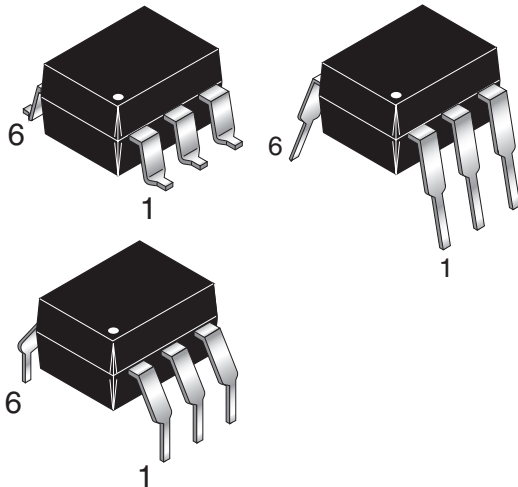
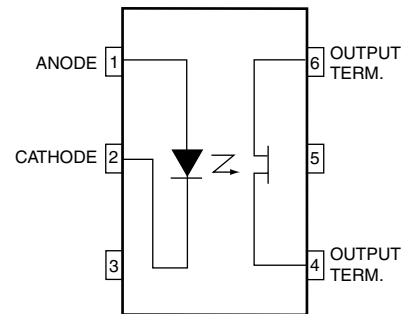


**H11F1 H11F2 H11F3**

**PACKAGE**



**SCHEMATIC**



**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
- $t_{\text{on}}, t_{\text{off}} \leq 15\text{ }\mu\text{S}$
- 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**

**Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

| Parameter                                                       | Symbol             | Device       | Value          | Units |
|-----------------------------------------------------------------|--------------------|--------------|----------------|-------|
| TOTAL DEVICE                                                    |                    |              |                |       |
| Storage Temperature                                             | T <sub>STG</sub>   | All          | -55 to +150    | °C    |
| Operating Temperature                                           | T <sub>OPR</sub>   | All          | -55 to +100    | °C    |
| Lead Solder Temperature                                         | T <sub>SOL</sub>   | All          | 260 for 10 sec | °C    |
| EMITTER                                                         |                    |              |                |       |
| Continuous Forward Current                                      | I <sub>F</sub>     | All          | 60             | mA    |
| Reverse Voltage                                                 | V <sub>R</sub>     | All          | 5              | V     |
| Forward Current - Peak (10 μs pulse, 1% duty cycle)             | I <sub>F(pk)</sub> | All          | 1              | A     |
| LED Power Dissipation 25°C Ambient<br>Derate Linearly From 25°C | P <sub>D</sub>     | All          | 100            | mW    |
|                                                                 |                    |              | 1.33           | mW/°C |
| DETECTOR                                                        |                    |              |                |       |
| Detector Power Dissipation @ 25°C<br>Derate linearly from 25°C  | P <sub>D</sub>     | All          | 300            | mW    |
|                                                                 |                    |              | 4.0            | mW/°C |
| Breakdown Voltage (either polarity)                             | BV <sub>4-6</sub>  | H11F1, H11F2 | ±30            | V     |
|                                                                 |                    | H11F3        | ±15            | V     |
| Continuous Detector Current (either polarity)                   | I <sub>4-6</sub>   | All          | ±100           | mA    |

**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                | $I_F = 16 \text{ mA}$                                      | $V_F$      | 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<br>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 | $f = 60\text{Hz}$ , $t = 1 \text{ min.}$     | $V_{\text{ISO}}$ | 5300      |      |     | Vac (rms) |
| Isolation Resistance           | $V_{\text{I-O}} = 500 \text{ VDC}$           | $R_{\text{ISO}}$ | $10^{11}$ |      |     | $\Omega$  |
| Isolation Capacitance          | $V_{\text{I-O}} = 0$ , $f = 1.0 \text{ MHz}$ | $C_{\text{ISO}}$ |           |      | 2   | pF        |

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

| DC Characteristics                      | Test Conditions                                                             | Symbol           | Device | Min | Typ* | Max | Units         |
|-----------------------------------------|-----------------------------------------------------------------------------|------------------|--------|-----|------|-----|---------------|
| On-State Resistance                     | $I_F = 16 \text{ mA}$ , $I_{4-6} = 100 \mu\text{A}$                         | $R_{4-6}$        | H11F1  |     |      | 200 | $\Omega$      |
|                                         |                                                                             |                  | H11F2  |     |      | 330 |               |
|                                         |                                                                             |                  | H11F3  |     |      | 470 |               |
| On-State Resistance                     | $I_F = 16 \text{ mA}$ , $I_{6-4} = 100 \mu\text{A}$                         | $R_{6-4}$        | H11F1  |     |      | 200 | $\Omega$      |
|                                         |                                                                             |                  | H11F2  |     |      | 330 |               |
|                                         |                                                                             |                  | H11F3  |     |      | 470 |               |
| Resistance, non-linearity and assymetry | $I_F = 16\text{mA}$ , $I_{4-6} = 25 \mu\text{A RMS}$ ,<br>$f = 1\text{kHz}$ |                  | All    |     |      | 0.1 | %             |
| AC Characteristics                      | Test Conditions                                                             | Symbol           | Device | Min | Typ* | Max | Units         |
| Turn-On Time                            | $R_L = 50\Omega$ , $I_F = 16\text{mA}$ , $V_{4-6} = 5\text{V}$              | $t_{\text{on}}$  | All    |     |      | 25  | $\mu\text{S}$ |
| Turn-Off Time                           | $R_L = 50\Omega$ , $I_F = 16\text{mA}$ , $V_{4-6} = 5\text{V}$              | $t_{\text{off}}$ | All    |     |      | 25  | $\mu\text{S}$ |

**H11F1 H11F2 H11F3**

Figure 1. Resistance vs. Input Current

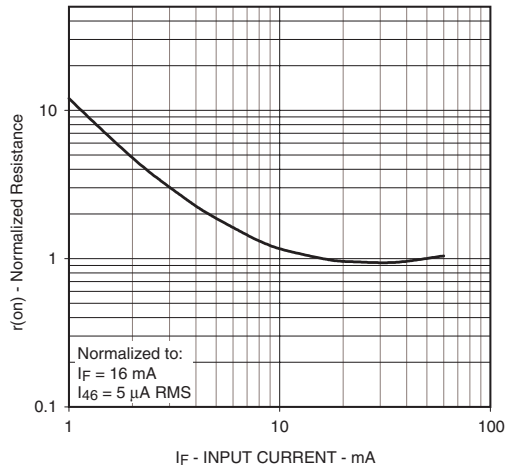


Figure 2. Output Characteristics

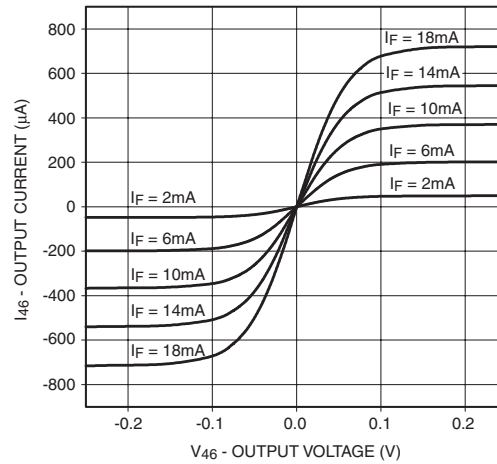


Figure 3. LED Forward Voltage vs. Forward Current

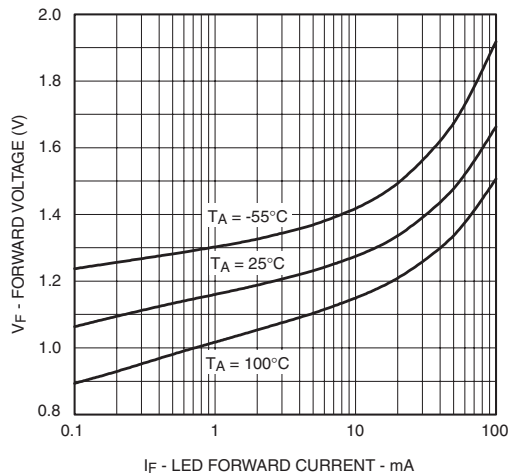


Figure 4. Off-state Current vs. Ambient Temperature

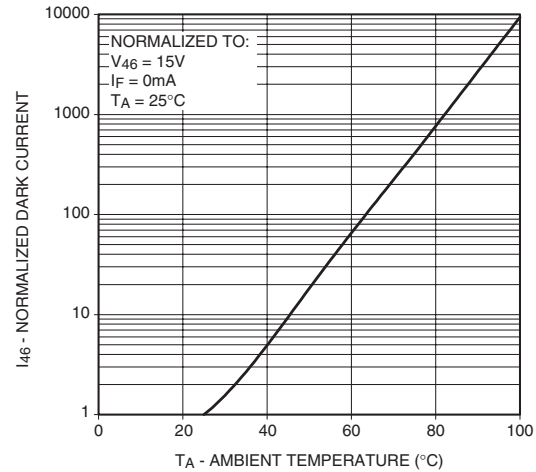


Figure 5. Resistance vs. Temperature

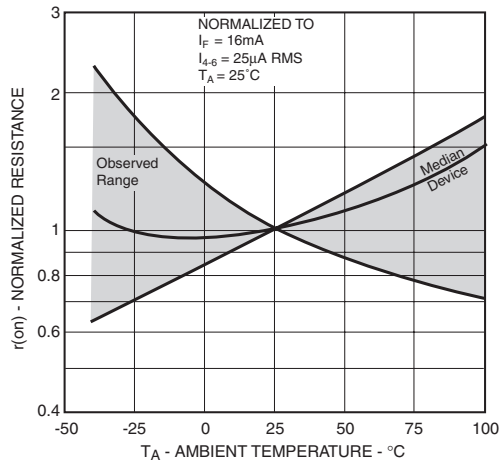
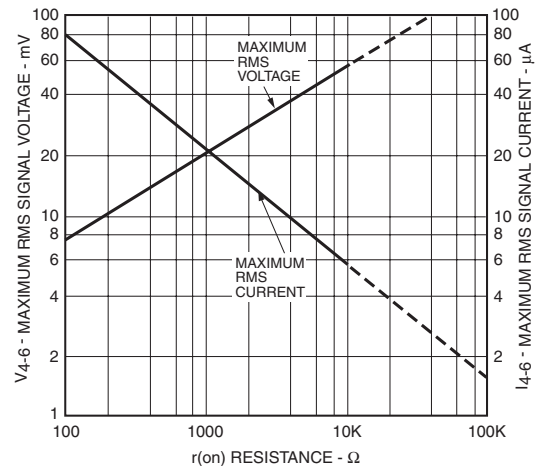
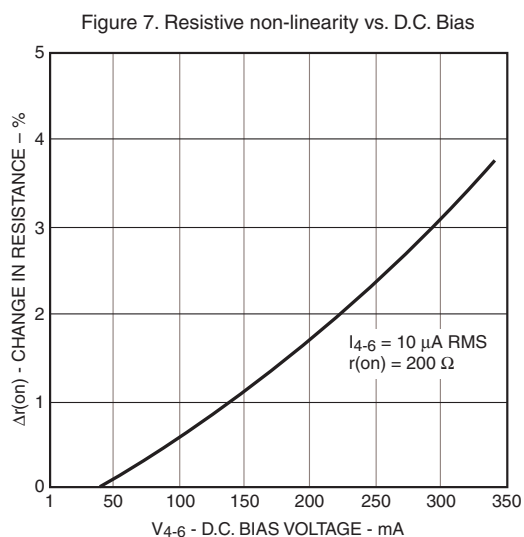


Figure 6. Region of Linear Resistance

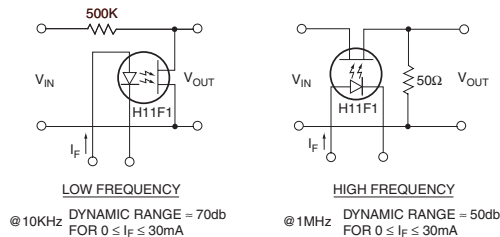




**TYPICAL APPLICATIONS**

**AS A VARIABLE RESISTOR**

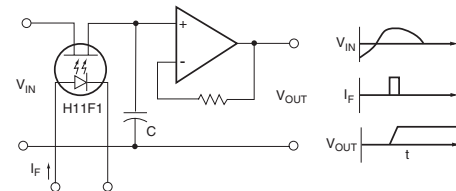
**ISOLATED VARIABLE ATTENUATORS**



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.

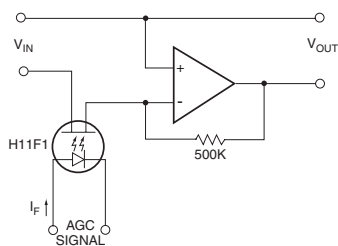
**AS AN ANALOG SIGNAL SWITCH**

**ISOLATED SAMPLE AND HOLD CIRCUIT**



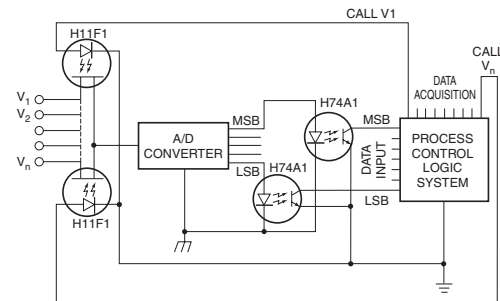
Accuracy and range are improved over conventional FET switches because the H11F has no charge injection from the control signal. The H11F also provides switching of either polarity input signal up to 30V magnitude.

**AUTOMATIC GAIN CONTROL**



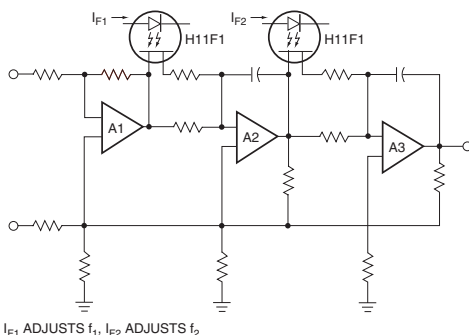
This simple circuit provides over 70db of stable gain control for an AGC signal range of from 0 to 30mA. This basic circuit can be used to provide programmable fade and attack for electronic music.

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



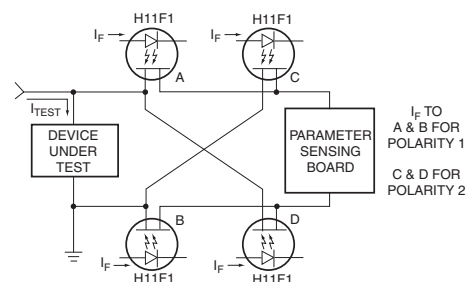
The optical isolation, linearity and low offset voltage of the H11F allows the remote multiplexing of low level analog signals from such transducers as thermocouples, Hall effect devices, strain gauges, etc. to a single A/D converter.

**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.

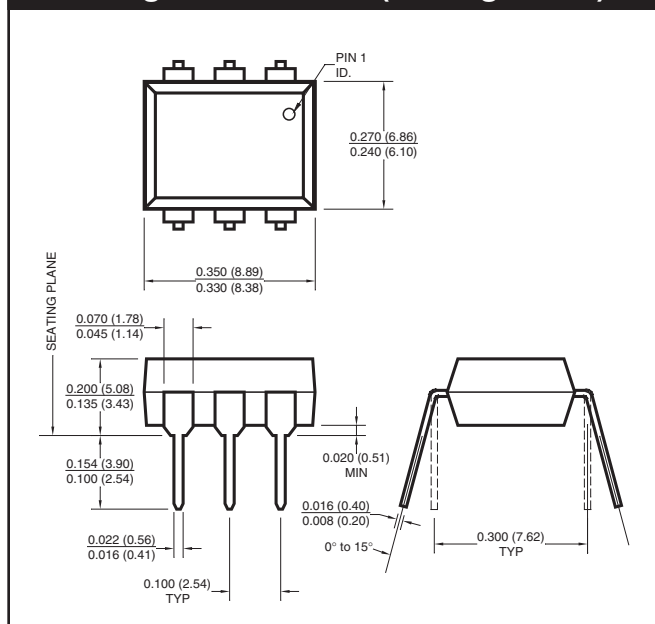
**TEST EQUIPMENT - KELVIN CONTACT POLARITY**



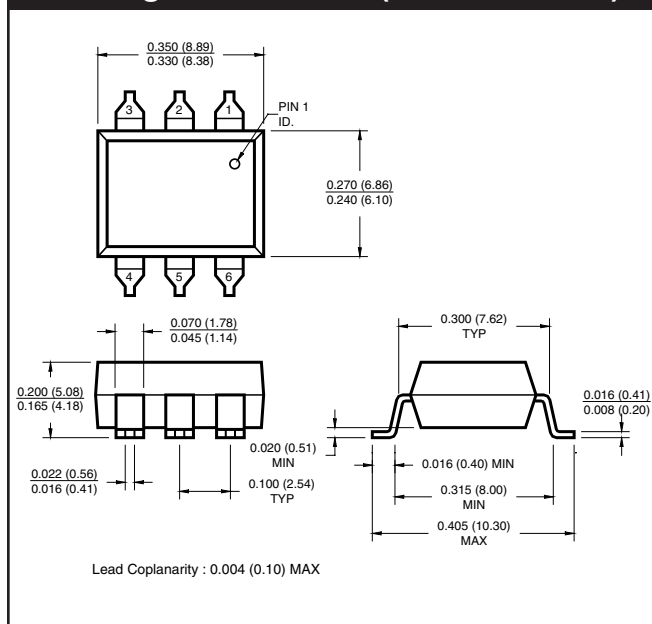
In many test equipment designs the auto polarity function uses reed relay contacts to switch the Kelvin Contact polarity. These reeds are normally one of the highest maintenance cost items due to sticking contacts and mechanical problems. The totally solid-State H11F eliminates these troubles while providing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

## H11F1 H11F2 H11F3

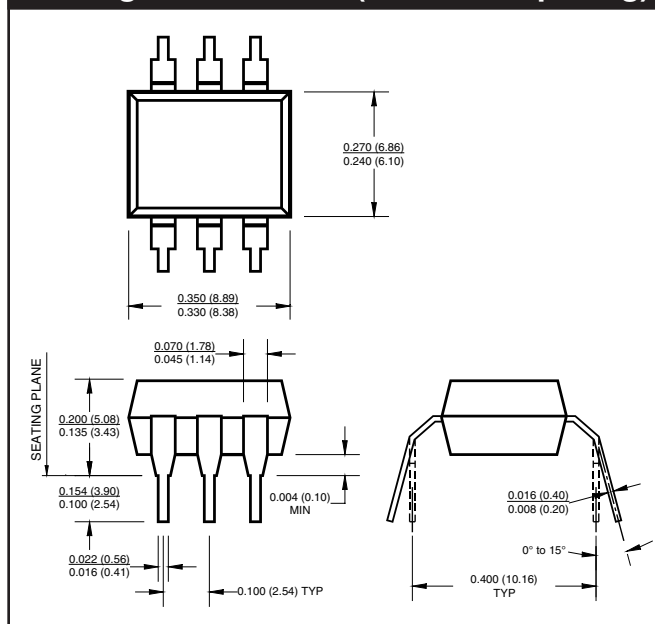
### Package Dimensions (Through Hole)



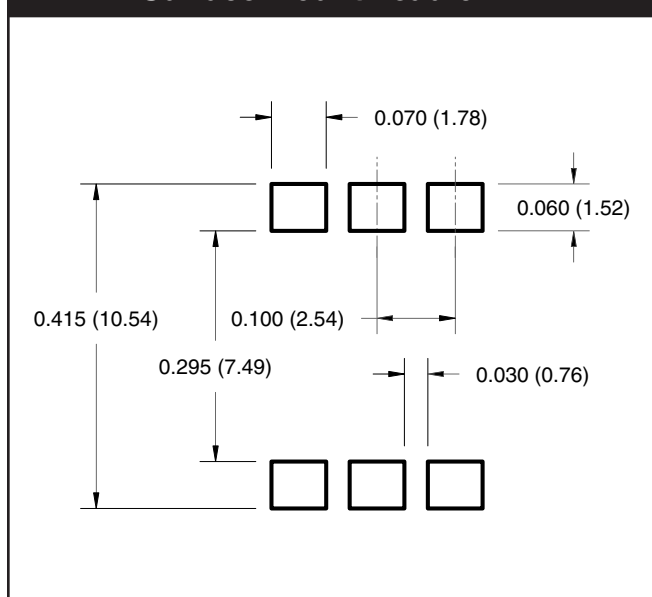
### Package Dimensions (Surface Mount)



### Package Dimensions (0.4" Lead Spacing)



### Recommended Pad Layout for Surface Mount Leadform



#### NOTE

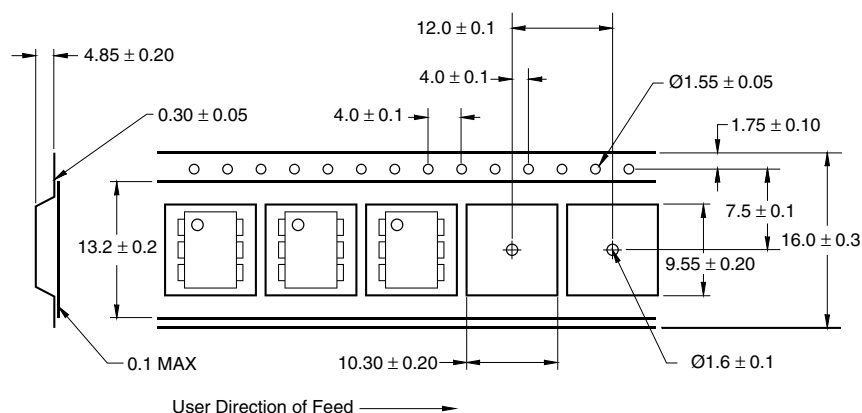
All dimensions are in inches (millimeters)

**H11F1 H11F2 H11F3**

## 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

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## H11F1 H11F2 H11F3

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