

H11AA1-M, H11AA2-M, H11AA3-M, H11AA4-M AC Input/Phototransistor Optocouplers

Features

- Bi-polar emitter input
- Built-in reverse polarity input protection
- Underwriters Laboratory (UL) recognized File #E90700, Volume 2
- VDE approved File #102497 (ordering option 'V')

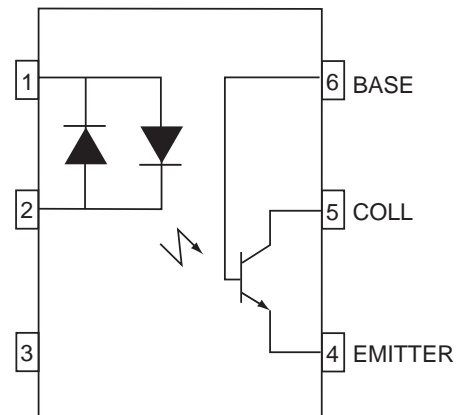
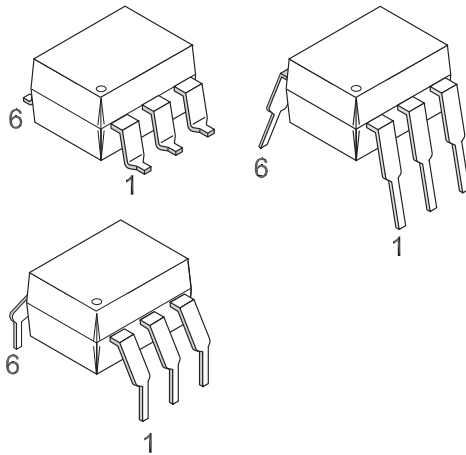
Applications

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

Description

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

Package and Schematic



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

Symbol	Parameter	Device	Value	Units
TOTAL DEVICE				
T_{STG}	Storage Temperature	All	-40 to +150	$^\circ\text{C}$
T_{OPR}	Operating Temperature	All	-40 to +100	$^\circ\text{C}$
T_{SOL}	Lead Solder Temperature	All	260 for 10 sec	$^\circ\text{C}$
P_D	Total Device Power Dissipation Derate Linearly From 25°C	All	250	mW
			2.94	mW/ $^\circ\text{C}$
EMITTER				
I_F	Continuous Forward Current	All	60	mA
$I_F(\text{pk})$	Forward Current – Peak (1 μs pulse, 300 pps)	All	± 1.0	A
P_D	LED Power Dissipation Derate Linearly From 25°C	All	120	mW
			1.41	mW/ $^\circ\text{C}$
DETECTOR				
I_C	Continuous Collector Current	All	50	mA
P_D	Detector Power Dissipation Derate linearity from 25°C	All	150	mW
			1.76	mW/ $^\circ\text{C}$

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

Individual Component Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.*	Max.	Unit
EMITTER							
V_F	Input Forward Voltage	$I_F = \pm 10\text{mA}$	All		1.17	1.5	V
C_J	Capacitance	$V_F = 0\text{V}$, $f = 1.0\text{MHz}$	All		80		pF
DETECTOR							
BV_{CEO}	Breakdown Voltage Collector to Emitter	$I_C = 1.0\text{mA}$, $I_F = 0$	All	30	100		V
BV_{CBO}	Collector to Base	$I_C = 100\mu\text{A}$, $I_F = 0$	All	70	120		V
BV_{EBO}	Emitter to Base	$I_E = 100\mu\text{A}$, $I_F = 0$	All	5	10		V
BV_{ECO}	Emitter to Collector	$I_E = 100\mu\text{A}$, $I_F = 0$	All	7	10		V
I_{CEO}	Leakage Current Collector to Emitter	$V_{CE} = 10\text{V}$, $I_F = 0$	H11AA1,3,4(-M)		1	50	nA
			H11AA2-M		1	200	
C_{CE}	Capacitance Collector to Emitter	$V_{CE} = 0$, $f = 1\text{MHz}$	All		10		pF
C_{CB}	Collector to Base	$V_{CB} = 0$, $f = 1\text{MHz}$	All		80		pF
C_{EB}	Emitter to Base	$V_{EB} = 0$, $f = 1\text{MHz}$	All		15		pF

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

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

Symbol	Characteristics	Test Conditions	Device	Min.	Typ.*	Max.	Units
CTR _{CE}	Current Transfer Ratio, Collector to Emitter	$I_F = \pm 10\text{mA}$, $V_{CE} = 10\text{V}$	H11AA4-M	100			%
			H11AA3-M	50			
			H11AA1-M	20			
			H11AA2-M	10			
	Current Transfer Ratio, Symmetry	$I_F = \pm 10\text{mA}$, $V_{CE} = 10\text{V}$ (Figure 11)	All	.33		3.0	
V _{CE(SAT)}	Saturation Voltage, Collector to Emitter	$I_F = \pm 10\text{mA}$, $I_{CE} = 0.5\text{mA}$	All			.40	V

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.*	Max.	Units
C _{I-O}	Package Capacitance Input/Output	$V_{I-O} = 0$, $f = 1\text{MHz}$		0.7		pF
V _{ISO}	Isolation Voltage	$f = 60\text{ Hz}$, $t = 1\text{ sec.}$	7500			Vac(pk)
R _{ISO}	Isolation Resistance	$V_{I-O} = 500\text{ VDC}$	10^{11}			Ω

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

Typical Performance Characteristics

Fig. 1 Input Voltage vs. Input Current

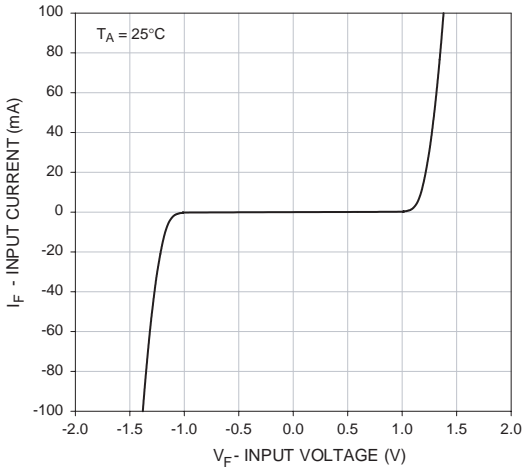


Fig. 2 Normalized CTR vs. Forward Current

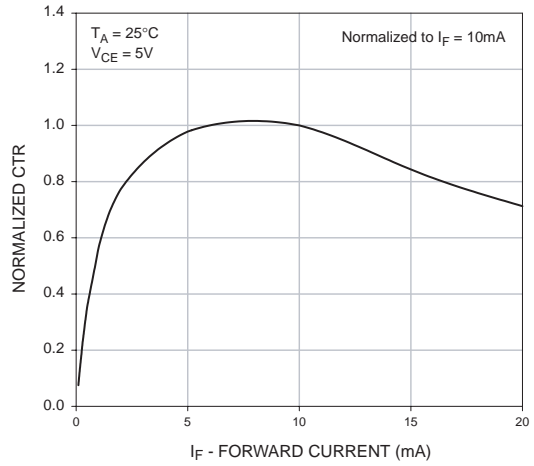


Fig. 3 Normalized CTR vs. Ambient Temperature

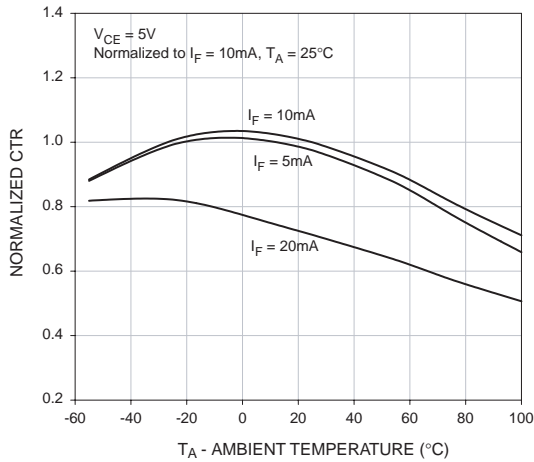


Fig. 4 CTR vs. RBE (Unsaturated)

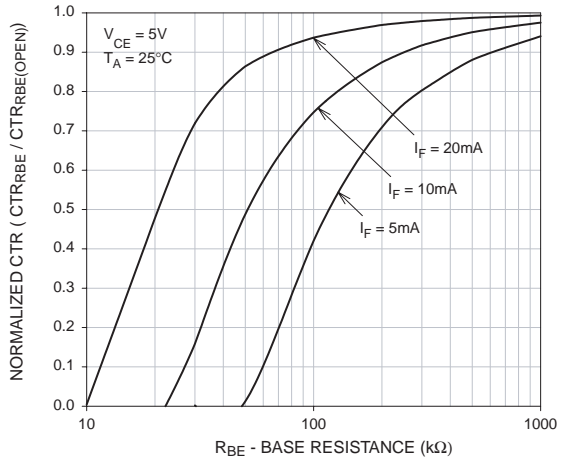


Fig. 5 CTR vs. RBE (Saturated)

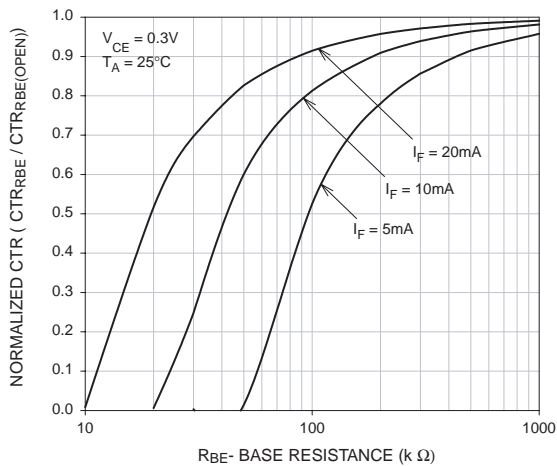
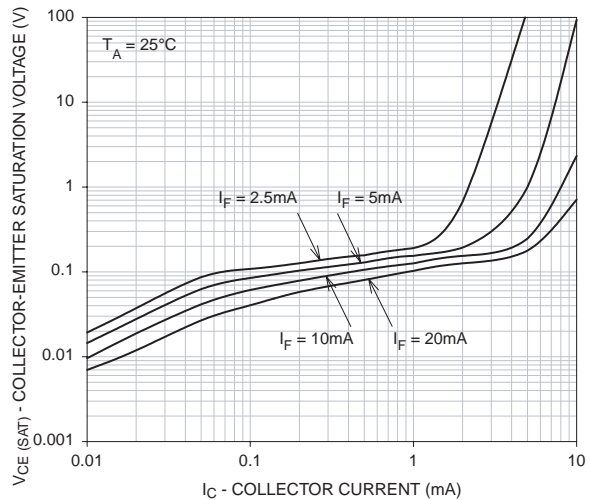


Fig. 6 Collector-Emitter Saturation Voltage vs. Collector Current



Typical Performance Characteristics (Continued)

Fig. 7 Switching Speed vs. Load Resistor

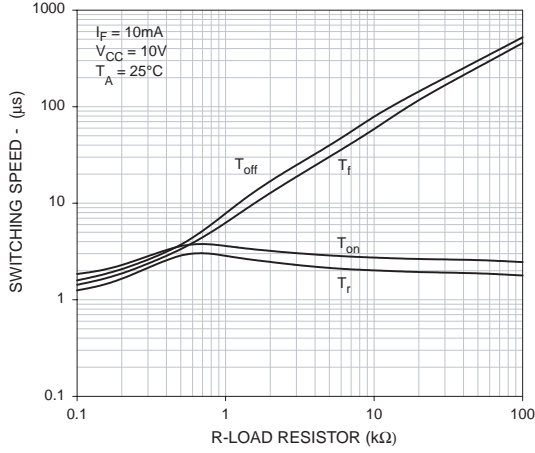


Fig. 8 Normalized t_{on} vs. R_{BE}

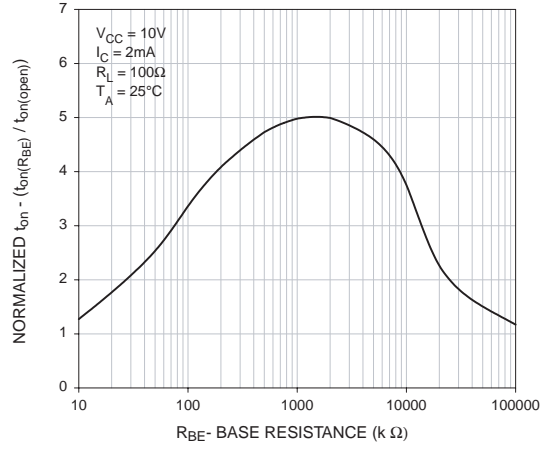


Fig. 9 Normalized t_{off} vs. R_{BE}

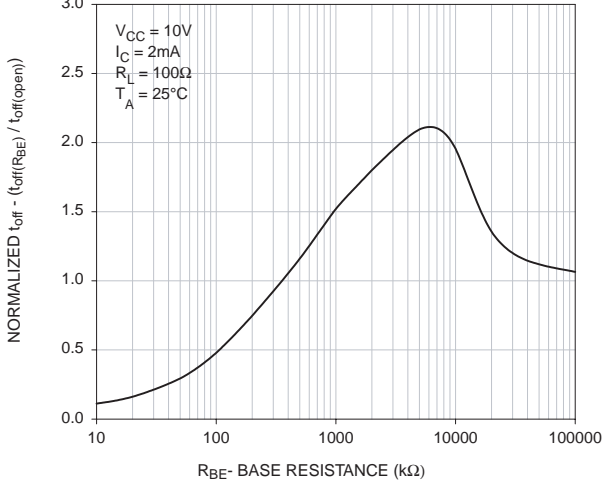


Fig. 10 Dark Current vs. Ambient Temperature

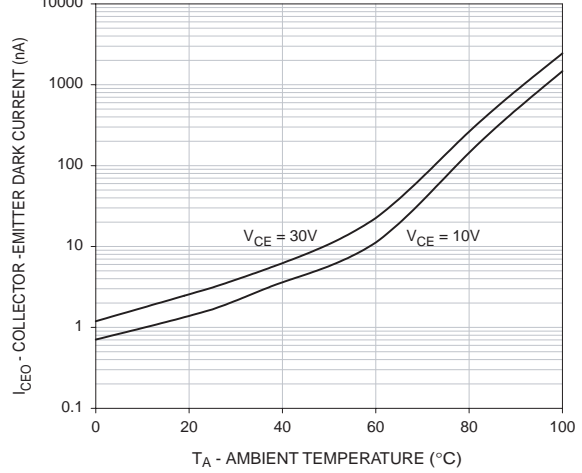
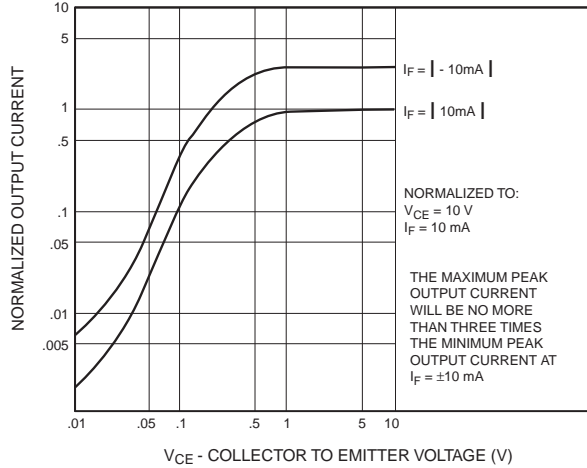
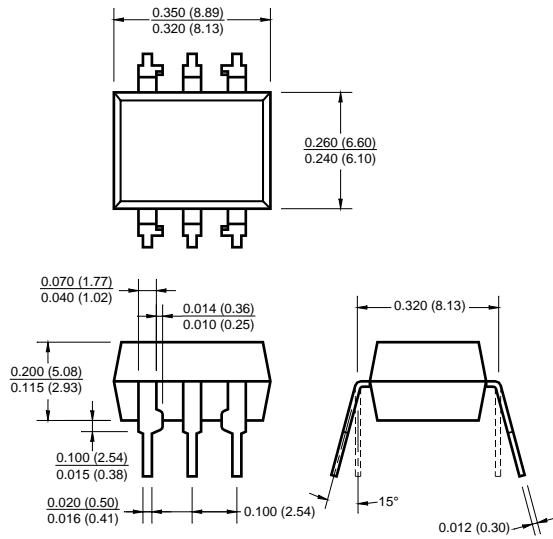


Fig. 11 Output Symmetry Characteristics

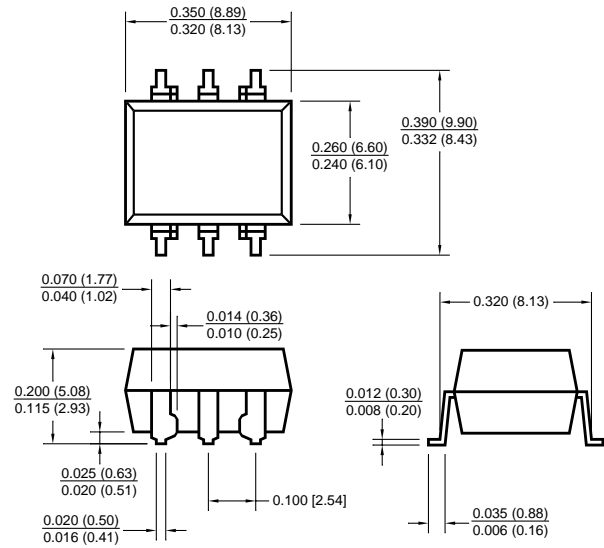


Mechanical Dimensions

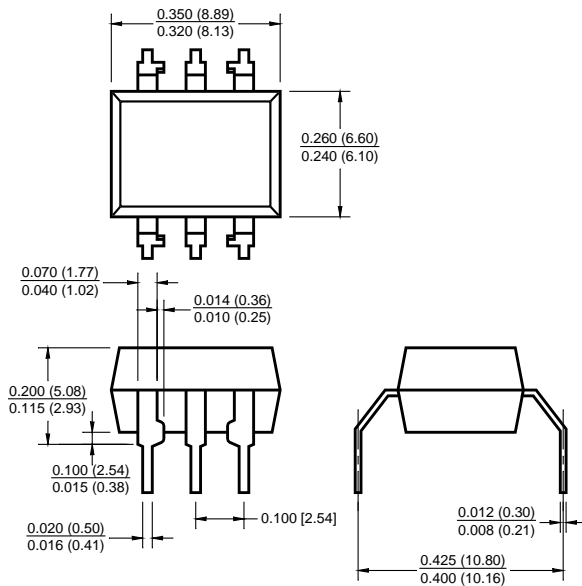
Package Dimensions (Through Hole)



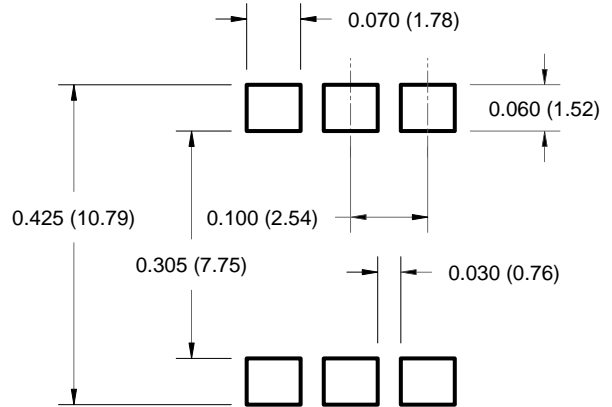
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



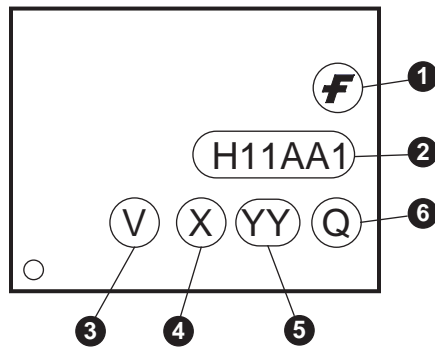
Note:

All dimensions are in inches (millimeters).

Ordering Information

Option/Order Entry Identifier	Description
S	Surface Mount Lead Bend
SR2	Surface Mount; Tape and Reel
T	0.4" Lead Spacing
V	VDE 0884
TV	VDE 0884, 0.4" Lead Spacing
SV	VDE 0884, Surface Mount
SR2V	VDE 0884, Surface Mount, Tape & Reel

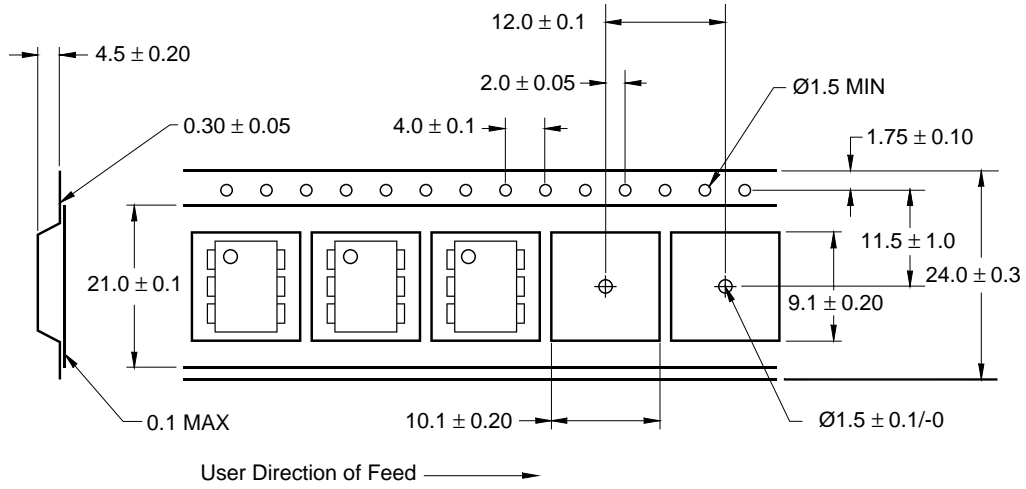
Marking Information



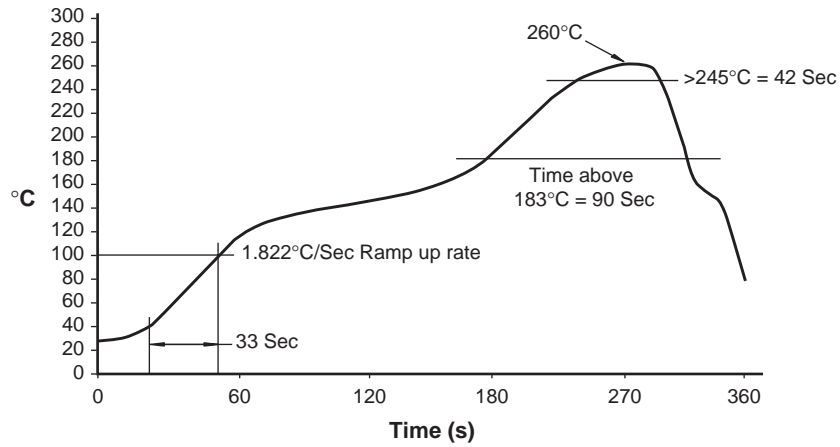
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code, e.g., '3'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

Carrier Tape Specifications



Reflow Profile (White Package, -M Suffix)



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Programmable Active Droop™				

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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 to improve design.
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