H11N1M

6-Pin DIP Schmitt Trigger Output Optocoupler

The H11N1M has a high−speed integrated circuit detector optically coupled to an aluminium gallium arsenide (AlGaAs) 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.

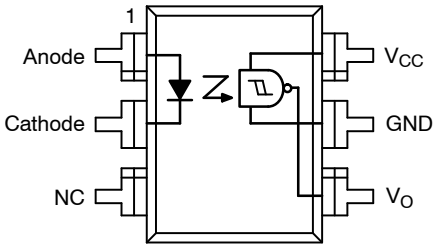
Features

- High Data Rate, 5 MHz Typical (NRZ)
- Free from Latch−up and Oscillation 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
- 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
- Interfaces Computers with Peripherals
- Isolated Power MOS Driver for Power Supplies

SCHEMATIC



(Top View)

Truth Table

Input	Output
H	L
L	H

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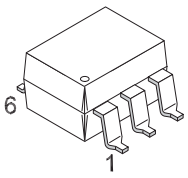

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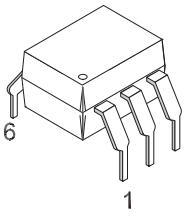
CASE 646BY



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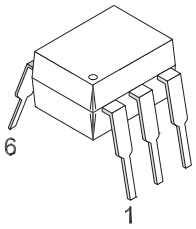

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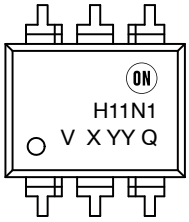
MARKING DIAGRAM



H11N1	= Device Code
V	= DIN EN/IEC60747−5−5 Option (only appears on component ordered with this option)
X	= One−Digit Year Code, e.g., “6”
YY	= Digit Work Week, Ranging from “01” to “53”
Q	= Assembly Package Code

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

Table 1. 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	6,000	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 (Note 1)	175	°C
$I_{S,INPUT}$	Input Current (Note 1)	350	mA
$P_{S,OUTPUT}$	Output Power (Note 1)	800	mW
R_{IO}	Insulation Resistance at T_S, V_{IO} = 500 V (Note 1)	> 10^9	Ω

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

Table 2. ABSOLUTE MAXIMUM RATINGS T_A = 25°C unless otherwise specified.

Symbol	Parameter	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	210	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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Table 3. ELECTRICAL CHARACTERISTICS T_A = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
EMITTER						
V_F	Input Forward Voltage	I_F = 10 mA		1.4	2.0	V
		I_F = 0.3 mA	0.75	1.25		
I_R	Reverse Current	V_R = 5 V			10	μA
C_J	Capacitance	V = 0 V, f = 1.0 MHz			100	pF
DETECTOR						
V_{CC}	Operating Voltage Range		4		15	V
$I_{CC(off)}$	Supply Current	I_F = 0 mA, V_{CC} = 5 V		6	10	mA
I_{OH}	Output Current, High	I_F = 0 mA, V_{CC} = V_O = 15 V			100	μA

Table 4. TRANSFER CHARACTERISTICS T_A = 25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$I_{CC(on)}$	Supply Current	I_F = 10 mA, V_{CC} = 5 V		6.5	10.0	mA
V_{OL}	Output Voltage, Low	R_L = 270 Ω, V_{CC} = 5 V, I_F = $I_{F(on)}$ Maximum			0.5	V
$I_{F(on)}$	Turn−On Threshold Current	R_L = 270 Ω, V_{CC} = 5 V (Note 2)	0.8		3.2	mA
$I_{F(off)}$	Turn−Off Threshold Current	R_L = 270 Ω, V_{CC} = 5 V	0.3			mA
$I_{F(off)}$ / $I_{F(on)}$	Hysteresis Ratio	R_L = 270 Ω, V_{CC} = 5 V	0.65		0.95	

Table 5. SWITCHING SPEED

Symbol	AC Characteristics	Test Conditions	Min	Typ	Max	Units
t_{on}	Turn−On Time	C = 120 pF, t_P = 1 μs, R_E = (Note 3), Figure 7		100	330	ns
t_r	Rise Time	C = 120 pF, t_P = 1 μs, R_E = (Note 3), Figure 7		7.5		ns
t_{off}	Turn−Off Time	C = 120 pF, t_P = 1 μs, R_E = (Note 3), Figure 7		150	330	ns
t_f	Fall Time	C = 120 pF, t_P = 1 μs, R_E = (Note 3), Figure 7		12		ns
	Data Rate			5		MHz

Table 6. 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

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

TYPICAL CHARACTERISTICS

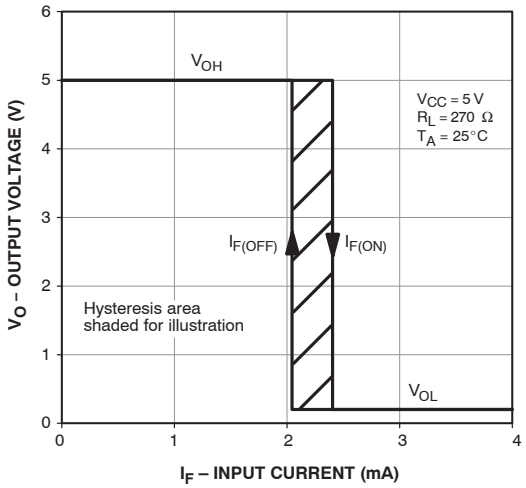


Figure 1. Transfer Characteristics

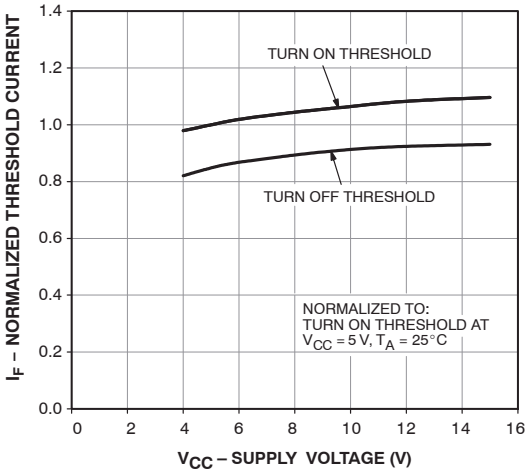


Figure 2. Threshold Current vs. Supply Voltage

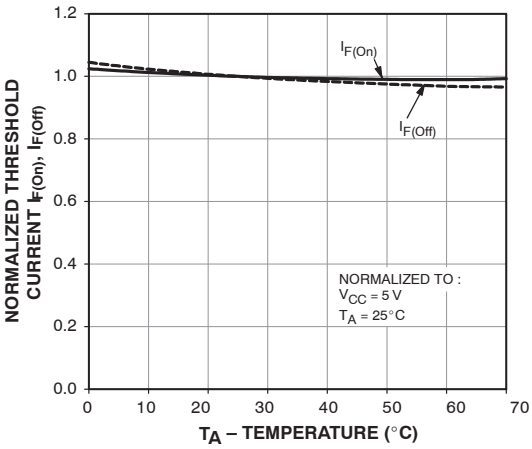


Figure 3. Threshold Current vs. Temperature

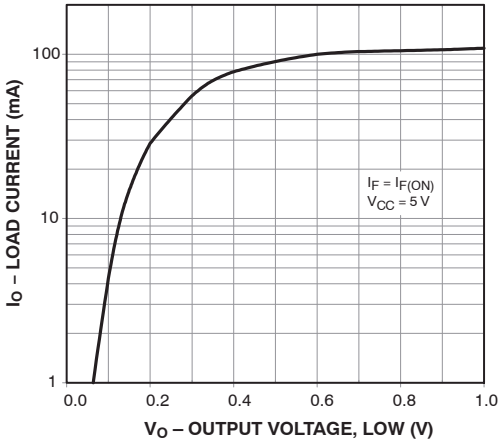


Figure 4. Load Current vs. Output Voltage

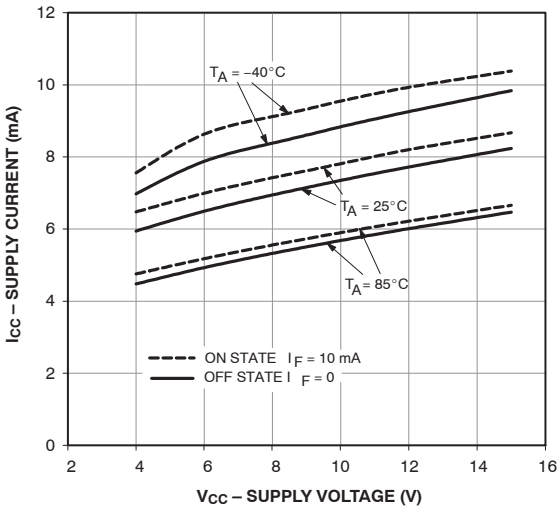


Figure 5. Supply Current vs. Supply Voltage

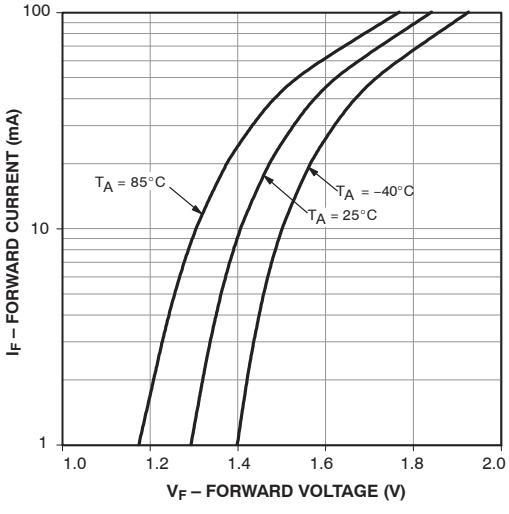


Figure 6. LED Forward Current vs. Forward Voltage

TEST CIRCUIT

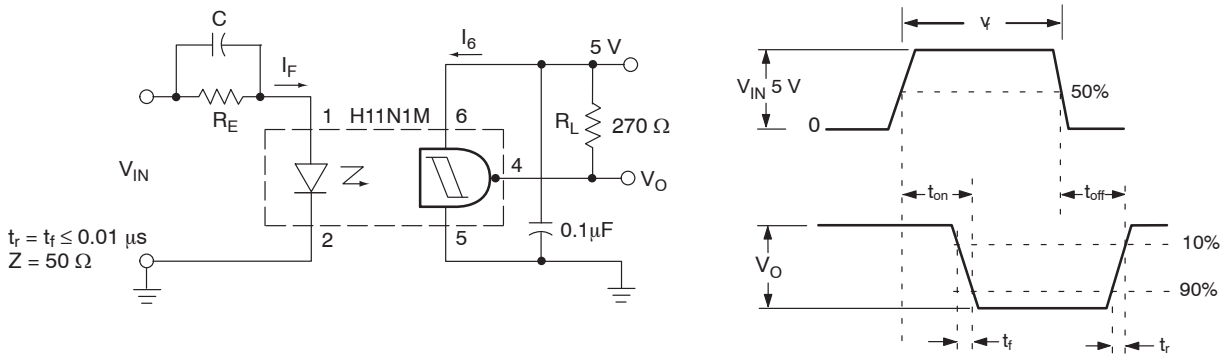


Figure 7. Switching Test Circuit and Waveforms

REFLOW PROFILE

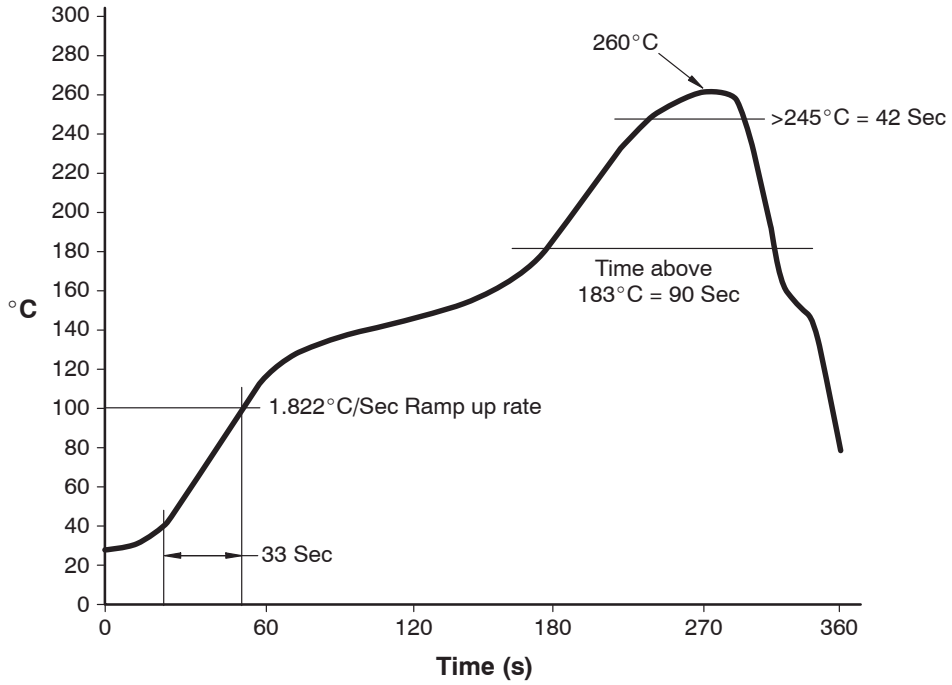


Figure 8. Reflow Profile

ORDERING INFORMATION

Part Number	Package	Packing Method
H11N1M	DIP 6−Pin	Tube (50 Units)
H11N1SM	SMT 6−Pin (Lead Bend)	Tube (50 Units)
H11N1SR2M	SMT 6−Pin (Lead Bend)	Tape and Reel (1000 Units)
H11N1VM	DIP 6−Pin, DIN EN/IEC60747−5−5 Option	Tube (50 Units)
H11N1SVM	SMT 6−Pin (Lead Bend), DIN EN/IEC60747−5−5 Option	Tube (50 Units)
H11N1SR2VM	SMT 6−Pin (Lead Bend), DIN EN/IEC60747−5−5 Option	Tape and Reel (1000 Units)
H11N1TVM	DIP 6−Pin, 0.4″ Lead Spacing, DIN EN/IEC60747−5−5 Option	Tube (50 Units)

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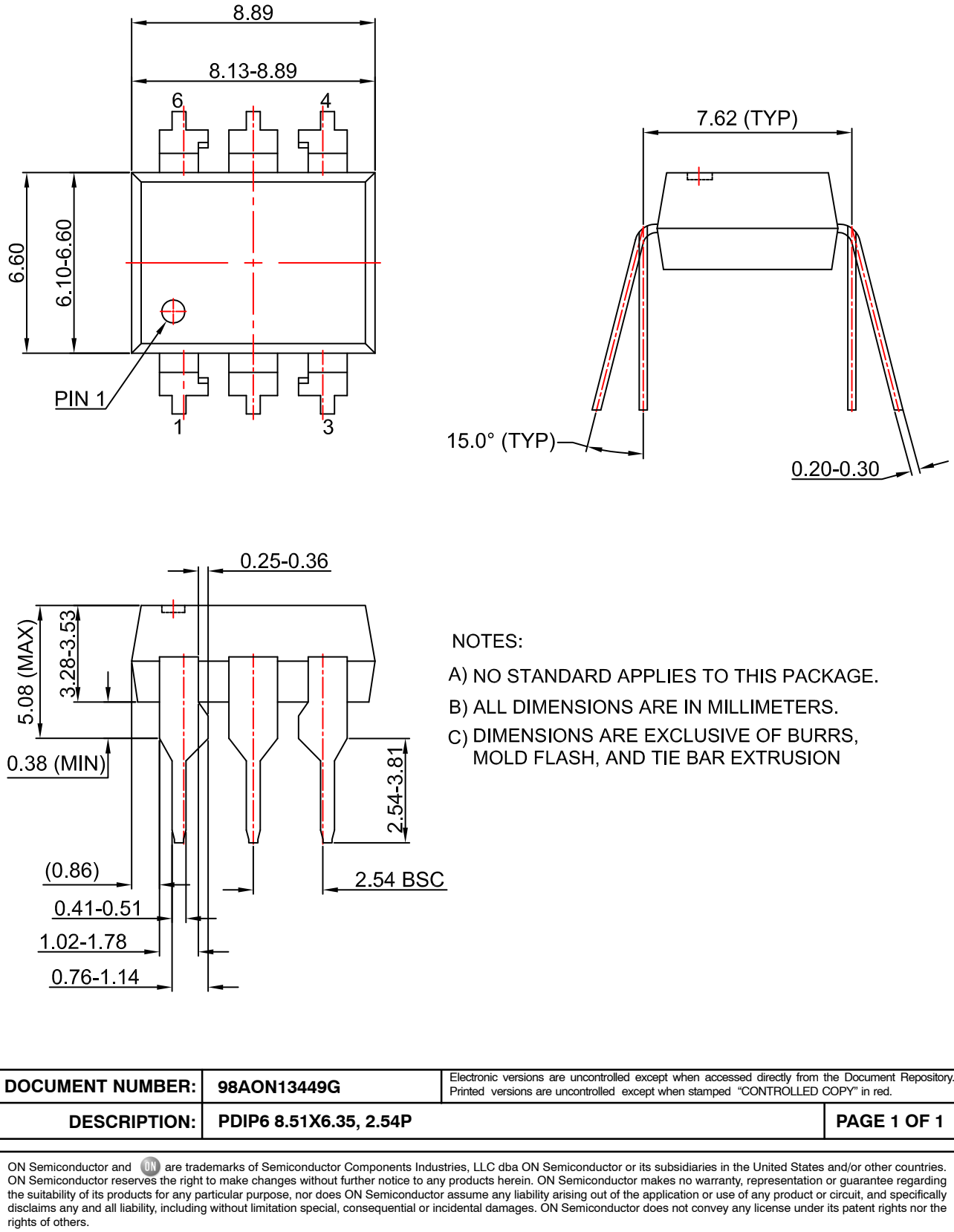

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MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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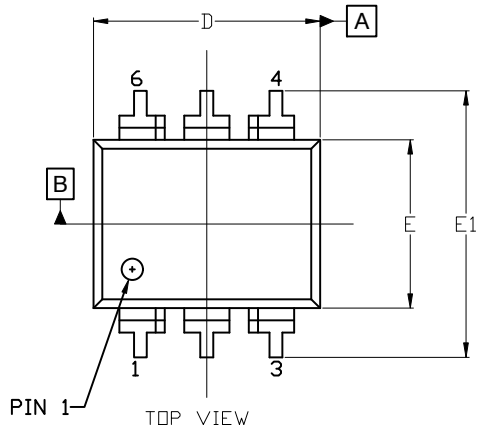

NOTES:
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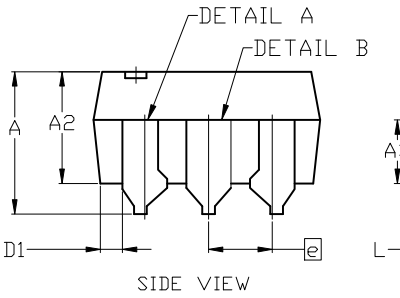
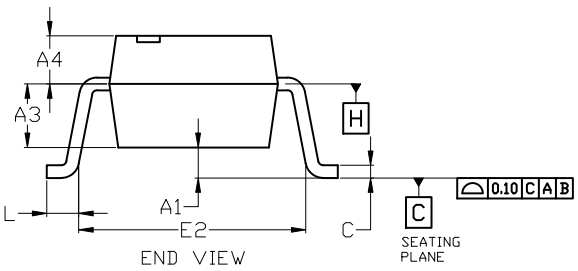
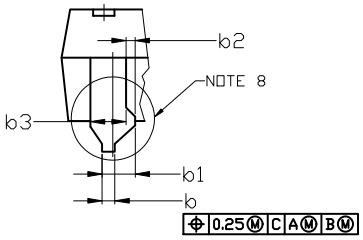
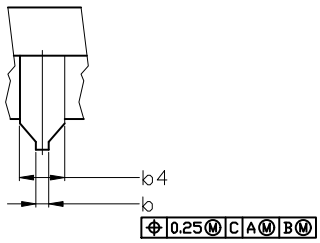
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS A, A1, AND L ARE MEASURED WITH THE PACKAGE SEATED.
4. DIMENSIONS D, D1, AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE NOT TO EXCEED 2.54mm.
5. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).
6. CENTER LINE OF CORNER LEADS ARE LOCATED BY LOCATING THE CENTER OF FEATURE b2 AND b3.

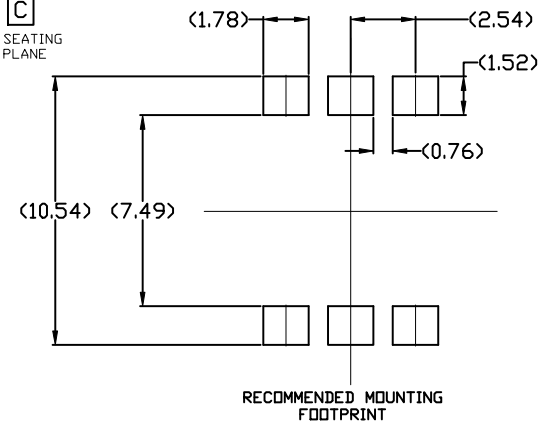
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	4.80
A1	0.38	---	---
A2	3.28	3.40	3.53
A3		2.49 REF	
A4		1.89 REF	
b	0.41	0.46	0.51
b1	0.76	0.92	1.14
b2	0.25	0.28	0.36
b3	1.02	1.40	1.78
b4		1.778 REF	
c	0.20	0.25	0.30
D	8.13	8.51	8.89
D1		0.86 REF	
E	6.10	6.35	6.60
E1	8.43	9.17	9.90
E2		8.13 REF	
e		2.54 BSC	
L	0.16	0.52	0.88











* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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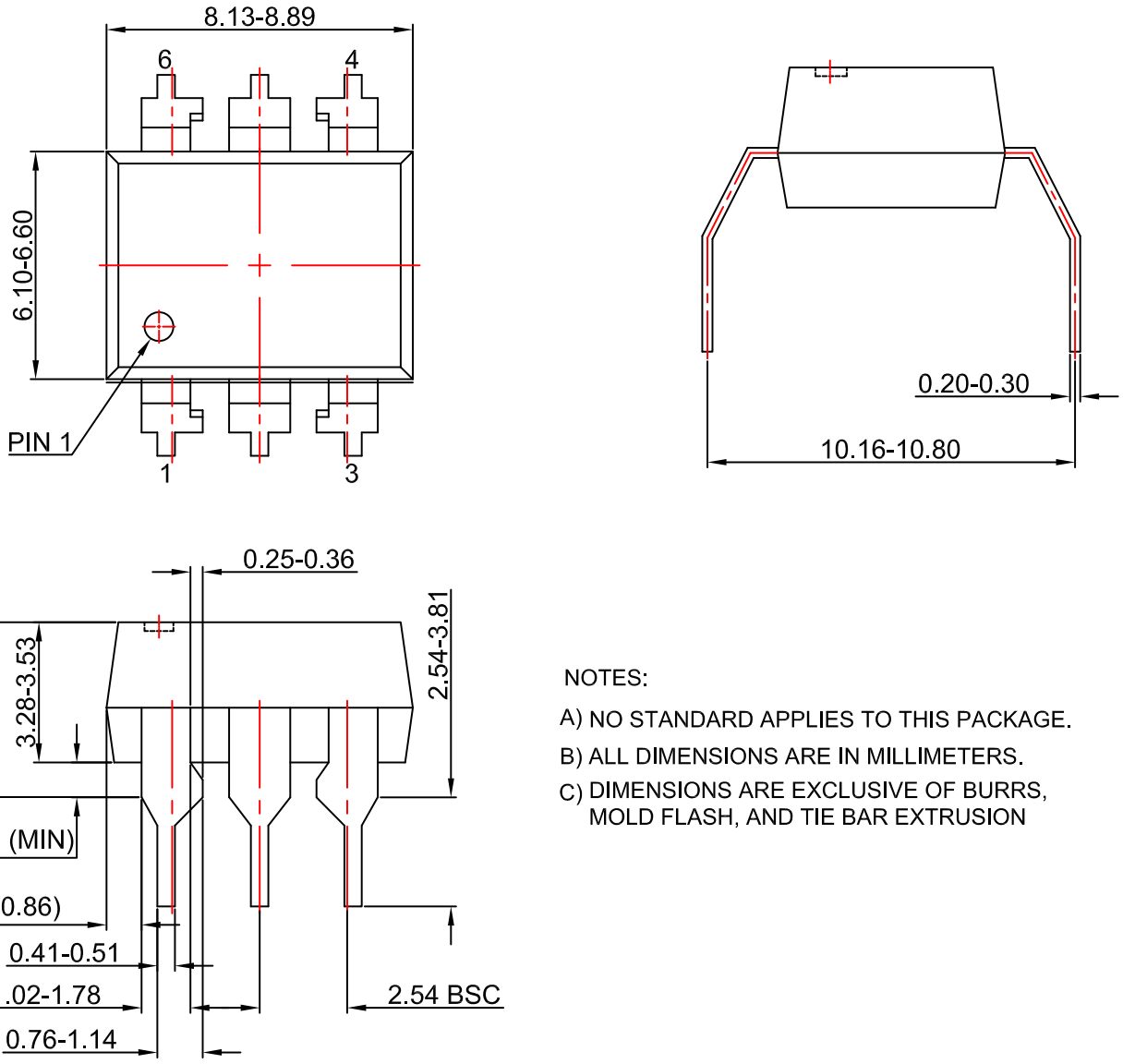

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