6-Pin DIP Schmitt Trigger Output Optocoupler

H11L1M, H11L2M, H11L3M

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.

Features

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

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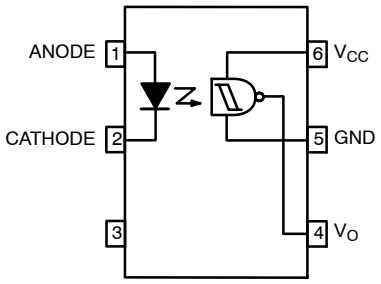
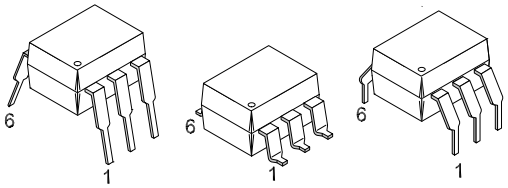
SCHEMATIC



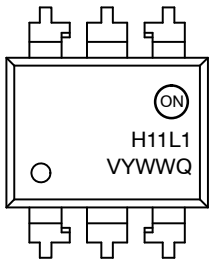
Truth Table

Input	Output
H	L
L	H



PDIP6 CASE 646BX | **PDIP6 CASE 646BY** | **PDIP6 CASE 646BZ**

MARKING DIAGRAM



H11L1	= Specific Device Code
V	= DIN EN/IEC40747−5−5 Option
Y	= Year Code
WW	= Work Week
Q	= Assembly Package Code

ORDERING INFORMATION

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

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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 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	Units
V_{PR}	Input−to−Output Test Voltage, Method A, $V_{IORM} \times 1.6 = V_{PR}$, Type and Sample Test with t_m = 10 s, Partial Discharge < 5 pC	1360	V_{peak}
	Input−to−Output Test Voltage, Method B, $V_{IORM} \times 1.875 = V_{PR}$, 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 (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.

ABSOLUTE MAXIMUM RATINGS

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

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.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Device	Min	Typ	Max	Units
INDIVIDUAL COMPONENT CHARACTERISTICS							
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							
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 (Note 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		All		0.1		
t_{off}	Turn−Off Time		All		1.2	4.0	
t_r	Rise Time		All		0.1		
	Data Rate		All		1.0		MHz
ISOLATION CHARACTERISTICS							
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 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

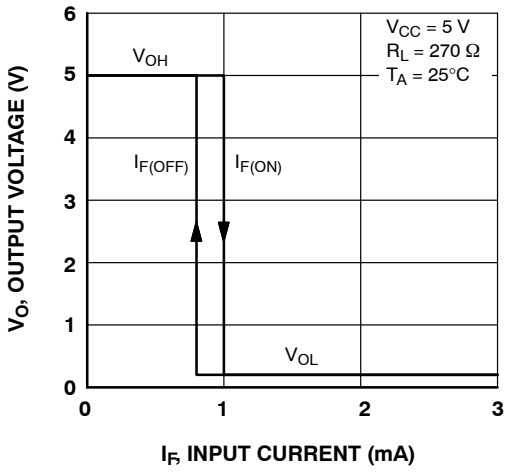

Figure 1. Transfer Characteristics

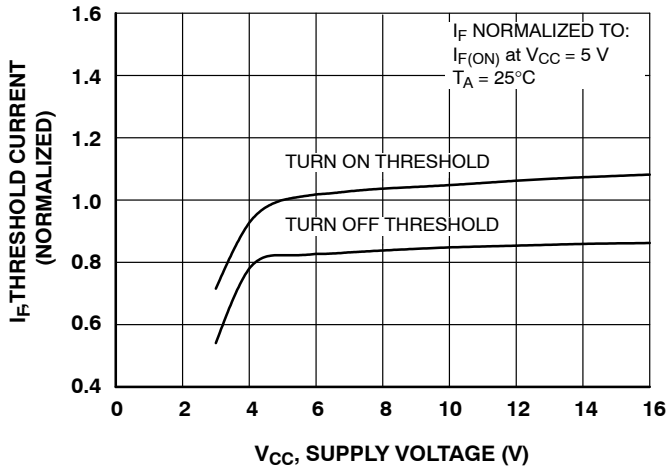

Figure 2. Threshold Current vs. Supply Voltage

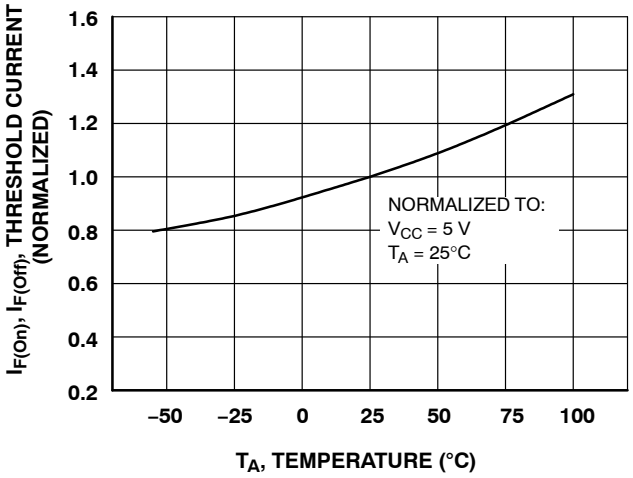

Figure 3. Threshold Current vs. Supply Temperature

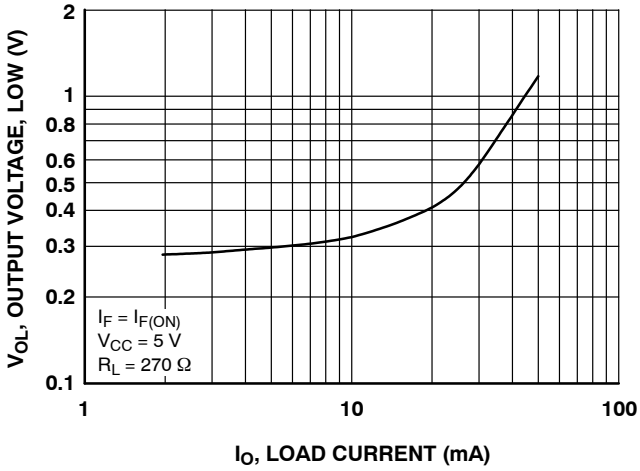

Figure 4. Output Voltage, Low vs. Load Current

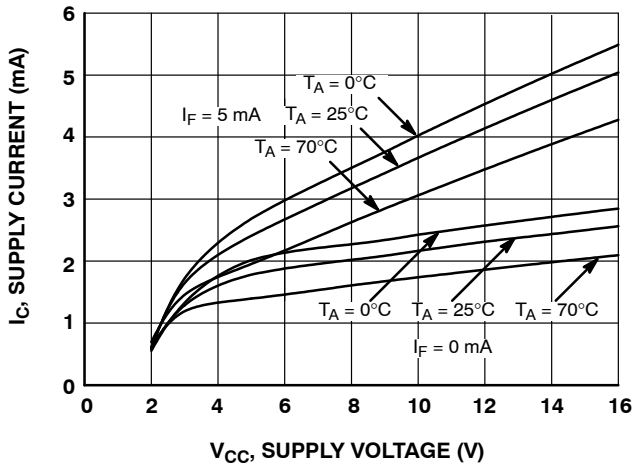

Figure 5. Supply Current vs. Supply Voltage

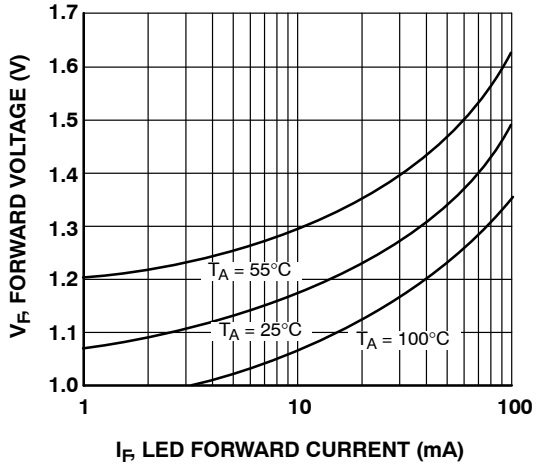

Figure 6. LED Forward Voltage vs. Forward Current

TYPICAL PERFORMANCE CURVES (continued)

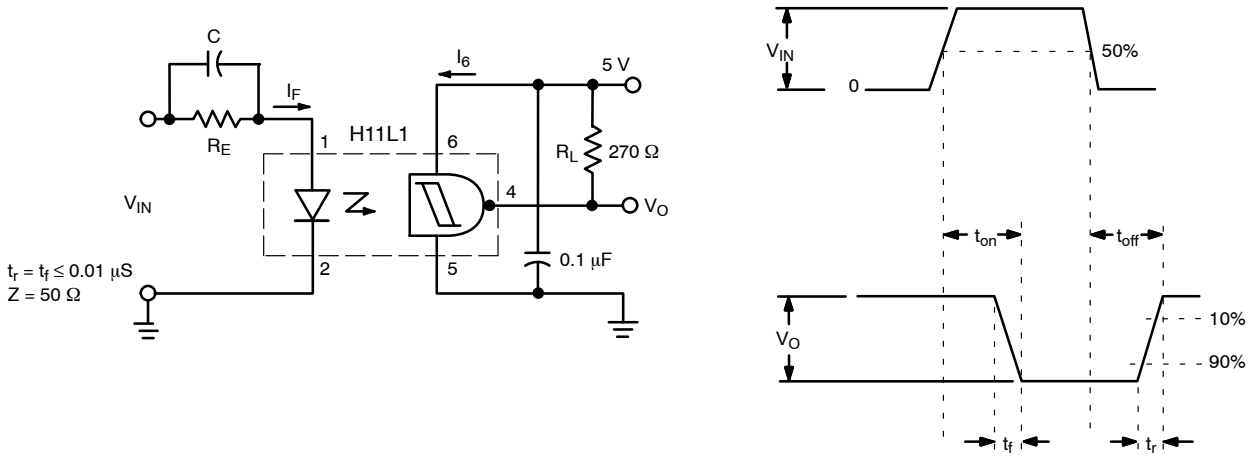

Figure 7. Switching Test Circuit and Waveforms

REFLOW PROFILE

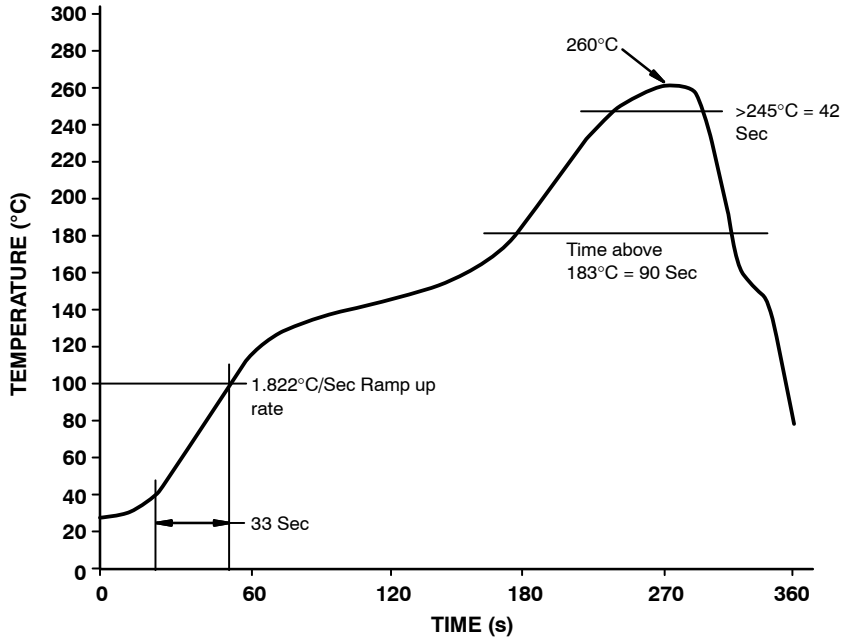

Figure 8. Reflow Profile

PACKAGE MARKING AND ORDERING INFORMATION

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

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

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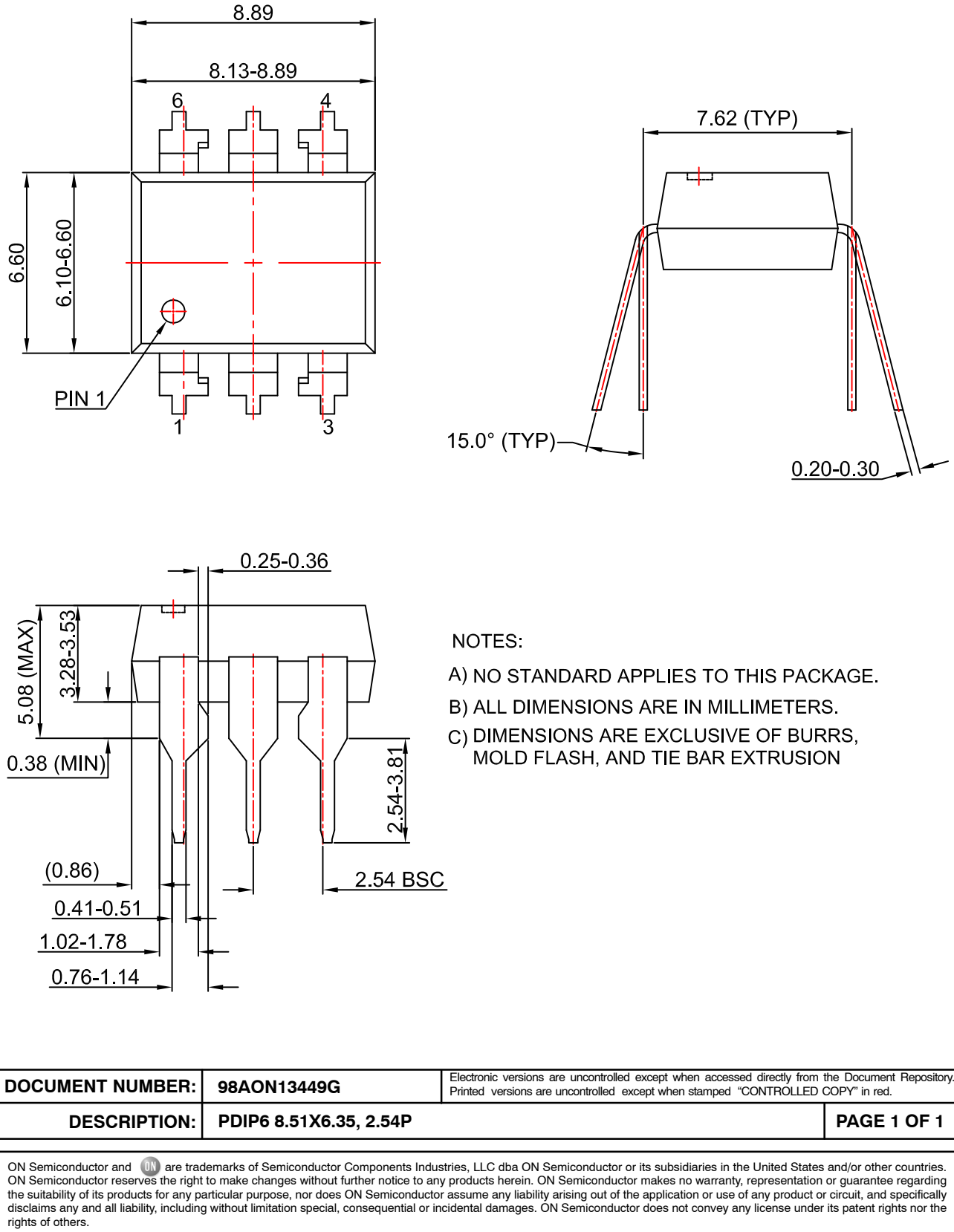

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MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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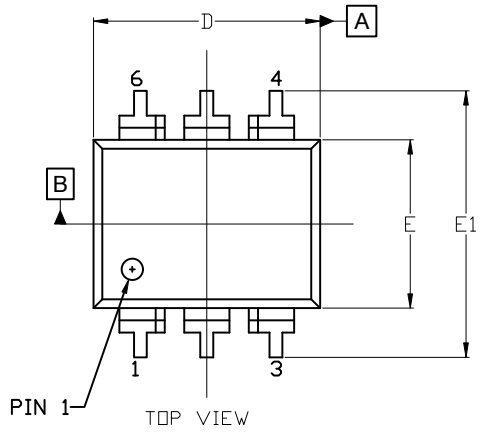

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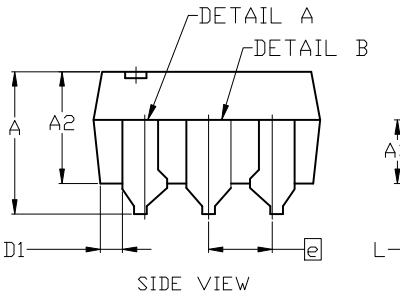
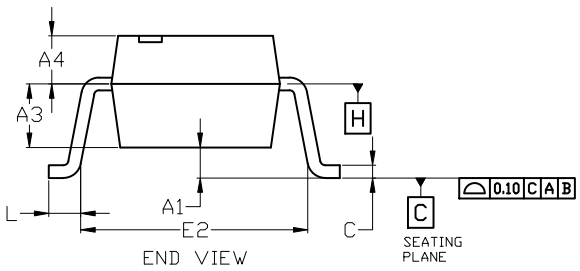
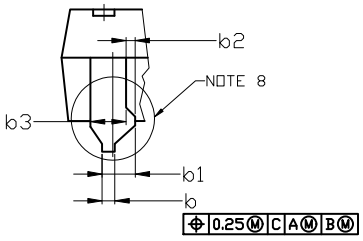
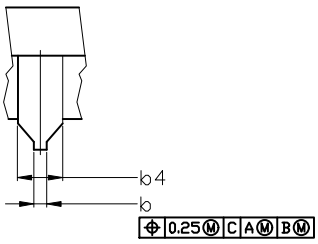
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS A, A1, AND L ARE MEASURED WITH THE PACKAGE SEATED.
4. DIMENSIONS D, D1, AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE NOT TO EXCEED 2.54mm.
5. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).
6. CENTER LINE OF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

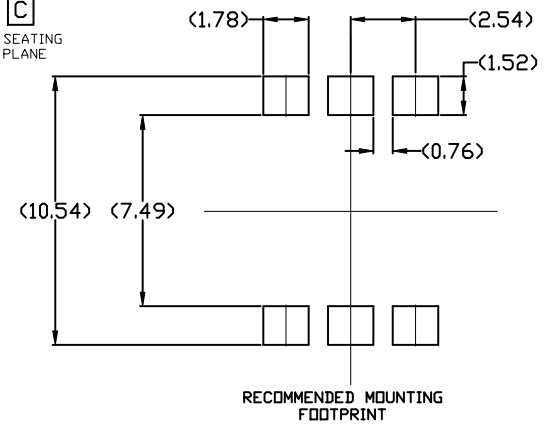
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	4.80
A1	0.38	---	---
A2	3.28	3.40	3.53
A3		2.49 REF	
A4		1.89 REF	
b	0.41	0.46	0.51
b1	0.76	0.92	1.14
b2	0.25	0.28	0.36
b3	1.02	1.40	1.78
b4		1.778 REF	
c	0.20	0.25	0.30
D	8.13	8.51	8.89
D1		0.86 REF	
E	6.10	6.35	6.60
E1	8.43	9.17	9.90
E2		8.13 REF	
e		2.54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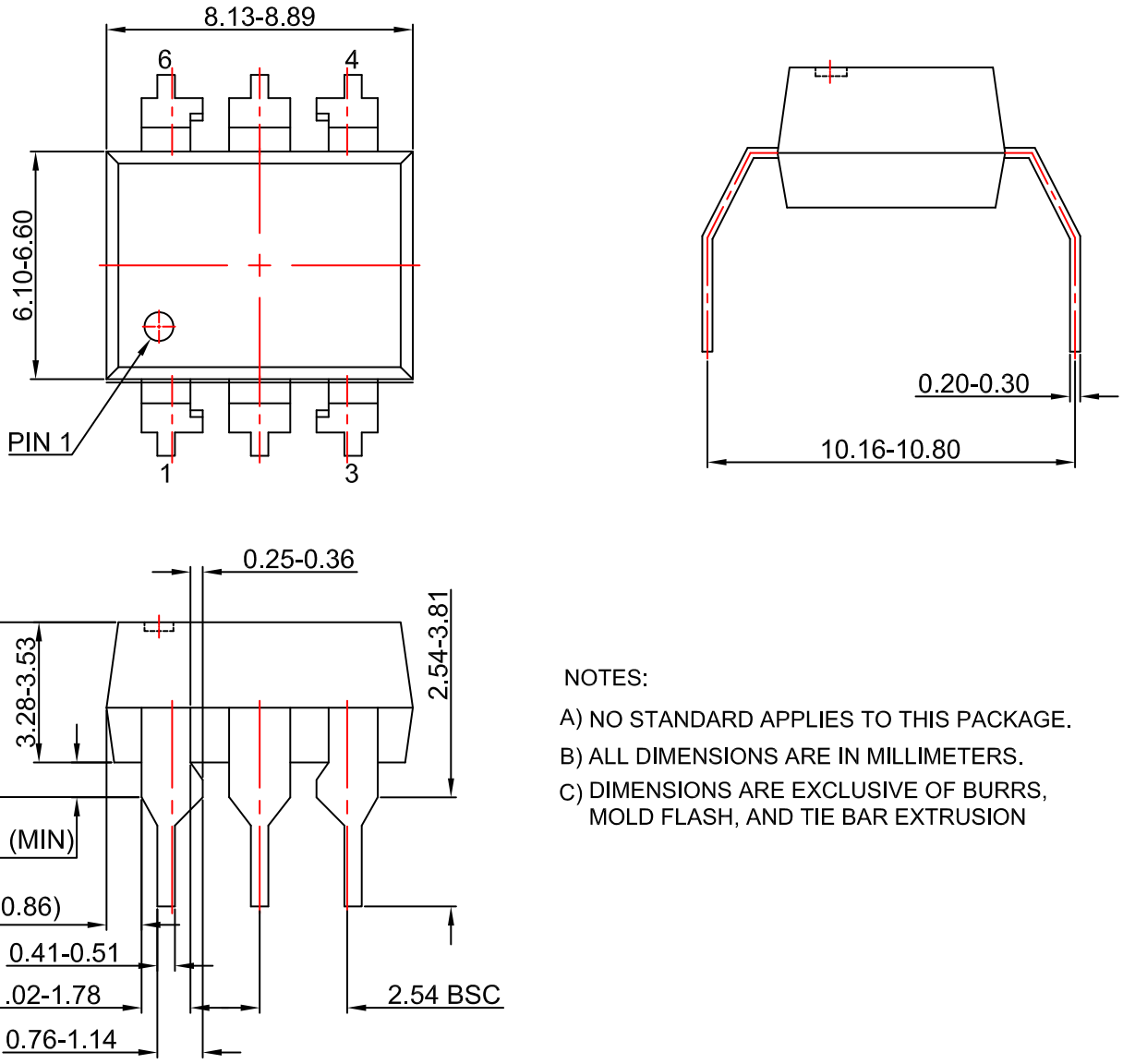

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