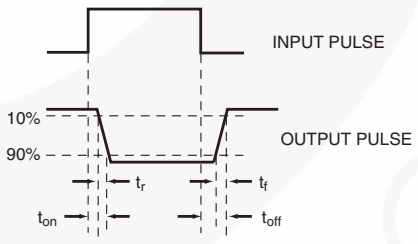
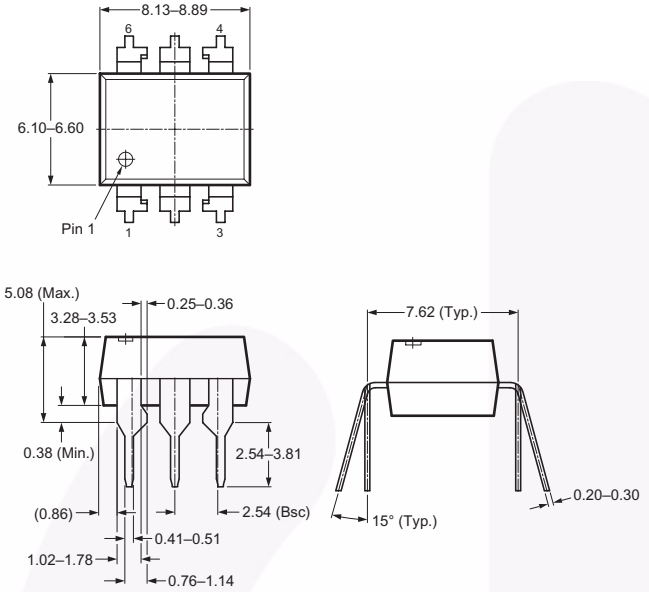


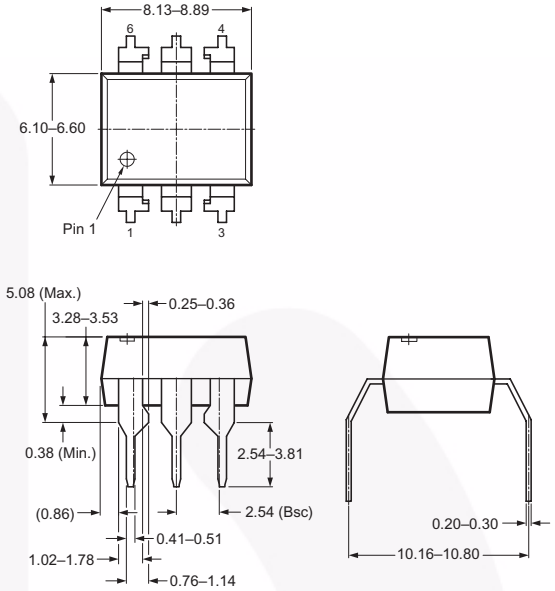
Figure 11. Switching Time Test Circuit and Waveforms

Package Dimensions

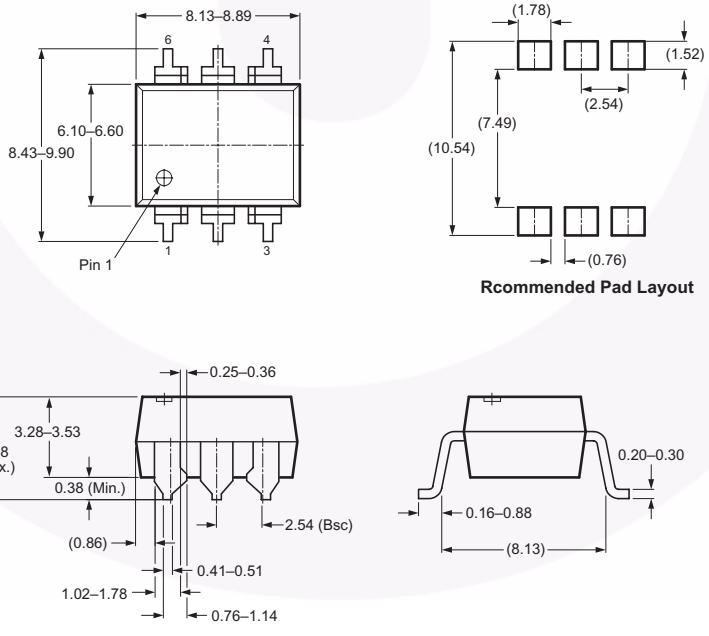
Through Hole



0.4" Lead Spacing



Surface Mount

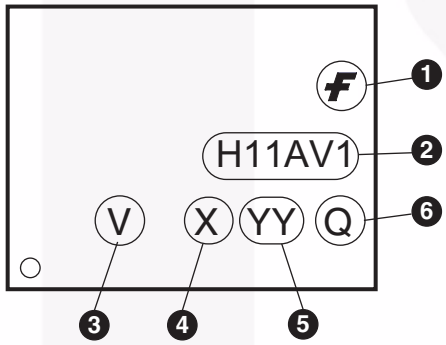


Note:
All dimensions in mm.

Ordering Information

Option	Order Entry Identifier (Example)	Description
No option	H11AV1M	Standard Through Hole Device
S	H11AV1SM	Surface Mount Lead Bend
SR2	H11AV1SR2M	Surface Mount; Tape and Reel
T	H11AV1TM	0.4" Lead Spacing
V	H11AV1VM	VDE 0884
TV	H11AV1TVM	VDE 0884, 0.4" Lead Spacing
SV	H11AV1SVM	VDE 0884, Surface Mount
SR2V	H11AV1SR2VM	VDE 0884, Surface Mount, Tape and Reel

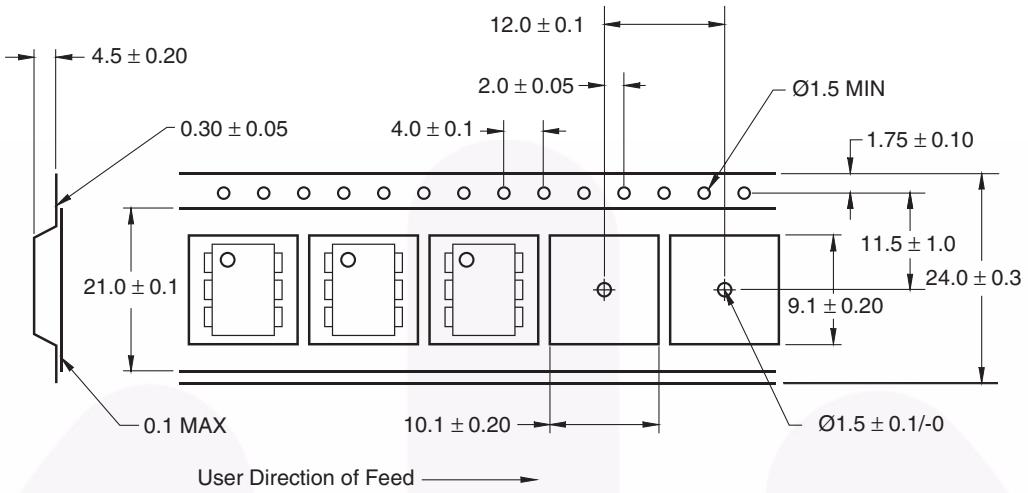
Marking Information



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., '3'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

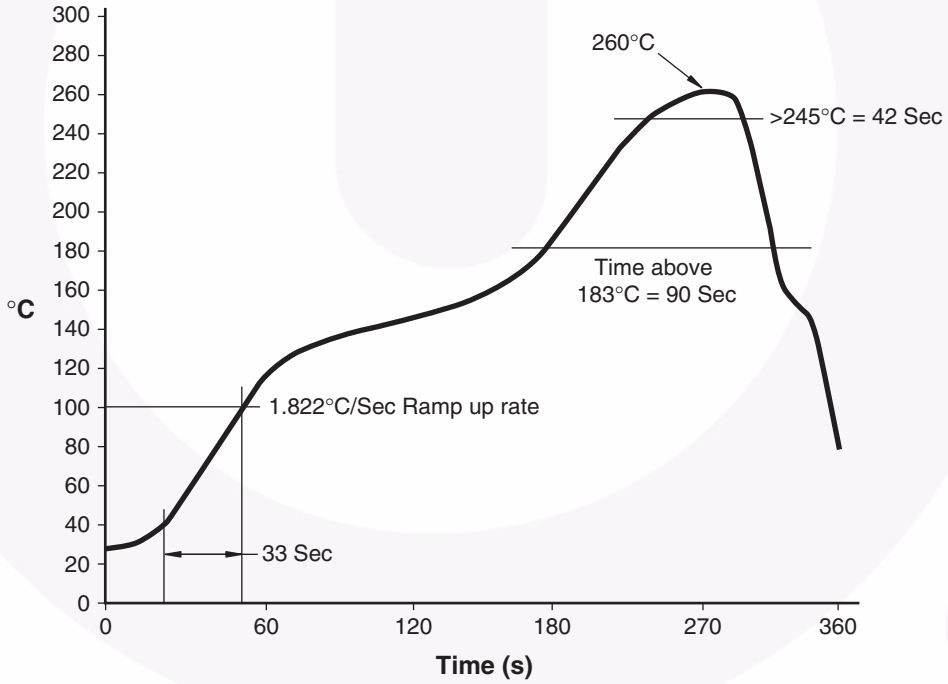
*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

Tape Dimensions



Note:
All dimensions are in millimeters.

Reflow Soldering Profile



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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.
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