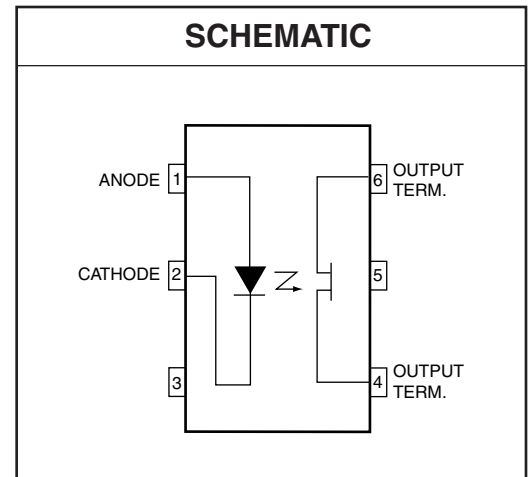
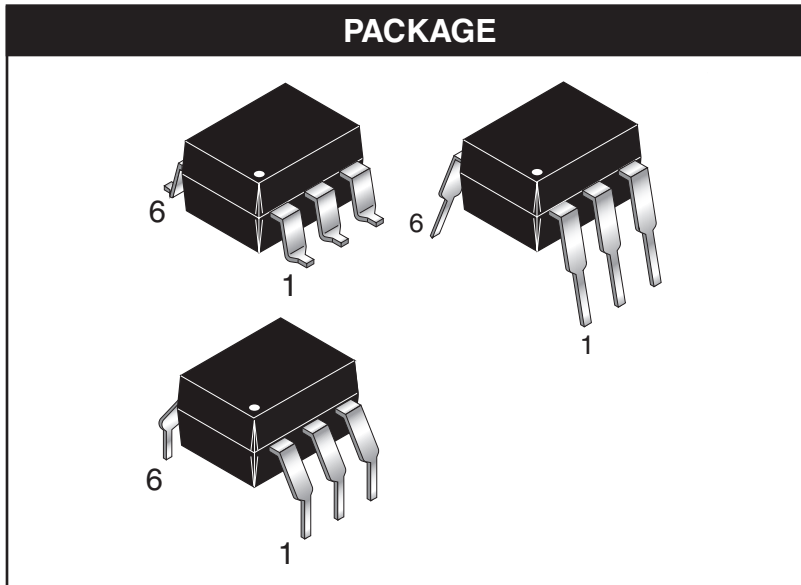


**H11F1 H11F2 H11F3**



**DESCRIPTION**

The H11F series consists of a Gallium-Aluminum-Arsenide IRED emitting diode coupled to a symmetrical bilateral silicon photo-detector. The detector is electrically isolated from the input and performs like an ideal isolated FET designed for distortion-free control of low level AC and DC analog signals. The H11F series devices are mounted in dual in-line packages.

**FEATURES**

As a remote variable resistor

- $\leq 100\Omega$  to  $\geq 300\text{ M}\Omega$
- $\geq 99.9\%$  linearity
- $\leq 15\text{ pF}$  shunt capacitance
- $\geq 100\text{ G}\Omega$  I/O isolation resistance

As an analog switch

- Extremely low offset voltage
- $60\text{ V}_{\text{pk-pk}}$  signal capability
- No charge injection or latch-up
- $t_{\text{on}}, t_{\text{off}} \leq 15\ \mu\text{S}$
- UL recognized (File #E90700)
- VDE recognized (File #E94766)
  - Ordering option '300' (e.g. H11F1.300)

**APPLICATIONS**

As a variable resistor –

- Isolated variable attenuator
- Automatic gain control
- Active filter fine tuning/band switching

As an analog switch –

- Isolated sample and hold circuit
- Multiplexed, optically isolated A/D conversion

**H11F1 H11F2 H11F3**

<b>Absolute Maximum Ratings</b> ( $T_A = 25^\circ\text{C}$ unless otherwise specified)				
Parameter	Symbol	Device	Value	Units
<b>TOTAL DEVICE</b>				
Storage Temperature	$T_{STG}$	All	-55 to +150	$^\circ\text{C}$
Operating Temperature	$T_{OPR}$	All	-55 to +100	$^\circ\text{C}$
Lead Solder Temperature	$T_{SOL}$	All	260 for 10 sec	$^\circ\text{C}$
<b>EMITTER</b>				
Continuous Forward Current	$I_F$	All	60	mA
Reverse Voltage	$V_R$	All	5	V
Forward Current - Peak (10 $\mu\text{s}$ pulse, 1% duty cycle)	$I_{F(pk)}$	All	1	A
LED Power Dissipation $25^\circ\text{C}$ Ambient Derate Linearly From $25^\circ\text{C}$	$P_D$	All	100	mW
			1.33	mW/ $^\circ\text{C}$
<b>DETECTOR</b>				
Detector Power Dissipation @ $25^\circ\text{C}$ Derate linearly from $25^\circ\text{C}$	$P_D$	All	300	mW
			4.0	mW/ $^\circ\text{C}$
Breakdown Voltage (either polarity)	$BV_{4-6}$	H11F1, H11F2	$\pm 30$	V
		H11F3	$\pm 15$	V
Continuous Detector Current (either polarity)	$I_{4-6}$	All	$\pm 100$	mA

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

<b>INDIVIDUAL COMPONENT CHARACTERISTICS</b>							
Parameter	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
<b>EMITTER</b>							
Input Forward Voltage	$I_F = 16 \text{ mA}$	$V_F$	All		1.3	1.75	V
Reverse Leakage Current	$V_R = 5 \text{ V}$	$I_R$	All			10	$\mu\text{A}$
Capacitance	$V = 0 \text{ V}, f = 1.0 \text{ MHz}$	$C_J$	All		50		pF
<b>OUTPUT DETECTOR</b>							
Breakdown Voltage Either Polarity	$I_{4-6} = 10\mu\text{A}, I_F = 0$	$BV_{4-6}$	H11F1, H11F2	30			V
			H11F3	15			
Off-State Dark Current	$V_{4-6} = 15 \text{ V}, I_F = 0$	$I_{4-6}$	All			50	nA
	$V_{4-6} = 15 \text{ V}, I_F = 0, T_A = 100^\circ\text{C}$		All			50	$\mu\text{A}$
Off-State Resistance	$V_{4-6} = 15 \text{ V}, I_F = 0$	$R_{4-6}$	All	300			M $\Omega$
Capacitance	$V_{4-6} = 15 \text{ V}, I_F = 0, f = 1\text{MHz}$	$C_{4-6}$	All			15	pF

**H11F1 H11F2 H11F3**

**ISOLATION CHARACTERISTICS**

Parameter	Test Conditions	Symbol	Min	Typ*	Max	Units
Input-Output Isolation Voltage	f = 60Hz, t = 1 min.	V <sub>ISO</sub>	5300			Vac (rms)
Isolation Resistance	V <sub>I-O</sub> = 500 VDC	R <sub>ISO</sub>	10 <sup>11</sup>			Ω
Isolation Capacitance	V <sub>I-O</sub> = 0, f = 1.0 MHz	C <sub>ISO</sub>			2	pF

**TRANSFER CHARACTERISTICS** (T<sub>A</sub> = 25°C Unless otherwise specified.)

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
On-State Resistance	I <sub>F</sub> = 16 mA, I <sub>4-6</sub> = 100 μA	R <sub>4-6</sub>	H11F1			200	Ω
			H11F2			330	
			H11F3			470	
On-State Resistance	I <sub>F</sub> = 16 mA, I <sub>6-4</sub> = 100 μA	R <sub>6-4</sub>	H11F1			200	Ω
			H11F2			330	
			H11F3			470	
Resistance, non-linearity and assymetry	I <sub>F</sub> = 16mA, I <sub>4-6</sub> = 25 μA RMS, f = 1kHz		All			0.1	%
AC Characteristics	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
Turn-On Time	R <sub>L</sub> = 50Ω, I <sub>F</sub> = 16mA, V <sub>4-6</sub> = 5V	t <sub>on</sub>	All			25	μS
Turn-Off Time	R <sub>L</sub> = 50Ω, I <sub>F</sub> = 16mA, V <sub>4-6</sub> = 5V	t <sub>off</sub>	All			25	μS

**H11F1 H11F2 H11F3**

Figure 1. Resistance vs. Input Current

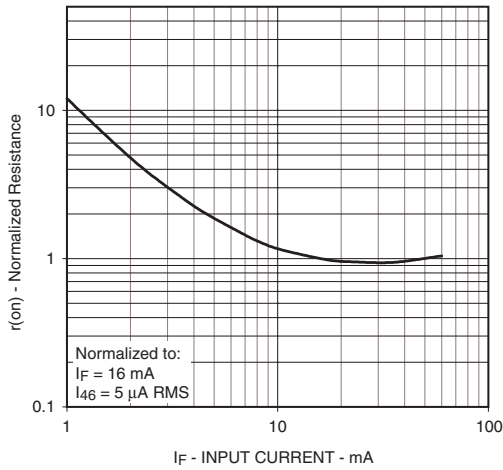


Figure 2. Output Characteristics

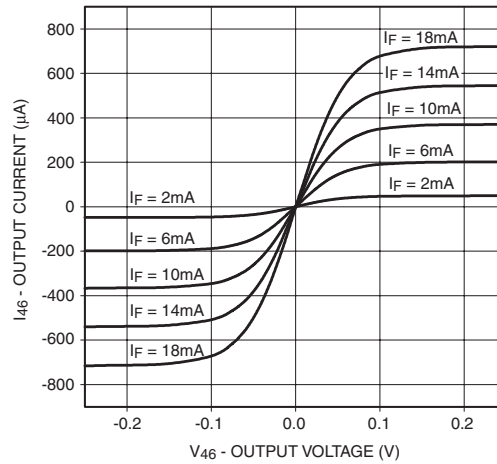


Figure 3. LED Forward Voltage vs. Forward Current

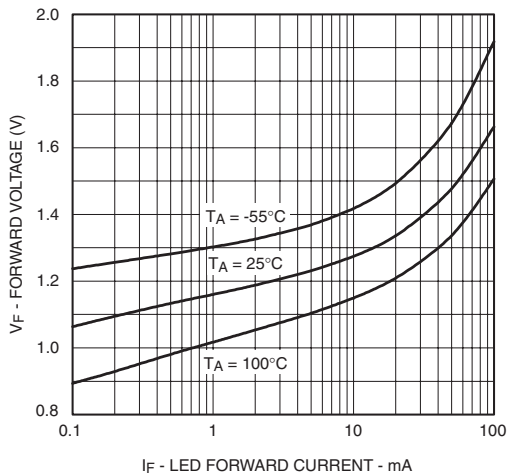


Figure 4. Off-state Current vs. Ambient Temperature

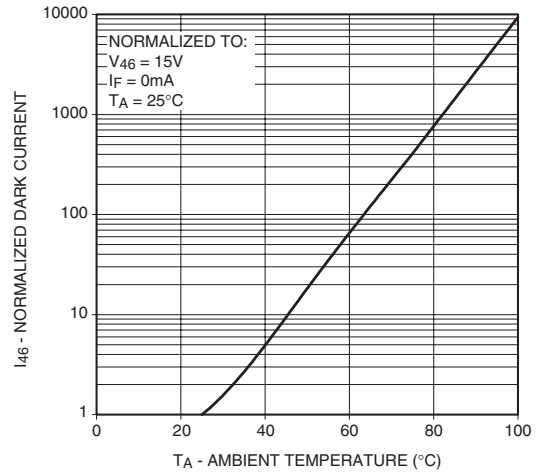


Figure 5. Resistance vs. Temperature

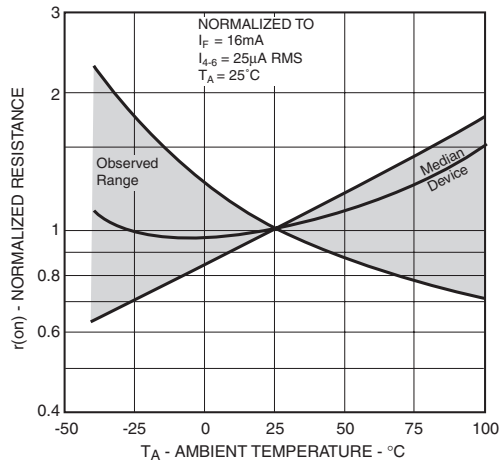


Figure 6. Region of Linear Resistance

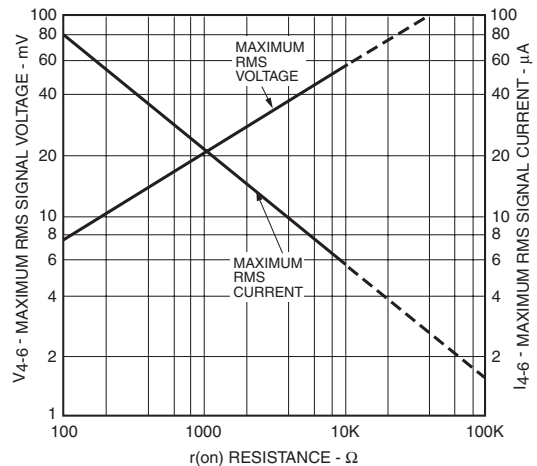
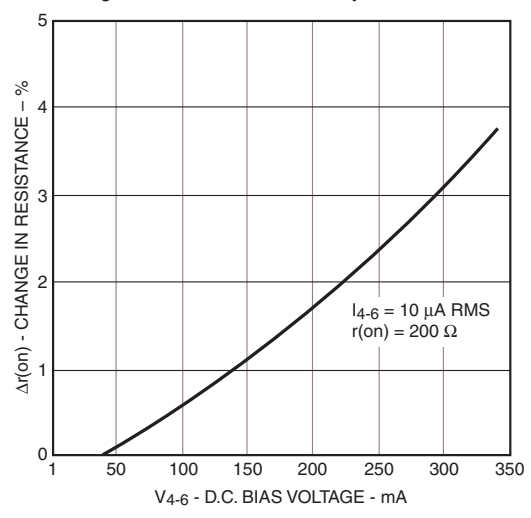


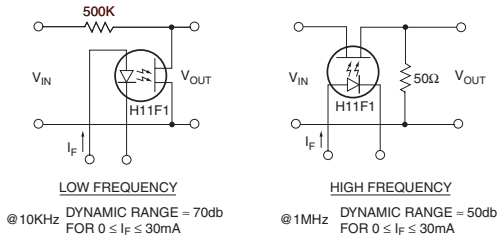
Figure 7. Resistive non-linearity vs. D.C. Bias



**TYPICAL APPLICATIONS**

**AS A VARIABLE RESISTOR**

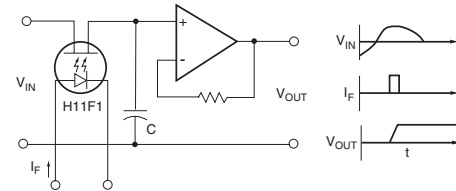
**ISOLATED VARIABLE ATTENUATORS**



Distortion free attenuation of low level A.C. signals is accomplished by varying the IRED current,  $I_F$ . Note the wide dynamic range and absence of coupling capacitors; D.C. level shifting or parasitic feedback to the controlling function.

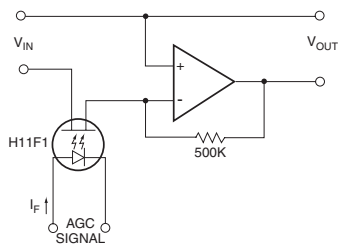
**AS AN ANALOG SIGNAL SWITCH**

**ISOLATED SAMPLE AND HOLD CIRCUIT**



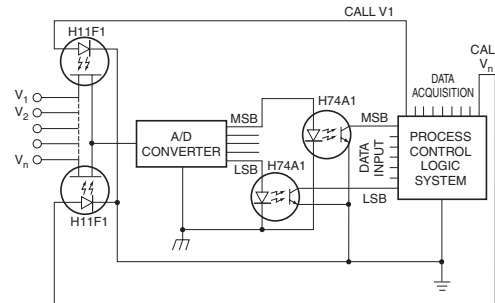
Accuracy and range are improved over conventional FET switches because the H11F has no charge injection from the control signal. The H11F also provides switching of either polarity input signal up to 30V magnitude.

**AUTOMATIC GAIN CONTROL**



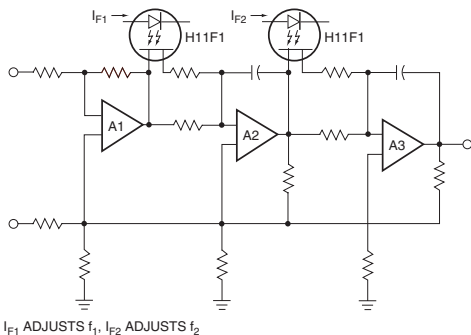
This simple circuit provides over 70db of stable gain control for an AGC signal range of from 0 to 30mA. This basic circuit can be used to provide programmable fade and attack for electronic music.

**MULTIPLEXED, OPTICALLY-ISOLATED A/D CONVERSION**



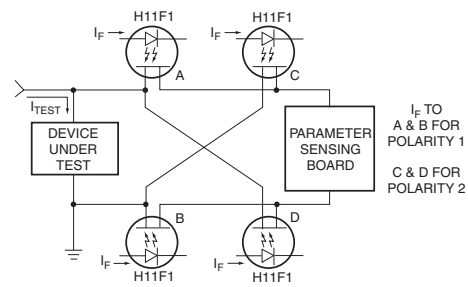
The optical isolation, linearity and low offset voltage of the H11F allows the remote multiplexing of low level analog signals from such transducers as thermocouples, Hall effect devices, strain gauges, etc. to a single A/D converter.

**ACTIVE FILTER FINE TUNING/BAND SWITCHING**



The linearity of resistance and the low offset voltage of the H11F allows the remote tuning or band-switching of active filters without switching glitches or distortion. This schematic illustrates the concept, with current to the H11F1 IRED's controlling the filter's transfer characteristic.

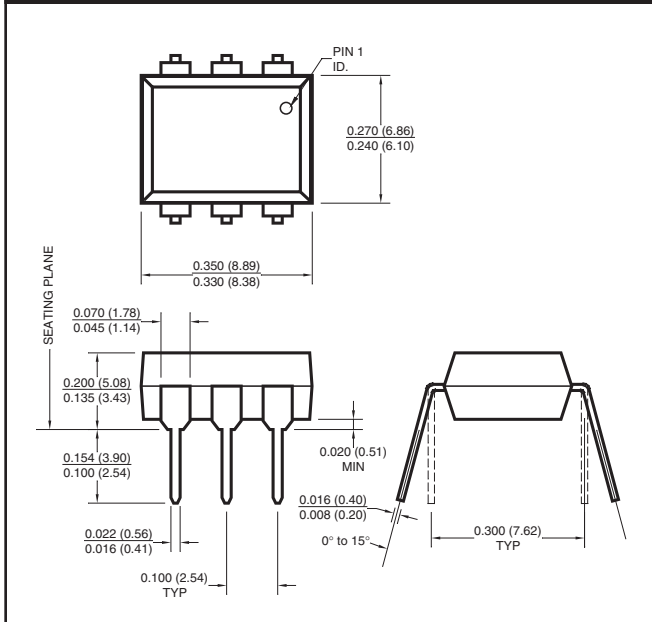
**TEST EQUIPMENT - KELVIN CONTACT POLARITY**



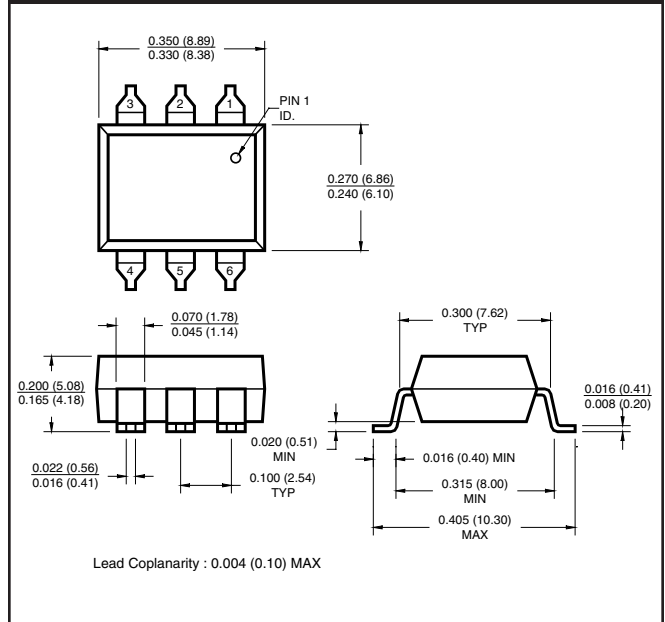
In many test equipment designs the auto polarity function uses reed relay contacts to switch the Kelvin Contact polarity. These reeds are normally one of the highest maintenance cost items due to sticking contacts and mechanical problems. The totally solid-State H11F eliminates these troubles while providing faster switching.

**H11F1 H11F2 H11F3**

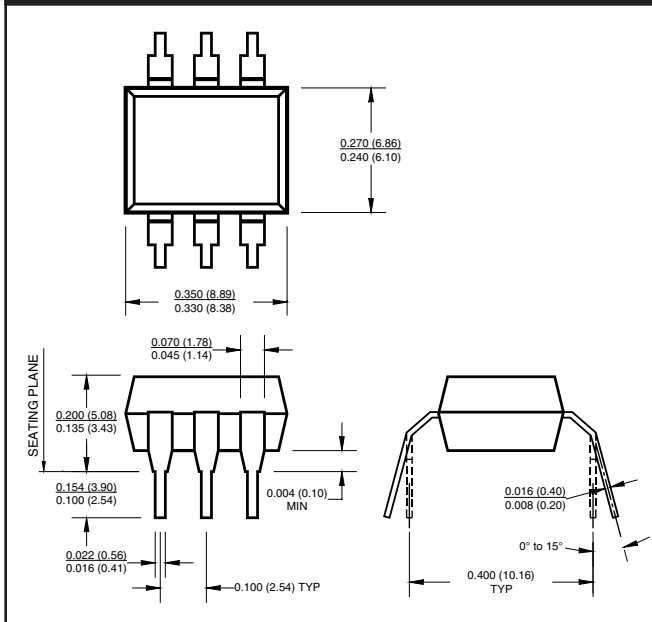
**Package Dimensions (Through Hole)**



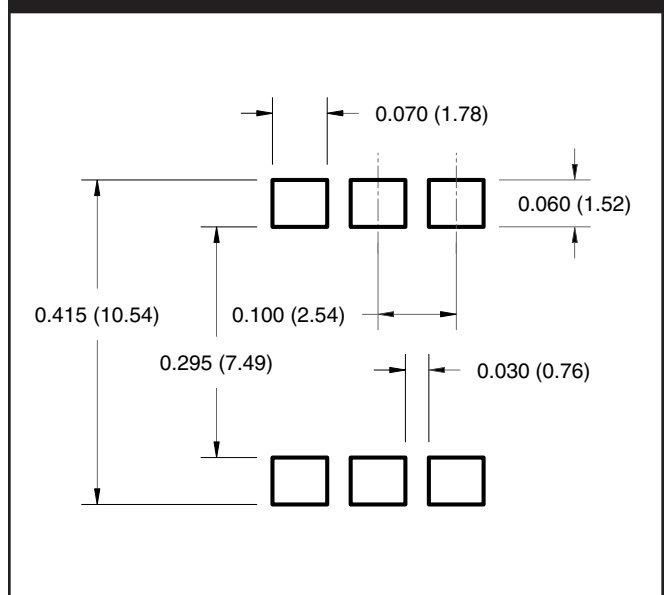
**Package Dimensions (Surface Mount)**



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



**Recommended Pad Layout for Surface Mount Leadform**



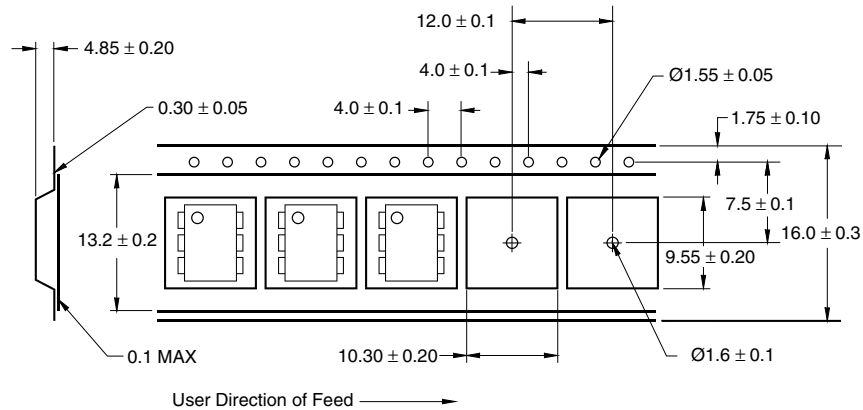
**NOTE**

All dimensions are in inches (millimeters)

**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 and Reel

**Carrier Tape Specifications**



**NOTE**

All dimensions are in inches (millimeters)

Tape and reel quantity is 1,000 units per reel



## **DISCLAIMER**

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

## **LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.