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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD™

September 2014

H11L1M, H11L2M, H11L3M
6-Pin DIP Schmitt Trigger Output 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
- Safety and Regulatory Approvals:
  - UL1577, 4,170 VAC_{RMS} for 1 Minute
  - DIN-EN/IEC60747-5-5, 850 V Peak Working Insulation Voltage

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

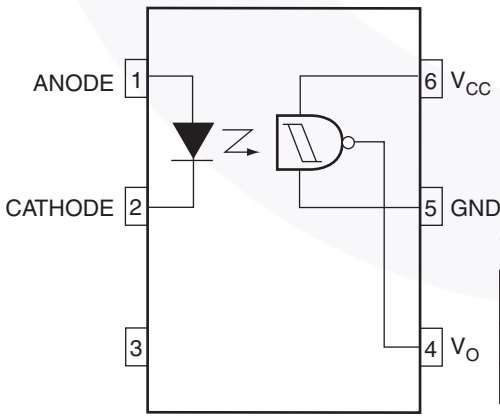


Figure 1. Schematic

Truth Table

Input	Output
H	L
L	H

Package Outlines

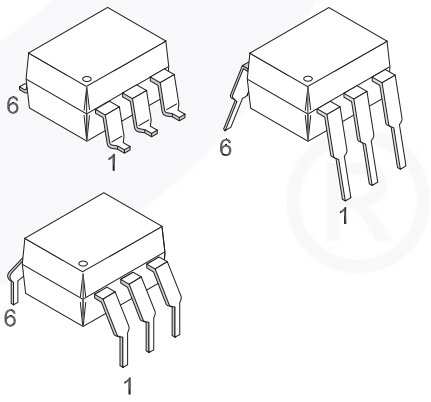


Figure 2. Package Outlines

Safety and Insulation Ratings

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

Parameter		Characteristics
Installation Classifications per DIN VDE 0110/1.89 Table 1, For Rated Mains Voltage	< 150 V_{RMS}	I–IV
	< 300 V_{RMS}	I–IV
Climatic Classification		55/100/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V_{PR}	Input-to-Output Test Voltage, Method A, V_{IORM} x 1.6 = V_{PR}, Type and Sample Test with t_m = 10 s, Partial Discharge < 5 pC	1360	V_{peak}
	Input-to-Output Test Voltage, Method B, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with t_m = 1 s, Partial Discharge < 5 pC	1594	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
	External Clearance (for Option TV, 0.4" Lead Spacing)	≥ 10	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.5	mm
T_S	Case Temperature[1]	175	°C
$I_{S,INPUT}$	Input Current[1]	350	mA
$P_{S,OUTPUT}$	Output Power[1]	800	mW
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500 V[1]	> 10^9	Ω

Note:

1. Safety limit values – maximum values allowed in the event of a failure.

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 +125	°C
T_{OPR}	Operating Temperature	-40 to +85	°C
T_J	Junction Temperature	-40 to +125	°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

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(2)	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 Minute	4170			VAC_{RMS}
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, T_A = 25°C	10^{11}			Ω

Note:

2. 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 30 mA.

Typical Performance Curves

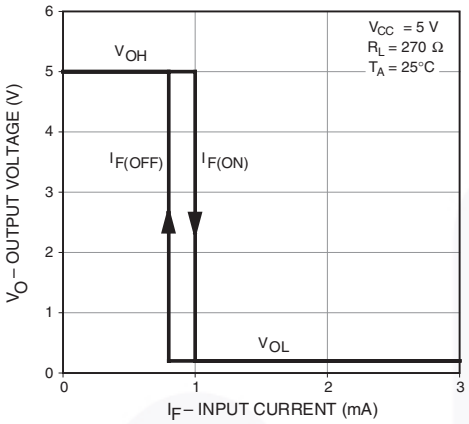


Figure 3. Transfer Characteristics

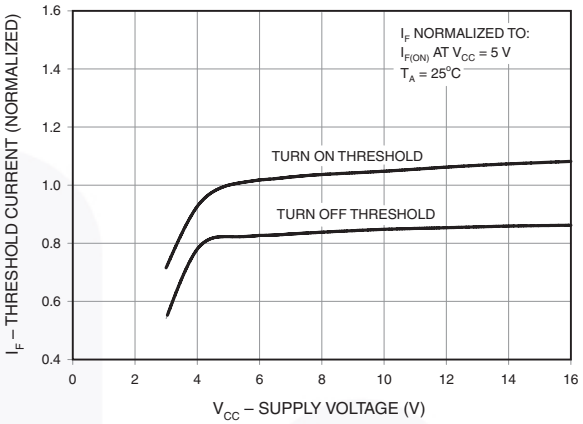


Figure 4. Threshold Current vs. Supply Voltage

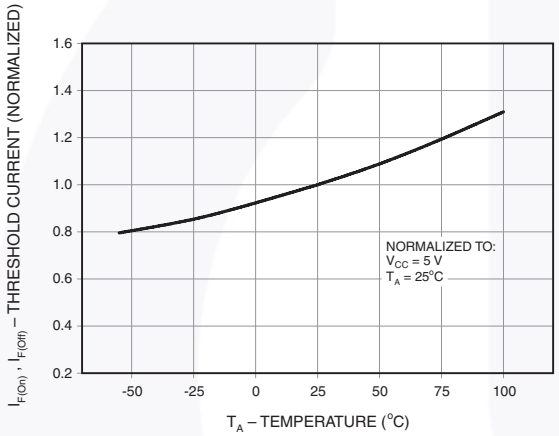


Figure 5. Threshold Current vs. Supply Temperature

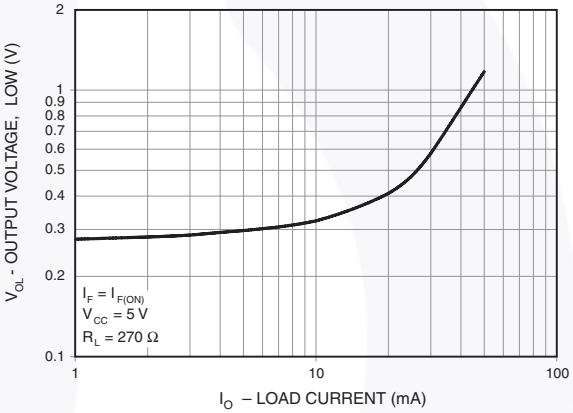


Figure 6. Output Voltage, Low vs. Load Current

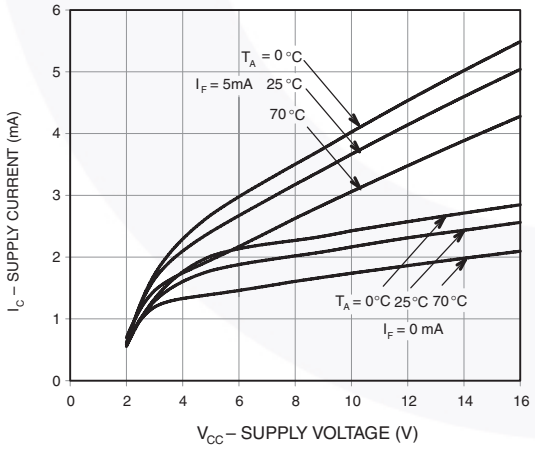


Figure 7. Supply Current vs. Supply Voltage

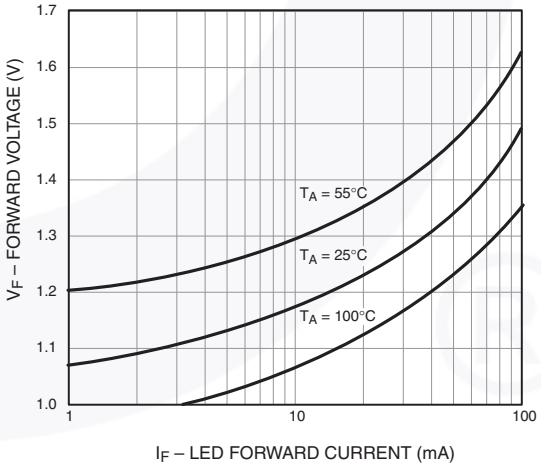


Figure 8. LED Forward Voltage vs. Forward Current

Typical Performance Curves (Continued)

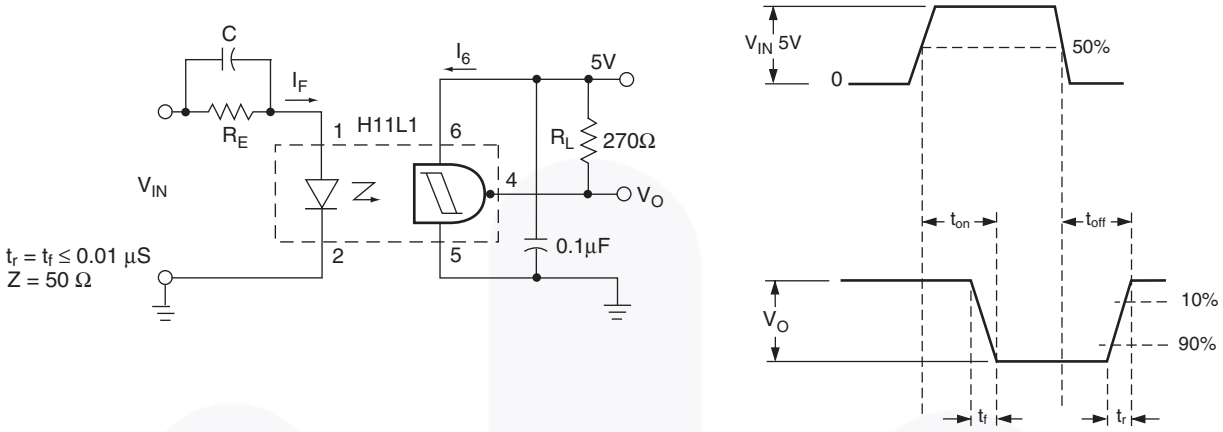


Figure 9. Switching Test Circuit and Waveforms

Reflow Profile

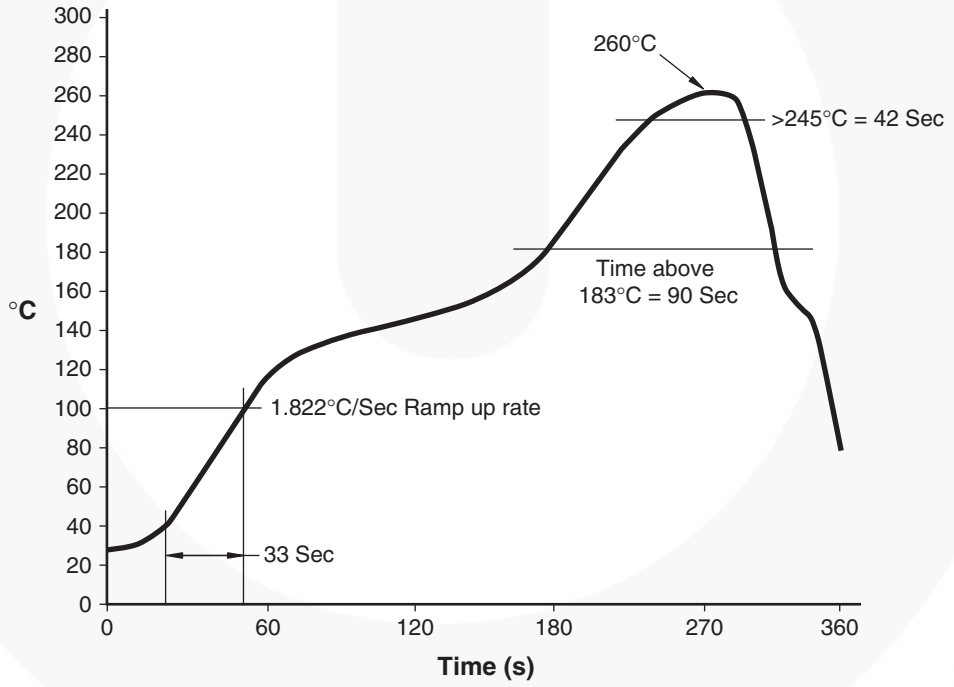


Figure 10. Reflow Profile

Ordering Information

Part Number	Package	Packing Method
H11L1M	DIP 6-Pin	Tube (50 Units)
H11L1SM	SMT 6-Pin (Lead Bend)	Tube (50 Units)
H11L1SR2M	SMT 6-Pin (Lead Bend)	Tape and Reel (1000 Units)
H11L1VM	DIP 6-Pin, DIN EN/IEC60747-5-5 Option	Tube (50 Units)
H11L1SVM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tube (50 Units)
H11L1SR2VM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	Tape and Reel (1000 Units)
H11L1TVM	DIP 6-Pin, 0.4” Lead Spacing, DIN EN/IEC60747-5-5 Option	Tube (50 Units)

Note:

3. The product orderable part number system listed in this table also applies to the H11L2M and H11L3M product families.

Marking Information

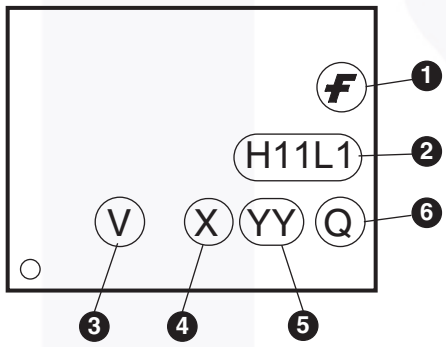
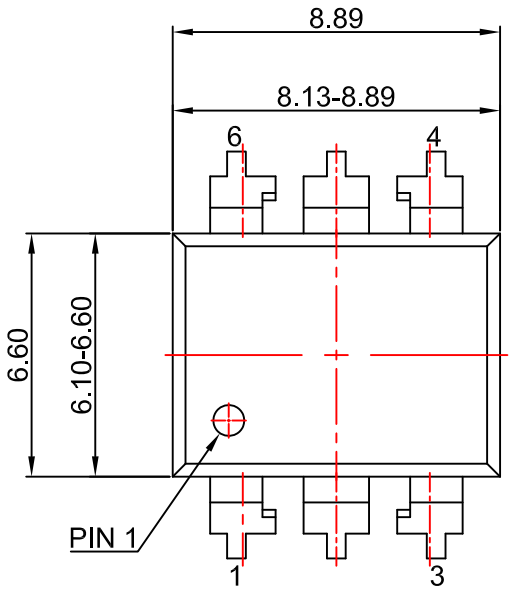
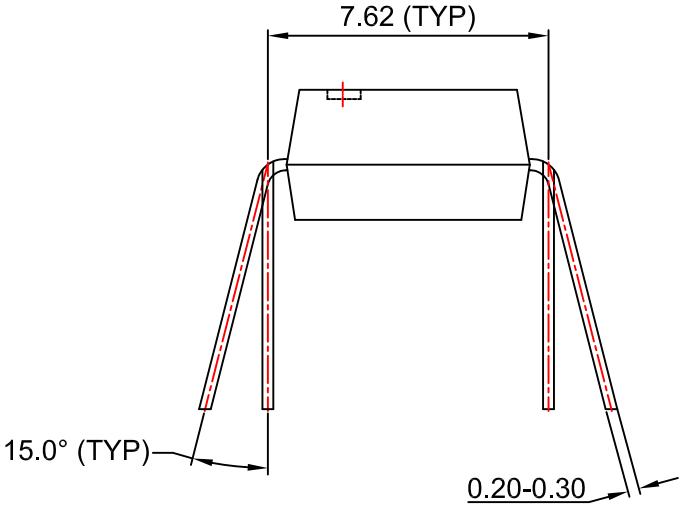


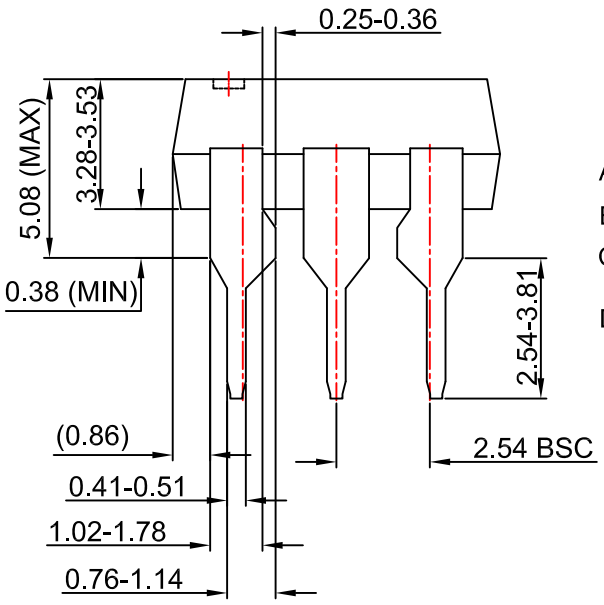
Figure 11. Top Mark

Table 1. Top Mark Definitions

1	Fairchild Logo
2	Device Number
3	DIN EN/IEC60747-5-5 Option (only appears on component ordered with this option)
4	One-Digit Year Code, e.g., “4”
5	Digit Work Week, Ranging from “01” to “53”
6	Assembly Package Code







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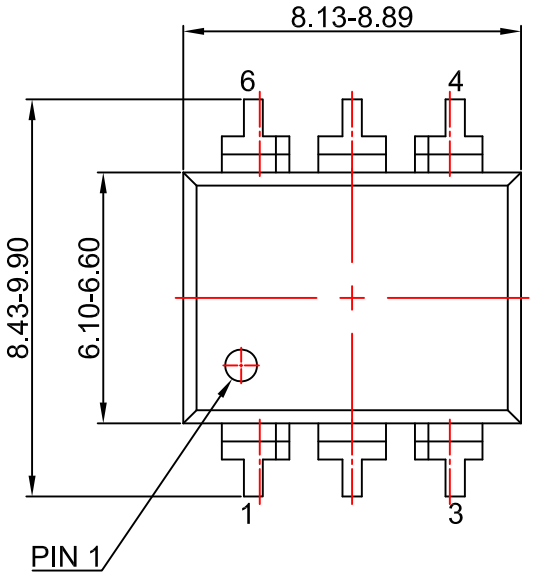
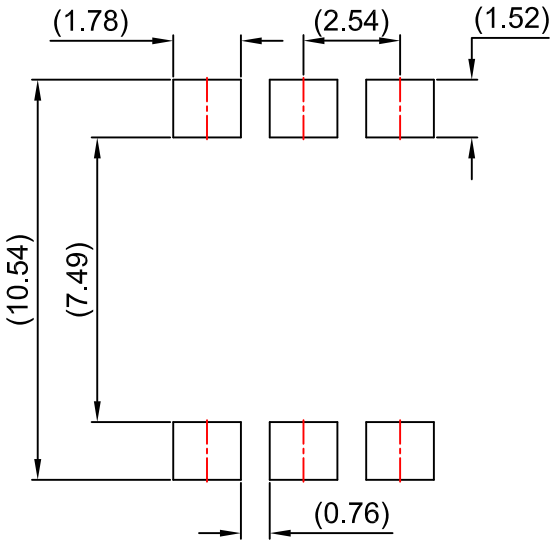
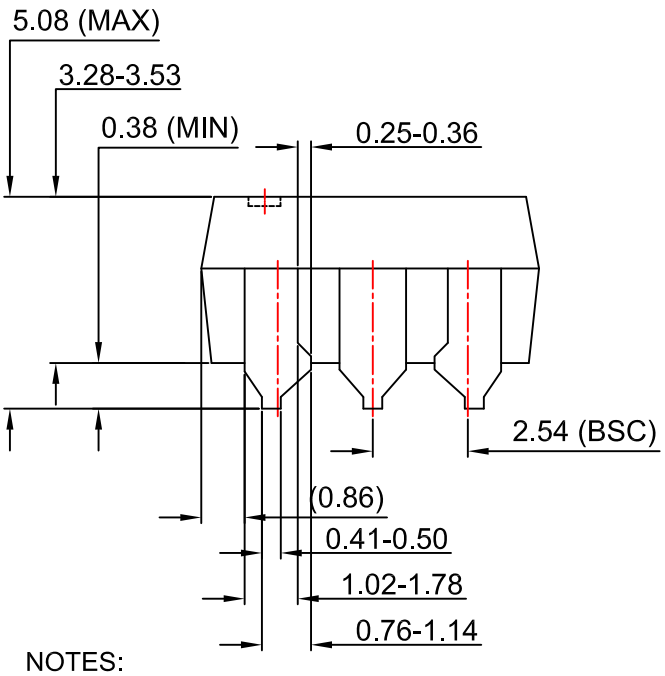
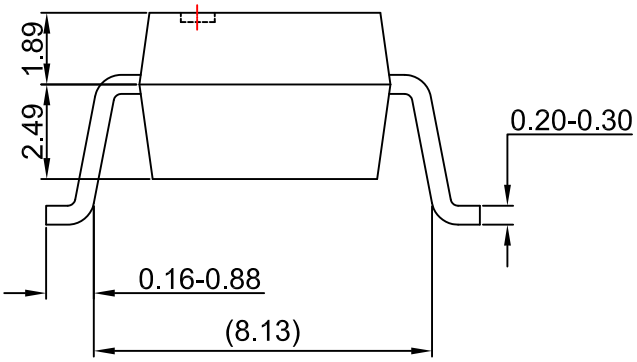




LAND PATTERN RECOMMENDATION





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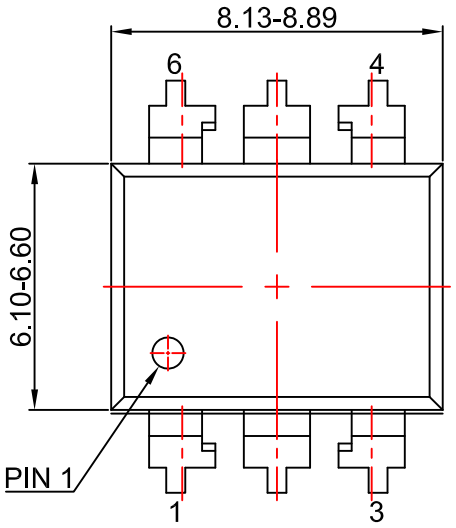

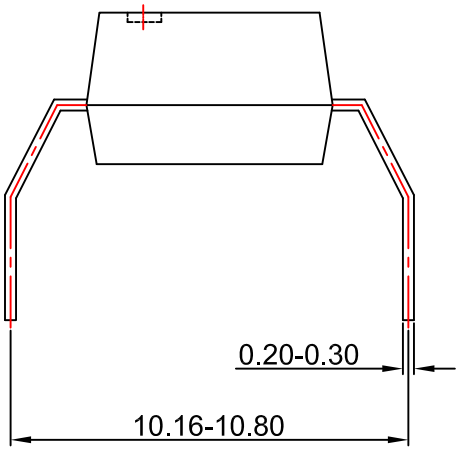

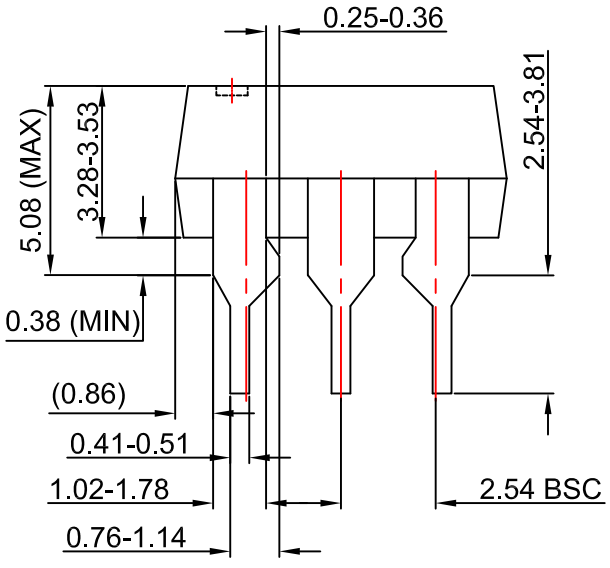

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