

# 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)

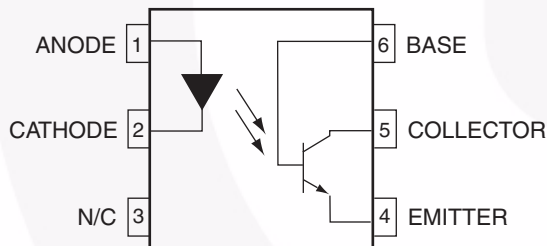
## Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

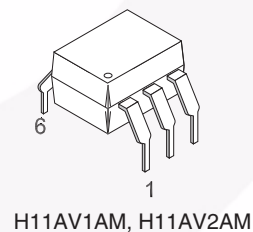
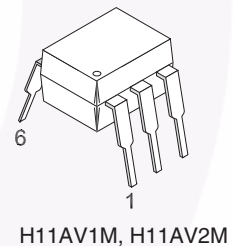
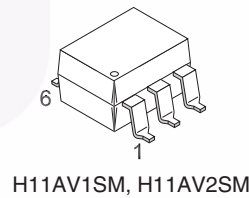
## Description

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



**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	Parameter	Value	Units
<b>TOTAL DEVICE</b>			
$T_{STG}$	Storage Temperature	-40 to +150	$^\circ\text{C}$
$T_{OPR}$	Operating Temperature	-40 to +100	$^\circ\text{C}$
$T_{SOL}$	Wave Solder Temperature (see page 8 for reflow solder profiles)	260 for 10 sec	$^\circ\text{C}$
$P_D$	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	250	mW
		2.94	mW/ $^\circ\text{C}$
<b>EMITTER</b>			
$I_F$	DC / Average Forward Input Current	60	mA
$V_R$	Reverse Input Voltage	6	V
$P_D$	LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	120	mW
		1.41	mW/ $^\circ\text{C}$
<b>DETECTOR</b>			
$V_{CEO}$	Collector-Emitter Voltage	70	V
$V_{CBO}$	Collector-Base Voltage	70	V
$V_{ECO}$	Emitter-Collector Voltage	7	V
$P_D$	Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	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
<b>EMITTER</b>						
$V_F$	Input Forward Voltage ( $I_F = 10\text{mA}$ )	$T_A = 25^\circ\text{C}$	0.8	1.18	1.5	V
		$T_A = -55^\circ\text{C}$	0.9	1.28	1.7	
		$T_A = 100^\circ\text{C}$	0.7	1.05	1.4	
$I_R$	Reverse Leakage Current	$V_R = 6.0\text{V}$			10	$\mu\text{A}$
<b>DETECTOR</b>						
$BV_{CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 1.0\text{mA}, I_F = 0$	70	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	$V_{CB} = 10\text{V}$		0.5		nA
$C_{CE}$	Capacitance	$V_{CE} = 0\text{V}, f = 1\text{MHz}$		8		pF

**Transfer Characteristics**

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

**Isolation Characteristics**

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

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

## 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, $V_{IORM} \times 1.875 = V_{PR}$ , 100% Production Test with $t_m = 1$ sec, Partial Discharge < 5pC	1594			$V_{peak}$
	Input to Output Test Voltage, Method a, $V_{IORM} \times 1.5 = V_{PR}$ , Type and Sample Test with $t_m = 60$ 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 $T_s$ , $V_{IO} = 500V$	$10^9$			$\Omega$

## Typical Performance Curves

Fig. 1 LED Forward Voltage vs. Forward Current

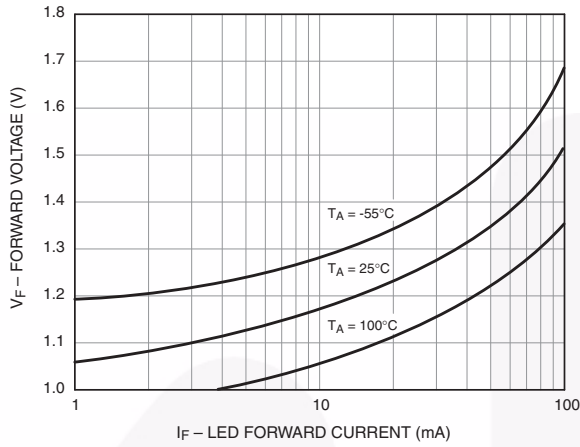


Fig. 2 Normalized CTR vs. Forward Current

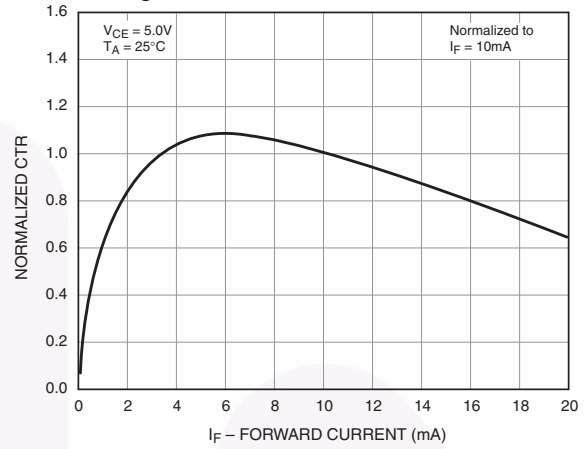


Fig. 3 Normalized CTR vs. Ambient Temperature

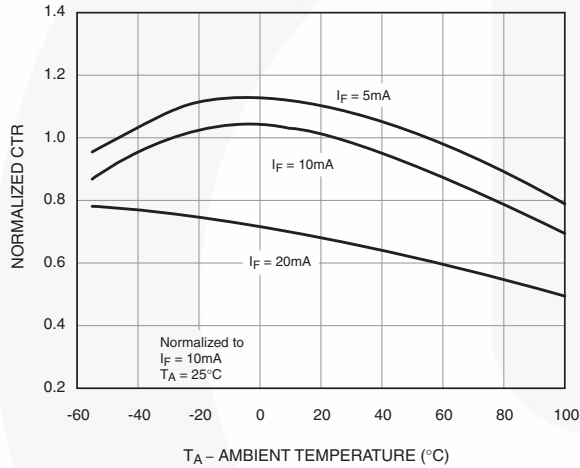


Fig. 4 CTR vs. RBE (Unsaturated)

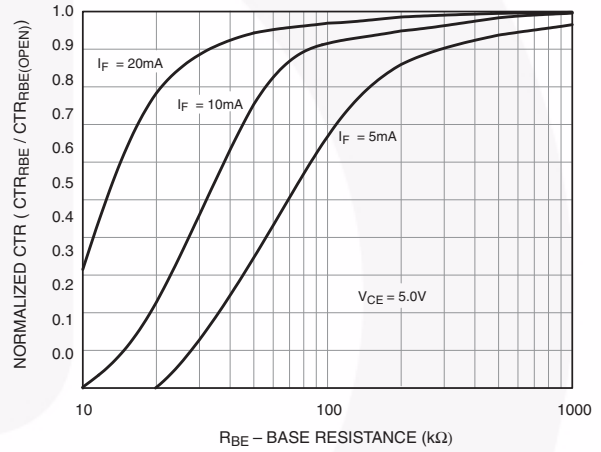


Fig. 5 CTR vs. RBE (Saturated)

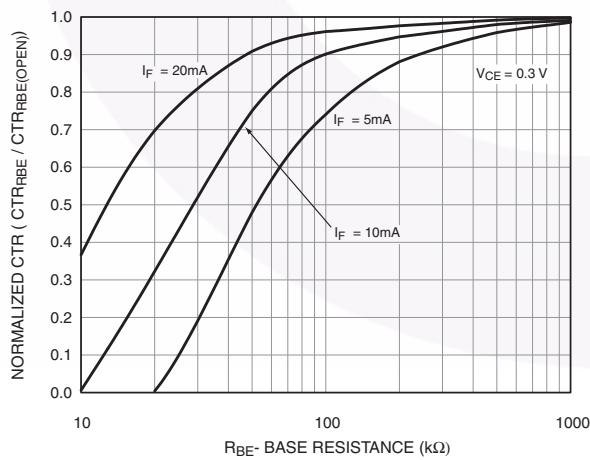
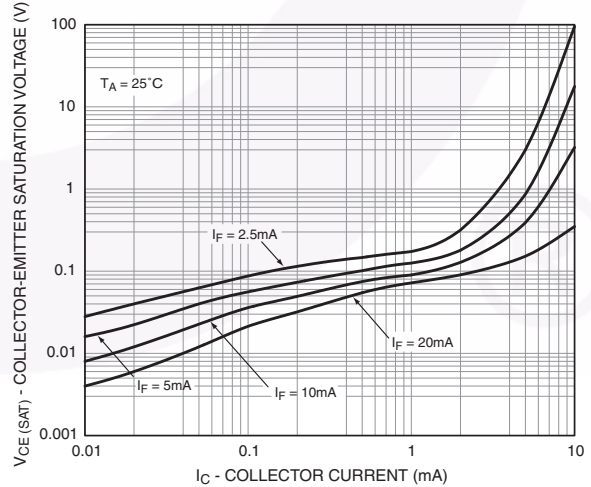


Fig. 6 Collector-Emitter Saturation Voltage vs Collector Current



Typical Performance Curves (Continued)

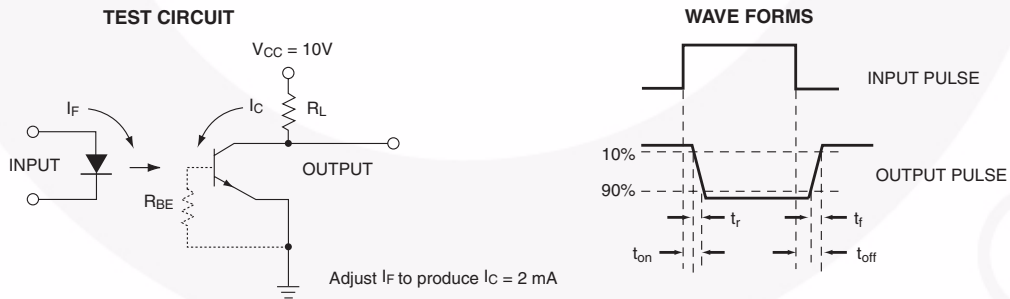
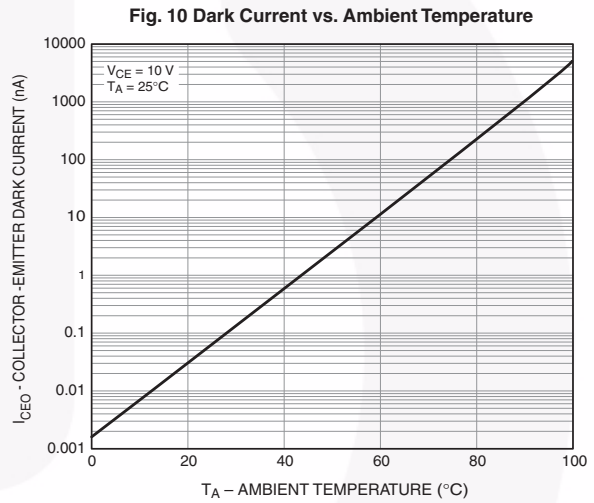
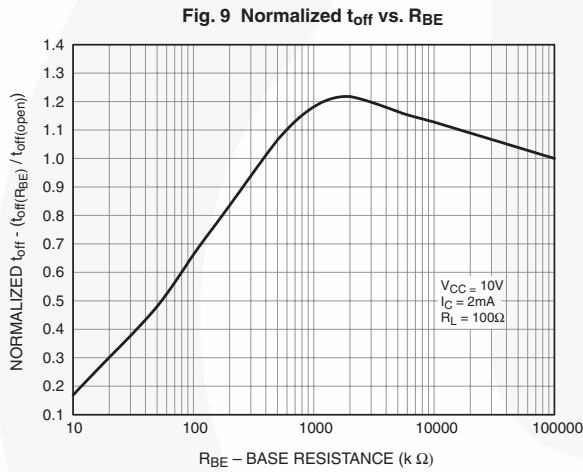
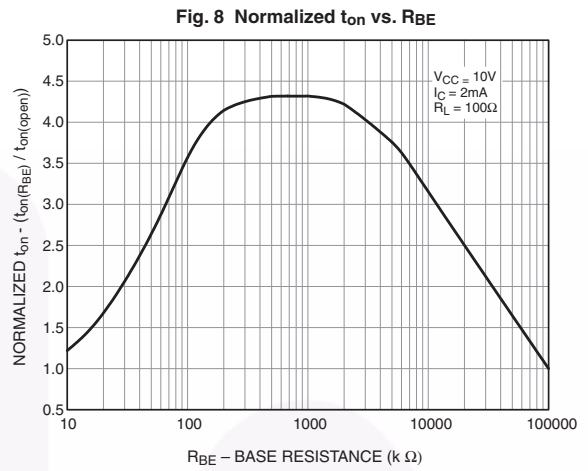
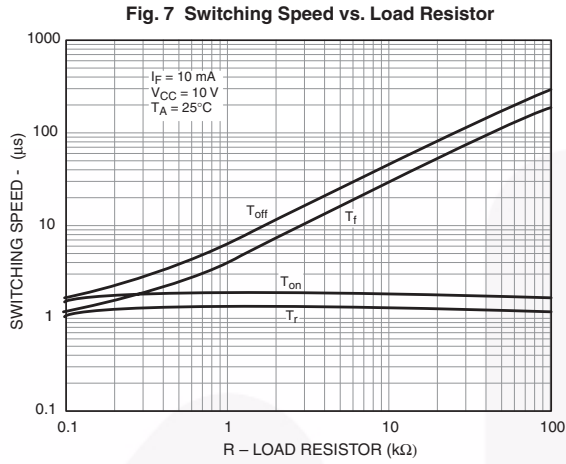
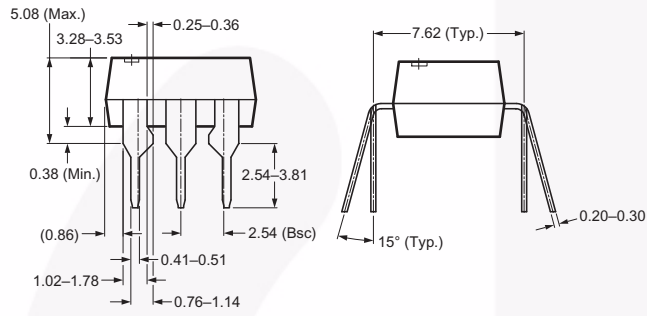


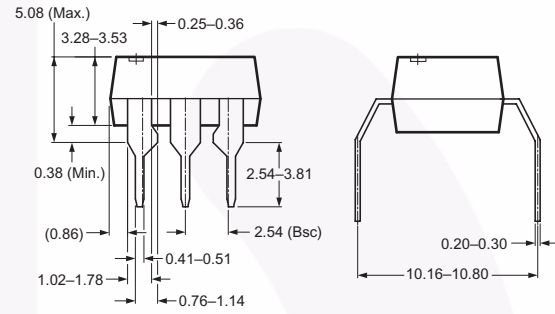
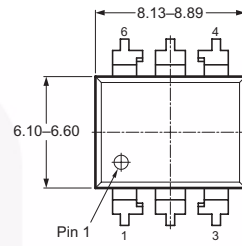
Figure 11. Switching Time Test Circuit and Waveforms

## Package Dimensions

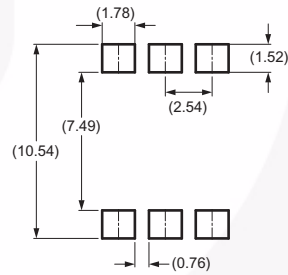
### Through Hole



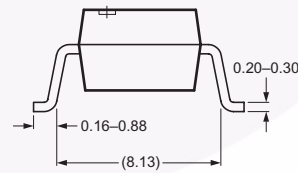
### 0.4" Lead Spacing



### Surface Mount



Recommended Pad Layout

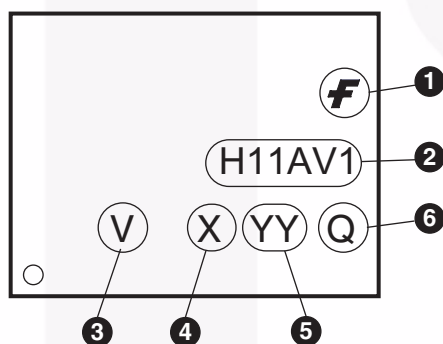


**Note:**  
All dimensions in mm.

## 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

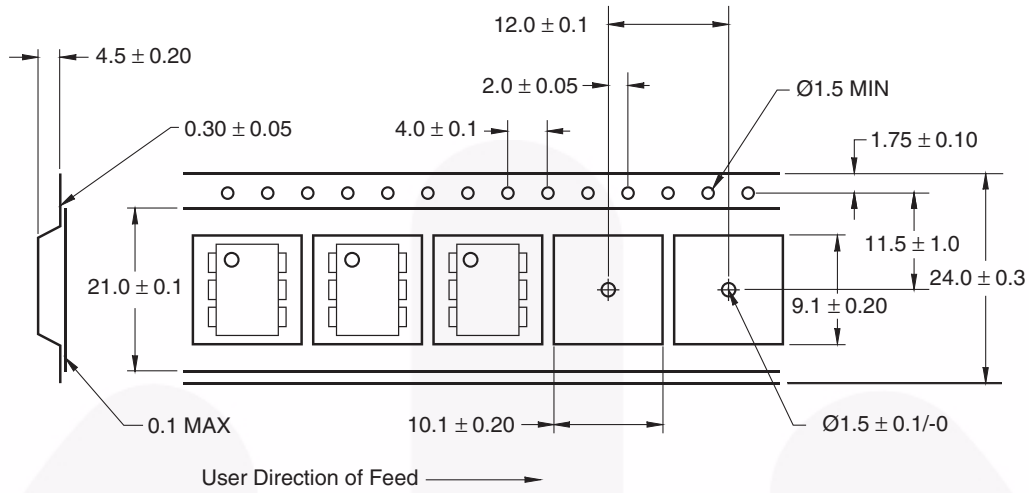


Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '3'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

\*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.



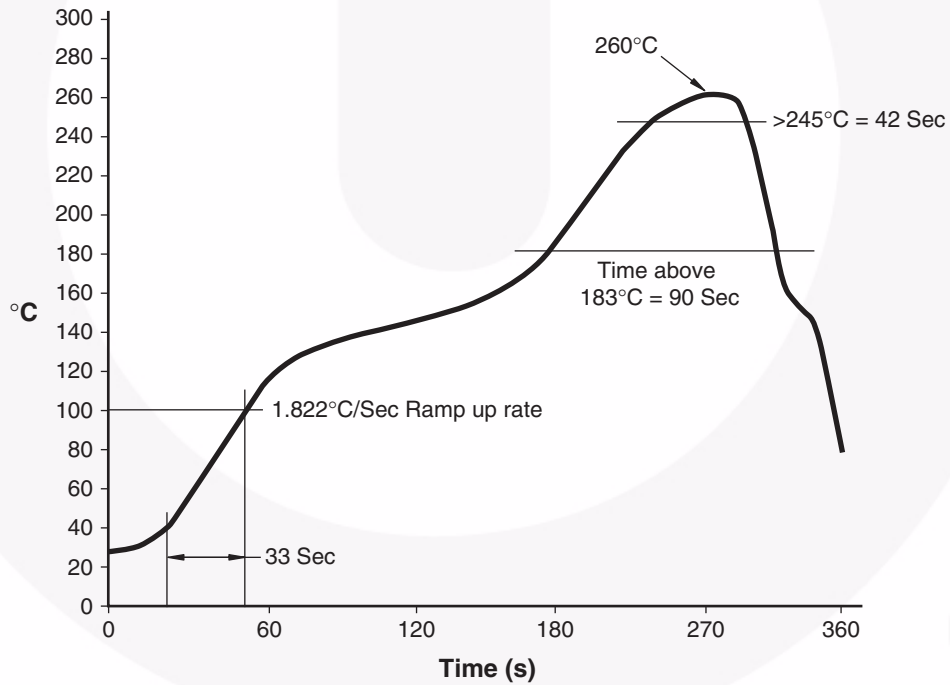
### Tape Dimensions



**Note:**

All dimensions are in millimeters.






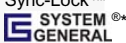
### Reflow Soldering Profile





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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.
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