H11F1, H11F2, H11F3

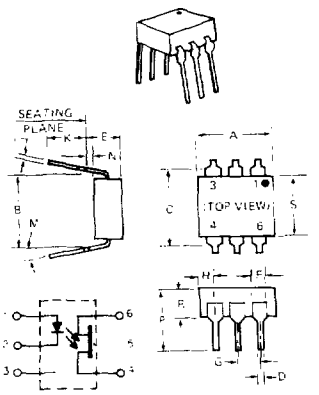
Optoisolator GaAlAs Infrared Emitting Diode and Bilateral Analog FET

The H11F family consists of a gallium-aluminum-arsenide infrared emitting diode coupled to a symmetrical bilateral silicon photodetector. 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. These devices are also available in surface-mount packaging.

FEATURES:

As a Remote Variable Resistor –
- ≤ 100Ω to ≥ 300MΩ
- ≥ 99.9% Linearity
- ≤ 15 pF Shunt Capacitance
- ≥ 100GΩ I/O Isolation Resistance

As An Analog Signal Switch –
- Extremely Low Offset Voltage
- 60V pk-pk Signal Capability
- No Charge Injection or Latchup
- t_{on}, t_{off} ≤ 15μsec.



SYMBOL	MILLIMETERS MIN.	MILLIMETERS MAX	INCHES MIN.	INCHES MAX.	NOTES
A	8.38	8.89	.330	.350	
B	7.62 REF		.300 REF		1
C		8.64		.340	2
D	.406	.508	.016	.020	
E		5.08		.200	3
F	1.01	1.78	.040	.070	
G	2.28	2.80	.090	.110	
H		3.16		.085	4
J	.203	.305	.008	.012	
K	2.54		.100		
M		15°		15°	
N	.381		.015		
P		9.53		.375	
R	2.92	3.43	.115	.135	
S	6.10	6.86	.240	.270	

NOTES
1. INSTALLED POSITION LEAD CENTERS
2. OVERALL INSTALLED DIMENSION
3. THESE MEASUREMENTS ARE MADE FROM THE SEATING PLANE
4. FOUR PLACES

Absolute Maximum Ratings: (25°C Unless Otherwise Specified)

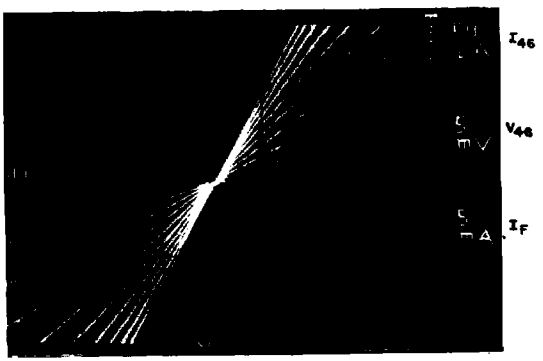
INFRARED EMITTING DIODE	
Power Dissipation	*100 milliwatts
Forward Current (Continuous)	60 milliamps
Forward Current (Peak) (Pulse Width 10 μsec Duty Cycle 1%)	1 amp
Reverse Voltage	6 volts

* Derate 1.33 mW/°C above 25°C.

PHOTO DETECTOR		
Power Dissipation	T_A = 25°C	**300 milliwatts
Breakdown Voltage		
H11F1 – H11F2		± 30 volts
H11F3		± 15 volts
Detector Current (Continuous)		±100 milliamps

**Derate 4.0 mW/°C above 25°C.

TOTAL DEVICE		
Storage Temperature		-55 to +150°C
Operating Temperature		-55 to +100°C
Lead Soldering Time (at 260°C),		10 Seconds
Surge Isolation Voltage (Input to Output)		
H11F1—H11F3	$3535V_{(PEAK)}$	$2500V_{(RMS)}$
Steady-State Isolation Voltage (Input to Output)		
H11F1—H11F3	$3180V_{(PEAK)}$	$2250V_{(RMS)}$



1. TYPICAL LOW LEVEL OUTPUT CHARACTERISTIC

ᵁᴸCovered under U.L. component recognition program, reference file E51868

VDE Approved to 0883/6.80 0110b Certificate # 35025

H11F1, H11F2, H11F3

Individual Electrical Characteristics: (25°C Unless Otherwise Specified)

INFRARED EMITTING DIODE	TYP.	MAX.	UNITS
Forward Voltage V_F (I_F = 16 mA)	1.1	1.75	volts
Reverse Current I_R (V_R = 5V)	–	10	microamps
Capacitance C_j (V = 0, f = 1 MHz)	50	–	picofarads

PHOTO-DETECTOR (Either Polarity)	MIN.	MAX.	UNITS
Breakdown Voltage–$V_{(BR)\,46}$ (I_{46} = 10μA; I_F = 0) – F1,2	30	–	volts
– F3	15	–	volts
Off-State Dark Current – I_{46} (V_{46}=15V; I_F =0; T_A = 25°C)	–	50	nanoamps
(V_{46}=15V; I_F =0; T_A =100°C)	–	50	microamps
Off-State Resistance – r_{46} (V_{46} = 15V; I_F = 0)	300	–	megohms
Capacitance – C_{46} (V_{46} = 0, I_F = 0, f = 1 MHz)	–	15	picofarads

Coupled Electrical Characteristics: (25°C)

		MIN.	TYP.	MAX.	UNITS
On-State Resistance – r_{46} (I_F = 16mA, I_{46} = 100μA)	H11F1	–	–	200	ohms
	H11F2	–	–	330	ohms
	H11F3	–	–	470	ohms
On-State Resistance – r_{64} (I_F = 16 mA, I_{64} = 100μA)	H11F1	–	–	200	ohms
	H11F2	–	–	330	ohms
	H11F3	–	–	470	ohms
Isolation Resistance (Input to Output) (V_{IO}= 500V)		100	–	–	gigohms
Input to Output Capacitance (V_{IO} = 0, f = 1 MHz)		–	–	2	picofarads
Turn-On Time – t_{on} (I_F = 16mA, R_L = 50Ω, V_{46} = 5V)		–	–	15	microseconds
Turn-Off Time – t_{off} (I_F = 16mA, R_L = 50Ω, V_{46} = 5V)		–	–	15	microseconds
Resistance, Non-Linearity and Asymmetry (I_F = 16mA, i_{46} = 25μA RMS, f = 1 KHz)		–	–	0.1	percent

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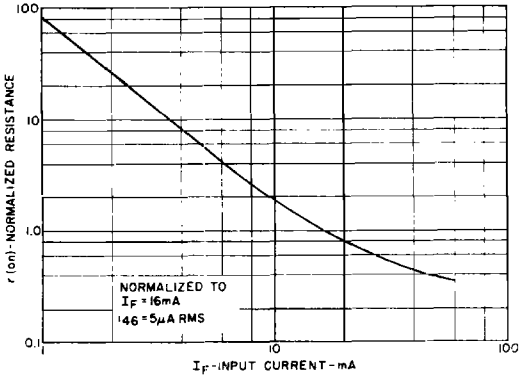
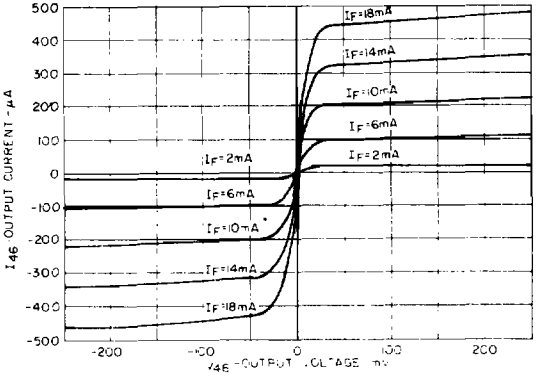
TYPICAL CHARACTERISTICS (25°C) – EITHER POLARITY

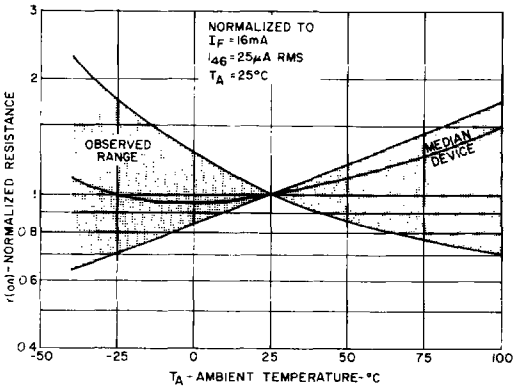


2. RESISTANCE VS. INPUT CURRENT

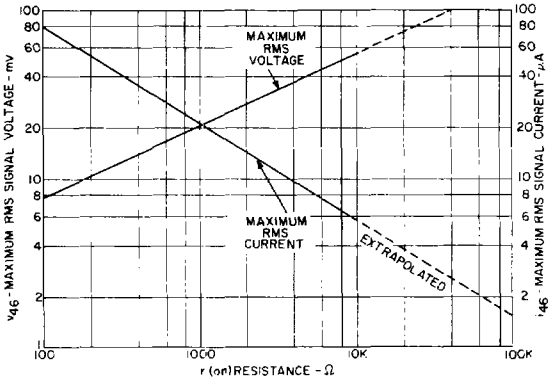


3. OUTPUT CHARACTERISTICS

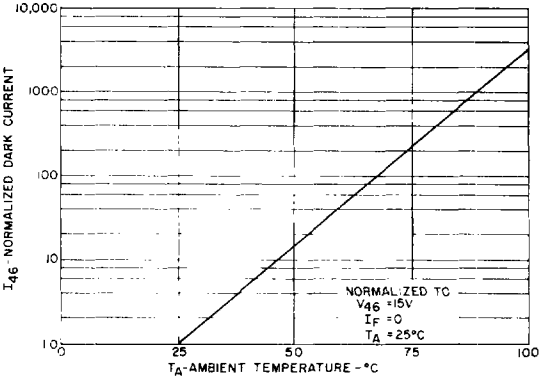
H11F1, H11F2, H11F3



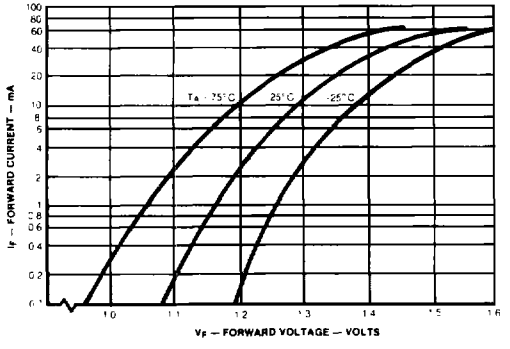
4. RESISTANCE VS. TEMPERATURE



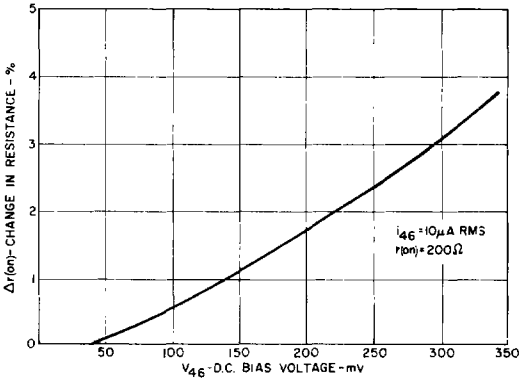
5. REGION OF LINEAR RESISTANCE



6 OFF-STATE CURRENT VS. TEMPERATURE



7. INPUT VOLTAGE VS. INPUT CURRENT

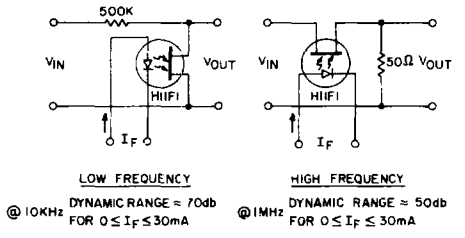


8. RESISTIVE NON-LINEARITY VS. D.C. BIAS

TYPICAL APPLICATIONS

AS A VARIABLE RESISTOR

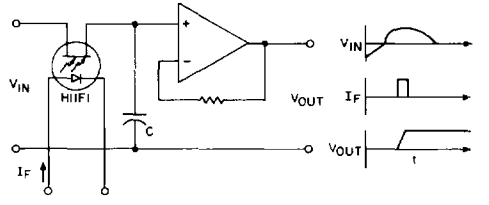
ISOLATED VARIABLE ATTENUATORS



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.

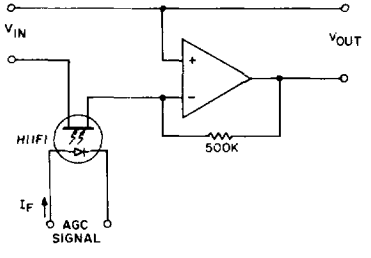
AS AN ANALOG SIGNAL SWITCH

ISOLATED SAMPLE AND HOLD CIRCUIT



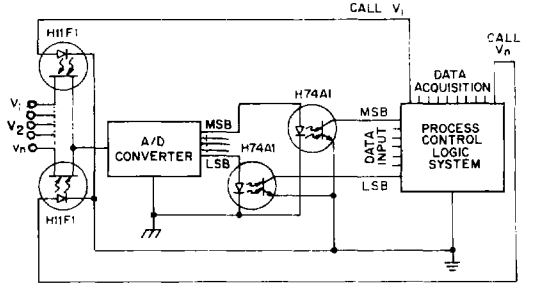
Accuracy and range are improved over conventional FET switches because the H11F has no charge injection from the control signal. The H11F also provides switching of either polarity input signal up to 30V magnitude.

AUTOMATIC GAIN CONTROL



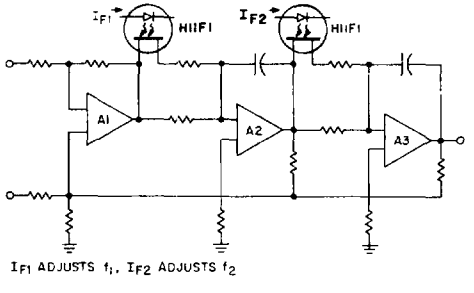
This simple circuit provides over 70db of stable gain control for an AGC signal range of from 0 to 30mA. This basic circuit can be used to provide programmable fade and attack for electronic music and can be modified with six components to a high performance compression amplifier.

MULTIPLEXED, OPTICALLY-ISOLATED A/D CONVERSION



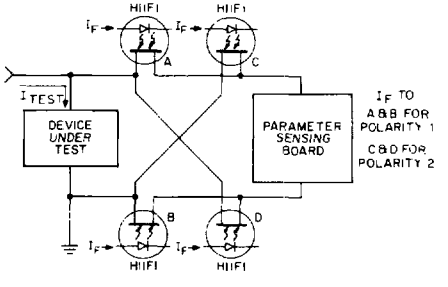
The optical isolation, linearity and low offset voltage of the H11F allows the remote multiplexing of low level analog signals from such transducers as thermocouplers, Hall effect devices, strain gauges, etc. to a single A/D converter.

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.

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