



# H11L1M, H11L2M, H11L3M 6-Pin DIP Optocoupler

## Features

- High data rate, 1MHz typical (NRZ)
- Free from latch up and oscillation throughout voltage and temperature ranges.
- Microprocessor compatible drive
- Logic compatible output sinks 16mA at 0.4V maximum
- Guaranteed on/off threshold hysteresis
- Wide supply voltage capability, compatible with all popular logic systems
- Underwriters Laboratory (UL) recognized—file #E90700, Volume 2
- VDE recognized – File#102497 – Add option V (e.g., H11L1VM)

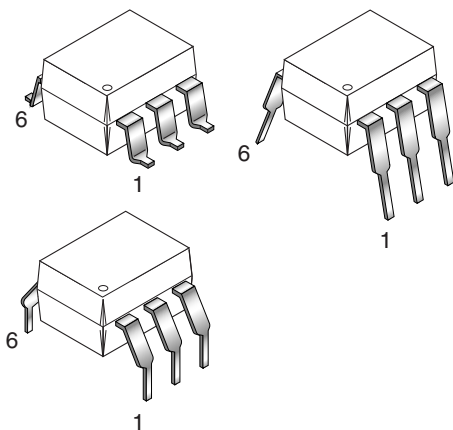
## Applications

- Logic to logic isolator
- Programmable current level sensor
- Line receiver—eliminate noise and transient problems
- A.C. to TTL conversion—square wave shaping
- Digital programming of power supplies
- Interfaces computers with peripherals

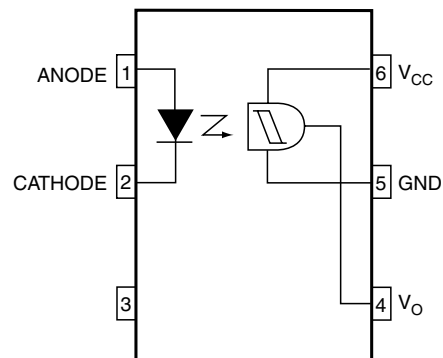
## Description

The H11LXM series has a high speed integrated circuit detector optically coupled to a gallium-arsenide infrared emitting diode. The output incorporates a Schmitt trigger, which provides hysteresis for noise immunity and pulse shaping. The detector circuit is optimized for simplicity of operation and utilizes an open collector output for maximum application flexibility.

## Packages



## Schematic



## Truth Table

Input	Output
H	L
L	H

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

Symbol	Parameters	Value	Units
<b>TOTAL DEVICE</b>			
$T_{STG}$	Storage Temperature	-55 to +150	$^\circ\text{C}$
$T_{OPR}$	Operating Temperature	-40 to +85	$^\circ\text{C}$
$T_{SOL}$	Lead Solder Temperature	260 for 10 sec	$^\circ\text{C}$
$P_D$	Total Device Power Dissipation @ $25^\circ\text{C}$	250	mW
	Derate Above $25^\circ\text{C}$	2.94	$\text{mW}/^\circ\text{C}$
<b>EMITTER</b>			
$I_F$	Continuous Forward Current	60	mA
$V_R$	Reverse Voltage	6	V
$I_F(\text{pk})$	Forward Current – Peak (1 $\mu\text{s}$ pulse, 300pps)	3.0	A
$P_D$	LED Power Dissipation $25^\circ\text{C}$ Ambient	120	mW
	Derate Linearly From $25^\circ\text{C}$	1.41	$\text{mW}/^\circ\text{C}$
<b>DETECTOR</b>			
$P_D$	Detector Power Dissipation @ $25^\circ\text{C}$	150	mW
	Derate Linearly from $25^\circ\text{C}$	2.0	$\text{mW}/^\circ\text{C}$
$V_O$	$V_{45}$ Allowed Range	0 to 16	V
$V_{CC}$	$V_{65}$ Allowed Range	3 to 16	V
$I_O$	$I_4$ Output Current	50	mA

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

Symbol	Parameters	Test Conditions	Device	Min.	Typ.	Max.	Units
<b>EMITTER</b>							
$V_F$	Input Forward Voltage	$I_F = 10\text{mA}$	All		1.2	1.5	V
		$I_F = 0.3\text{mA}$		0.75	1.0		
$I_R$	Reverse Current	$V_R = 3\text{V}$	All			10	$\mu\text{A}$
$C_J$	Capacitance	$V = 0, f = 1.0\text{MHz}$	All			100	pF
<b>DETECTOR</b>							
$V_{CC}$	Operating Voltage Range		All	3		15	V
$I_{CC(\text{off})}$	Supply Current	$I_F = 0, V_{CC} = 5\text{V}$	All		1.6	5.0	mA
$I_{OH}$	Output Current, High	$I_F = 0, V_{CC} = V_O = 15\text{V}$	All			100	$\mu\text{A}$

**Transfer Characteristics**

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Units
<b>DC CHARACTERISTICS</b>							
$I_{CC(\text{on})}$	Supply Current	$I_F = 10\text{mA}, V_{CC} = 5\text{V}$	All		1.6	5.0	mA
$V_{OL}$	Output Voltage, low	$R_L = 270\Omega, V_{CC} = 5\text{V}, I_F = I_{F(\text{on})} \text{ max.}$	All		0.2	0.4	V
$I_{F(\text{on})}$	Turn-On Threshold Current <sup>(1)</sup>	$R_L = 270\Omega, V_{CC} = 5\text{V}$	H11L1M			1.6	mA
			H11L2M			10.0	
			H11L3M			5.0	
$I_{F(\text{off})}$	Turn-Off Threshold Current	$R_L = 270\Omega, V_{CC} = 5\text{V}$	All	0.3	1.0		mA
$I_{F(\text{off})}/I_{F(\text{on})}$	Hysteresis Ratio	$R_L = 270\Omega, V_{CC} = 5\text{V}$	All	0.50	0.75	0.90	
<b>AC CHARACTERISTICS, Switching Speed</b>							
$t_{\text{on}}$	Turn-On time	$R_L = 270\Omega, V_{CC} = 5\text{V}, I_F = I_{F(\text{on})}, T_A = 25^\circ\text{C}$	All		1.0	4	$\mu\text{s}$
$t_f$	Fall Time	$R_L = 270\Omega, V_{CC} = 5\text{V}, I_F = I_{F(\text{on})}, T_A = 25^\circ\text{C}$	All		0.1		$\mu\text{s}$
$t_{\text{off}}$	Turn-Off Time	$R_L = 270\Omega, V_{CC} = 5\text{V}, I_F = I_{F(\text{on})}, T_A = 25^\circ\text{C}$	All		1.2	4	$\mu\text{s}$
$t_r$	Rise time	$R_L = 270\Omega, V_{CC} = 5\text{V}, I_F = I_{F(\text{on})}, T_A = 25^\circ\text{C}$	All		0.1		$\mu\text{s}$
	Data Rate		All		1.0		MHz

**Isolation Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{\text{ISO}}$	Input-Output Isolation Voltage	$t = 1 \text{ sec.}$	7500			$V_{\text{PEAK}}$
$C_{\text{ISO}}$	Isolation Capacitance	$V_{\text{I-O}} = 0\text{V}, f = 1\text{MHz}$		0.4	0.6	pF
$R_{\text{ISO}}$	Isolation Resistance	$V_{\text{I-O}} = \pm 500 \text{ VDC}$	$10^{11}$			$\Omega$

**Note:**

- Maximum  $I_{F(\text{ON})}$  is the maximum current required to trigger the output. For example, a 1.6mA maximum trigger current would require the LED to be driven at a current greater than 1.6mA to guarantee the device will turn on. A 10% guard band is recommended to account for degradation of the LED over its lifetime. The maximum allowable LED drive current is 60mA.

## Typical Performance Curves

Figure 1. Transfer Characteristics

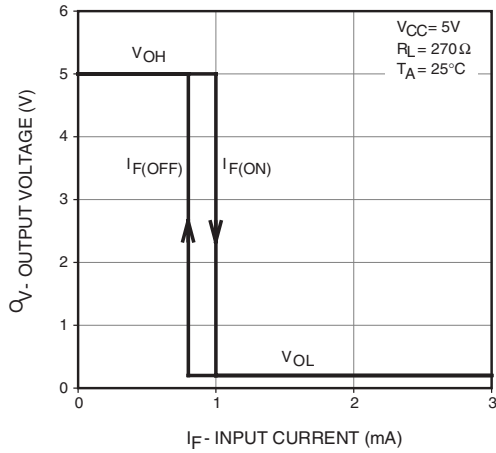


Figure 2. Threshold Current vs. Supply Voltage

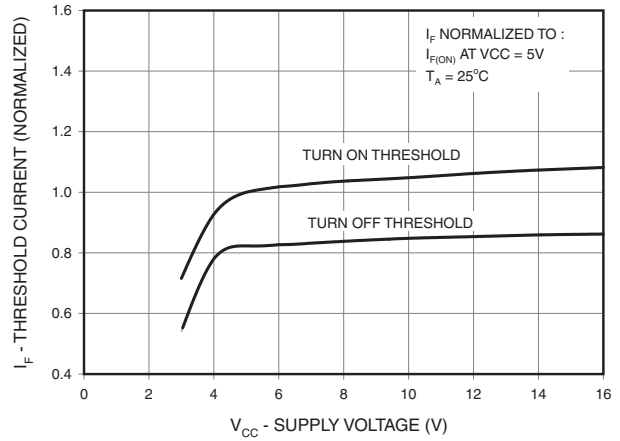


Figure 3. Threshold Current vs. Supply Temperature

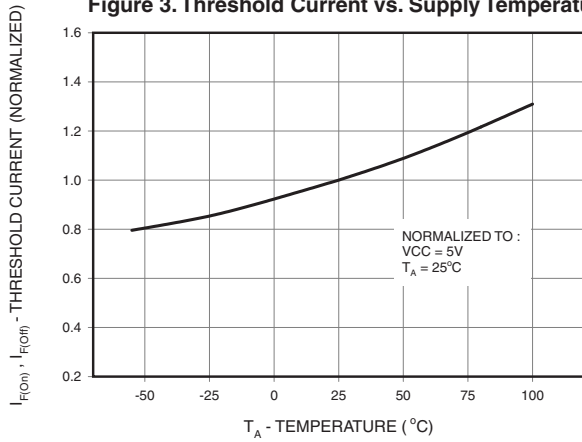


Figure 4. Output Voltage, Low vs. Load Current

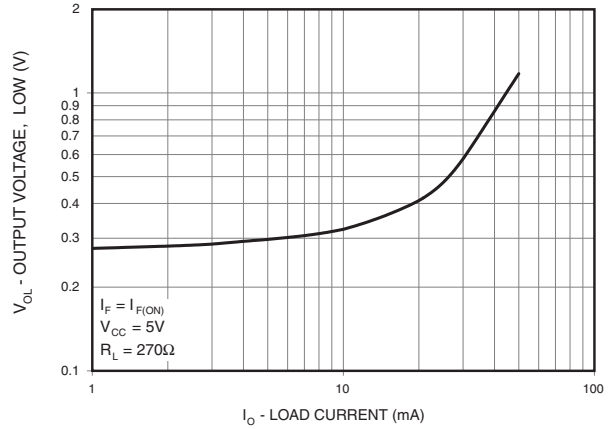


Figure 5. Supply Current vs. Supply Voltage

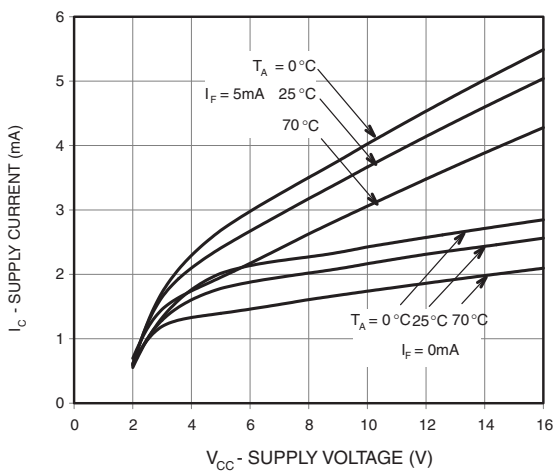
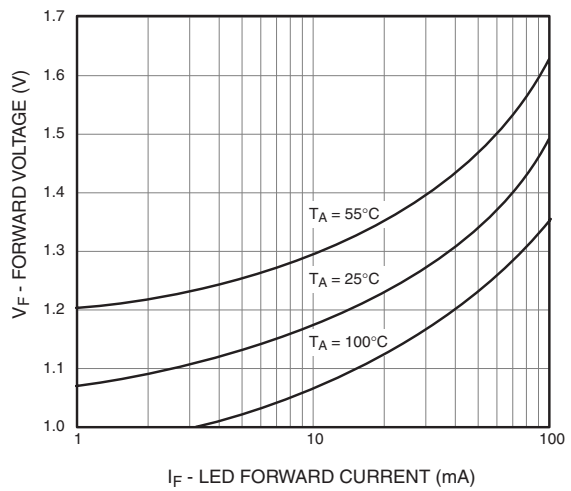


Figure 6. LED Forward Voltage vs. Forward Current



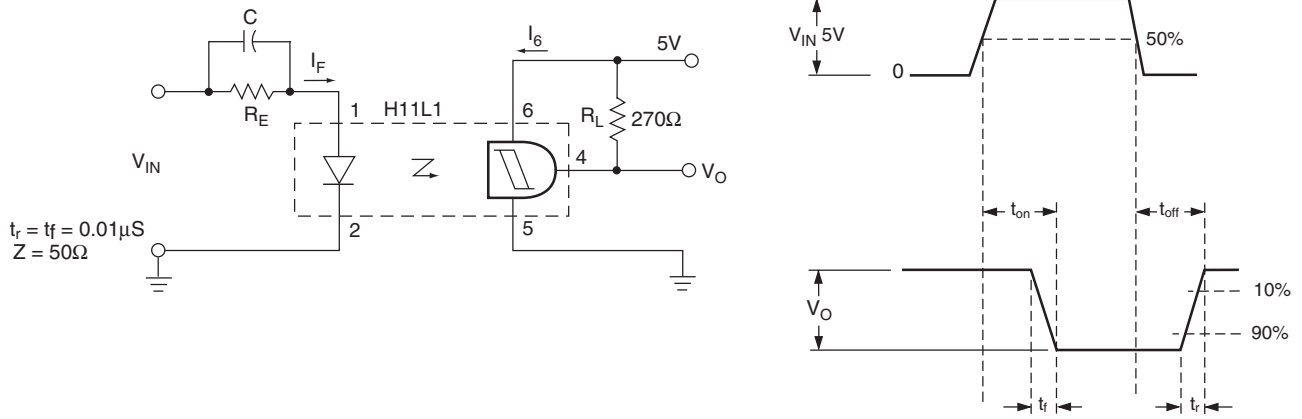
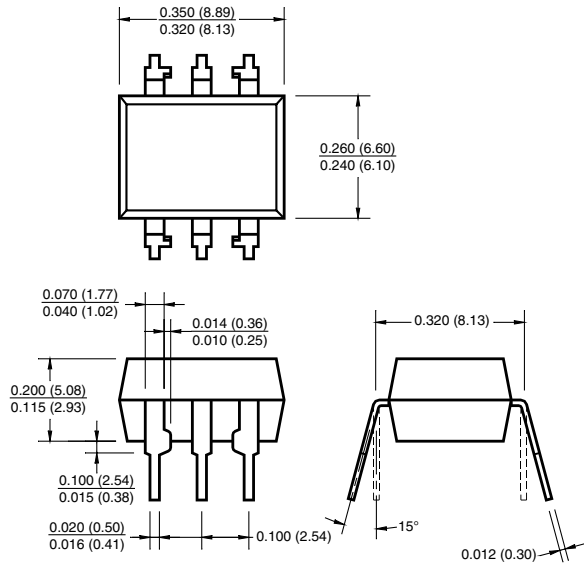


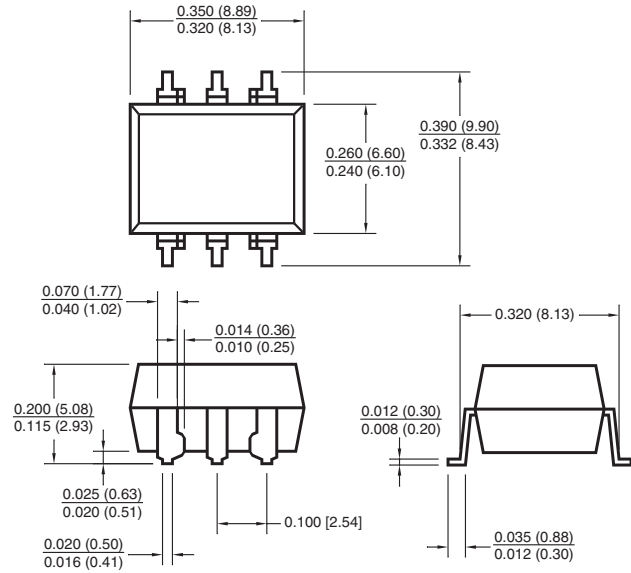
Figure 7. Switching Test Circuit and Waveforms

## Package Dimensions

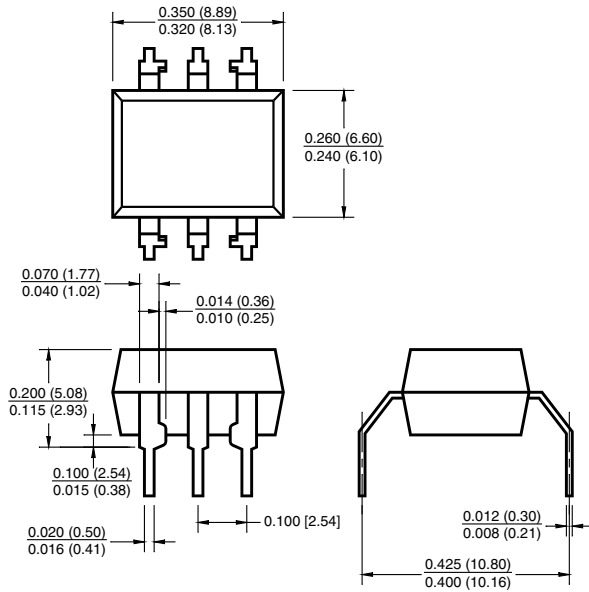
### Through Hole



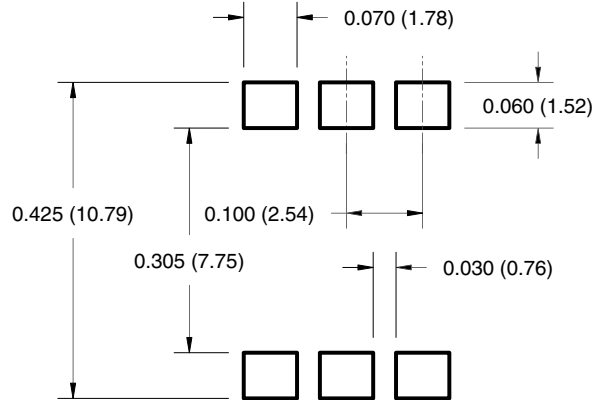
### Surface Mount



### 0.4" Lead Spacing



### Recommend Pad Layout for Surface Mount Leadform



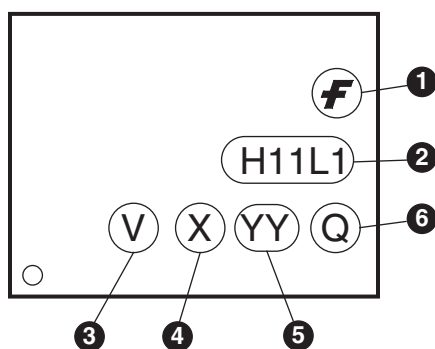
#### Note:

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

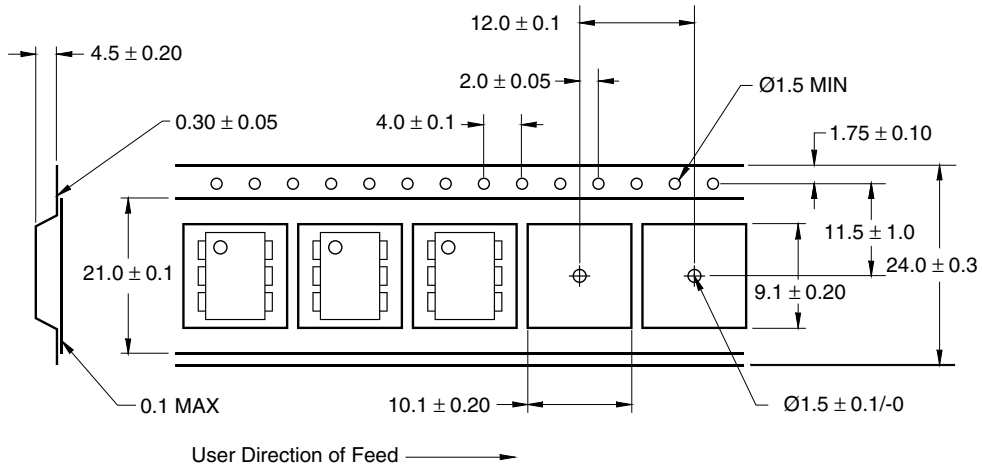
## Marking Information



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

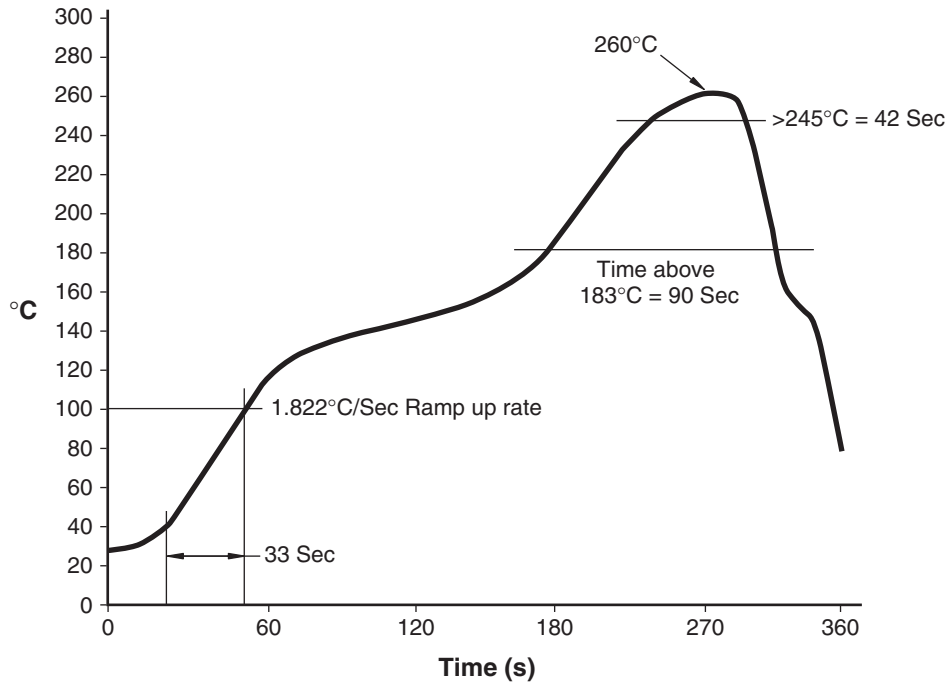
\*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

### Tape Dimensions



**Note:**  
All dimensions are in millimeters.

### Reflow Profile





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FAST®	MicroFET™	QS™	TinyBuck™	
FASTr™	MicroPak™	QT Optoelectronics™	TinyPWM™	
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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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