

# H11AA1, H11AA3, H11AA2, H11AA4 AC Input/Phototransistor Optocouplers

## Features

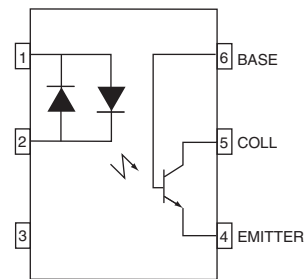
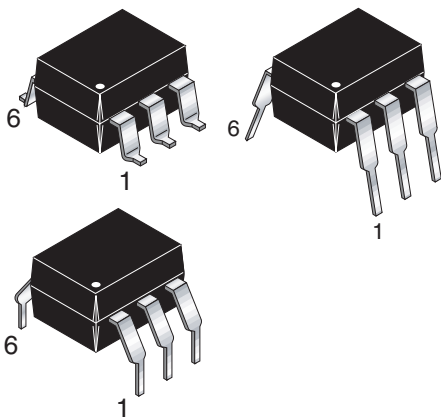
- Bi-polar emitter input
- Built-in reverse polarity input protection
- Underwriters Laboratory (UL) recognized – File #E90700
- VDE approved – File #E94766 (ordering option '300')

## Applications

- AC line monitor
- Unknown polarity DC sensor
- Telephone line interface

## Description

The H11AAX series consists of two gallium-arsenide infrared emitting diodes connected in inverse parallel driving a single silicon phototransistor output.



Parameter	Symbol	Device	Value	Units
<b>TOTAL DEVICE</b>				
Storage Temperature	$T_{STG}$	All	-55 to +150	°C
Operating Temperature	$T_{OPR}$	All	-55 to +100	°C
Lead Solder Temperature	$T_{SOL}$	All	260 for 10 sec	°C
Total Device Power Dissipation	$P_D$	All	350	mW
Derate Linearly From 25°C			4.6	mW/°C
<b>EMITTER</b>				
Continuous Forward Current	$I_F$	All	100	mA
Forward Current - Peak (1 $\mu$ s pulse, 300 pps)	$I_{F(pk)}$	All	$\pm 1.0$	A
LED Power Dissipation	$P_D$	All	200	mW
Derate Linearly From 25°C			2.6	mW/°C
<b>DETECTOR</b>				
Detector Power Dissipation	$P_D$	All	300	mW
Derate above 25°C			4.0	mW/°C

**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	$I_F = \pm 10\text{ mA}$	$V_F$	All		1.2	1.5	V
Capacitance	$V_F = 0\text{ V}, f = 1.0\text{ MHz}$	$C_J$	All		80		pF
<b>DETECTOR</b>							
Breakdown Voltage Collector to Emitter	$I_C = 1.0\text{ mA}, I_F = 0$	$BV_{CEO}$	All	30			V
Collector to Base	$I_C = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{CBO}$	All	70			V
Emitter to Base	$I_E = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{EBO}$	All	5			V
Emitter to Collector	$I_E = 100\text{ }\mu\text{A}, I_F = 0$	$BV_{ECO}$	All	7			V
Leakage Current Collector to Emitter	$V_{CE} = 10\text{ V}, I_F = 0$	$I_{CEO}$	H11AA1,3,4 H11AA2			50 200	nA
Capacitance Collector to Emitter	$V_{CE} = 0, f = 1\text{ MHz}$	$C_{CE}$	All		10		pF
Collector to Base	$V_{CE} = 0, f = 1\text{ MHz}$	$C_{CB}$	All		80		pF
Emitter to Base	$V_{CE} = 0, f = 1\text{ MHz}$	$C_{EB}$	All		15		pF

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

Characteristics	Test Conditions	Symbol	Device	Min	Typ	Max	Units
Current Transfer Ratio, Collector to Emitter	$I_F = \pm 10\text{ mA}, V_{CE} = 10\text{ V}$	$CTR_{CE}$	H11AA4	100			%
			H11AA3	50			
			H11AA1	20			
			H11AA2	10			
Current Transfer Ratio, Symmetry	$I_F = \pm 10\text{ mA}, V_{CE} = 10\text{ V}$ (Figure.8)		All	.33		3.0	
Saturation Voltage Collector to Emitter	$I_F = \pm 10\text{ mA}, I_{CE} = 0.5\text{ mA}$	$V_{CE(SAT)}$	All			.40	V

**Isolation Characteristics**

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Units
Package Capacitance input/output	$V_{I-O} = 0, f = 1\text{ MHz}$	$C_{I-O}$		0.7		pF
Isolation Voltage	$f = 60\text{ Hz}, t = 1\text{ min.}$	$V_{ISO}$	5300			VAC(RMS)
Isolation Resistance	$V_{I-O} = 500\text{ VDC}$	$R_{ISO}$	1011			$\Omega$

Fig. 1 Input Voltage vs. Input Current

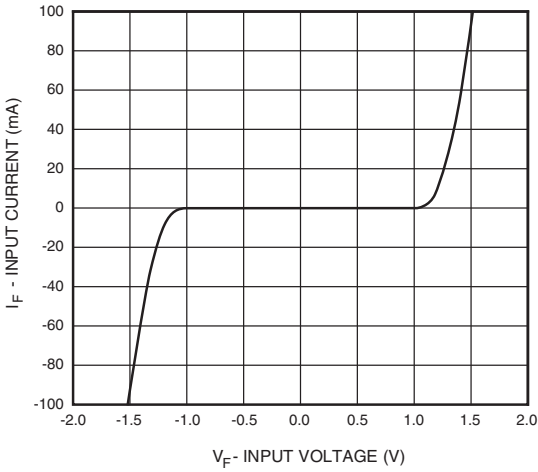


Fig. 2 Normalized CTR vs. Forward Current

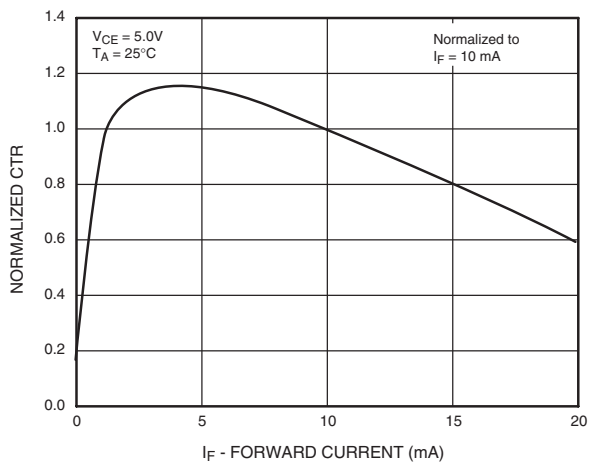


Fig. 3 Normalized CTR vs. Ambient Temperature

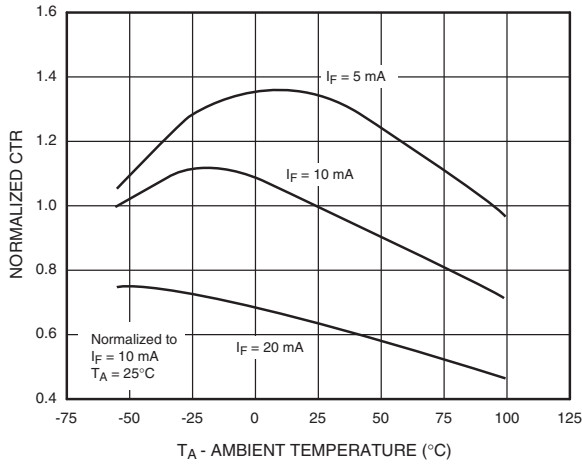


Fig. 4 CTR vs. RBE (Unsaturated)

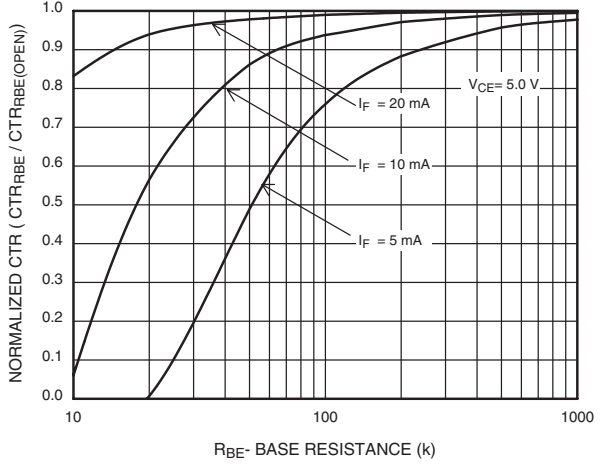


Fig. 5 CTR vs. RBE (Saturated)

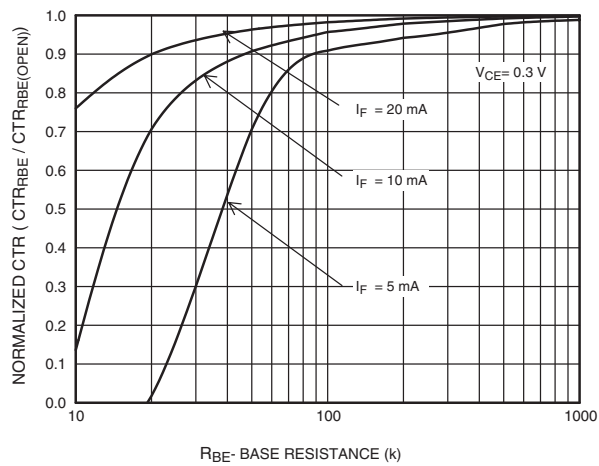
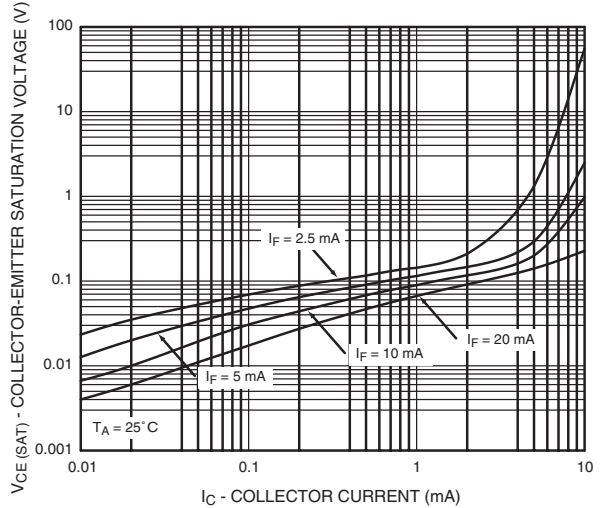
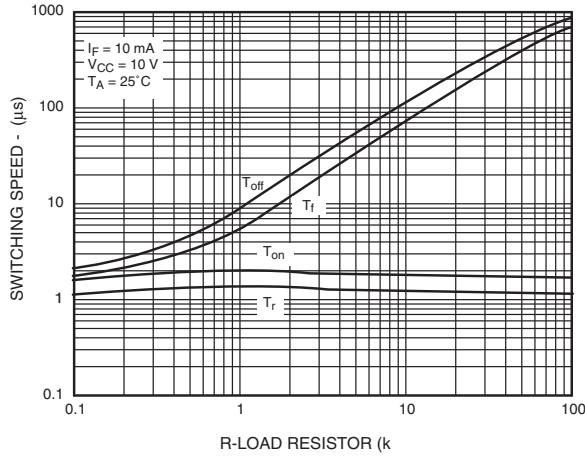


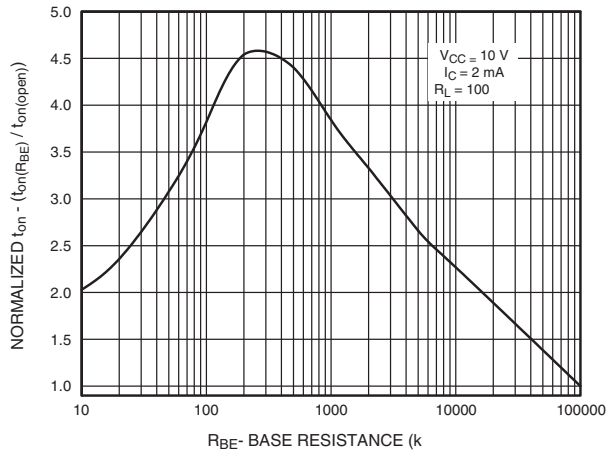
Fig. 6 Collector-Emitter Saturation Voltage vs. Collector Current



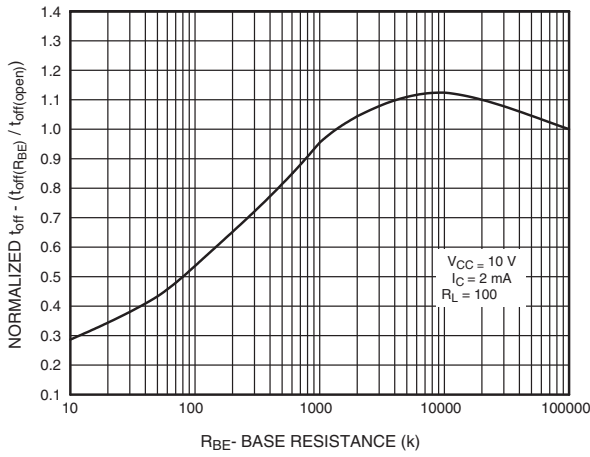
**Fig. 7 Switching Speed vs. Load Resistor**



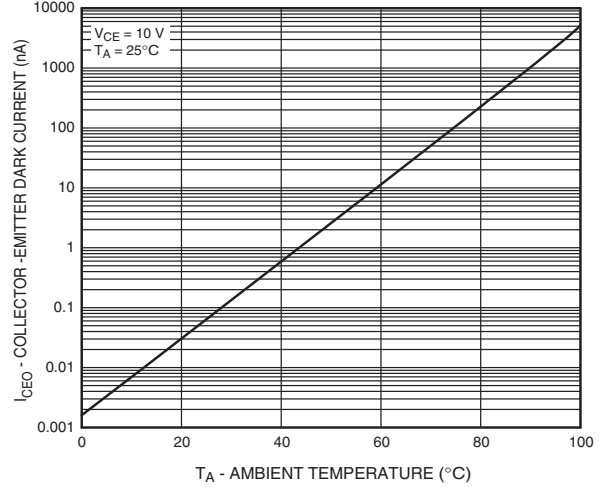
**Fig. 8 Normalized  $t_{on}$  vs.  $R_{BE}$**



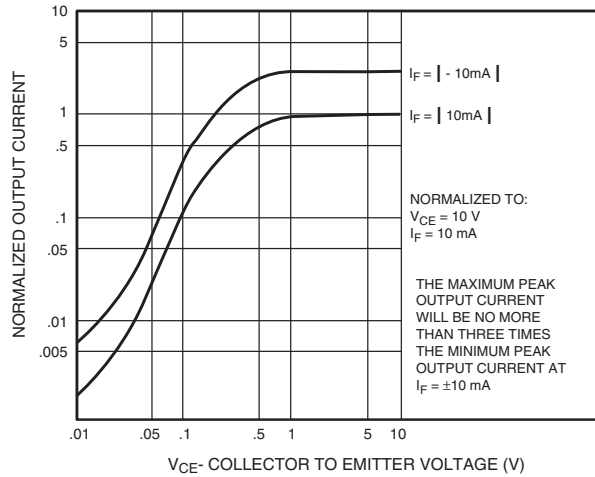
**Fig. 9 Normalized  $t_{off}$  vs.  $R_{BE}$**



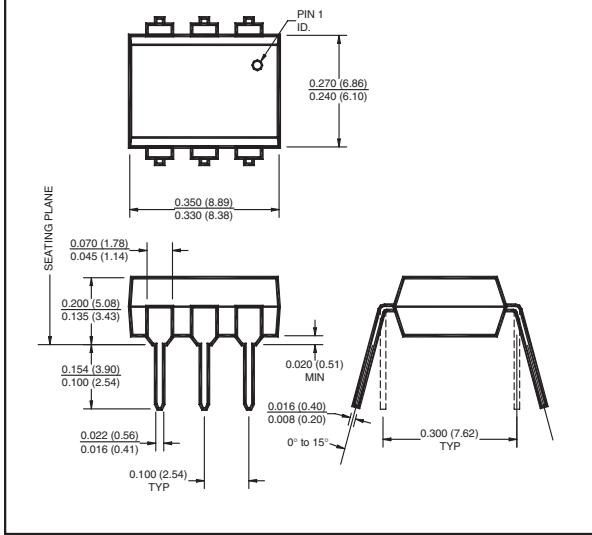
**Fig. 10 Dark Current vs. Ambient Temperature**



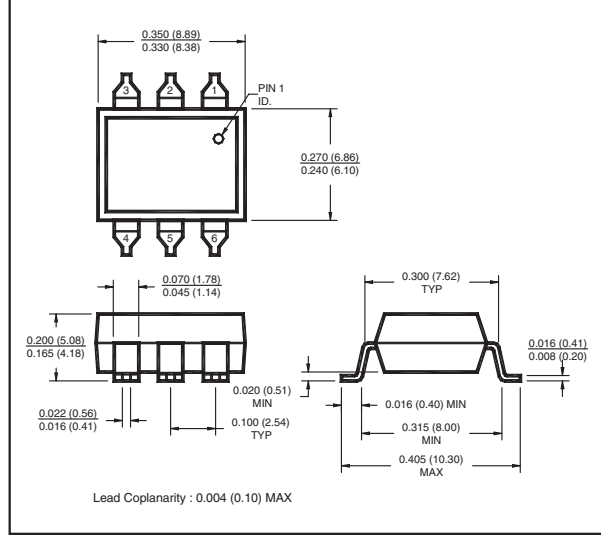
**Fig. 11 Output Symmetry Characteristics**



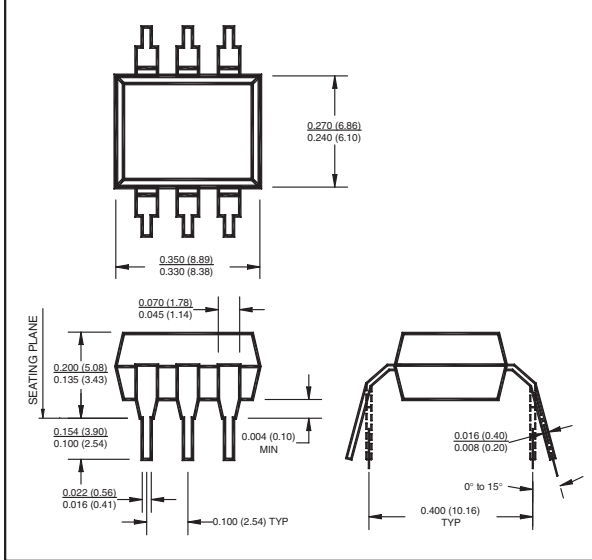
### Package Dimensions (Through Hole)



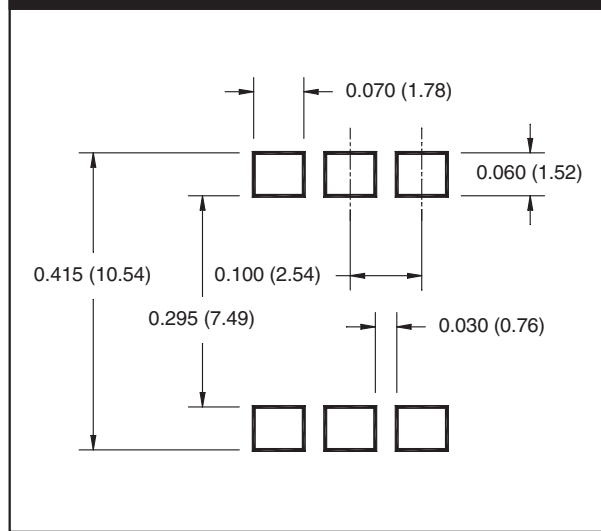
### Package Dimensions (Surface Mount)



### Package Dimensions (0.4"Lead Spacing)



### Recommended Pad Layout for Surface Mount Leadform



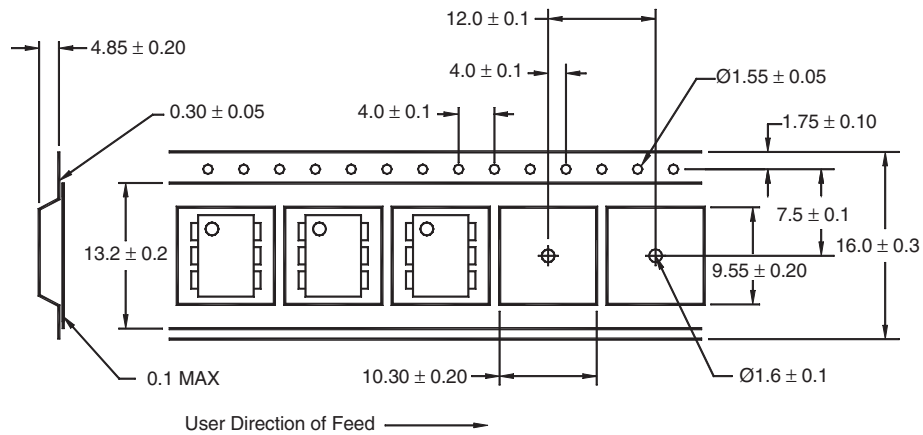
**Note**

All dimensions are in inches (millimeters)

### Ordering Information

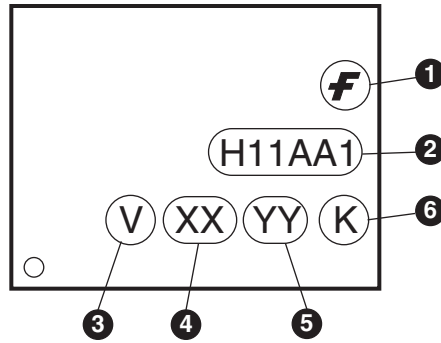
Option	Order Entry Identifier	Description
S	.S	Surface Mount Lead Bend
SD	.SD	Surface Mount; Tape and Reel
W	.W	0.4" Lead Spacing
300	.300	VDE 0884
300W	.300W	VDE 0884, 0.4" Lead Spacing
3S	.3S	VDE 0884, Surface Mount
3SD	.3SD	VDE 0884, Surface Mount, Tape and Reel

### Carrier Tape Specifications ("D" Taping Orientation)



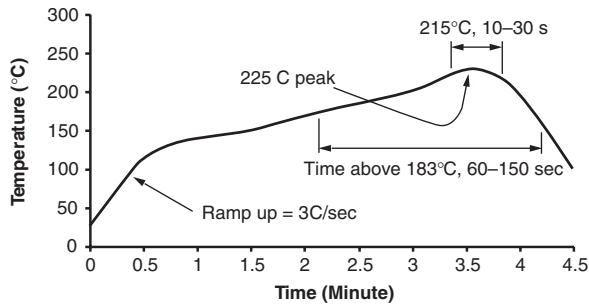
**Note**  
All dimensions are in millimeters

## 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

## 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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EnSigna™	ImpliedDisconnect™	OCXPro™	SILENT SWITCHER®	Wire™
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FACT Quiet Series™		OPTOPLANAR™	SPM™	
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## PRODUCT STATUS DEFINITIONS

### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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Rev. I16