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FAIRCHILD SEMICONDUCTOR®

January 2014

H11L1M, H11L2M, H11L3M
6-Pin DIP Optocoupler

Features

- High Data Rate, 1 MHz Typical (NRZ)
- Free from Latch-up and Oscilliation Throughout Voltage and Temperature Ranges
- Microprocessor Compatible Drive
- Logic Compatible Output Sinks 16 mA at 0.4 V 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., H11LIVM)

Applications

- Logic-to-Logic Isolator
- Programmable Current Level Sensor
- Line Receiver—Eliminate Noise and Transient Problems
- AC 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.

Schematic

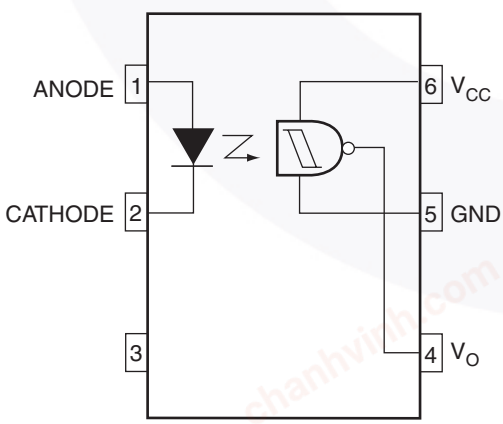


Figure 1. Schematic

Truth Table

Input	Output
H	L
L	H

Package Outlines

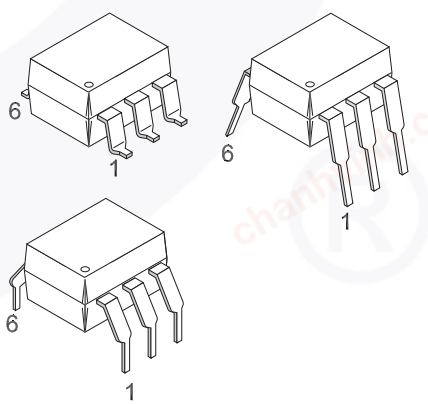


Figure 2. Package Outlines

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Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. T_A = 25°C unless otherwise specified.

Symbol	Parameters	Value	Units
Total Device			
T_{STG}	Storage Temperature	-40 to +150	°C
T_{OPR}	Operating Temperature	-40 to +85	°C
T_{SOL}	Lead Solder Temperature	260 for 10 seconds	°C
P_D	Total Device Power Dissipation at 25°C	250	mW
	Derate Above 25°C	2.94	mW/°C
Emitter			
I_F	Continuous Forward Current	30	mA
V_R	Reverse Voltage	6	V
I_F(pk)	Forward Current – Peak (1 µs pulse, 300 pps)	100	mA
P_D	LED Power Dissipation	60	mW
Detector			
P_D	Detector Power Dissipation	150	mW
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

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Electrical Characteristics

T_A = 25°C unless otherwise specified.

Individual Component Characteristics

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

Transfer Characteristics

Symbol	Parameter	Test Conditions	Device	Min.	Typ.	Max.	Units
DC Characteristics							
$I_{CC(on)}$	Supply Current	I_F = 10 mA, V_{CC} = 5 V	All		1.6	5.0	mA
V_{OL}	Output Voltage, Low	R_L= 270 Ω,V_{CC} = 5 V, I_F = $I_{F(on)}$ max.	All		0.2	0.4	V
$I_{F(on)}$	Turn-On Threshold Current(1)	R_L = 270 Ω, V_{CC} = 5 V	H11L1M			1.6	mA
			H11L2M			10.0	
			H11L3M			5.0	
$I_{F(off)}$	Turn-Off Threshold Current	R_L = 270 Ω, V_{CC} = 5 V	All	0.3	1.0		mA
$I_{F(off)}/I_{F(on)}$	Hysteresis Ratio	R_L = 270 Ω, V_{CC} = 5 V	All	0.50	0.75	0.90	
AC Characteristics, Switching Speed							
t_{on}	Turn-On Time	R_L = 270 Ω, V_{CC} = 5 V, I_F = $I_{F(on)}$, T_A = 25°C	All		1.0	4.0	µs
t_f	Fall Time	R_L = 270 Ω, V_{CC} = 5 V, I_F = $I_{F(on)}$, T_A = 25°C	All		0.1		µs
t_{off}	Turn-Off Time	R_L = 270 Ω, V_{CC} = 5 V, I_F = $I_{F(on)}$, T_A = 25°C	All		1.2	4.0	µs
t_r	Rise Time	R_L = 270 Ω, V_{CC} = 5 V, I_F = $I_{F(on)}$, T_A = 25°C	All		0.1		µs
	Data Rate		All		1.0		MHz

Isolation Characteristics

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

Note:

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

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Safety and Insulation Ratings

As per IEC 60747-5-2, this optocoupler is suitable for “safe electrical insulation” only within the safety limit data. Compliance with the safety ratings is ensured by means of protective circuits.

Symbol	Parameter	Min.	Typ.	Max.	Unit
	Installation Classifications per DIN VDE 0110/1.89 see Table 1				
	For Rated Main Voltage < 150 Vrms		I-IV		
	For Rated Main Voltage < 300 Vrms		I-IV		
	Climatic Classification		55/100/21		
	Pollution Degree (DIN VDE 0110/1.89)		2		
CTI	Comparative Tracking Index	175			
V_{PR}	Input to Output Test Voltage, Method b, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with t_m = 1 Second, Partial Discharge < 5 pC	1594			V_{peak}
	Input to Output Test Voltage, Method a, V_{IORM} x 1.5 = V_{PR}, Type and Sample Test with t_m = 60 Seconds, Partial Discharge < 5 pC	1275			V_{peak}
V_{IORM}	Maximum Working Insulation Voltage	850			V_{peak}
V_{IOTM}	Highest Allowable Over Voltage	6000			V_{peak}
	External Creepage	7			mm
	External Clearance	7			mm
	Insulation Thickness	0.5			mm
R_{IO}	Insulation Resistance at Ts, V_{IO} = 500 V	10^9			Ω

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Typical Performance Curves

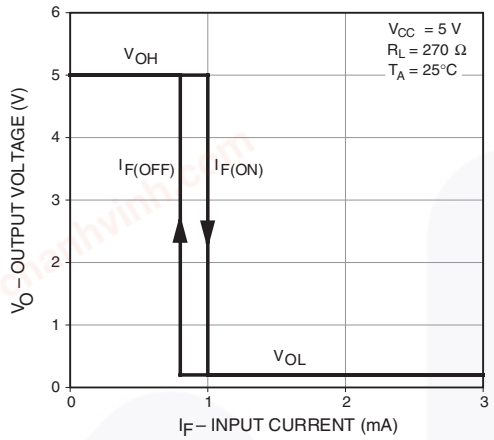


Figure 3. Transfer Characteristics

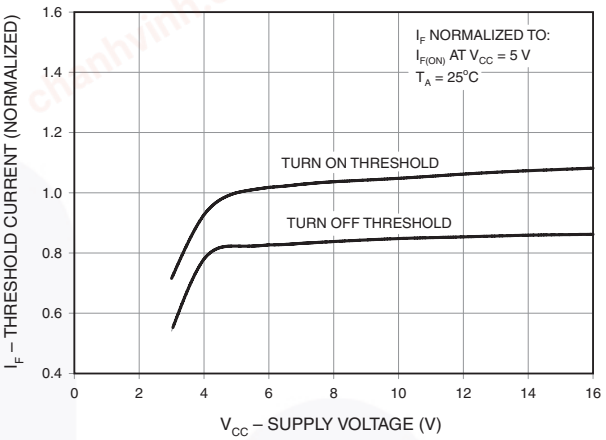


Figure 4. Threshold Current vs. Supply Voltage

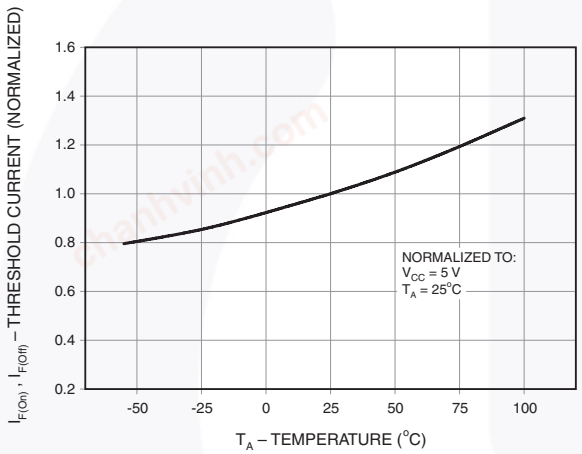


Figure 5. Threshold Current vs. Supply Temperature

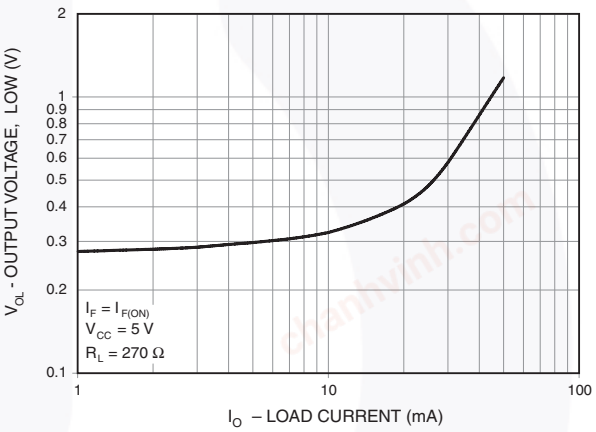


Figure 6. Output Voltage, Low vs. Load Current

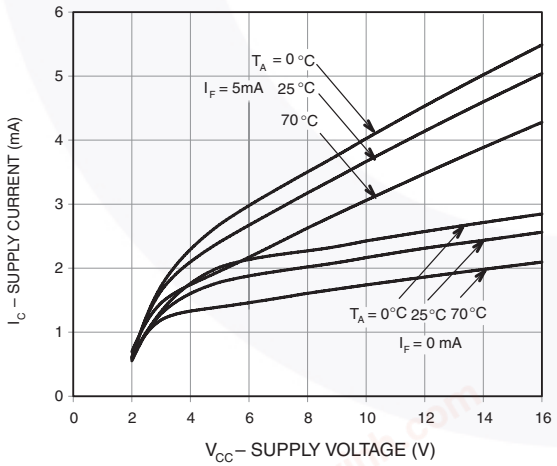


Figure 7. Supply Current vs. Supply Voltage

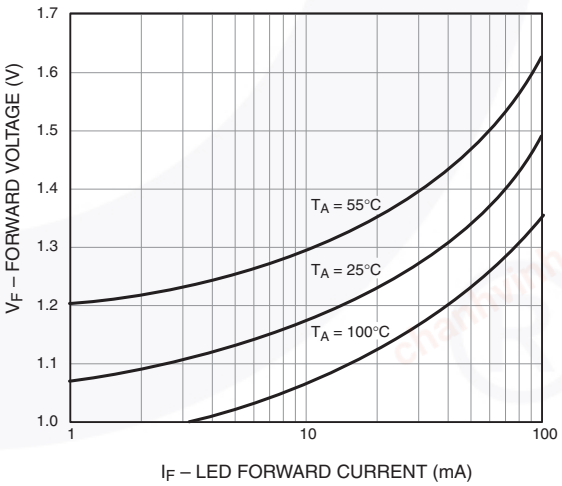


Figure 8. LED Forward Voltage vs. Forward Current

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Typical Performance Curves (Continued)

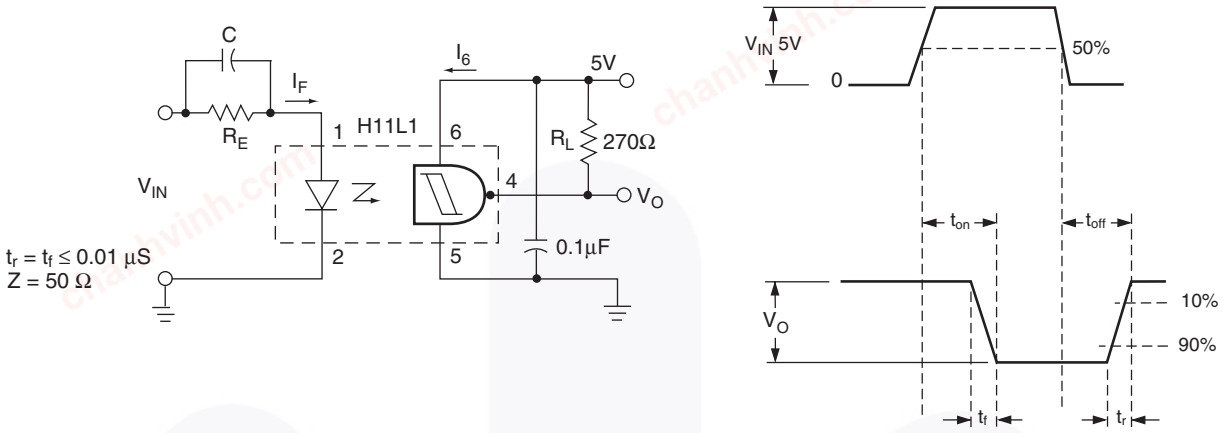


Figure 9. Switching Test Circuit and Waveforms

Reflow Profile

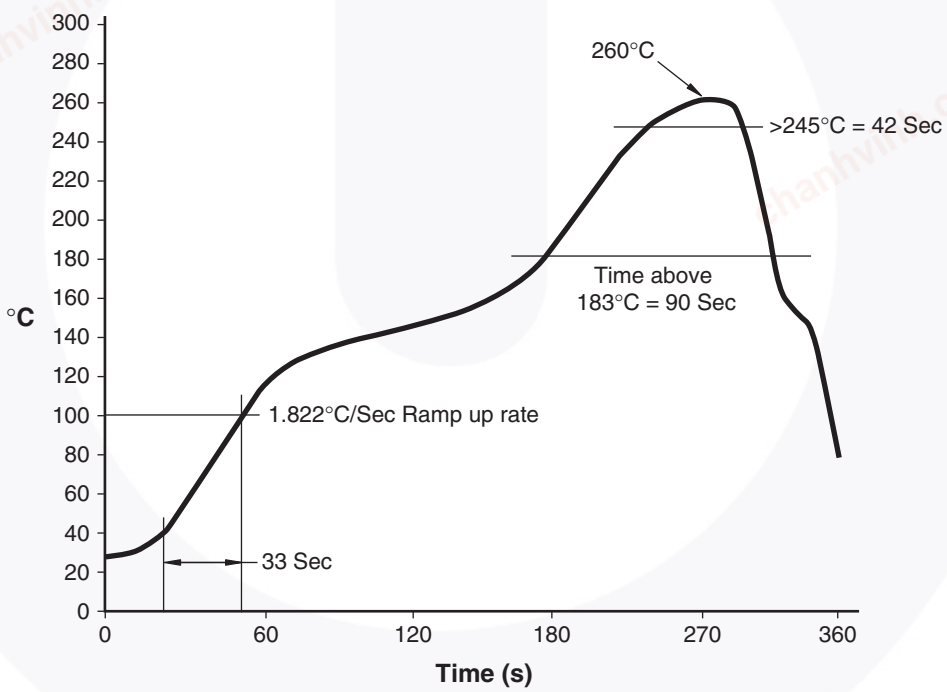


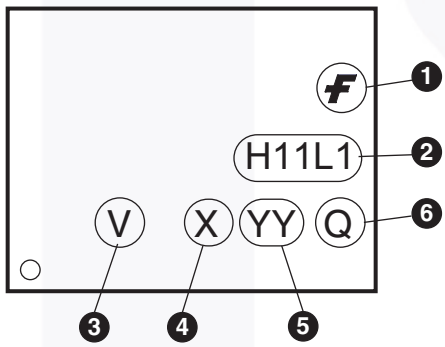
Figure 10. Reflow Profile

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Ordering Information

Option	Order Entry Identifier (Example)	Description
No option	H11L1M	Standard Through Hole Device
S	H11L1SM	Surface Mount Lead Bend
SR2	H11L1SR2M	Surface Mount; Tape and Reel
T	H11L1TM	0.4" Lead Spacing
V	H11L1VM	VDE 0884
TV	H11L1TVM	VDE 0884, 0.4" Lead Spacing
SV	H11L1SVM	VDE 0884, Surface Mount
SR2V	H11L1SR2VM	VDE 0884, Surface Mount, Tape and Reel

Marking Information



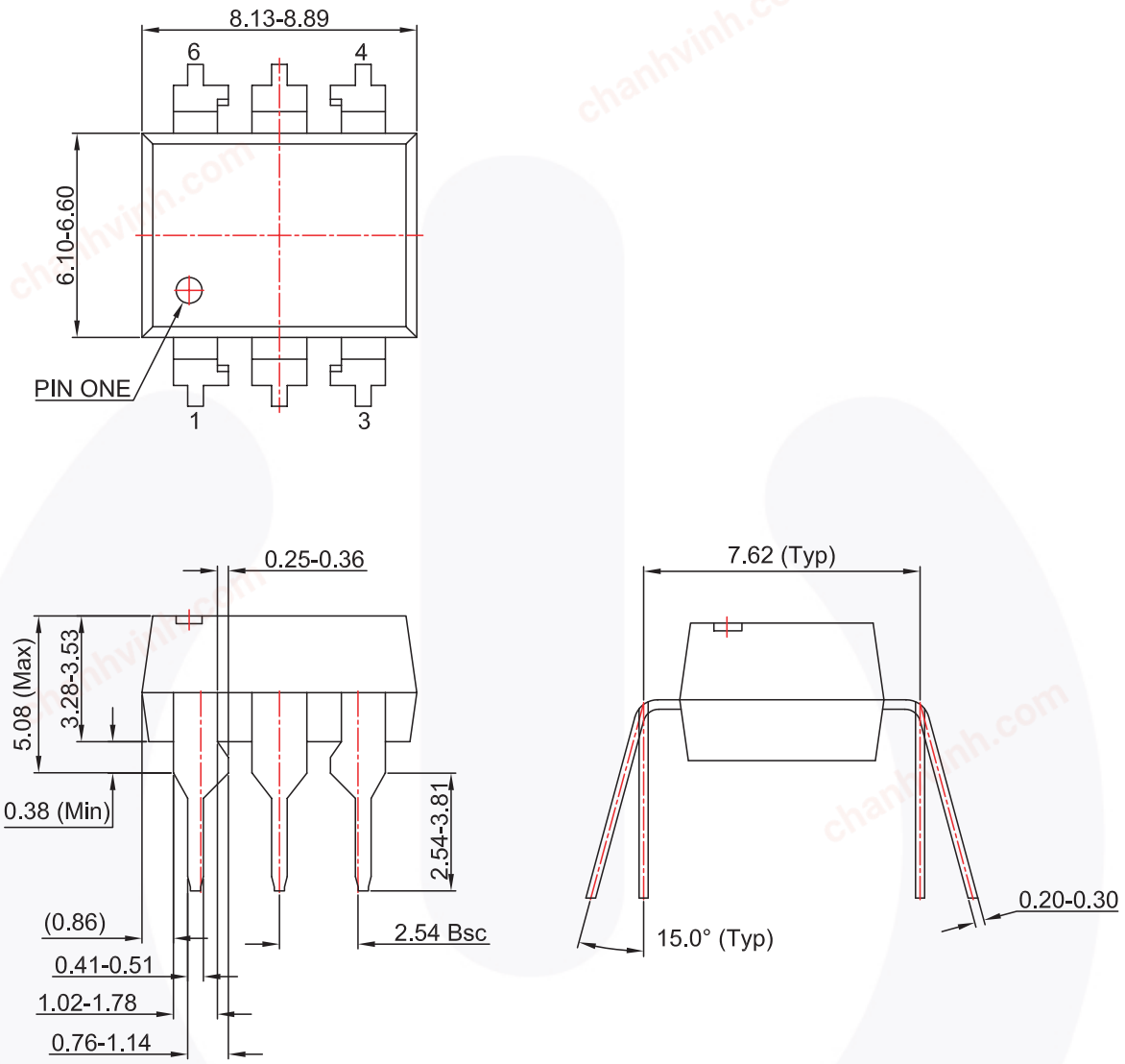
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One-digit year code, e.g., ‘3’
5	Two-digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

*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.

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Package Dimensions



NOTES:

A) NO STANDARD APPLIES TO THIS PACKAGE.

B) ALL DIMENSIONS ARE IN MILLIMETERS.

C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION

D) DRAWING FILENAME AND REVSION: MKT-N06BREV3.

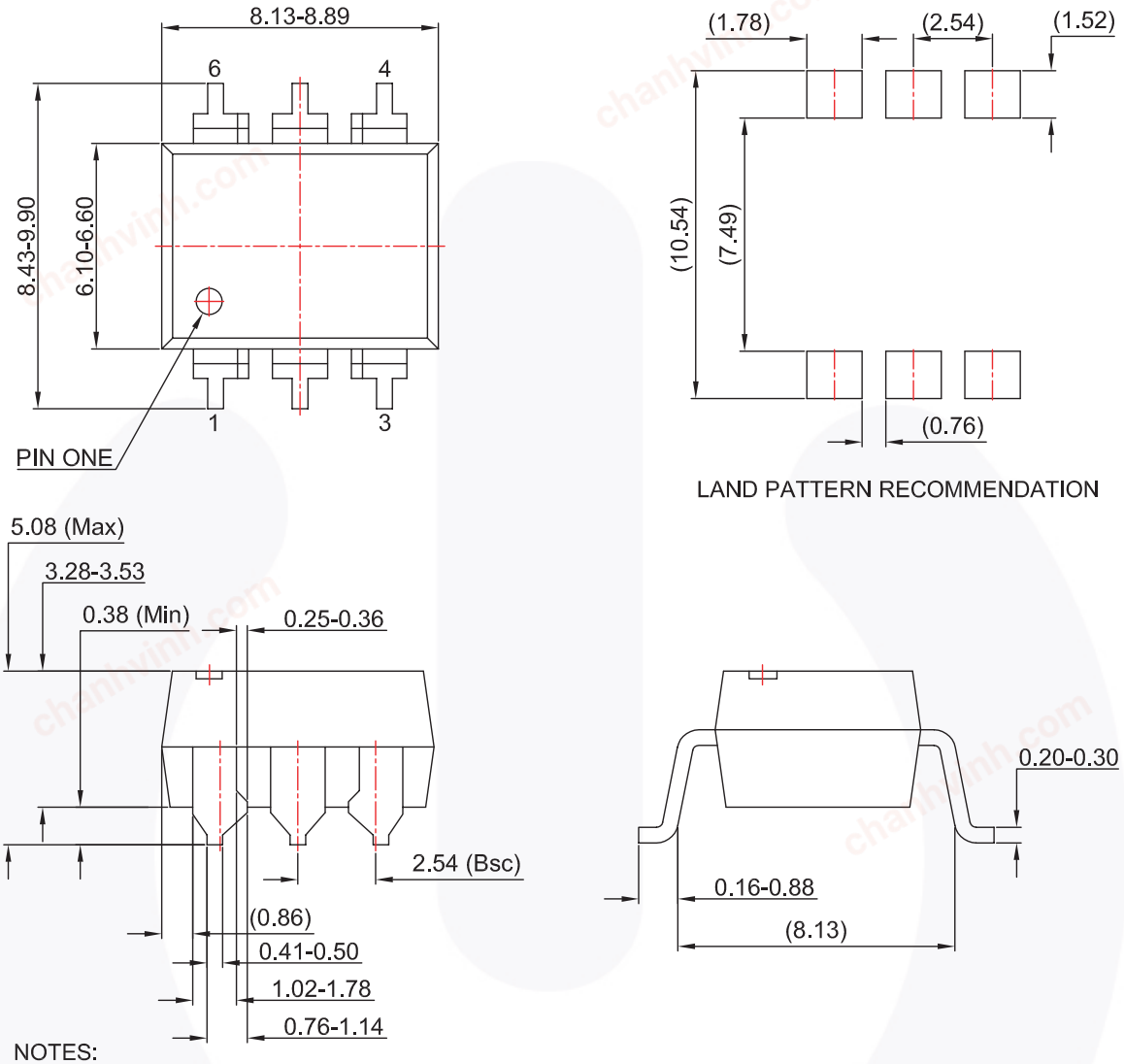
Figure 11. 6-pin DIP Through Hole

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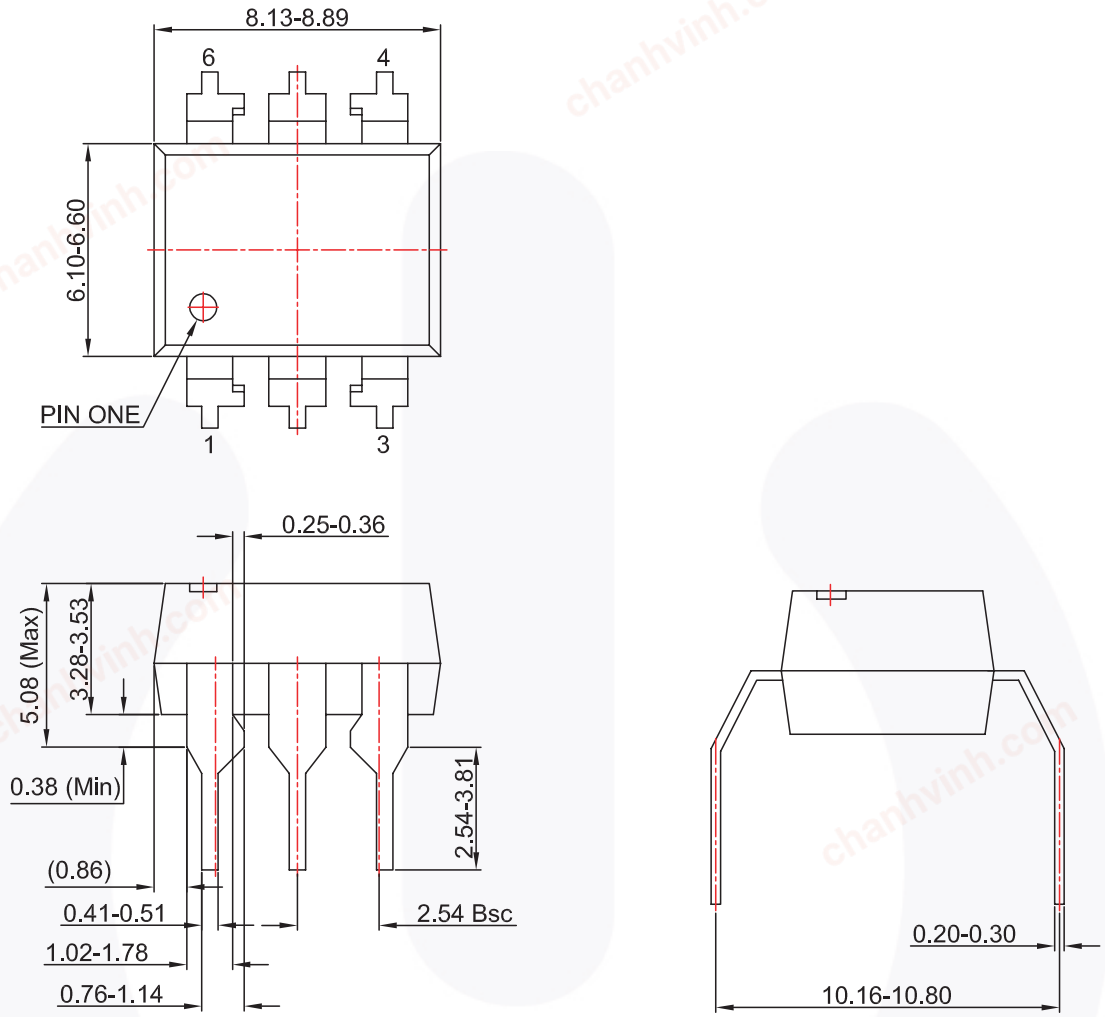
Figure 12. 6-pin DIP Surface Mount

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D) DRAWING FILENAME AND REVSION: MKT-N06DREV3.

Figure 13. 6-pin DIP 0.4" Lead Spacing

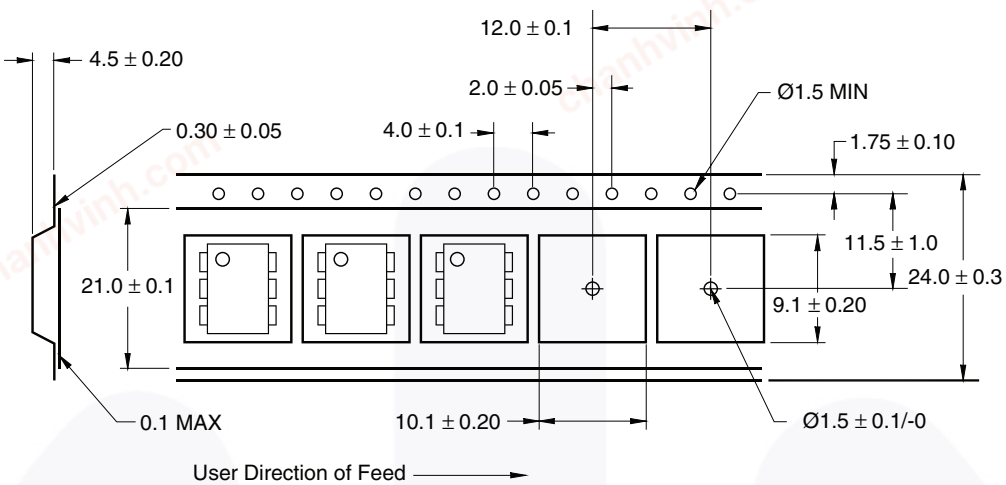
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Tape Dimensions



Note:
All dimensions are in millimeters.

Figure 14. Tape Dimensions

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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.

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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; 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.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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