

H11F1M, H11F2M, H11F3M Photo FET Optocouplers

Features

As a remote variable resistor:

- $\blacksquare \le 100\Omega \text{ to} \ge 300 \text{M}\Omega$
- ≥ 99.9% linearity
- ≤ 15pF shunt capacitance
- $\blacksquare \ge 100 G\Omega$ I/O isolation resistance
- As an analog switch:
- Extremely low offset voltage
- 60 V_{pk-pk} signal capability
- No charge injection or latch-up
- t_{on}, t_{off} ≤ 15µS
- UL recognized (File #E90700)

Applications

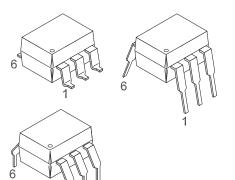
As a remote variable resistor:

- 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

Packages



Schematic

General Description

The H11FXM series consists of a Gallium-Aluminum-

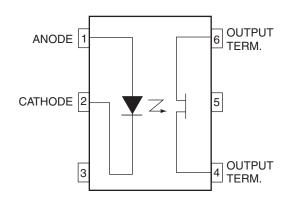
Arsenide IRED emitting diode coupled to a symmetrical bilateral silicon photo-detector. The detector is electri-

cally 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 H11FXM series

devices are mounted in dual in-line packages.



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Absolute Maximum Ratings (T_A = 25°C unless otherwise specified)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Device	Value	Units
TOTAL DEVIC	;E		1 1	
T _{STG}	Storage Temperature	All	-55 to +150	°C
T _{OPR}	Operating Temperature	All	-40 to +100	°C
T _{SOL}	Lead Solder Temperature	All	260 for 10 sec	°C
EMITTER			1	
۱ _F	Continuous Forward Current	All	60	mA
V _R	Reverse Voltage	All	5	V
I _{F(pk)}	Forward Current – Peak (10 µs pulse, 1% duty cycle)	All	1	А
PD	LED Power Dissipation 25°C Ambient	All	100	mW
	Derate Linearly from 25°C		1.33	mW/°C
DETECTOR			1	
PD	Detector Power Dissipation @ 25°C	All	300	mW
	Derate linearly from 25°C		4.0	mW/°C
BV ₄₋₆	Breakdown Voltage (either polarity)	H11F1M, H11F2M	±30	V
		H11F3M	±15	V
I ₄₋₆	Continuous Detector Current (either polarity)	All	±100	mA

Electrical Characteristics (T_A = 25°C unless otherwise specified.)

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Тур.*	Max.	Unit
EMITTER							
V _F	Input Forward Voltage	I _F = 16mA	All		1.3	1.75	V
I _R	Reverse Leakage Current	V _R = 5V	All			10	μA
CJ	Capacitance	V = 0 V, f = 1.0 MHz	All		50		pF
OUTPUT	DETECTOR	•					
BV ₄₋₆	Breakdown Voltage	I ₄₋₆ = 10μΑ, I _F = 0	H11F1M, H11F2M	30			V
	Either Polarity		H11F3M	15			
I ₄₋₆	Off-State Dark Current	V ₄₋₆ = 15 V, I _F = 0	All			50	nA
		V ₄₋₆ = 15 V, I _F = 0, T _A = 100°C	All			50	μA
R ₄₋₆	Off-State Resistance	V ₄₋₆ = 15 V, I _F = 0	All	300			MΩ
C ₄₋₆	Capacitance	V ₄₋₆ = 15 V, I _F = 0, f = 1MHz	All			15	pF

Transfer Characteristics

Symbol	Characteristics	Test Conditions	Device	Min	Тур*	Max	Units
DC CHAF	ACTERISTICS			-			
R ₄₋₆	R ₄₋₆ On-State Resistance	I _F = 16mA,	H11F1M			200	Ω
		I ₄₋₆ = 100μA	H11F2M			330	
			H11F3M			470	
R ₆₋₄	On-State Resistance	I _F = 16mA,	H11F1M			200	Ω
	I ₆₋₄ = 100μA	H11F2M			330		
			H11F3M			470	
	Resistance, non-linearity and assymetry	I _F = 16mA, I ₄₋₆ = 25μA RMS, f = 1kHz	All			0.1	%
AC CHAF	ACTERISTICS	1			1	1	
t _{on}	Turn-On Time	R _L = 50Ω, I _F = 16mA, V ₄₋₆ = 5V	All			25	μS
t _{off}	Turn-Off Time	R _L = 50Ω, I _F = 16mA, V ₄₋₆ = 5V	All			25	μS

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Device	Min.	Тур.*	Max.	Units
V _{ISO}	Isolation Voltage	f = 60Hz, t = 1 sec.	All	7500			V _{AC} PEAK
R _{ISO}	Isolation Resistance	V _{I-O} = 500 VDC	All	10 ¹¹			Ω
C _{ISO}	Isolation Capacitance	f = 1MHz	All		0.2		pF

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

IF = 18mA

IF = 14mA

 $I_F = 10 mA$

 $I_F = 6mA$

 $I_F = 2mA$

0.2

80

100

100

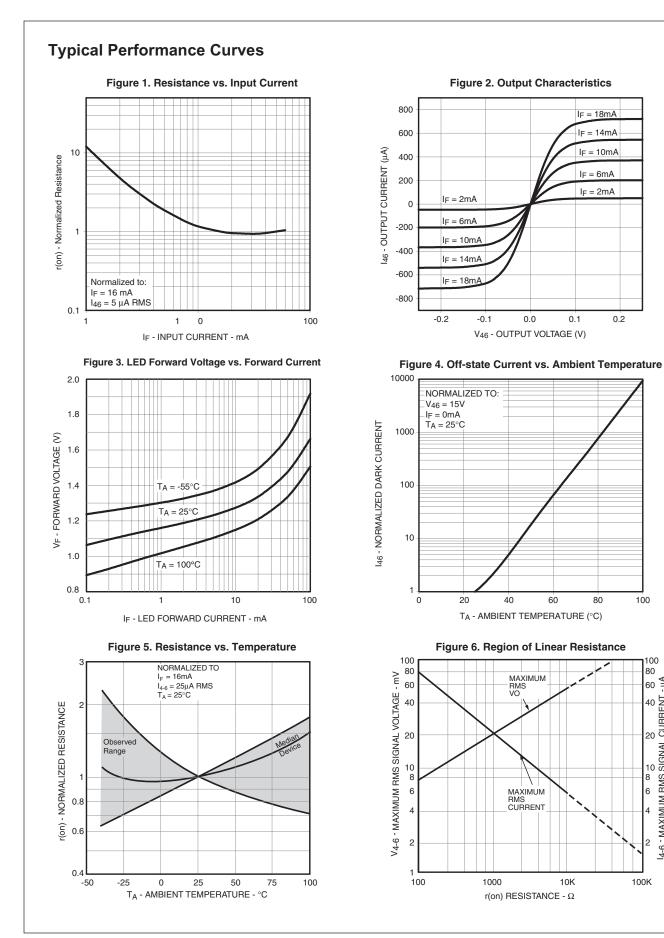
60 ¥

14-6 - MAXIMUM RMS SIGNAL

6

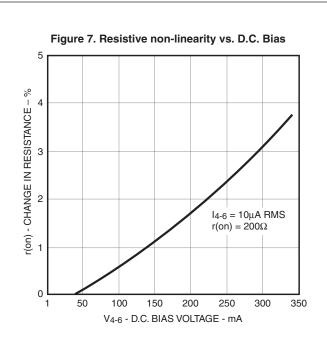
80

0.1



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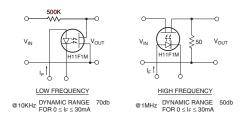
100K



Typical Applications

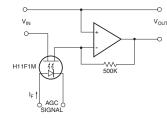
As a Variable Resistor

ISOLATED VARIABLE ATTENUATORS



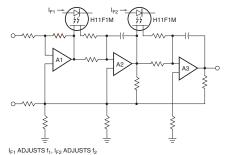
Distortion free attenuation of low level A.C. signals is accomplished by varying the IRED current, I_F Note the wide dynamic range and absence of coupling capacitors; D.C. level shifting or parasitic feedback to the controlling function.

AUTOMATIC GAIN CONTROL



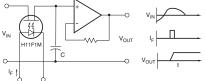
This simple circuit provides over 70db of stable gain control for an AGC signal range of from 0 to 30mA. This basic circuit can be used to provide programmable fade and attack for electronic music.

ACTIVE FILTER FINE TUNING/BAND SWITCHING



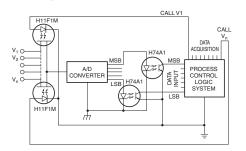
The linearity of resistance and the low offset voltage of the H11FXM allows the remote tuning or band-switching of active filters without switching glitches or distortion. This schematic illustrates the concept, with current to the H11F1M IRED's controlling the filter's transfer characteristic.

As an Analog Signal Switch ISOLATED SAMPLE AND HOLD CIRCUIT



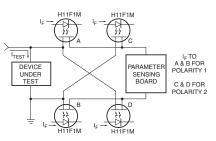
Accuracy and range are improved over conventional FET switches because the H11FXM has no charge injection from the control signal. The H11FXM also provides switching of either polarity input signal up to 30V magnitude.

MULTIPLEXED, OPTICALLY-ISOLATED A/D CONVERSION



The optical isolation, linearity and low offset voltage of the H11FXM allows the remote multiplexing of low level analog signals from such transducers as thermocouplers, Hall effect devices, strain gauges, etc. to a single A/D converter.

TEST EQUIPMENT - KELVIN CONTACT POLARITY

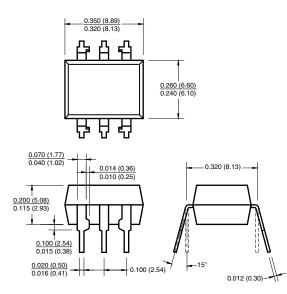


In many test equipment designs the auto polarity function uses reed relay contacts to switch the Kelvin Contact polarity. These reeds are normally one of the highest maintenance cost items due to sticking contacts and mechanical problems. The totally solid-State H11FXM eliminates these troubles while providing faster switching.

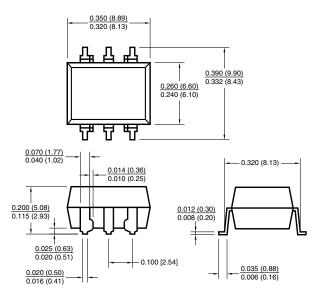
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Package Dimensions

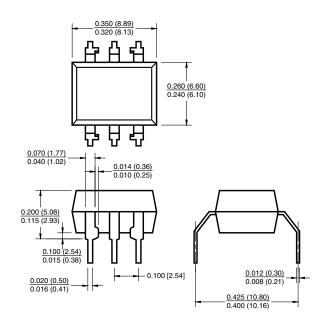




Surface Mount



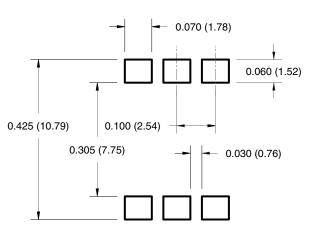
0.4" Lead Spacing



Note:

All dimensions are in inches (millimeters).

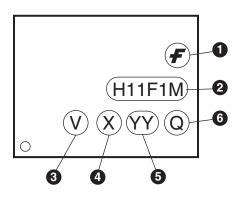
Recommended Pad Layout for Surface Mount Leadform



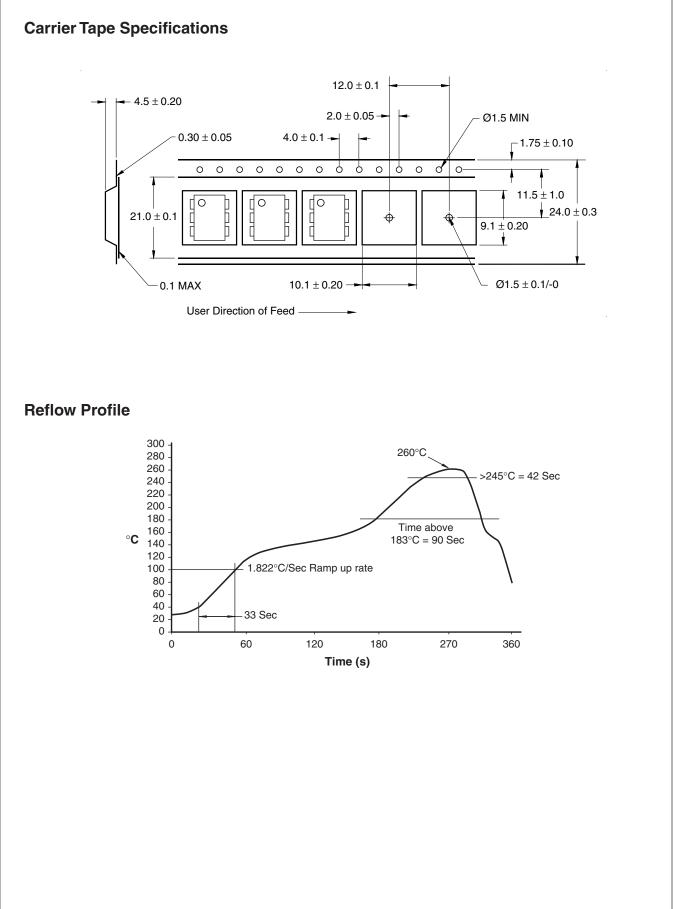
Ordering Information

Option	Order Entry Identifier (Example)	Description
No option	H11F1M	Standard Through Hole Device
S	H11F1SM	Surface Mount Lead Bend
SR2	H11F1SR2M	Surface Mount; Tape and Reel
Т	H11F1TM	0.4" Lead Spacing
V	H11F1VM	VDE 0884
TV	H11F1TVM	VDE 0884, 0.4" Lead Spacing
SV	H11F1SVM	VDE 0884, Surface Mount
SR2V	H11F1SR2VM	VDE 0884, Surface Mount, Tape and Reel

Marking Information



Definiti	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., '7'				
5	Two digit work week ranging from '01' to '53'				
6	Assembly package code				





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Rev. 128

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