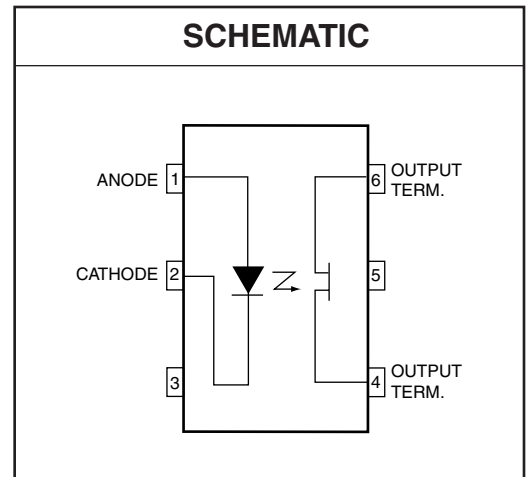
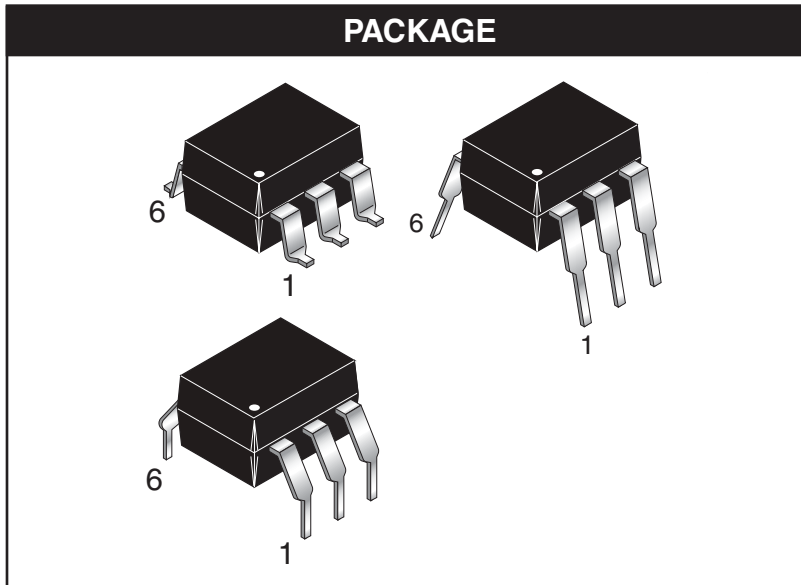




THE DATASHEET OF H11F1S



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

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise specified)				
Parameter	Symbol	Device	Value	Units
TOTAL DEVICE				
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	$^\circ\text{C}$
EMITTER				
Continuous Forward Current	I_F	All	60	mA
Reverse Voltage	V_R	All	5	V
Forward Current - Peak (10 μs pulse, 1% duty cycle)	$I_{F(pk)}$	All	1	A
LED Power Dissipation 25°C Ambient Derate Linearly From 25°C	P_D	All	100	mW
			1.33	mW/ $^\circ\text{C}$
DETECTOR				
Detector Power Dissipation @ 25°C Derate linearly from 25°C	P_D	All	300	mW
			4.0	mW/ $^\circ\text{C}$
Breakdown Voltage (either polarity)	BV_{4-6}	H11F1, H11F2	± 30	V
		H11F3	± 15	V
Continuous Detector Current (either polarity)	I_{4-6}	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
EMITTER							
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	μA
Capacitance	$V = 0 \text{ V}, f = 1.0 \text{ MHz}$	C_J	All		50		pF
OUTPUT DETECTOR							
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	μA
Off-State Resistance	$V_{4-6} = 15 \text{ V}, I_F = 0$	R_{4-6}	All	300			M Ω
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 _{ISO}	5300			Vac (rms)
Isolation Resistance	V _{I-O} = 500 VDC	R _{ISO}	10 ¹¹			Ω
Isolation Capacitance	V _{I-O} = 0, f = 1.0 MHz	C _{ISO}			2	pF

TRANSFER CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

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

H11F1 H11F2 H11F3

Figure 1. Resistance vs. Input Current

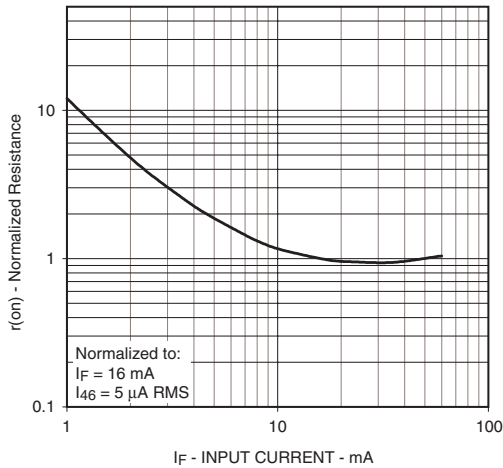


Figure 2. Output Characteristics

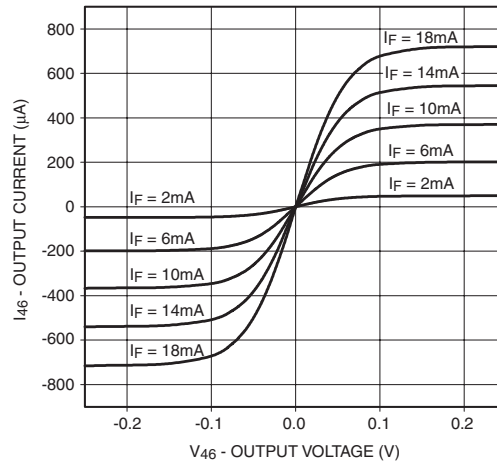


Figure 3. LED Forward Voltage vs. Forward Current

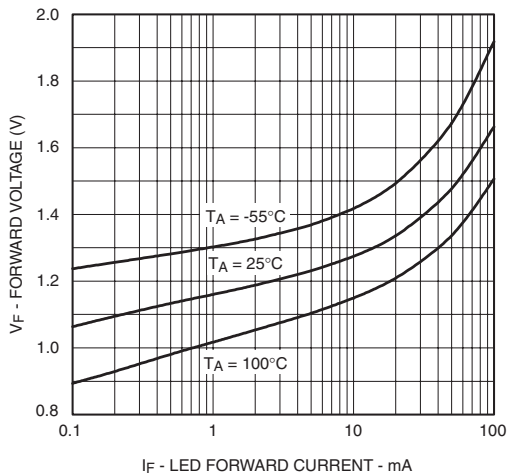


Figure 4. Off-state Current vs. Ambient Temperature

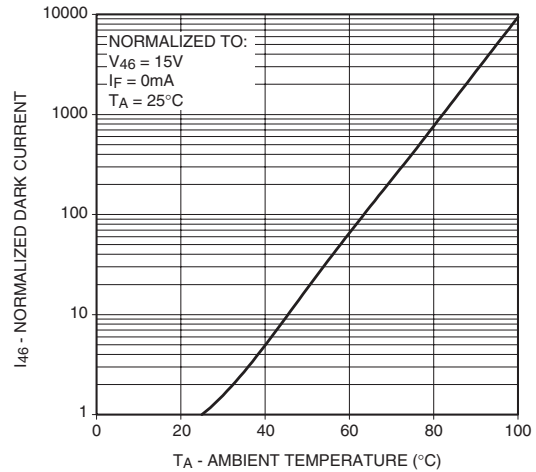


Figure 5. Resistance vs. Temperature

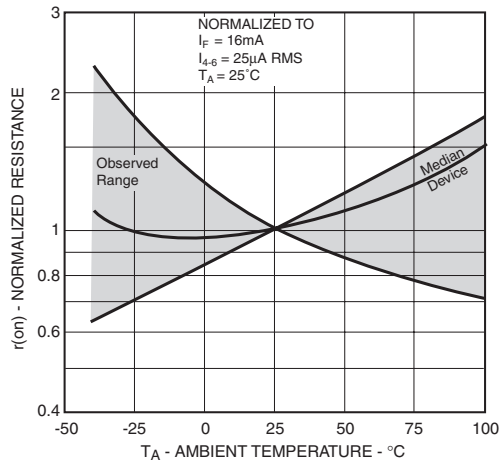


Figure 6. Region of Linear Resistance

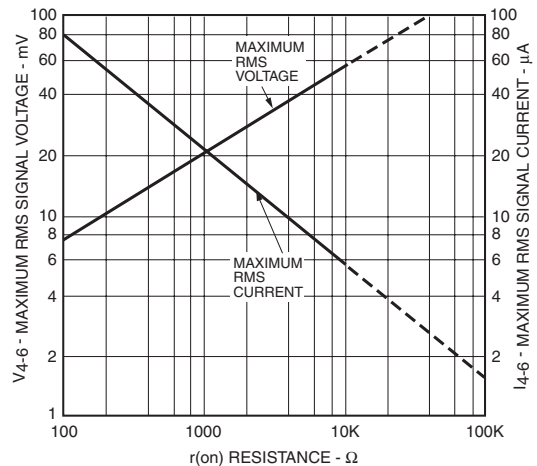
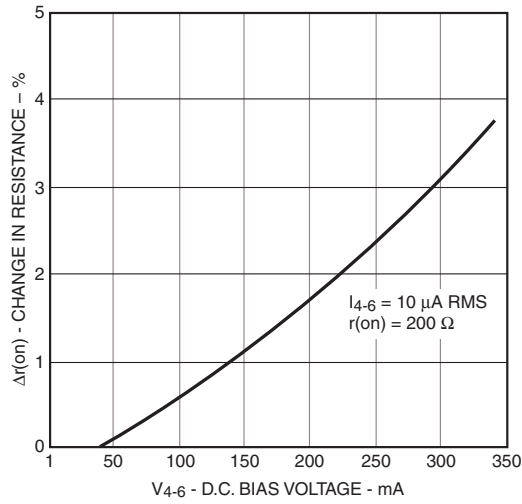


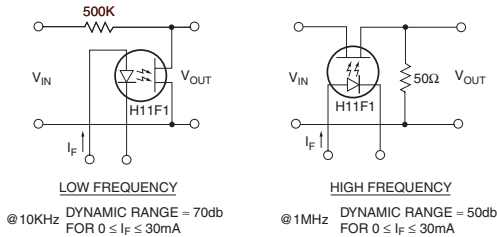
Figure 7. Resistive non-linearity vs. D.C. Bias



TYPICAL APPLICATIONS

AS A VARIABLE RESISTOR

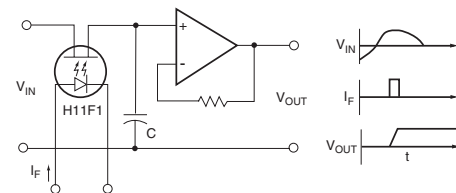
ISOLATED VARIABLE ATTENUATORS



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.

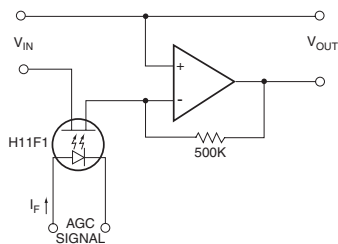
AS AN ANALOG SIGNAL SWITCH

ISOLATED SAMPLE AND HOLD CIRCUIT



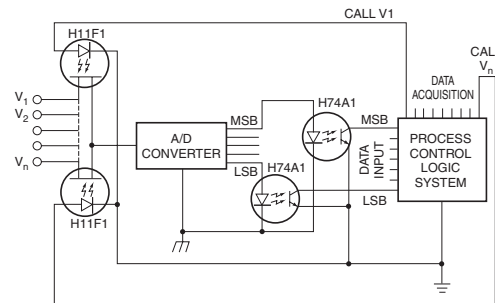
Accuracy and range are improved over conventional FET switches because the H11F has no charge injection from the control signal. The H11F also provides switching of either polarity input signal up to 30V magnitude.

AUTOMATIC GAIN CONTROL



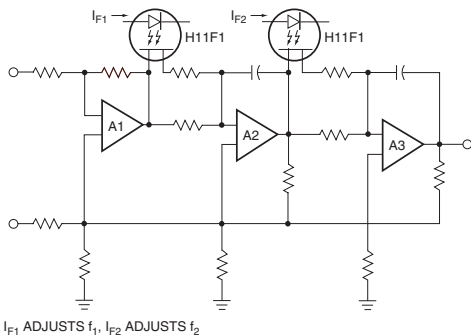
This simple circuit provides over 70db of stable gain control for an AGC signal range of from 0 to 30mA. This basic circuit can be used to provide programmable fade and attack for electronic music.

MULTIPLEXED, OPTICALLY-ISOLATED A/D CONVERSION



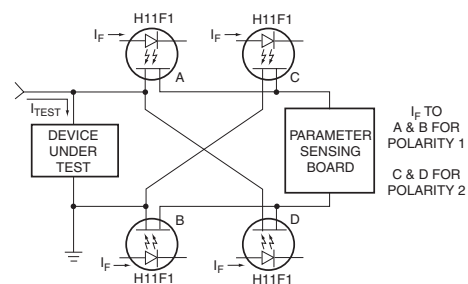
The optical isolation, linearity and low offset voltage of the H11F allows the remote multiplexing of low level analog signals from such transducers as thermocouples, Hall effect devices, strain gauges, etc. to a single A/D converter.

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.

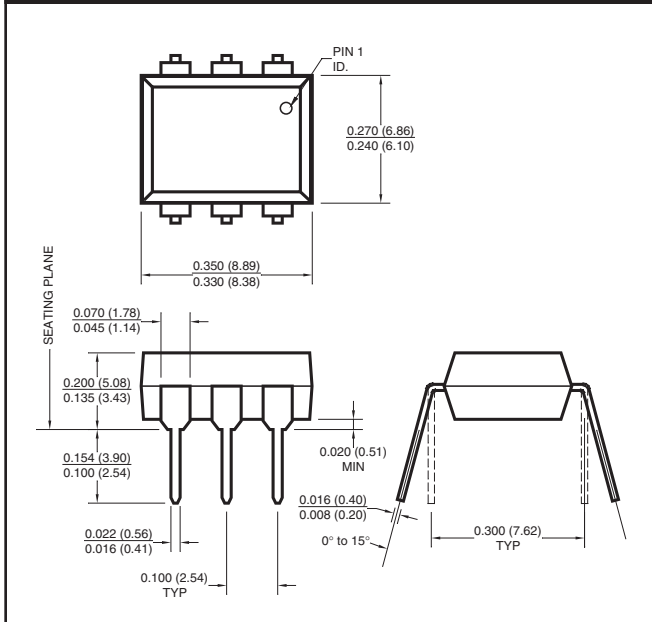
TEST EQUIPMENT - KELVIN CONTACT POLARITY



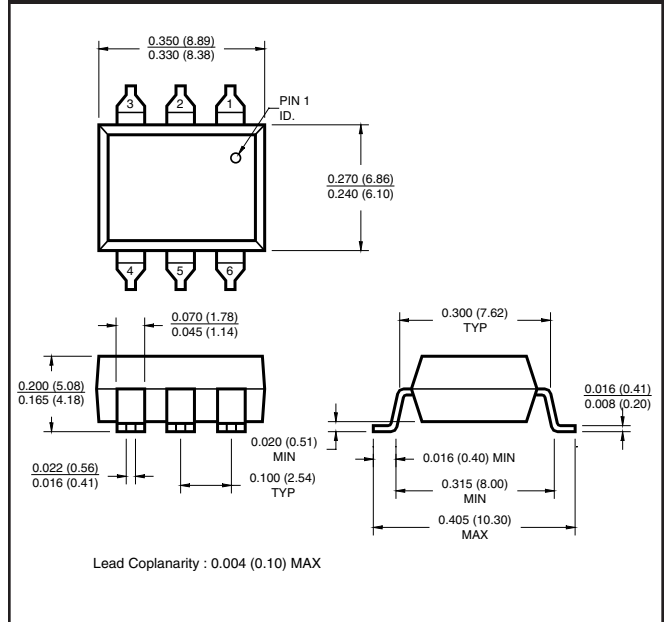
In many test equipment designs the auto polarity function uses reed relay contacts to switch the Kelvin Contact polarity. These reeds are normally one of the highest maintenance cost items due to sticking contacts and mechanical problems. The totally solid-State H11F eliminates these troubles while providing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

H11F1 H11F2 H11F3

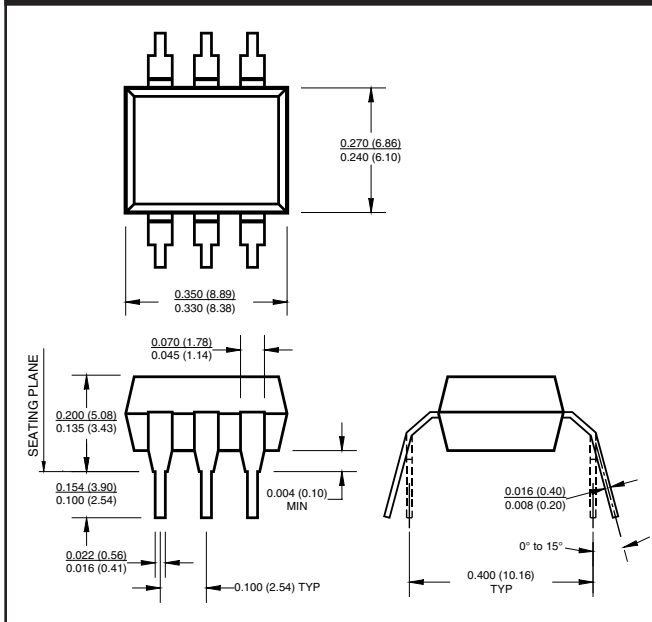
Package Dimensions (Through Hole)



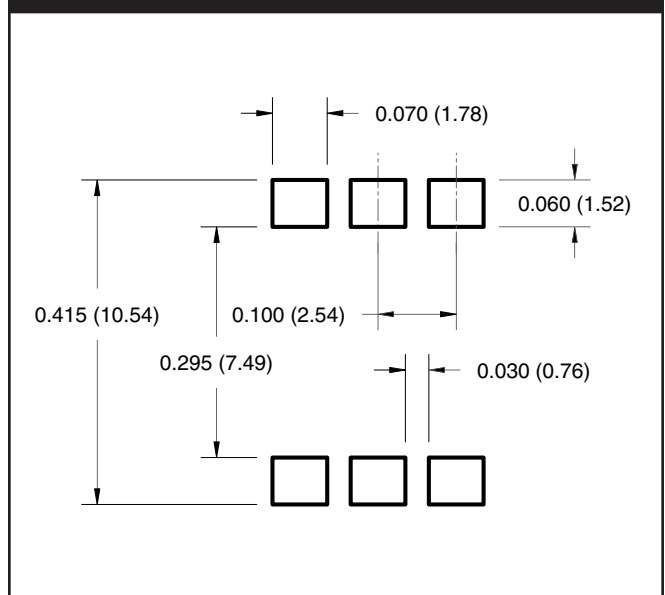
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



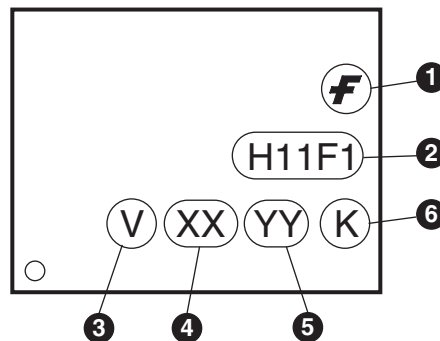
NOTE

All dimensions are in inches (millimeters)

ORDERING INFORMATION

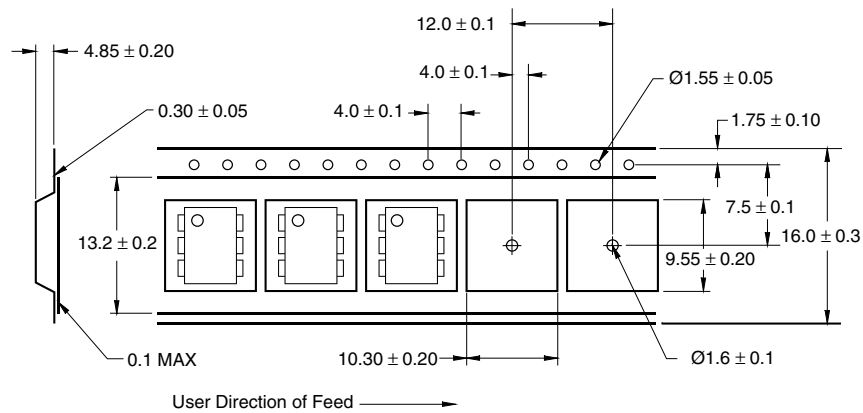
Option	Order Entry Identifier	Description
S	.S	Surface Mount Lead Bend
SD	.SD	Surface Mount; Tape and Reel
W	.W	0.4" Lead Spacing
300	.300	VDE 0884
300W	.300W	VDE 0884, 0.4" Lead Spacing
3S	.3S	VDE 0884, Surface Mount
3SD	.3SD	VDE 0884, Surface Mount, Tape and Reel

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	Two digit year code, e.g., '03'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

Carrier Tape Specifications

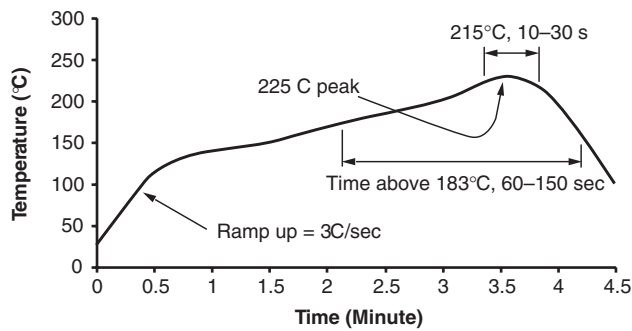


NOTE

All dimensions are in inches (millimeters)

Tape and reel quantity is 1,000 units per reel

Reflow Profile (Black Package, No Suffix)



- Peak reflow temperature: 225°C (package surface temperature)
- Time of temperature higher than 183°C for 60–150 seconds
- One time soldering reflow is recommended

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