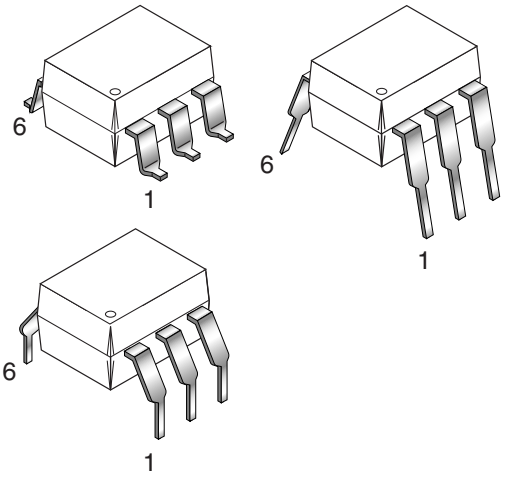
FAIRCHILD
SEMICONDUCTOR®

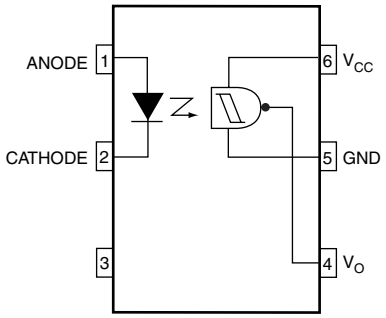
6-PIN DIP
HIGH SPEED LOGIC OPTOCOUPLERS

H11N1-M **H11N2-M** **H11N3-M**

PACKAGE



SCHEMATIC



DESCRIPTION

The H11NX-M series has a high speed integrated circuit detector optically coupled to an AlGaAs infrared emitting diode. The output incorporates a Schmitt trigger, which provides hysteresis for noise immunity and pulse s haping. The detector circuit is optimized for simplicity of operation and utilizes an open collector output for maximum application flexibility.

Truth Table

Input	Output
H	L
L	H

FEATURES

- High data rate, 5 MHz typical (NRZ)
- Free from latch up and oscilliation throughout voltage and temperature ranges.
- Microprocessor compatible drive
- Logic compatible output sinks 16 mA at 0.5 V maximum
- Guaranteed on/off threshold hysteresis
- Wide supply voltage capability, compatible with all popular logic systems
- High common mode transient immunity, 2000 V/µs minimum
- Fast switching t_r = 7.5ns typical, t_f = 12ns typical
- Underwriter Laboratory (UL) recognized—file #E90700
- VDE recognized – File#102497 – Add option V (e.g., H11N1VM)

APPLICATIONS

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

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Device	Value	Units
TOTAL DEVICE				
Storage Temperature	T_{STG}	All	-55 to +150	°C
Operating Temperature	T_{OPR}	All	-40 to +85	°C
Lead Solder Temperature	T_{SOL}	All	260 for 10 sec	°C
Total Device Power Dissipation @ 25°C	P_D	All	250	mW
Derate Above 25°C			2.94	mW/°C
EMITTER				
Continuous Forward Current	I_F	All	30	mA
Reverse Voltage	V_R	All	6	V
Forward Current - Peak (1 µs pulse, 300 pps)	I_F(pk)	All	1.0	A
LED Power Dissipation 25°C Ambient	P_D	All	120	mW
Derate Linearly From 25°C			1.41	mW/°C
DETECTOR				
Detector Power Dissipation @ 25°C	P_D	All	150	mW
Derate Linearly from 25°C			1.76	mW/°C
V_{45} Allowed Range	V_O	All	0 to 16	V
V_{65} Allowed Range	V_{CC}	All	0 to 16	V
I_4 Output Current	I_O	All	50	mA

ELECTRICAL CHARACTERISTICS (T_A = 0-70°C Unless otherwise specified.)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameters	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
EMITTER							
Input Forward Voltage	I_F = 10 mA	V_F	All		1.4	2	V
	I_F = 0.3 mA			0.75	1.25		
Reverse Current	V_R = 5 V	I_R	All			10	µA
Capacitance	V = 0, f = 1.0 MHz	C_J	All			100	pF
DETECTOR							
Operating Voltage Range		V_{CC}	All	4		15	V
Supply Current	I_F = 0, V_{CC} = 5V	$I_{CC(off)}$	All		6	10	mA
Output Current, High	I_F = 0.3mA, V_{CC} = V_O = 15V	I_{OH}	All			100	µA

*Typical values at T_A = 25°C

TRANSFER CHARACTERISTICS

DC Characteristics	Test Conditions	Symbol	Device	Min	Typ*	Max	Units
Supply Current	I_F = 10mA, V_{CC} = 5V	$I_{CC(on)}$	All		6.5	10	mA
Output Voltage, low	R_L=270Ω,V_{CC}=5V, I_F=$I_{F(on)}$ max.	V_{OL}	All			0.5	V
Turn-On Threshold Current	R_L=270Ω, V_{CC} = 5V note 1	$I_{F(on)}$	H11N1-M	0.8		3.2	mA
			H11N2-M	2.3		5	
			H11N3-M	4.1		10	
Turn-Off Threshold Current	R_L=270Ω, V_{CC} = 5V	$I_{F(off)}$	All	0.3			mA
Hysteresis Ratio	R_L=270Ω, V_{CC} = 5V	$I_{F(off)}/I_{F(on)}$	All	0.65		0.95	
AC Characteristics	**Test Conditions**	**Symbol**	**Device**	**Min**	**Typ**	**Max**	**Units**
SWITCHING SPEED							
Propagation delay time High to Low	C=120pF, t_P=1µs, R_E: Note 2 Fig. 1	t_{PHL}	All		100	330	ns
Rise Time	C=120pF, t_P=1µs, R_E: Note 2 Fig. 1	t_r	All		7.5		ns
Propagation delay time Low to High	C=120pF, t_P=1µs, R_E: Note 2 Fig. 1	t_{PLH}	All		150	330	ns
Fall time	C=120pF, t_P=1µs, R_E: Note 2 Fig. 1	t_f	All		12		ns
Data Rate			All		5		MHz

ISOLATION CHARACTERISTICS

Parameters	Test Conditions	Symbol	Min	Typ*	Max	Units
Input-Output Isolation Voltage	f = 60 Hz, t =1 sec.	V_{ISO}	7500			V_{PEAK}
Isolation Capacitance	V_{I-O} = 0V, f = 1 MHz	C_{ISO}		0.4	0.6	pF
Isolation Resistance	V_{I-O} = ±500 VDC	R_{ISO}	10^{11}			Ω

*Typical values at T_A = 25°C

NOTES:

1. Maximum $I_{F(ON)}$ is the maximum current required to trigger the output. For example, a 3.2mA maximum trigger current would require the LED to be driven at a current greater than 3.2mA 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 30mA.
2. H11N1: R_E = 910Ω
   H11N2: R_E = 560Ω
   H11N3: R_E = 240Ω

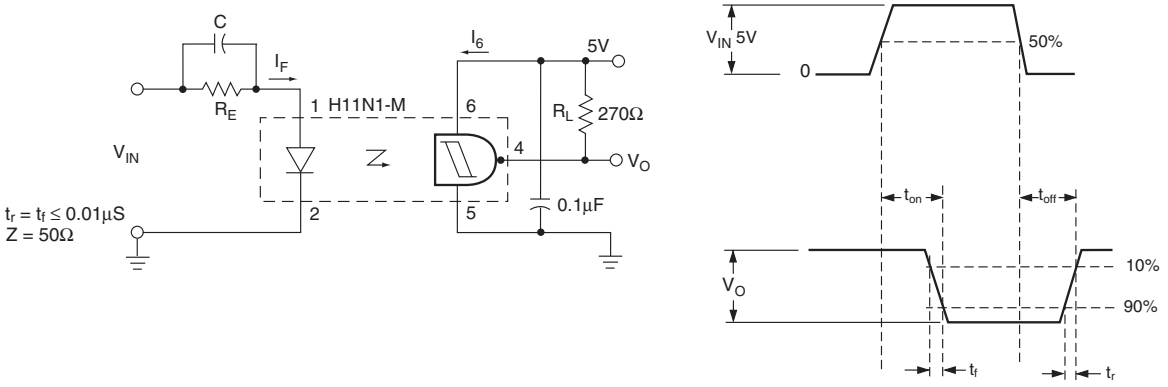


Figure 1. Switching Test Circuit and Waveforms

Figure 2. Transfer Characteristics

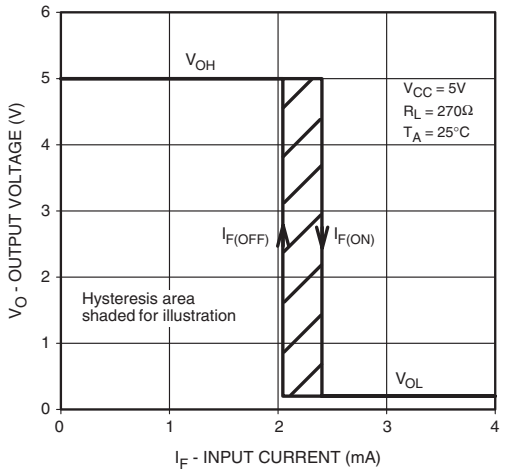


Figure 3. Threshold Current vs. Supply Voltage

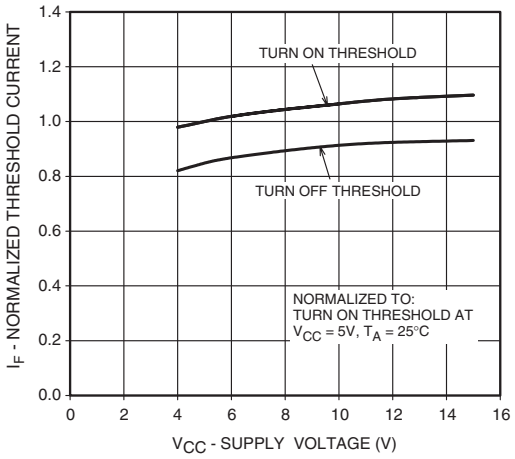


Figure 4. Threshold Current vs. Temperature

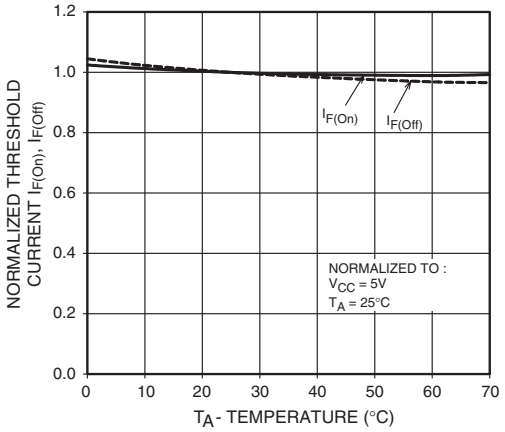


Figure 5. Load Current vs. Output Voltage

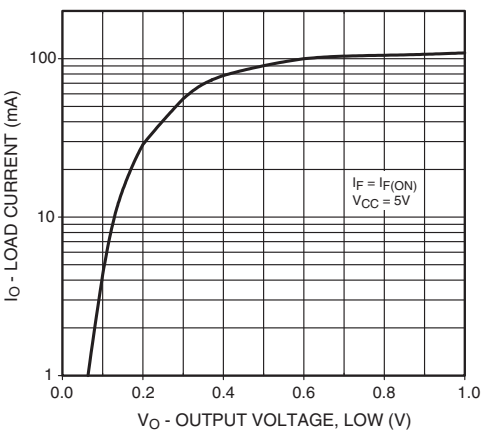


Figure 6. Supply Current vs. Supply Voltage

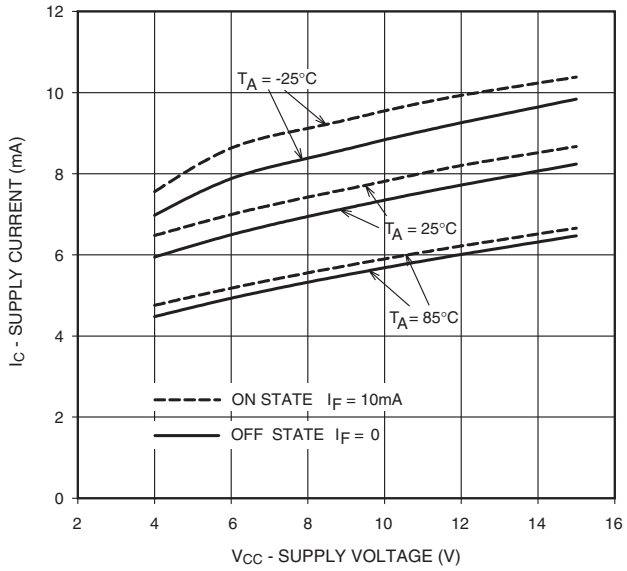
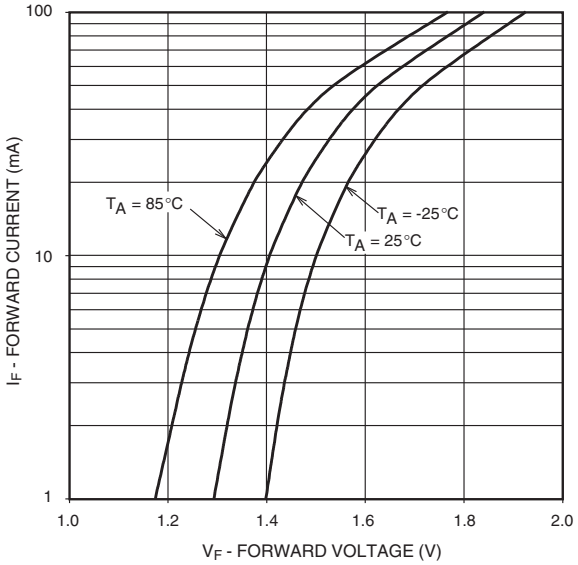
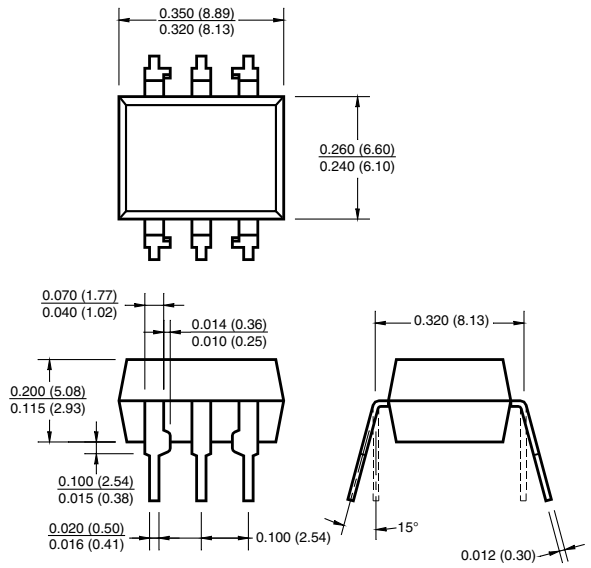


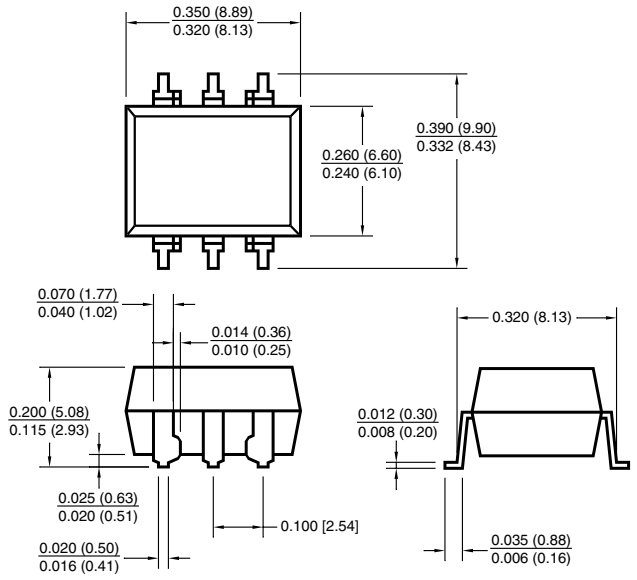
Figure 7. LED Forward Voltage vs. Forward Current



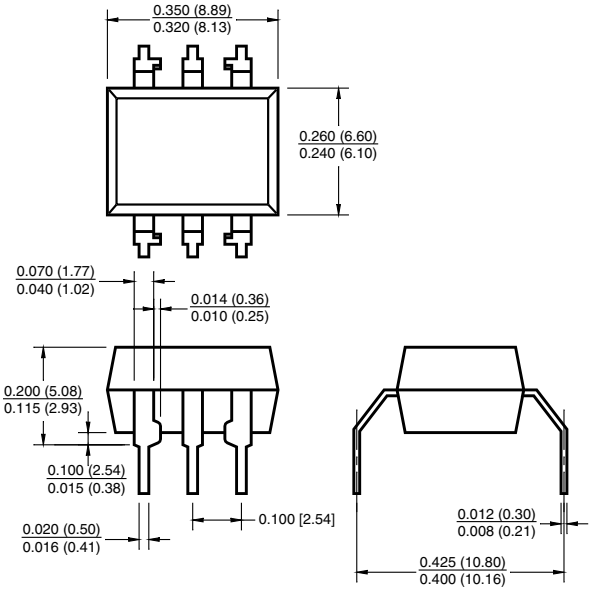
Package Dimensions (Through Hole)



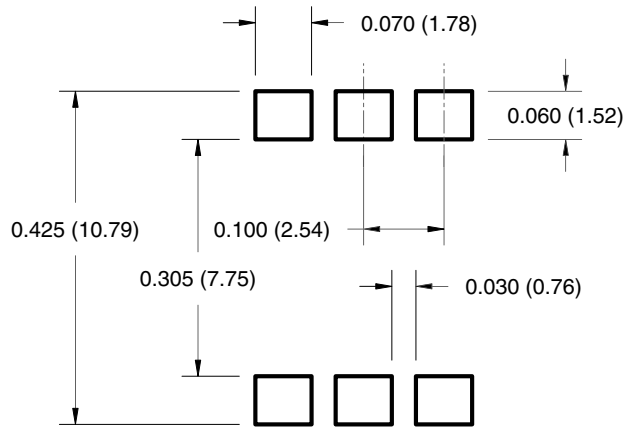
Package Dimensions (Surface Mount)



Package Dimensions (0.4” Lead Spacing)



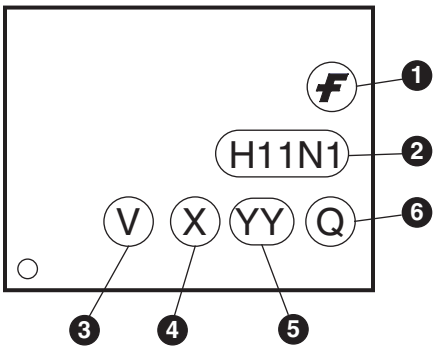
Recommended Pad Layout for Surface Mount Leadform



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

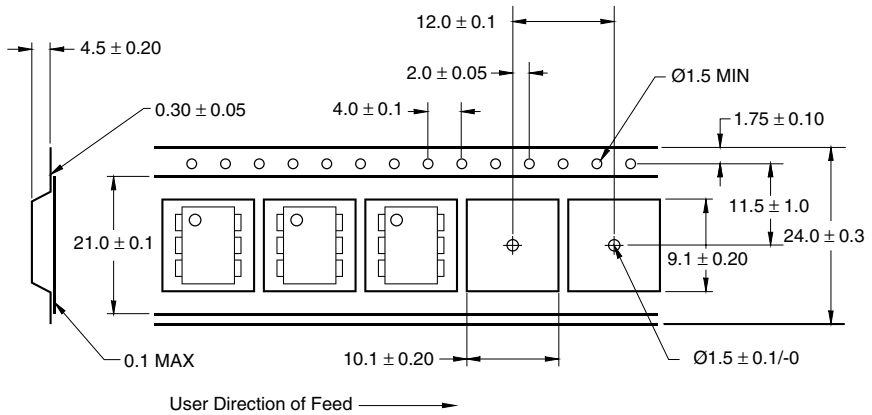
MARKING INFORMATION



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

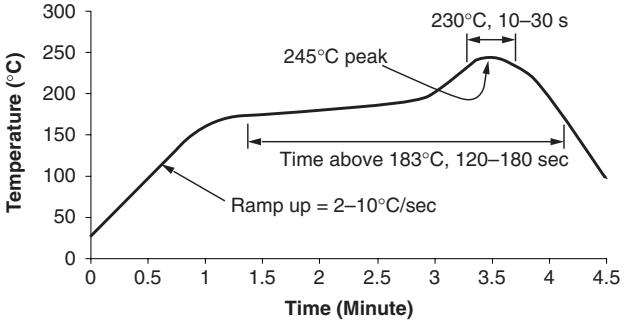
*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

Carrier Tape Specifications



NOTE
All dimensions are in inches (millimeters)

Reflow Profile (White Package, -M Suffix)



- Peak reflow temperature: 245°C (package surface temperature)
- Time of temperature higher than 183°C for 120–180 seconds
- One time soldering reflow is recommended

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.