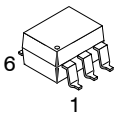
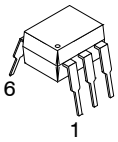
6-Pin DIP Phototransistor Optocouplers

H11AV1M, H11AV1AM



PDIP6 8.51x6.35, 2.54P
CASE 646BY



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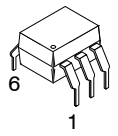
CASE 646BX



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CASE 646BZ

Description

The general purpose optocouplers consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6−pin dual in−line white package.

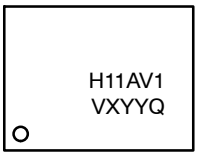
Features

- H11AV1M and H11AV1AM Feature 0.3” and 0.4” Input−Output Lead Spacing Respectively
- Safety and Regulatory Approvals:
  - UL1577, 4,170 VAC_{RMS} for 1 Minute
  - DIN−EN/IEC60747−5−5, 850 V Peak Working Insulation Voltage

Applications

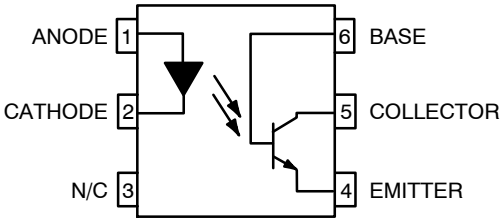
- Power Supply Regulators
- Digital Logic Inputs
- Microprocessor Inputs

MARKING DIAGRAM



H11AV1	= Specific Device Code
V	= DIN EN/IEC60747−5−5 Option (only appears on component ordered with this option)
X	= One−Digit Year Code
YY	= Digit Work Week
Q	= Assembly Package Code

SCHEMATIC



ORDERING INFORMATION

See detailed ordering and shipping information on page 7 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 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 (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	Parameter	Max	Unit
TOTAL DEVICE			
T_{STG}	Storage Temperature	−40 to +125	°C
T_{OPR}	Operating Temperature	−40 to +100	°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 @ T_A = 25°C	270	mW
	Derate Above 25°C	2.94	mW/°C
EMITTER			
I_F	DC / Average Forward Input Current	60	mA
V_R	Reverse Input Voltage	6	V
P_D	LED Power Dissipation @ T_A = 25°C	120	mW
	Derate Above 25°C	1.41	mW/°C
DETECTOR			
V_{CEO}	Collector−to−Emitter Voltage	70	V
V_{CBO}	Collector−to−Base Voltage	70	V
V_{ECO}	Emitter−to−Collector Voltage	7	V
P_D	Detector Power Dissipation @ T_A = 25°C	150	mW
	Derate Above 25°C	1.76	mW/°C

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 – INDIVIDUAL COMPONENT CHARACTERISTICS

(T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
EMITTER						
V_F	Input Forward Voltage (I_F = 10 mA)	T_A = 25°C	0.80	1.18	1.50	V
		T_A = −55°C	0.90	1.28	1.70	
		T_A = 100°C	0.70	1.05	1.40	
I_R	Reverse Leakage Current	V_R = 6.0 V	–	–	10	μA
DETECTOR						
BV_{CEO}	Collector−to−Emitter Breakdown Voltage	I_C = 1.0 mA, I_F = 0	70	100	–	V
BV_{CBO}	Collector−to−Base Breakdown Voltage	I_C = 100 μA, I_F = 0	70	1200	–	V
BV_{ECO}	Emitter−to−Collector Breakdown Voltage	I_E = 100 μA, I_F = 0	7	10	–	V
I_{CEO}	Collector−to−Emitter Dark Current	V_{CE} = 10 V, I_F = 0	–	1	50	nA
I_{CBO}	Collector−to−Base Dark Current	V_{CB} = 10 V	–	0.5	–	nA
C_{CE}	Capacitance	V_{CE} = 0 V, f = 1 MHz	–	8	–	pF

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.

ELECTRICAL CHARACTERISTICS – TRANSFER CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
DC CHARACTERISTIC						
CTR	Current Transfer Ratio, Collector−to−Emitter	I_F = 10 mA, V_{CE} = 10 V	100	–	300	%
$V_{CE\ (SAT)}$	Saturation Voltage, Collector−to−Emitter	I_C = 2 mA, I_F = 20 mA	–	–	0.4	V
AC CHARACTERISTIC						
T_{ON}	Non−Saturated Turn−on Time	I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 11)	–	–	15	μs
T_{OFF}	Non Saturated Turn−off Time	I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω (Figure 11)	–	–	15	μs

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.

ELECTRICAL CHARACTERISTICS – ISOLATION CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{ISO}	Input−Output Isolation Voltage	t = 1 Minute	4170	–	–	VAC_{RMS}
C_{ISO}	Isolation Capacitance	V_{I-O} = 0 V, f = 1 MHz	–	0.2	–	pF
R_{ISO}	Isolation Resistance	V_{I-O} = ±500 VDC, T_A = 25°C	1011	–	–	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.

TYPICAL PERFORMANCE CURVES

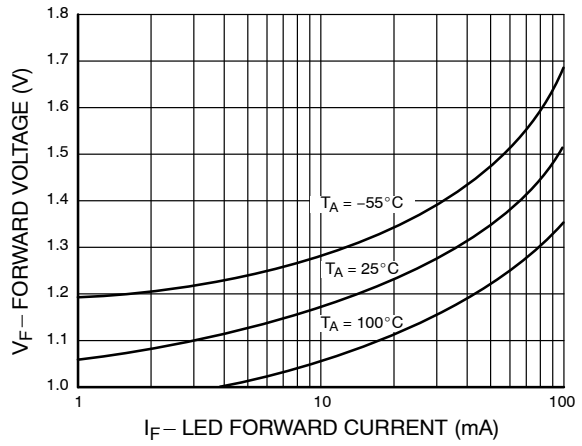


Figure 1. LED Forward Voltage vs. Forward Current

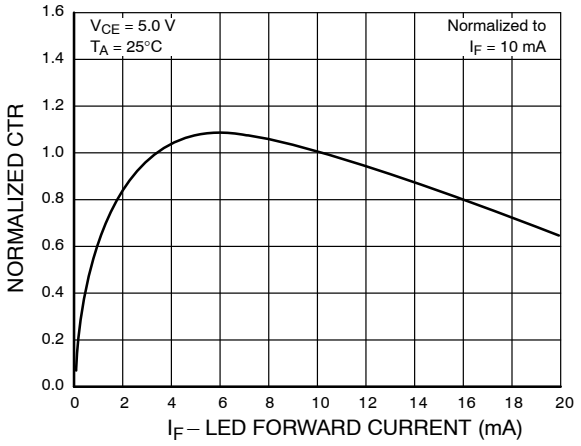


Figure 2. Normalized CTR vs. Forward Current

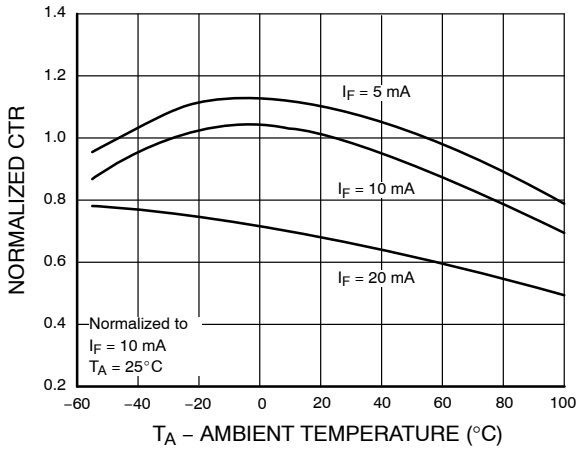


Figure 3. Normalized CTR vs. Ambient Temperature

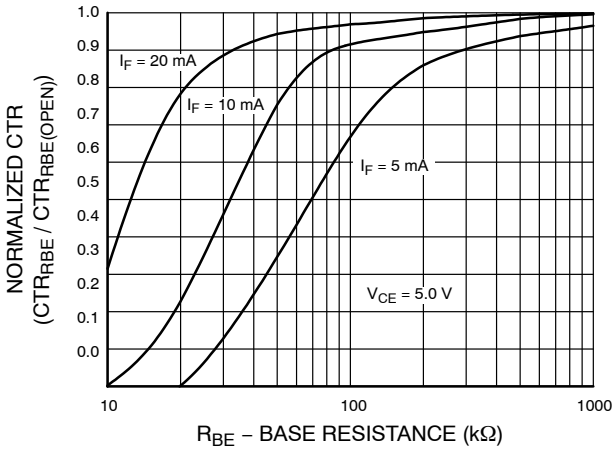


Figure 4. CTR vs. RBE (Unsaturated)

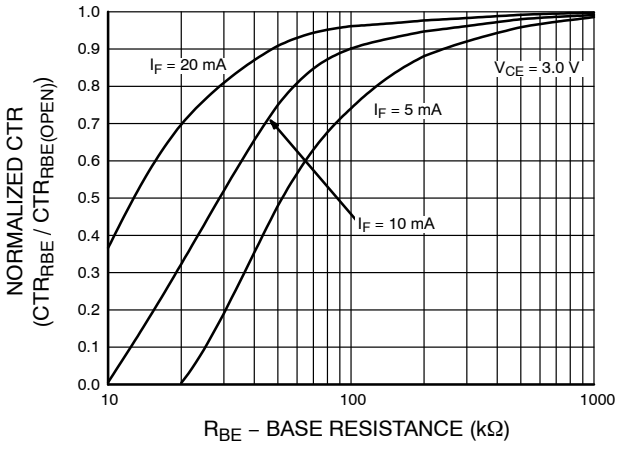


Figure 5. CTR vs. RBE (Saturated)

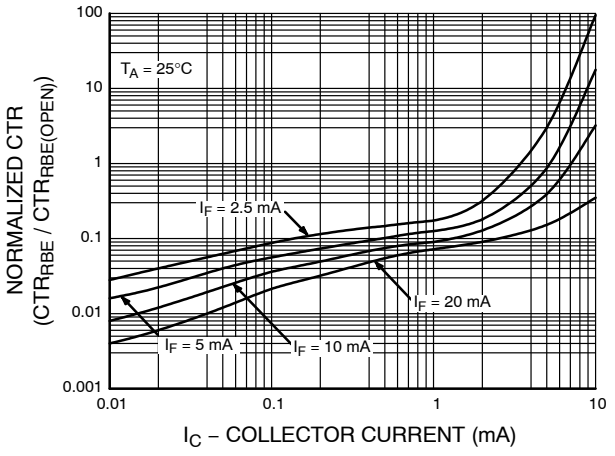


Figure 6. Collector–Emitter Saturation Voltage vs. Collector Current

TYPICAL PERFORMANCE CURVES (continued)

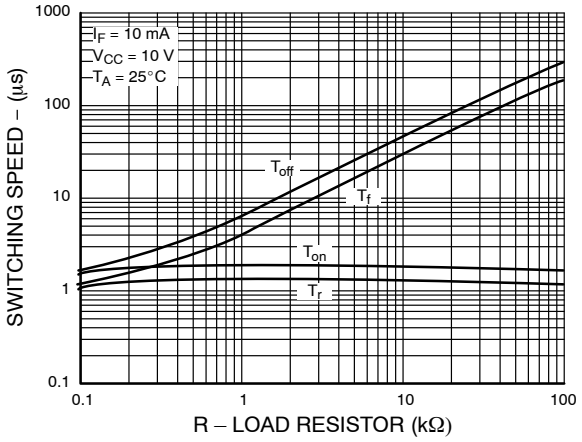


Figure 7. Switching Speed vs. Load Resistor

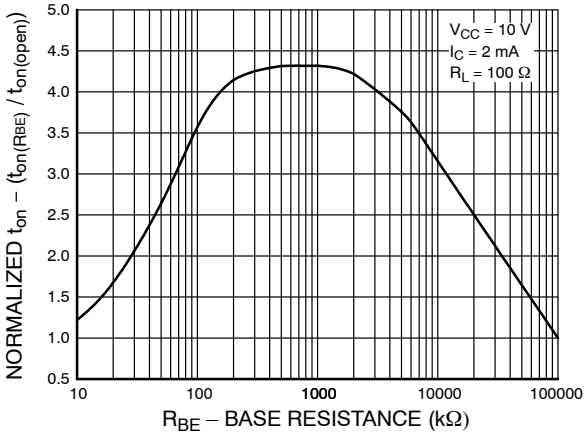


Figure 8. Normalized ton vs. RBE

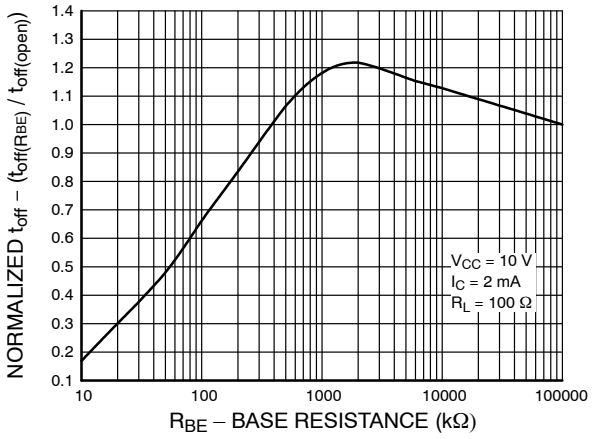


Figure 9. Normalized toff vs. RBE

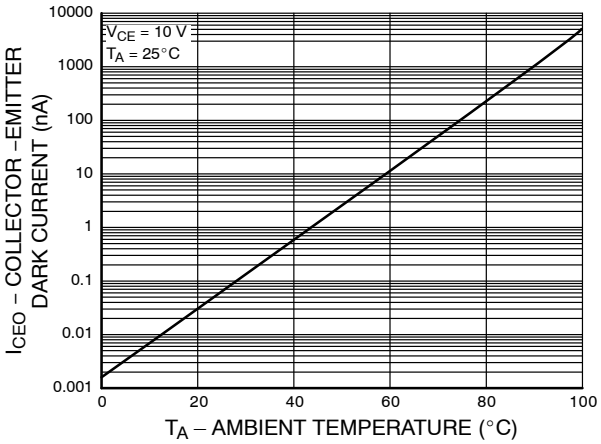


Figure 10. Dark Current vs. Ambient Temperature

SWITCHING TIME TEST CIRCUIT AND WAVEFORM

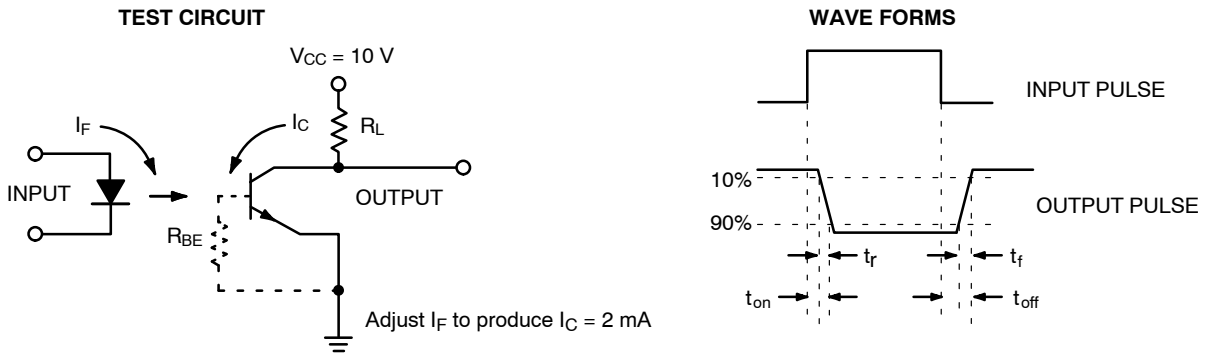
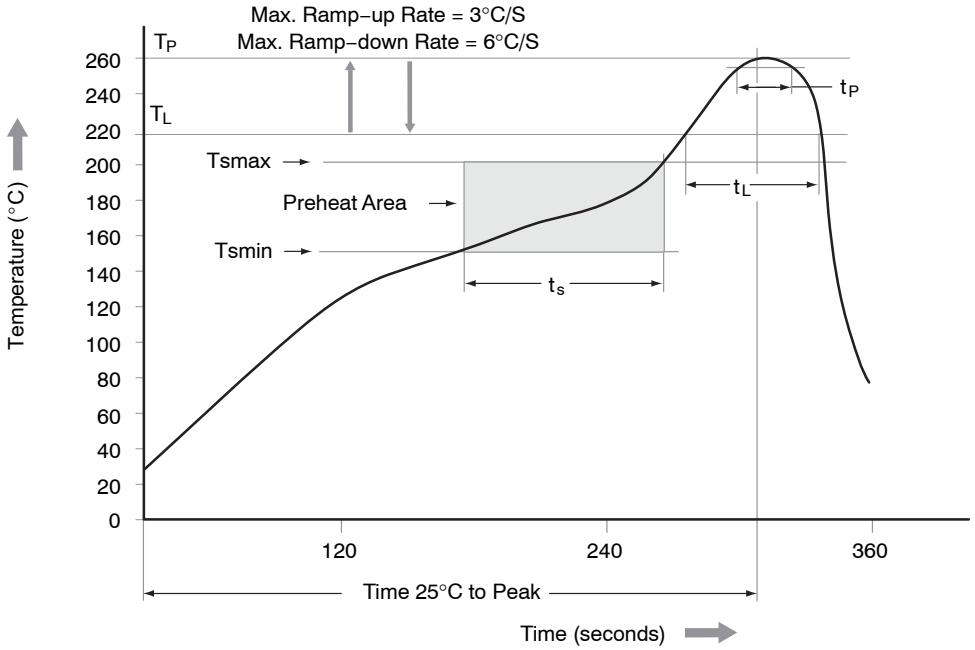


Figure 11. Switching Time Test Circuit and Waveform

REFLOW PROFILE



Profile Feature	Pb−Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t_S) from (Tsmin to Tsmax)	60–120 seconds
Ramp−up Rate (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / −5°C
Time (t_P) within 5°C of 260°C	30 seconds
Ramp−down Rate (T_P to T_L)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

Figure 12. Reflow Profile

ORDERING INFORMATION

Part Number	Package	Shipping†
H11AV1M	DIP 6−Pin	50 Units / Tube
H11AV1SM	SMT 6−Pin (Lead Bend)	50 Units / Tube
H11AV1SR2M	SMT 6−Pin (Lead Bend)	1000 / Tape & Reel
H11AV1VM	DIP 6−Pin, DIN EN/IEC60747−5−5 Option	50 Units / Tube
H11AV1SVM	SMT 6−Pin (Lead Bend), DIN EN/IEC60747−5−5 Option	50 Units / Tube
H11AV1SR2VM	SMT 6−Pin (Lead Bend), DIN EN/IEC60747−5−5 Option	1000 / Tape & Reel
H11AV1AM	DIP 6−Pin, 0.4” Lead Spacing	50 Units / Tube
H11AV1AVM	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.

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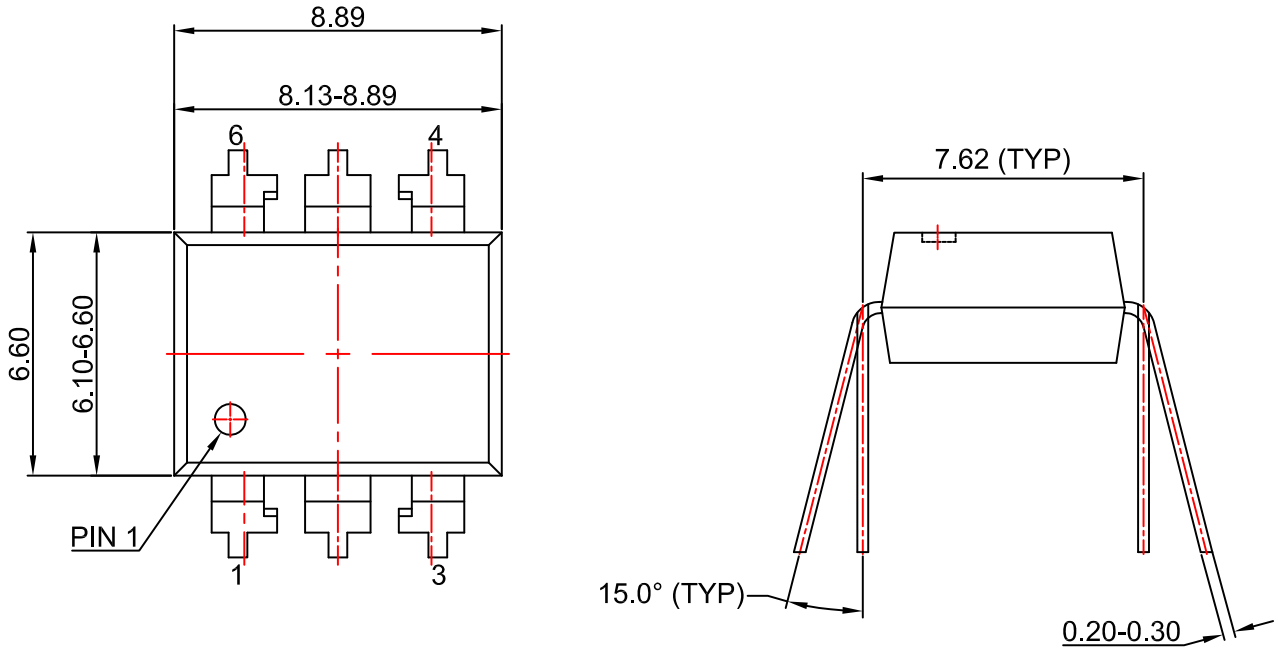

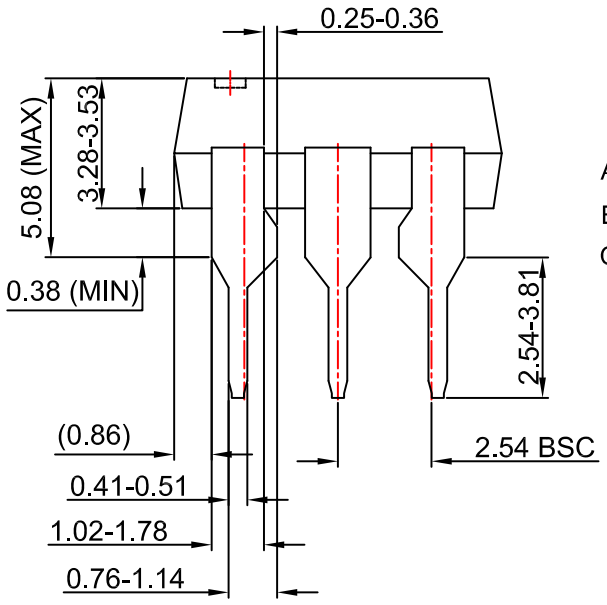

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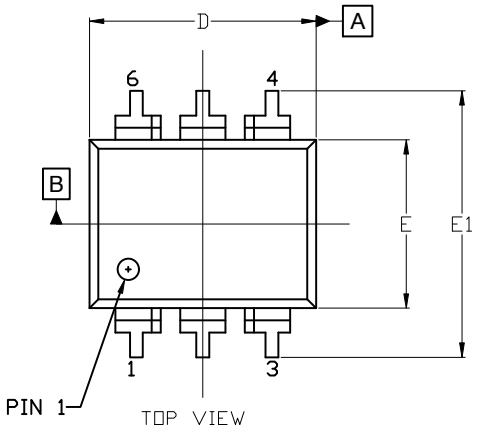

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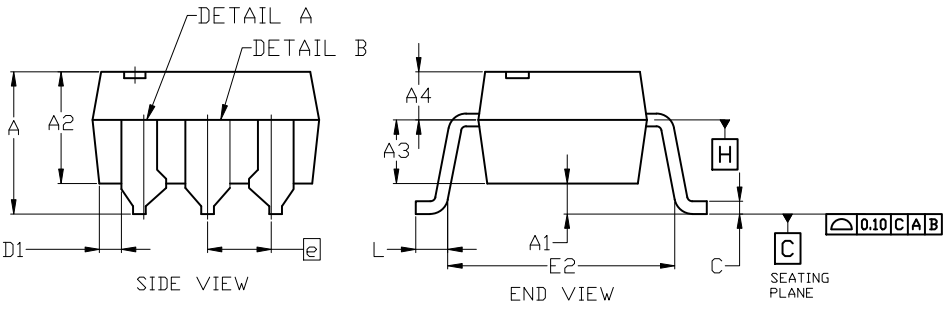
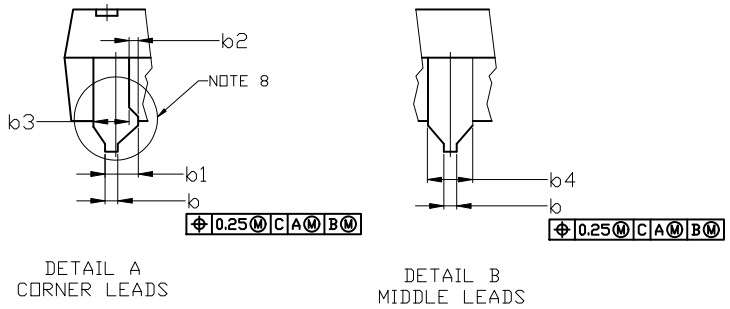
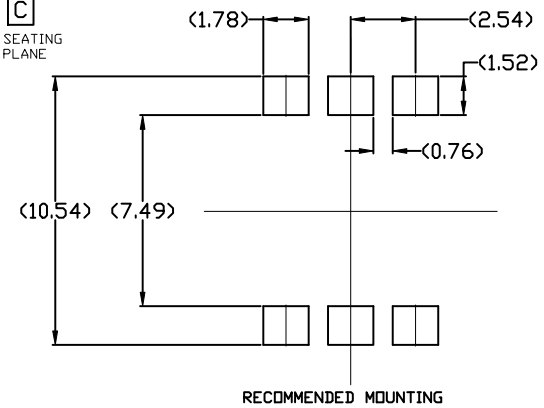
5. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).
6. CENTER LINE OF CORNER LEADS ARE LOCATED BY LOCATING THE CENTER OF FEATURE b2 AND b3.

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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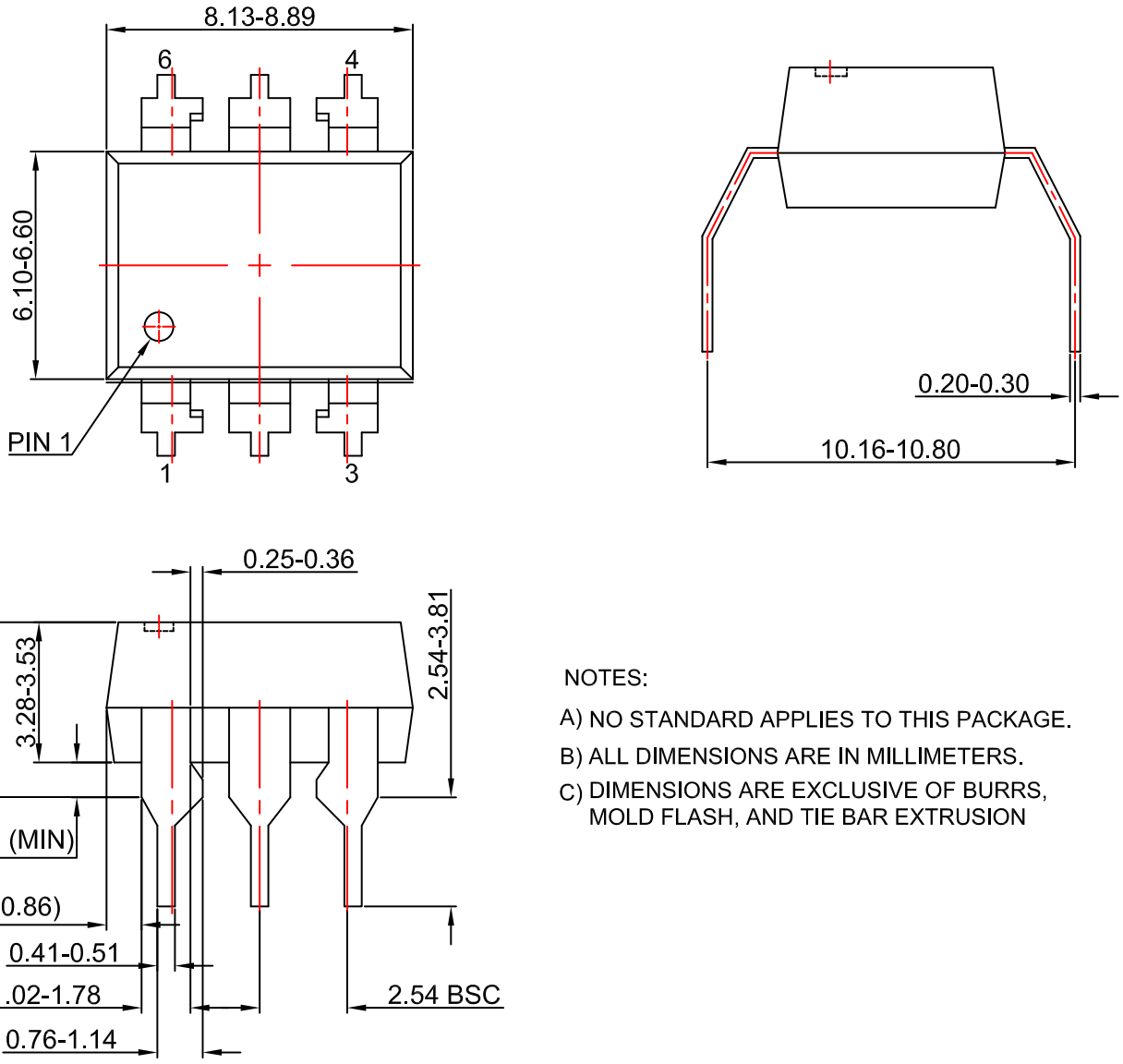

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