

## DESCRIPTION

The H11AG series consists of a Gallium-Aluminum-Arsenide IRED emitting diode coupled with a silicon phototransistor in a dual in-line package. This device provides the unique feature of the high current transfer ratio at both low output voltage and low input current. This makes it ideal for use in low power logic circuits, telecommunications equipment and portable electronics isolation applications.

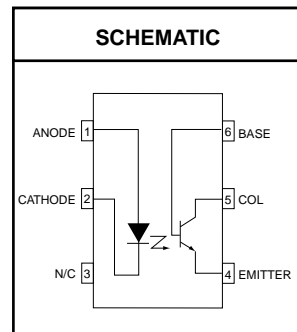
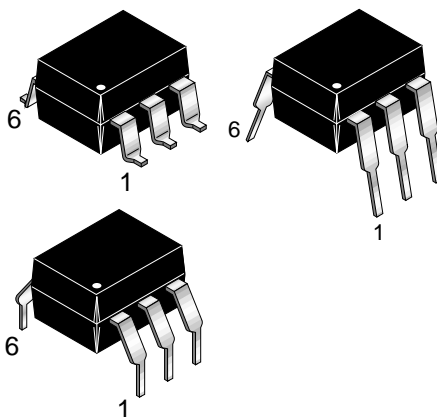
## FEATURES

- High efficiency low degradation liquid epitaxial IRED
- Logic level compatible, input and output currents, with CMOS and LS/TTL
- High DC current transfer ratio at low input currents
- Underwriters Laboratory (UL) recognized File #E90700

## APPLICATIONS

- CMOS driven solid state reliability
- Telephone ring detector
- Digital logic isolation

H11AG1 H11AG2 H11AG3



ABSOLUTE MAXIMUM RATINGS				
Parameters	Symbol	Device	Value	Units
<b>TOTAL DEVICE</b>				
Storage Temperature	$T_{STG}$	All	-55 to +150	°C
Operating Temperature	$T_{OPR}$	All	-55 to +100	°C
Lead Solder Temperature	$T_{SOL}$	All	260 for 10 sec	°C
Total Device Power Dissipation @ 25°C (LED plus detector) Derate Linearly From 25°C	$P_D$	All	260	mW
			3.5	mW/°C
<b>EMITTER</b>				
Continuous Forward Current	$I_F$	All	50	mA
Reverse Voltage	$V_R$	All	6	V
Forward Current - Peak (1 $\mu$ s pulse, 300 pps)	$I_F(pk)$	All	3.0	A
LED Power Dissipation 25°C Ambient Derate Linearly From 25°C	$P_D$	All	75	mW
			1.0	mW/°C
<b>DETECTOR</b>				
Detector Power Dissipation @ 25°C Derate Linearly from 25°C	$P_D$	All	150	mW
			2.0	mW/°C
Continuous Collector Current		All	50	mA

**H11AG1 H11AG2 H11AG3**
**ELECTRICAL CHARACTERISTICS** ( $T_A = 0-70^\circ\text{C}$  Unless otherwise specified.)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

Parameters	Test Conditions	Symbol	Device	Min	Typ	Max	Units
<b>EMITTER</b>							
Input Forward Voltage	$I_F = 1\text{ mA}$	$V_F$	All			1.5	V
Reverse Leakage Current	$V_R = 5\text{ V}, T_A = 25^\circ\text{C}$	$I_R$	All			10	$\mu\text{A}$
	$V_R = 5\text{ V}, T_A = 70^\circ\text{C}$	$I_R$	All			100	$\mu\text{A}$
Capacitance	$V = 0, f = 1.0\text{ MHz}$	$C_J$	All			100	pF
<b>DETECTOR</b>							
Breakdown Voltage							
Collector to Emitter	$I_C = 1.0\text{ mA}, I_F = 0$	$BV_{CEO}$	All	30			V
Collector to Base	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{CBO}$	All	70			V
Emitter to Collector	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{ECO}$	All	7			V
Leakage Current							
Collector to Emitter	$V_{CE} = 10\text{ V}, I_F = 0$	$I_{CEO}$	All		5	10	$\mu\text{A}$
Capacitance	$V_{CE} = 10\text{ V}, f = 1\text{ MHz}$	$C_{CE}$	All		2		pF

**ISOLATION CHARACTERISTICS**

Parameters	Test Conditions	Symbol	Min	Typ	Max	Units
Input-Output Isolation Voltage	$I_{I-O} \leq 1\text{ }\mu\text{A}, t = 1\text{ min.}$	$V_{ISO}$	5300			Vac(rms)

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

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
Current Transfer Ratio	$I_F = 1\text{ mA}, V_{CE} = 5\text{ V}$	CTR	H11AG1	300			%
			H11AG2	200			
			H11AG3	100			
	$I_F = 1\text{ mA}, V_{CE} = 0.6\text{ V}$	CTR	H11AG1	100			
			H11AG2	50			
			H11AG3	20			
	$I_F = 0.2\text{ mA}, V_{CE} = 1.5\text{ V}$	CTR	H11AG1	100			
			H11AG2	50			
Saturation Voltage	$I_F = 20\text{ mA}, I_C = 0.5\text{ mA}$	$V_{CE(SAT)}$	All			.40	V
AC Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
<b>Non-Saturated Switching Times</b>							
Turn-On Time	$R_L = 100\text{ }\Omega, I_F = 1\text{ mA}, V_{CC} = 5\text{ V}$	$t_{on}$	All		5		$\mu\text{S}$
Turn-Off Time	$R_L = 100\text{ }\Omega, I_F = 1\text{ mA}, V_{CC} = 5\text{ V}$	$t_{off}$	All		5		$\mu\text{S}$

H11AG1 H11AG2 H11AG3

Figure 1. LED Forward Voltage vs. Forward Current

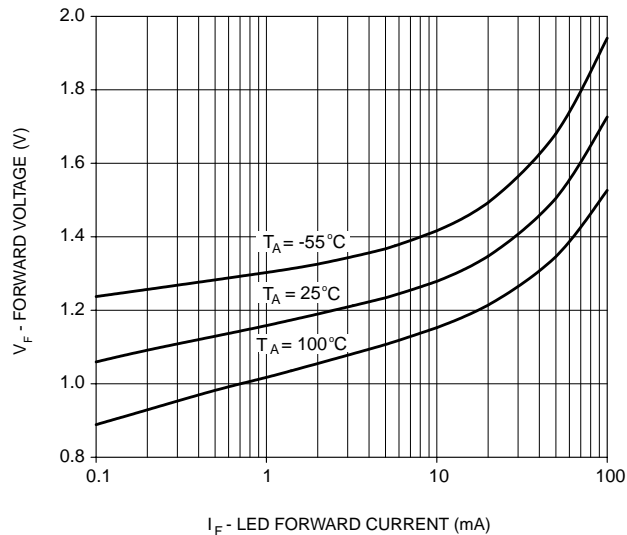


Figure 2. Normalized Current Transfer Ratio vs. Forward Current

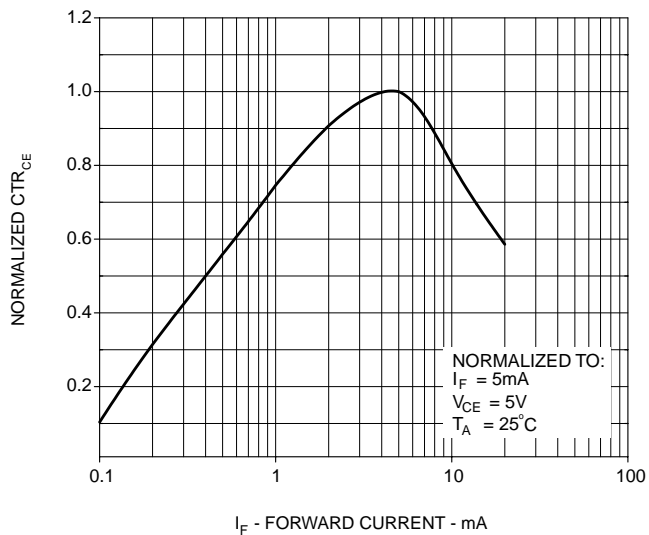


Figure 3. Normalized CTR vs. Temperature

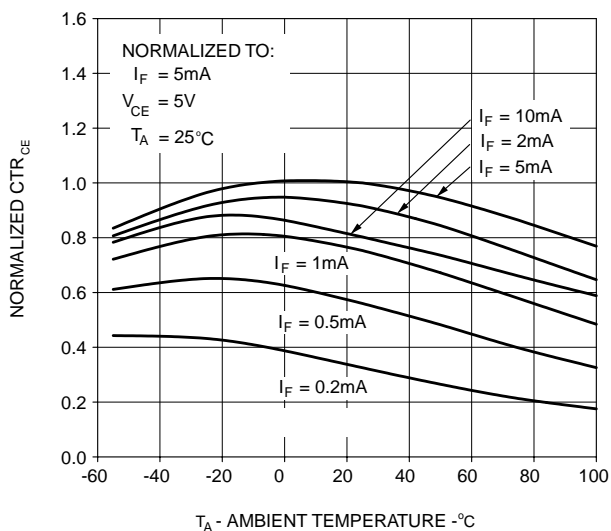


Figure 4. Normalized Collector vs. Collector - Emitter Voltage

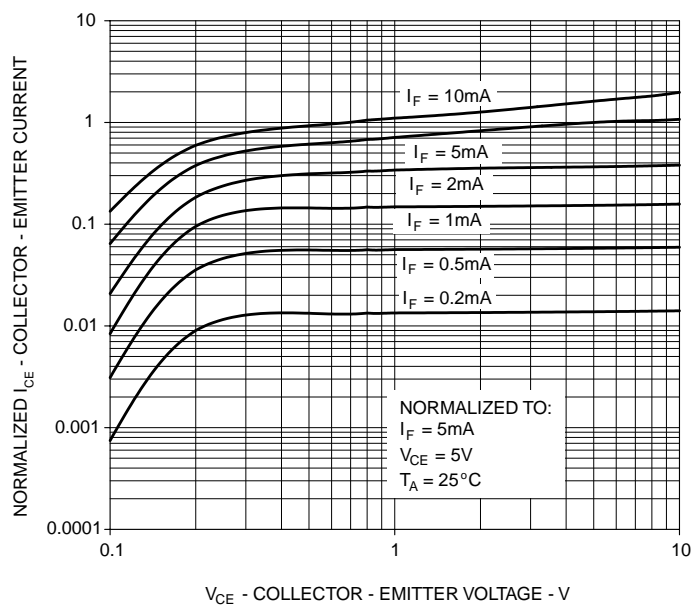


Figure 5. Normalized Collector Base Photocurrent Ratio vs. Forward Current

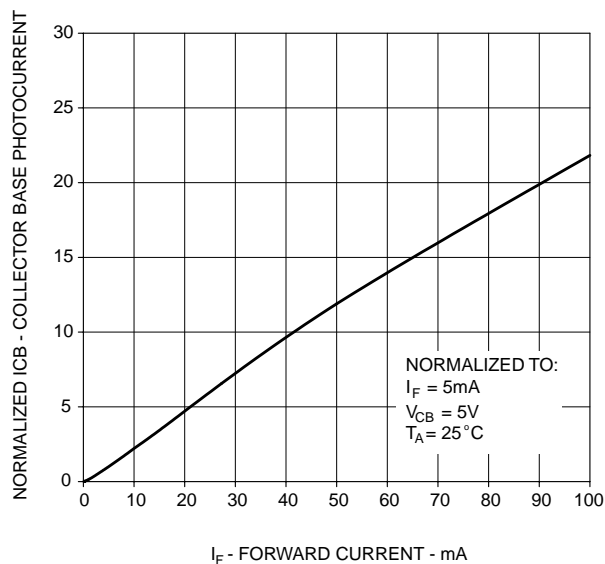


Figure 6. Normalized Collector - Base Current vs. Temperature

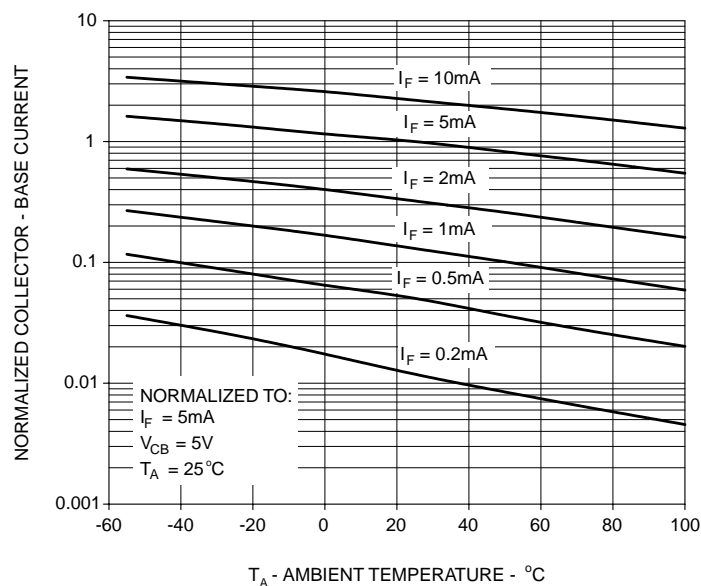
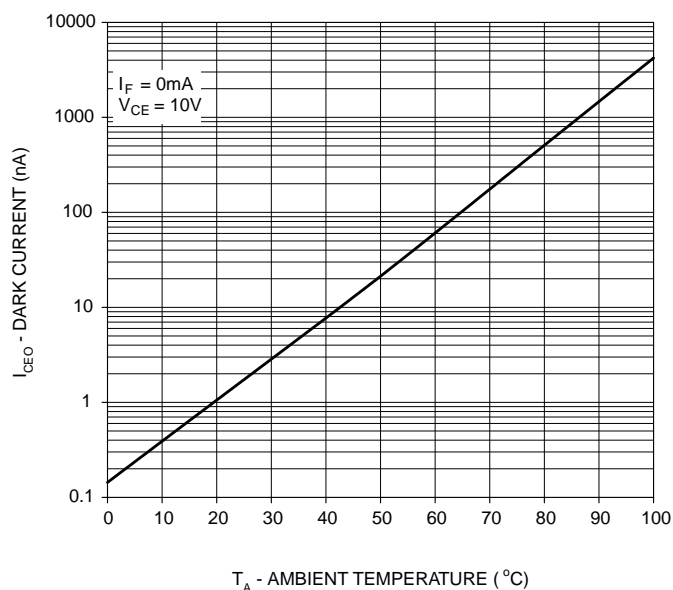


Figure 7. Collector-Emitter Dark Current vs. Ambient Temperature



H11AG1 H11AG2 H11AG3

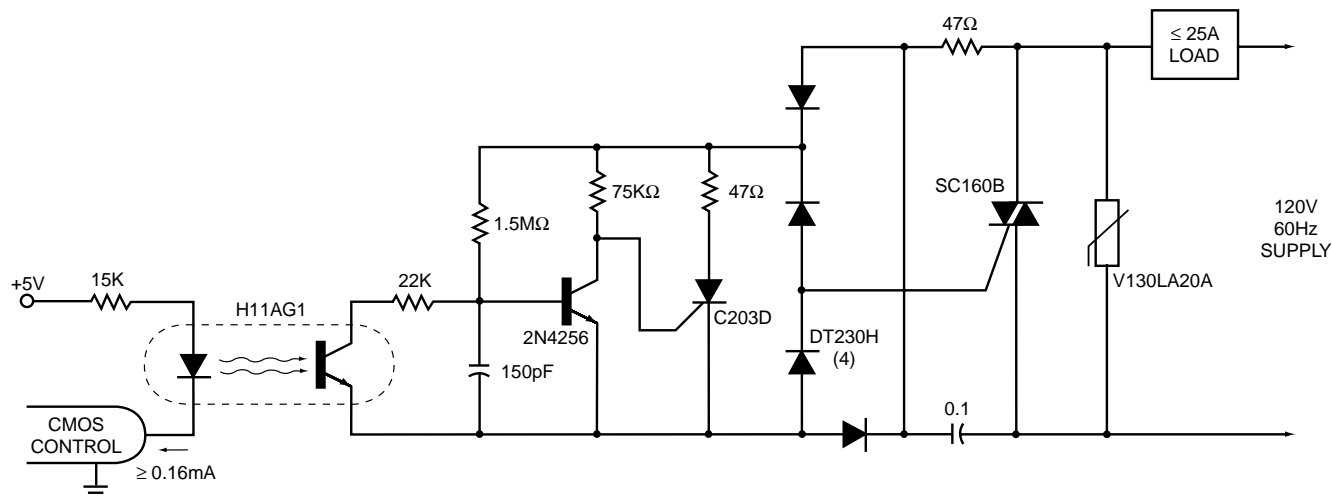
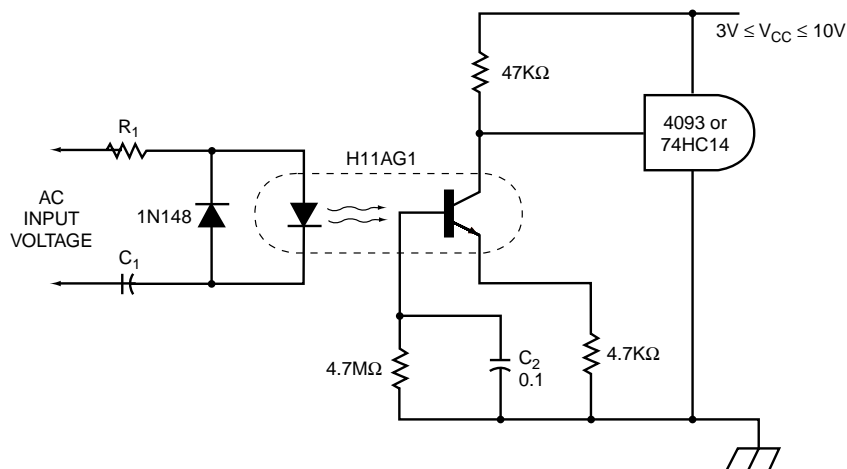


Figure 8. CMOS Input, 3KW, Zero Voltage Switching Solid State Relay

The H11AG1's superior performance at low input currents allows standard CMOS logic circuits to directly operate a 25A solid state relay. Circuit operation is as follows: power switching is provided by the SC160B, 25A triac. Its gate is controlled by the C203B via the DT230H rectifier bridge. The C203B turn-on is inhibited by the 2N4256 when line voltage is above 12V and/or the H11AG is off. False trigger and dv/dt protection are provided by the combination of the MOV® varistor and RC snubber network.



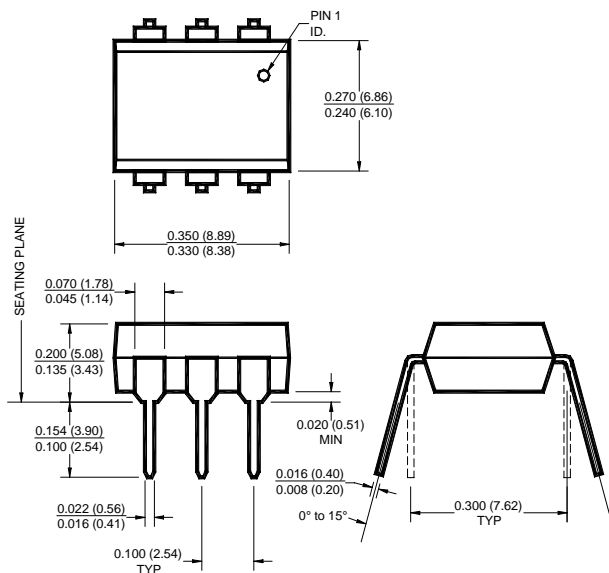
INPUT	R <sub>1</sub>	C <sub>1</sub>	Z
40-90 VRMS 20 Hz	75 K 1/10 W	0.1 μF 100 V	109K
95-135 VRMS 60 Hz	180 K 1/10 W	12 nF 200 V	285K
200-280 VRMS 50/60 Hz	390 K 1/4 W	6.80 nF 400 V	550K

DC component of input voltage is ignored due to C1

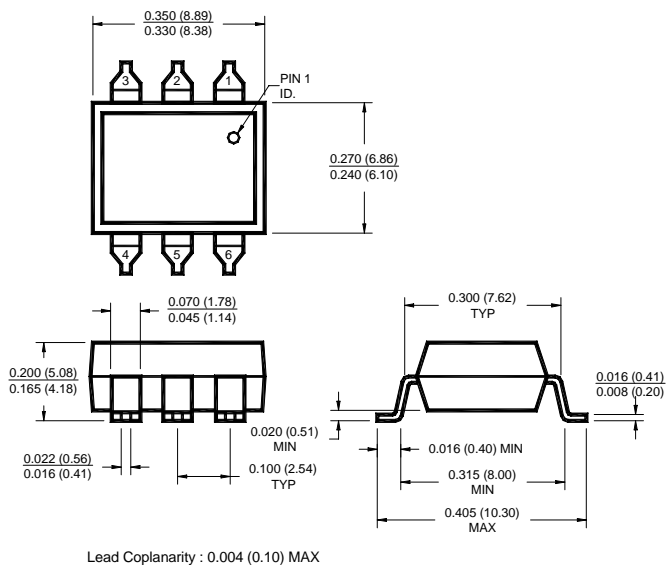
Figure 9. Telephone Ring Detector/A.C. Line CMOS Input Isolator

The H11AG1 uses less input power than the neon bulb traditionally used to monitor telephone and line voltages. Additionally, response time can be tailored to ignore telephone dial tap, switching transients and other undesired signals by modifying the value of C2. The high impedance to line voltage also can simply board layout spacing requirements.

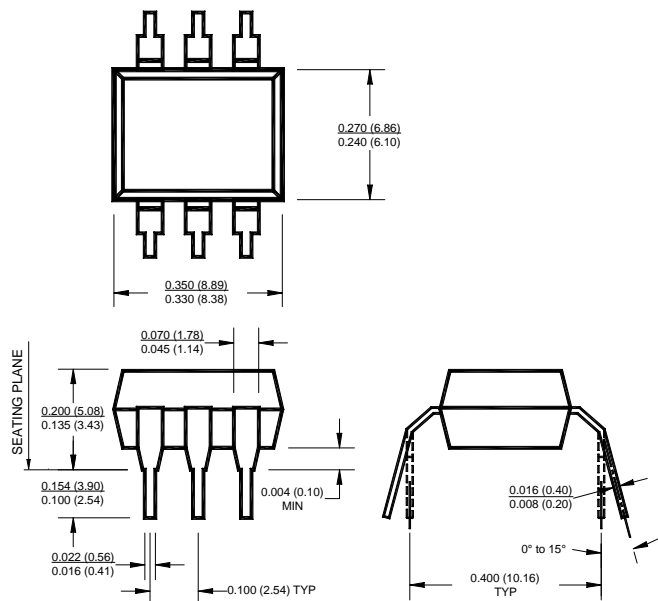
## Package Dimensions (Through Hole)



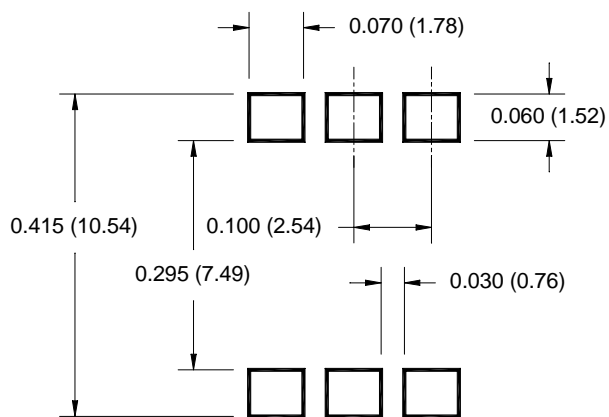
## Package Dimensions (Surface Mount)



### Package Dimensions (0.4" Lead Spacing)



## Recommended Pad Layout for Surface Mount Leadform



### NOTE

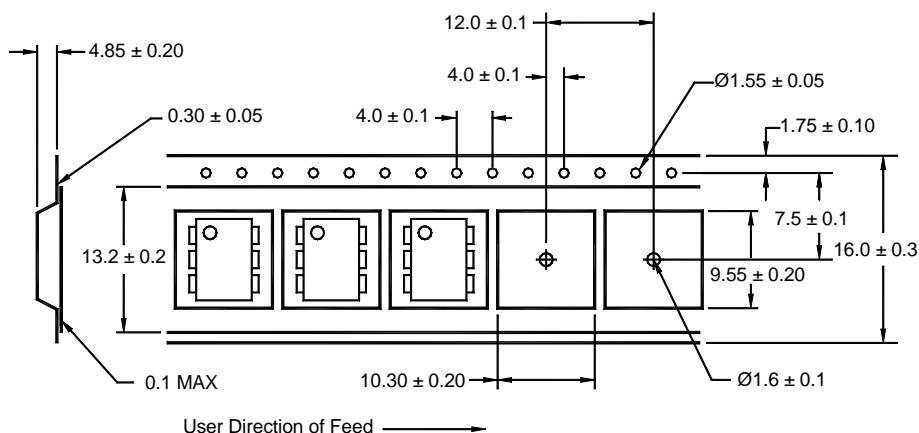
All dimensions are in inches (millimeters)

H11AG1 H11AG2 H11AG3

## ORDERING INFORMATION

Option	Order Entry Identifier	Description
S	.S	Surface Mount Lead Bend
SD	.SD	Surface Mount; Tape and reel
W	.W	0.4" Lead Spacing
300	.300	VDE 0884
300W	.300W	VDE 0884, 0.4" Lead Spacing
3S	.3S	VDE 0884, Surface Mount
3SD	.3SD	VDE 0884, Surface Mount, Tape & Reel

## Carrier Tape Specifications ("D" Taping Orientation)



## NOTE

All dimensions are millimeters

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