

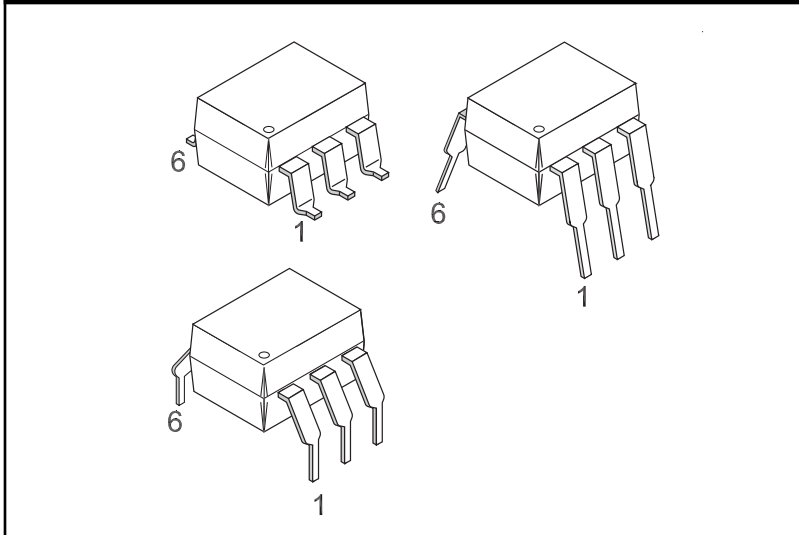
H11AA1-M

H11AA2-M

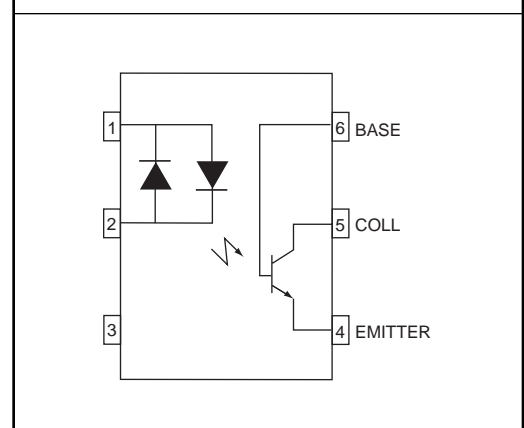
H11AA3-M

H11AA4-M

**PACKAGE**



**SCHEMATIC**



**DESCRIPTION**

The H11AAX-M series consists of two gallium-arsenide infrared emitting diodes connected in inverse parallel driving a single silicon phototransistor output.

**FEATURES**

- Bi-polar emitter input
- Built-in reverse polarity input protection
- Underwriters Laboratory (UL) recognized File #E90700, Volume 2
- VDE approved File #102497 (ordering option 'V')

**APPLICATIONS**

- AC line monitor
- Unknown polarity DC sensor
- Telephone line interface

**H11AA1-M**

**H11AA2-M**

**H11AA3-M**

**H11AA4-M**

**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified)

Parameter	Symbol	Device	Value	Units
<b>TOTAL DEVICE</b>				
Storage Temperature	$T_{STG}$	All	-40 to +150	$^\circ\text{C}$
Operating Temperature	$T_{OPR}$	All	-40 to +100	$^\circ\text{C}$
Lead Solder Temperature	$T_{SOL}$	All	260 for 10 sec	$^\circ\text{C}$
Total Device Power Dissipation Derate Linearly From $25^\circ\text{C}$	$P_D$	All	250	mW
			2.94	mW/ $^\circ\text{C}$
<b>EMITTER</b>				
Continuous Forward Current	$I_F$	All	60	mA
Forward Current – Peak (1 $\mu\text{s}$ pulse, 300 pps)	$I_F(\text{pk})$	All	$\pm 1.0$	A
LED Power Dissipation Derate Linearly From $25^\circ\text{C}$	$P_D$	All	120	mW
			1.41	mW/ $^\circ\text{C}$
<b>DETECTOR</b>				
Continuous Collector Current	$I_C$	All	50	mA
Detector Power Dissipation Derate linearity from $25^\circ\text{C}$	$P_D$	All	150	mW
			1.76	mW/ $^\circ\text{C}$

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

Parameter	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit						
<b>EMITTER</b>													
Input Forward Voltage	$I_F = \pm 10 \text{ mA}$	$V_F$	All		1.17	1.5	V						
Capacitance	$V_F = 0 \text{ V}, f = 1.0 \text{ MHz}$	$C_J$	All		80		pF						
<b>DETECTOR</b>													
Breakdown Voltage Collector to Emitter	$I_C = 1.0 \text{ mA}, I_F = 0$	$BV_{CEO}$	All	30	100		V						
Collector to Base	$I_C = 100 \mu\text{A}, I_F = 0$	$BV_{CBO}$	All	70	120		V						
Emitter to Base	$I_E = 100 \mu\text{A}, I_F = 0$	$BV_{EBO}$	All	5	10		V						
Emitter to Collector	$I_E = 100 \mu\text{A}, I_F = 0$	$BV_{ECO}$	All	7	10		V						
Leakage Current Collector to Emitter	$V_{CE} = 10 \text{ V}, I_F = 0$	$I_{CEO}$	H11AA1,3,4(-M)		1	50	nA						
			H11AA2-M		1	200							
Capacitance	$V_{CE} = 0, f = 1 \text{ MHz}$	$C_{CE}$	All		10		pF						
								$C_{CB}$	All		80		pF

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

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**TRANSFER CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

Characteristics	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
Current Transfer Ratio, Collector to Emitter	$I_F = \pm 10 \text{ mA}, V_{CE} = 10 \text{ V}$	$CTR_{CE}$	H11AA4-M	100			%
			H11AA3-M	50			
			H11AA1-M	20			
			H11AA2-M	10			
Current Transfer Ratio, Symmetry	$I_F = \pm 10 \text{ mA}, V_{CE} = 10 \text{ V}$ (Figure 11)		All	.33		3.0	
Saturation Voltage Collector to Emitter	$I_F = \pm 10 \text{ mA}, I_{CE} = 0.5 \text{ mA}$	$V_{CE(SAT)}$	All			.40	V

**ISOLATION CHARACTERISTICS**

Characteristic	Test Conditions	Symbol	Min	Typ*	Max	Units
Package Capacitance input/output	$V_{I-O} = 0, f = 1 \text{ MHz}$	$C_{I-O}$		0.7		pF
Isolation Voltage	$f = 60 \text{ Hz}, t = 1 \text{ sec.}$	$V_{ISO}$	7500			Vac(pk)
Isolation Resistance	$V_{I-O} = 500 \text{ VDC}$	$R_{ISO}$	$10^{11}$			$\Omega$

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

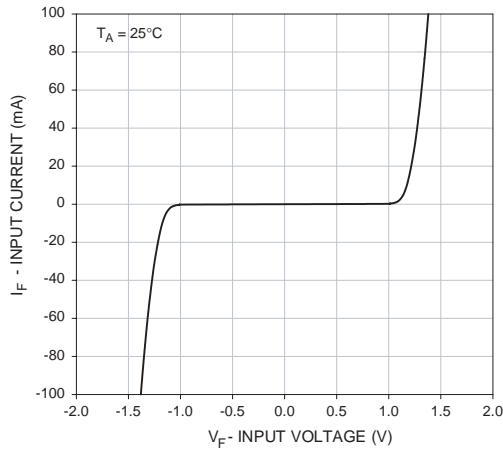
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**H11AA2-M**

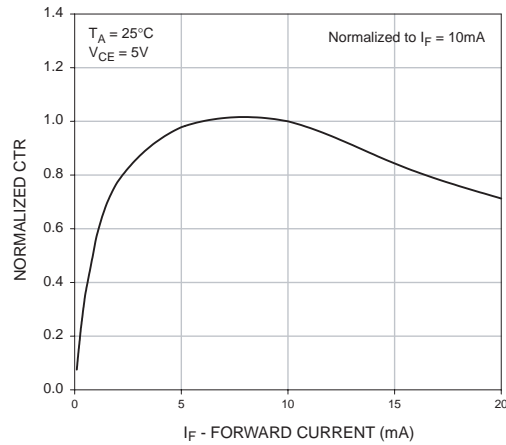
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**H11AA4-M**

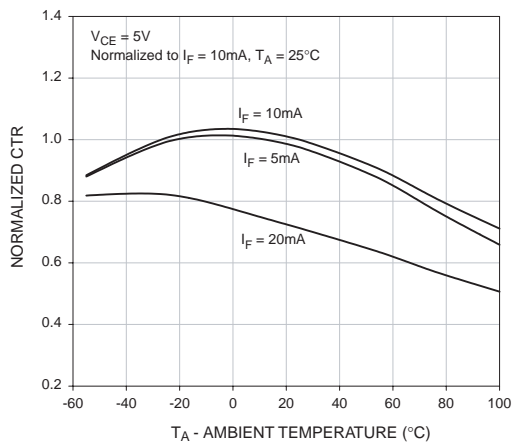
**Fig. 1 Input Voltage vs. Input Current**



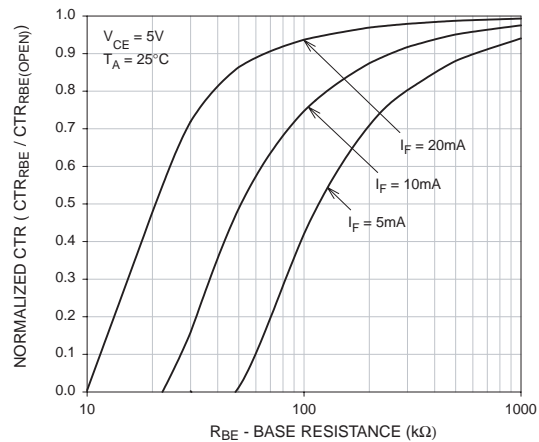
**Fig. 2 Normalized CTR vs. Forward Current**



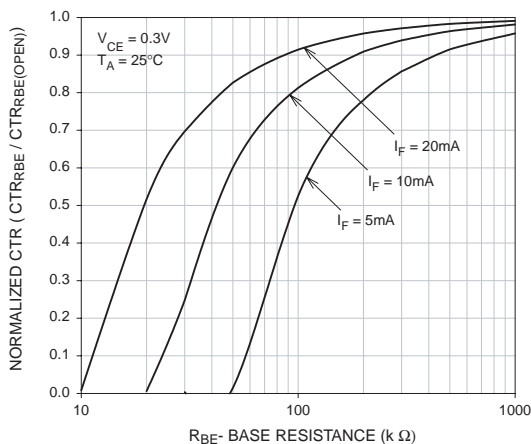
**Fig. 3 Normalized CTR vs. Ambient Temperature**



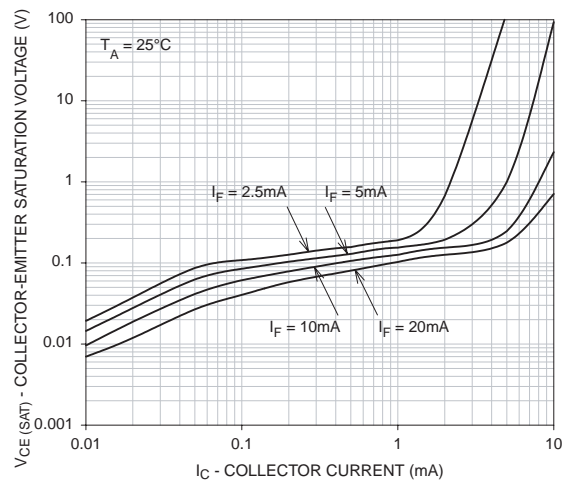
**Fig. 4 CTR vs. RBE (Unsaturated)**



**Fig. 5 CTR vs. RBE (Saturated)**



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



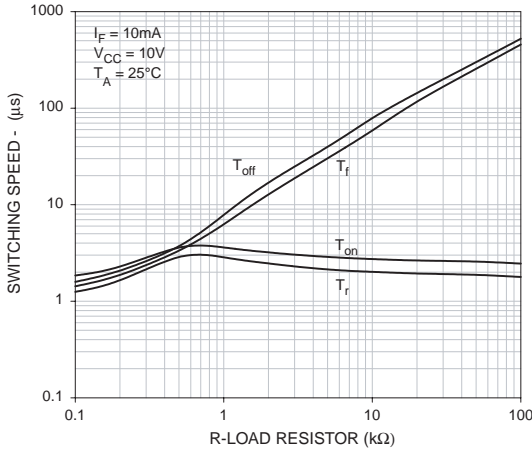
**H11AA1-M**

**H11AA2-M**

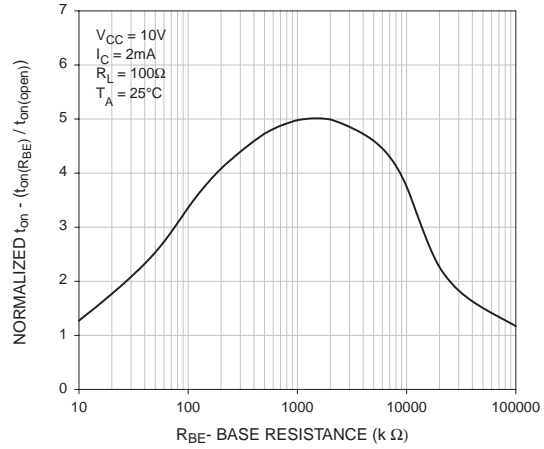
**H11AA3-M**

**H11AA4-M**

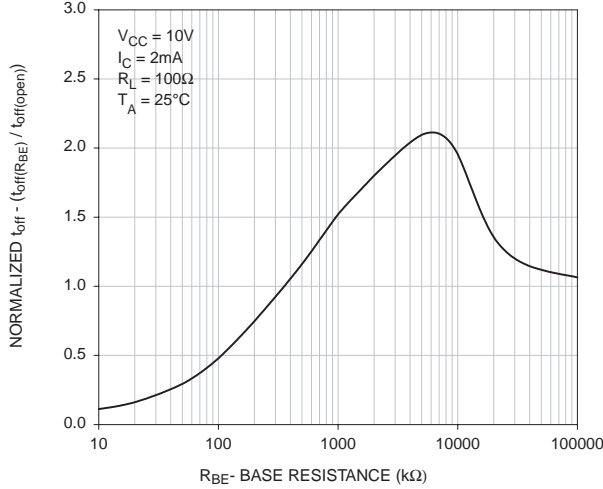
**Fig. 7 Switching Speed vs. Load Resistor**



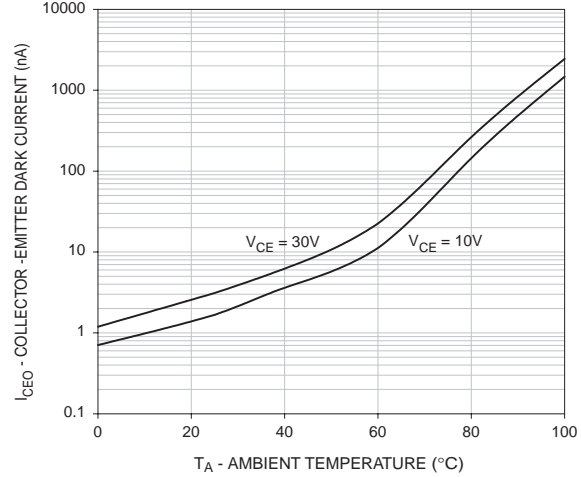
**Fig. 8 Normalized  $t_{on}$  vs.  $R_{BE}$**



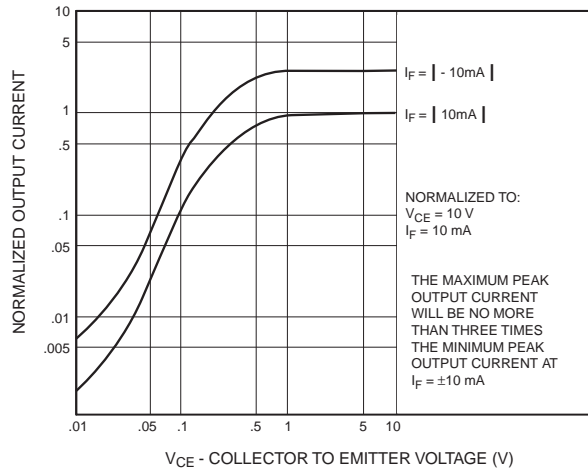
**Fig. 9 Normalized  $t_{off}$  vs.  $R_{BE}$**



**Fig. 10 Dark Current vs. Ambient Temperature**



**Fig. 11 Output Symmetry Characteristics**



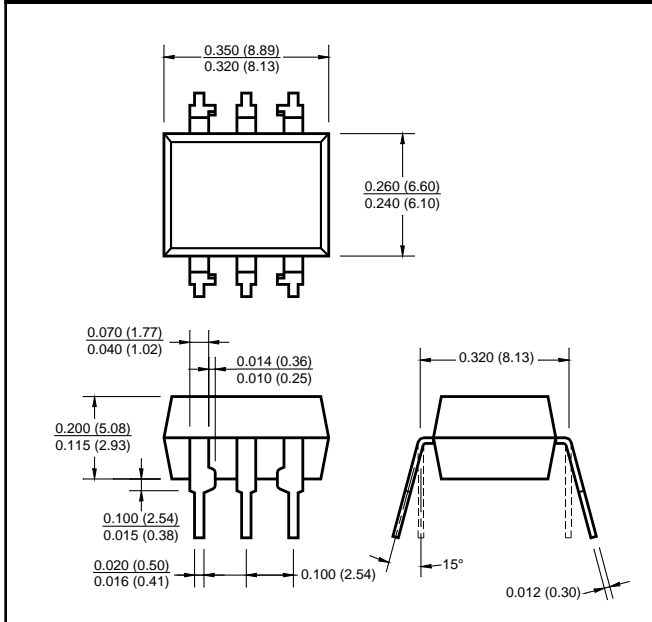
**H11AA1-M**

**H11AA2-M**

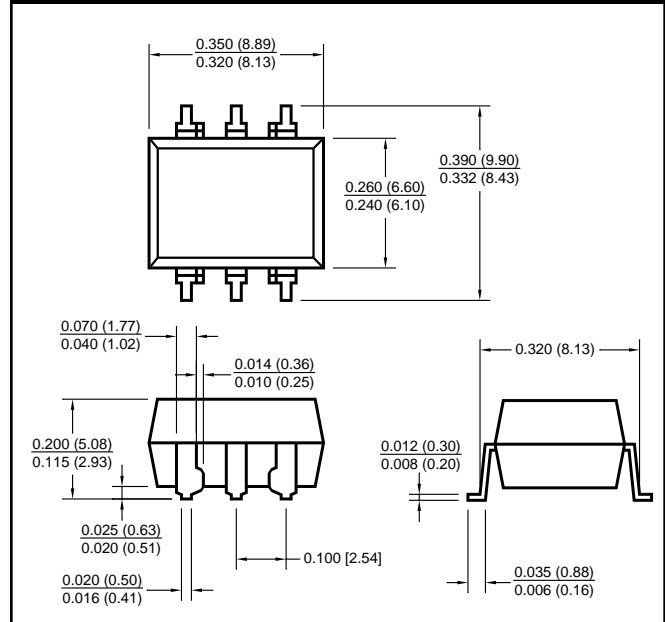
**H11AA3-M**

**H11AA4-M**

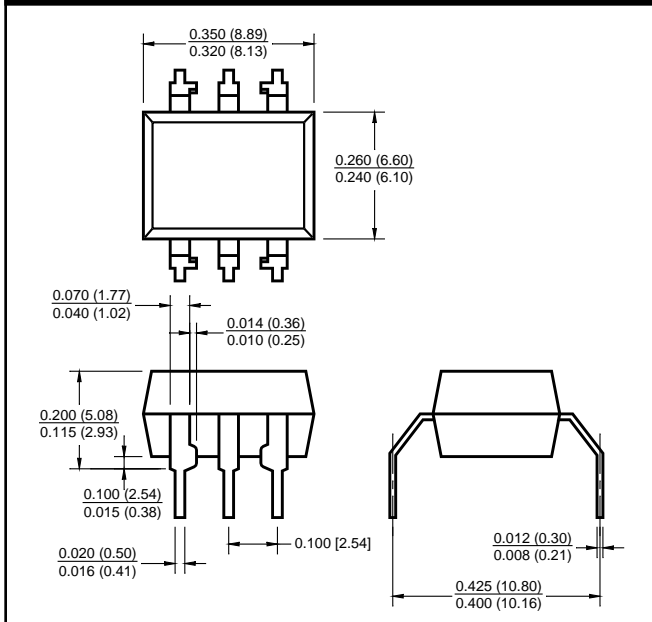
**Package Dimensions (Through Hole)**



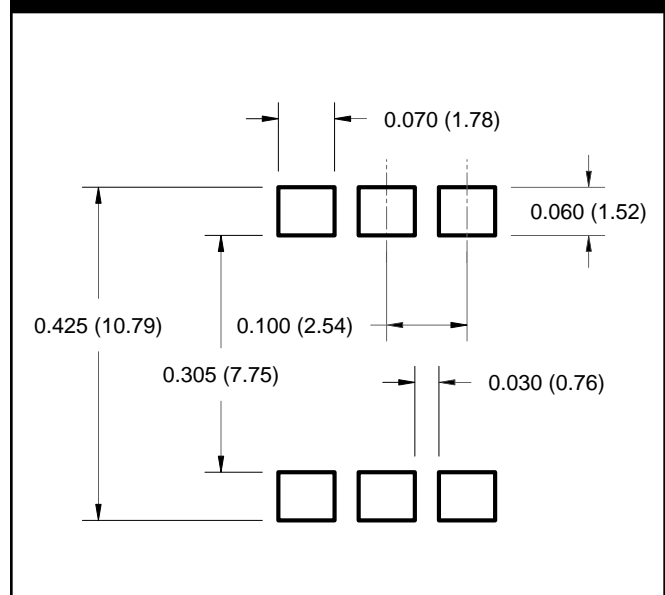
**Package Dimensions (Surface Mount)**



**Package Dimensions (0.4" Lead Spacing)**



**Recommended Pad Layout for  
Surface Mount Leadform**



**NOTE**

All dimensions are in inches (millimeters)

**H11AA1-M**

**H11AA2-M**

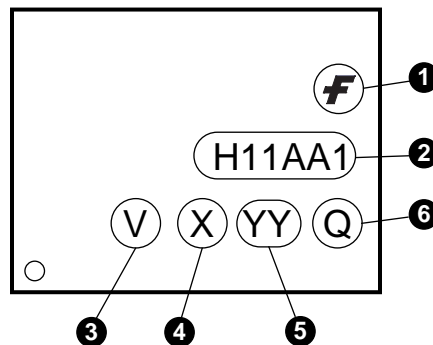
**H11AA3-M**

**H11AA4-M**

**ORDERING INFORMATION**

Option/Order Entry Identifier	Description
S	Surface Mount Lead Bend
SR2	Surface Mount; Tape and Reel
T	0.4" Lead Spacing
V	VDE 0884
TV	VDE 0884, 0.4" Lead Spacing
SV	VDE 0884, Surface Mount
SR2V	VDE 0884, Surface Mount, Tape & 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.

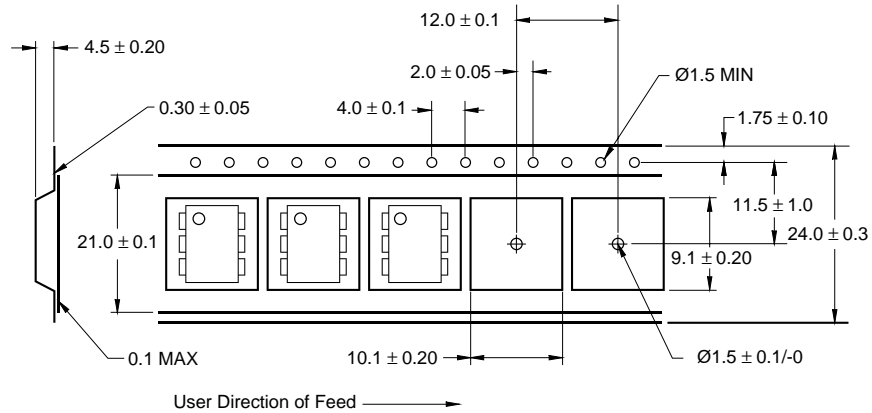
H11AA1-M

H11AA2-M

H11AA3-M

H11AA4-M

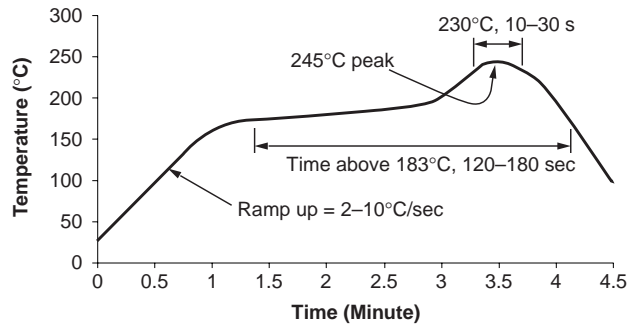
**Carrier Tape Specifications**



**NOTE**

All dimensions are in inches (millimeters)

**Reflow Profile (White Package, -M Suffix)**



- Peak reflow temperature: 245°C (package surface temperature)
- Time of temperature higher than 183°C for 120-180 seconds
- One time soldering reflow is recommended



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**H11AA1-M**

**H11AA2-M**

**H11AA3-M**

**H11AA4-M**

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