

# 6-Pin DIP High Voltage Photodarlington Optocouplers

## H11G1M, H11G2M

### Description

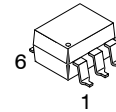
The H11G1M and H11G2M are photodarlington-type optically coupled optocouplers. These devices have a gallium arsenide infrared emitting diode coupled with a silicon darlington connected phototransistor which has an integral base-emitter resistor to optimize elevated temperature characteristics.

### Features

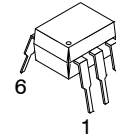
- High  $BV_{CEO}$ :
  - ♦ 100 V Minimum for H11G1M
  - ♦ 80 V Minimum for H11G2M
- High Sensitivity to Low Input Current (Minimum 500% CTR at  $I_F = 1$  mA)
- Low Leakage Current at Elevated Temperature (Maximum 100  $\mu$ A at 80°C)
- Safety and Regulatory Approvals:
  - ♦ UL1577, 4,170 VAC<sub>RMS</sub> for 1 Minute
  - ♦ DIN-EN/IEC60747-5-5, 850 V Peak Working Insulation Voltage

### Application

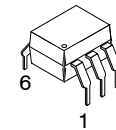
- CMOS Logic Interface
- Telephone Ring Detector
- Low Input TTL Interface
- Power Supply Isolation
- Replace Pulse Transformer



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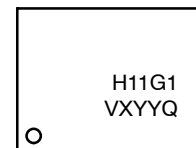


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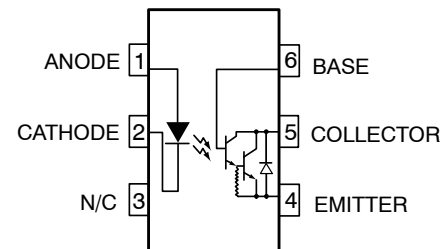
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### MARKING DIAGRAM



- H11G1 = 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 6 of this data sheet.

# H11G1M, H11G2M

## 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 <sub>RMS</sub>	I-IV
	<300 V <sub>RMS</sub>	I-IV
Climatic Classification		55/100/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V <sub>PR</sub>	Input-to-Output Test Voltage, Method A, V <sub>IORM</sub> × 1.6 = V <sub>PR</sub> , Type and Sample Test with t <sub>m</sub> = 10 s, Partial Discharge < 5 pC	1360	V <sub>peak</sub>
	Input-to-Output Test Voltage, Method B, V <sub>IORM</sub> × 1.875 = V <sub>PR</sub> , 100% Production Test with t <sub>m</sub> = 1 s, Partial Discharge < 5 pC	1594	V <sub>peak</sub>
V <sub>IORM</sub>	Maximum Working Insulation Voltage	850	V <sub>peak</sub>
V <sub>IOTM</sub>	Highest Allowable Over-Voltage	6000	V <sub>peak</sub>
	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 <sub>S</sub>	Case Temperature (Note 1)	175	°C
I <sub>S,INPUT</sub>	Input Current (Note 1)	350	mA
P <sub>S,OUTPUT</sub>	Output Power (Note 1)	800	mW
R <sub>IO</sub>	Insulation Resistance at T <sub>S</sub> , V <sub>IO</sub> = 500 V (Note 1)	>10 <sup>9</sup>	Ω

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

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Max	Unit
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### TOTAL DEVICE

T <sub>STG</sub>	Storage Temperature	-40 to +125	°C
T <sub>OPR</sub>	Operating Temperature	-40 to +100	°C
T <sub>J</sub>	Junction Temperature	-40 to +125	°C
T <sub>SOL</sub>	Lead Solder Temperature	260 for 10 seconds	°C
P <sub>D</sub>	Total Device Power Dissipation @ T <sub>A</sub> = 25°C	290	mW
	Derate Above 25°C	3.5	mW/°C

### EMITTER

I <sub>F</sub>	DC / Average Forward Input Current	60	mA
V <sub>R</sub>	Reverse Input Voltage	6.0	V
I <sub>F(pk)</sub>	Forward Current – Peak (1 μs pulse, 300 pps)	3.0	A
P <sub>D</sub>	LED Power Dissipation @ T <sub>A</sub> = 25°C	90	mW
	Derate Above 25°C	1.8	mW/°C

### DETECTOR

V <sub>CEO</sub>	Collector Emitter Voltage	H11G1M	100	V
		H11G2M	80	V
P <sub>D</sub>	Photodetector Power Dissipation @ T <sub>A</sub> = 25°C		200	mW
	Derate Above 25°C		2.67	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.

# H11G1M, H11G2M

## ELECTRICAL CHARACTERISTICS – INDIVIDUAL COMPONENT CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>EMITTER</b>						
V <sub>F</sub>	Forward Voltage	I <sub>F</sub> = 10 mA	–	1.3	1.5	V
ΔV <sub>F</sub> /ΔT <sub>A</sub>	Forward Voltage Temperature Coefficient		–	–1.8	–	mV/°C
BV <sub>R</sub>	Reverse Breakdown Voltage	I <sub>R</sub> = 10 μA	3.0	25	–	V
C <sub>J</sub>	Junction Capacitance	V <sub>F</sub> = 0 V, f = 1 MHz	–	50	–	pF
		V <sub>F</sub> = 1 V, f = 1 MHz	–	65	–	pF
I <sub>R</sub>	Reverse Leakage Current	V <sub>R</sub> = 3.0 V	–	0.001	10	μA

## DETECTOR

BV <sub>CEO</sub>	Breakdown Voltage Collector to Emitter	H11G1M	I <sub>C</sub> = 1.0 mA, I <sub>F</sub> = 0	100	–	–	V
		H11G2M		80	–	–	V
BV <sub>CBO</sub>	Collector to Base	H11G1M	I <sub>C</sub> = 100 μA	100	–	–	V
		H11G2M		80	–	–	V
BV <sub>EBO</sub>	Emitter Base			7	10	–	V
I <sub>CEO</sub>	Leakage Current Collector to Emitter	H11G1M	V <sub>CE</sub> = 80 V, I <sub>F</sub> = 0	–	–	100	nA
		H11G2M	V <sub>CE</sub> = 60 V, I <sub>F</sub> = 0	–	–	100	nA
		H11G1M	V <sub>CE</sub> = 80 V, I <sub>F</sub> = 0, T <sub>A</sub> = 80°C	–	–	100	μA
		H11G2M	V <sub>CE</sub> = 60 V, I <sub>F</sub> = 0, T <sub>A</sub> = 80°C	–	–	100	μA

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<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>EMITTER</b>						
CTR	Current Transfer Ratio, Collector to Emitter	I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 1 V	100 (1000)	–	–	mA (%)
		I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V	5 (500)	–	–	mA (%)
V <sub>CE</sub> (SAT)	Saturation Voltage	I <sub>F</sub> = 16 mA, I <sub>C</sub> = 50 mA,	–	0.85	1.0	V
		I <sub>F</sub> = 1 mA, I <sub>C</sub> = 1 mA,	–	0.75	1.0	V

## SWITCHING TIMES

t <sub>ON</sub>	Turn on Time	R <sub>L</sub> = 100 Ω, I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 5 V, f ≤ 30 Hz, Pulse Width ≤ 300 μs	–	5	–	μs
t <sub>OFF</sub>	Turn off Time		–	100	–	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<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V <sub>ISO</sub>	Input–Output Isolation Voltage	t = 1 Minute	4170	–	–	VAC <sub>RMS</sub>
C <sub>ISO</sub>	Isolation Capacitance	V <sub>I-O</sub> = 0 V, f = 1 MHz	–	0.2	–	pF
R <sub>ISO</sub>	Isolation Resistance	V <sub>I-O</sub> = ±500 VDC, T <sub>A</sub> = 25°C	10 <sup>11</sup>	–	–	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

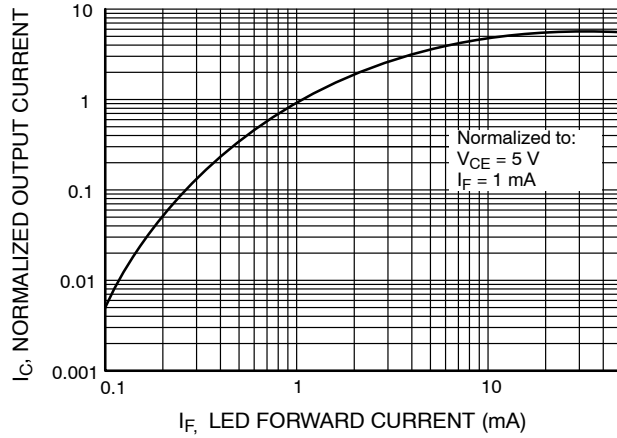


Figure 1. Output Current vs. Input Current

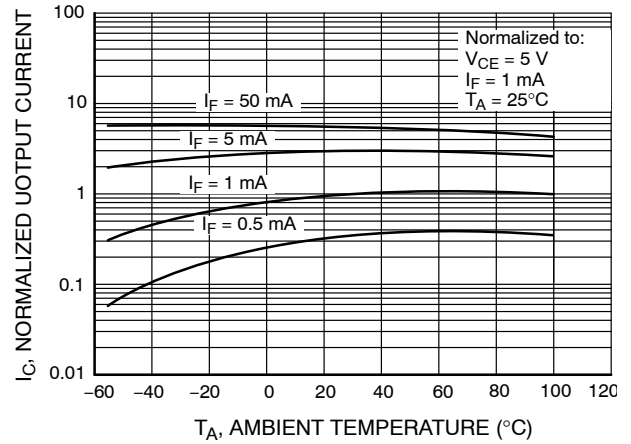


Figure 2. Normalized Output Current vs. Temperature

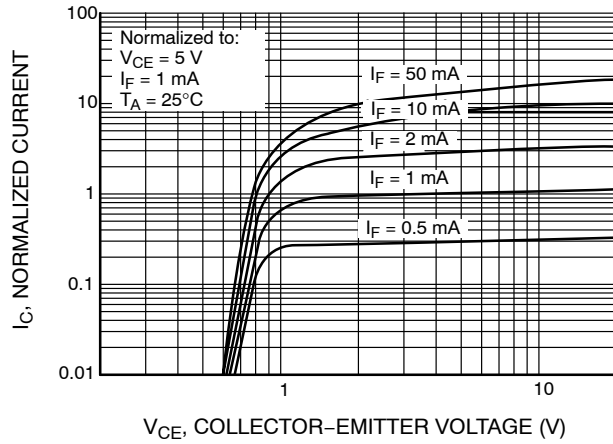


Figure 3. Output Current vs. Collector-Emitter Voltage

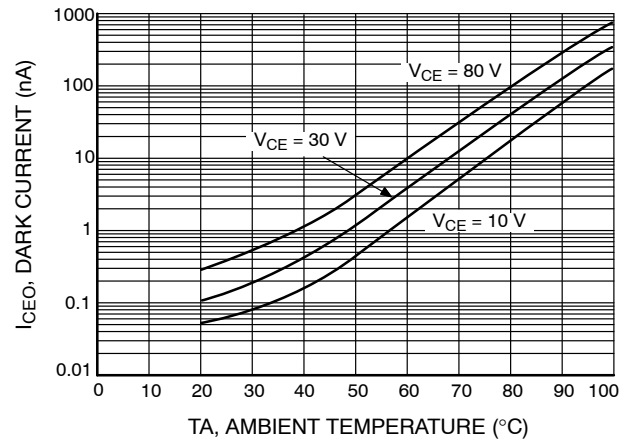


Figure 4. Collector-Emitter Dark Current vs. Ambient Temperature

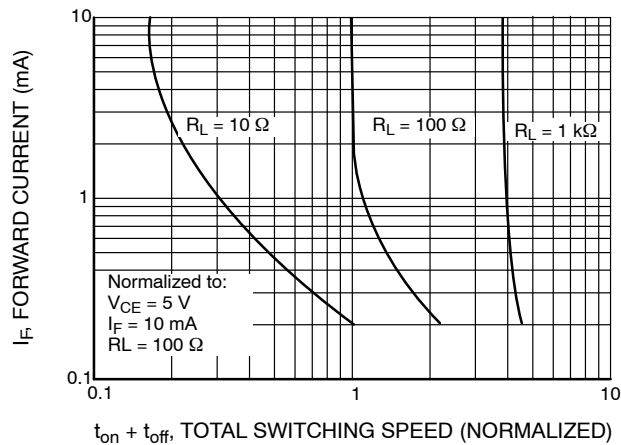
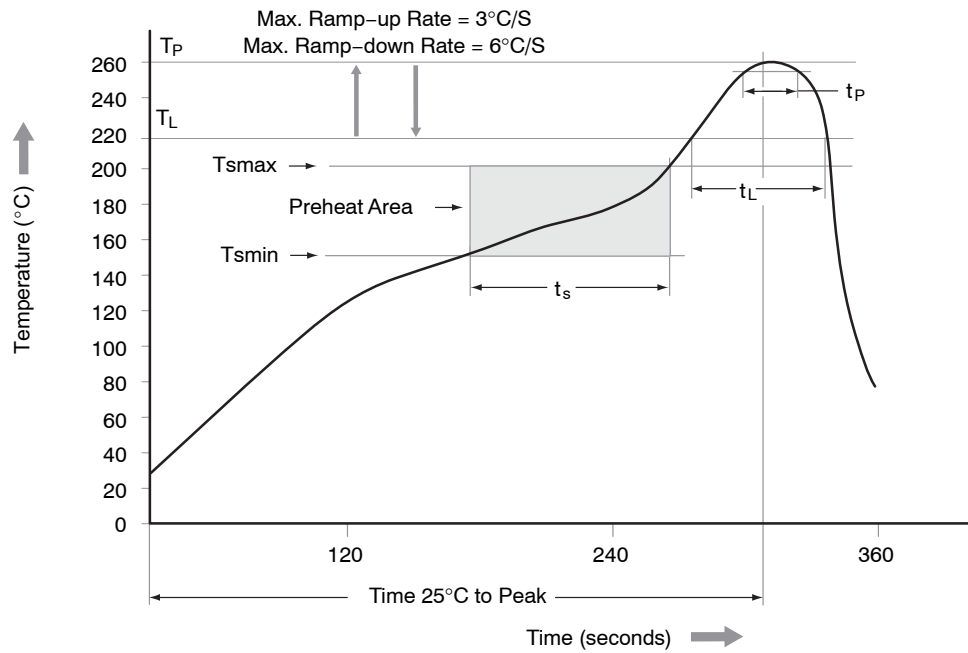


Figure 5. Input Current vs. Total Switching Speed (Typical Values)

# H11G1M, H11G2M

## REFLOW PROFILE



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	150°C
Temperature Max. (T <sub>smax</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60–120 seconds
Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60–150 seconds
Peak Body Package Temperature	260°C +0°C / –5°C
Time (t <sub>P</sub> ) within 5°C of 260°C	30 seconds
Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

Figure 6. Reflow Profile

## H11G1M, H11G2M

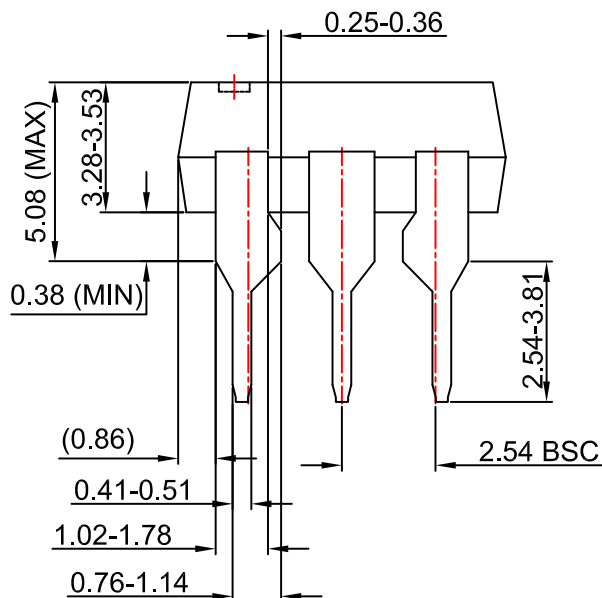
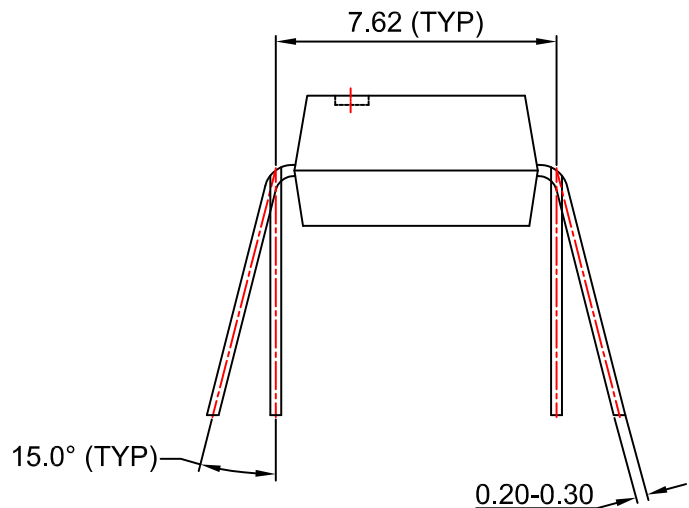
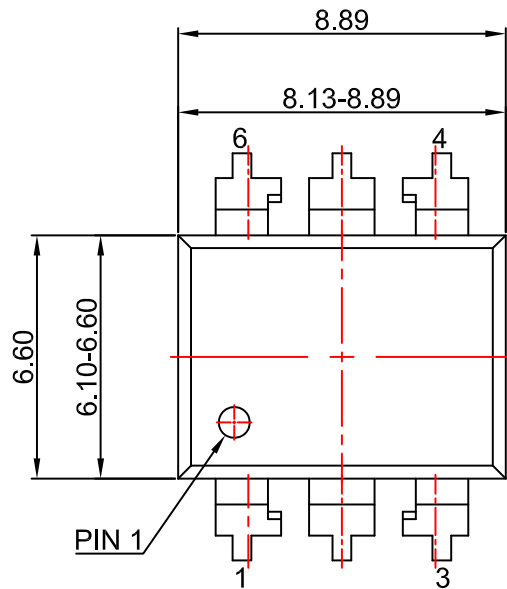
### ORDERING INFORMATION

Part Number	Package	Shipping <sup>†</sup>
H11G1M	DIP 6-Pin	50 Units / Tube
H11G1SM	SMT 6-Pin (Lead Bend)	50 Units / Tube
H11G1SR2M	SMT 6-Pin (Lead Bend)	1000 / Tape & Reel
H11G1VM	DIP 6-Pin, DIN EN/IEC60747-5-5 Option	50 Units / Tube
H11G1SVM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	50 Units / Tube
H11G1SR2VM	SMT 6-Pin (Lead Bend), DIN EN/IEC60747-5-5 Option	1000 / Tape & Reel
H11G1TVM	DIP 6-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-5 Option	50 Units / Tube

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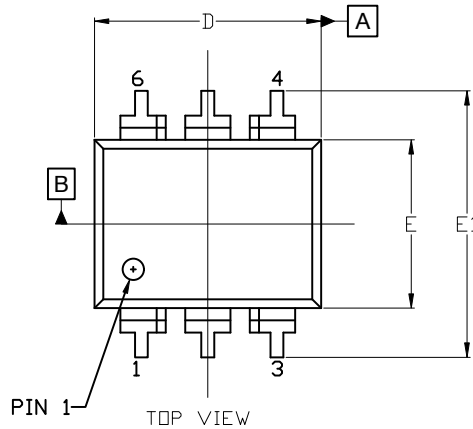
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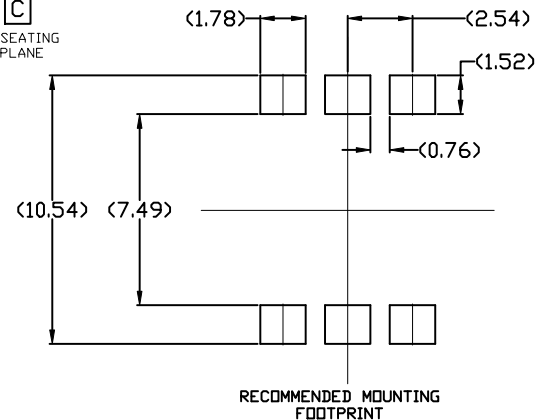
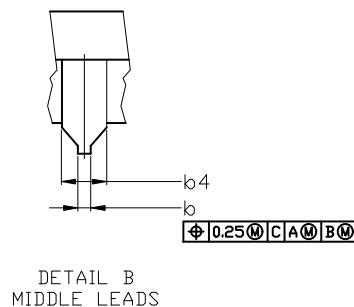
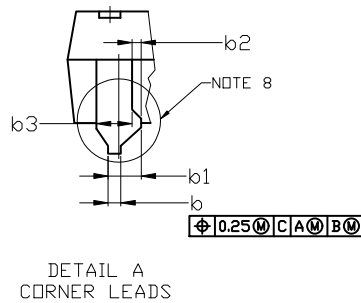
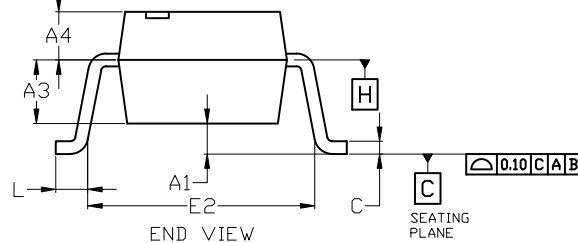
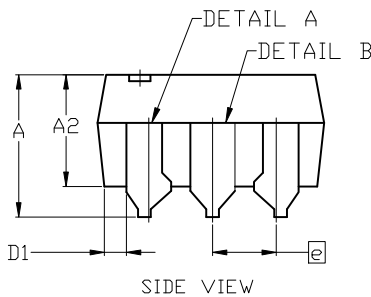
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5. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).
6. CENTER LINE OF CORNER LEADS IS LOCATED BY LOCATING THE CENTER OF FEATURE b2 AND b3.

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, SOLDERM/D.

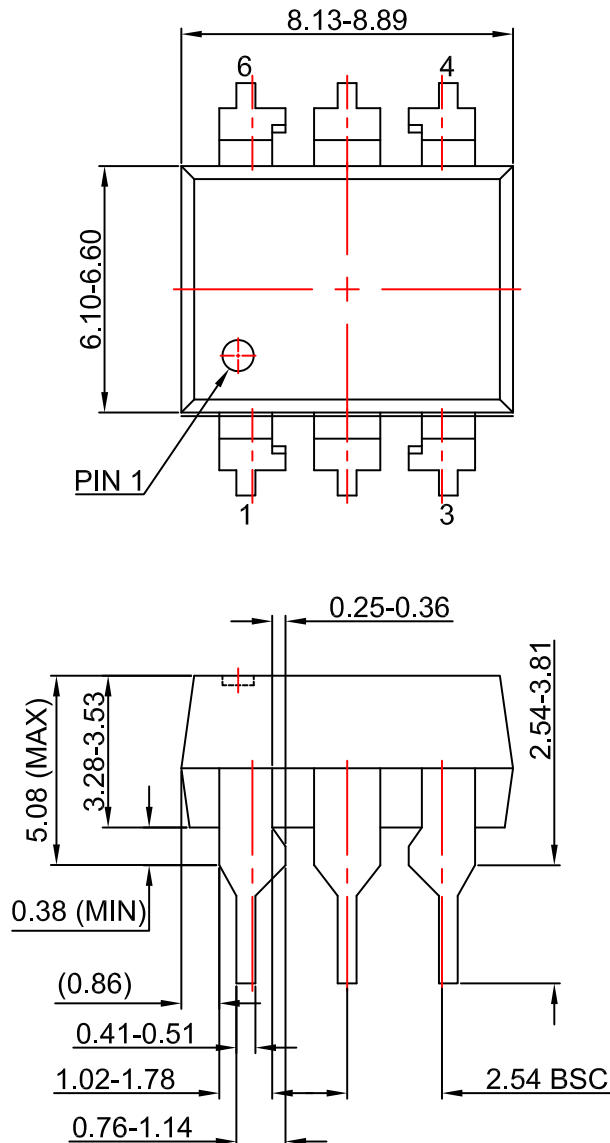
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