6-Pin DIP High Voltage Photodarlington Optocouplers

H11G1M, H11G2M

ON Semiconductor®

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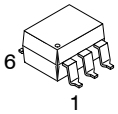
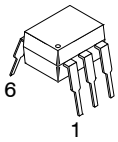


PDIP6 8.51x6.35, 2.54P
CASE 646BY



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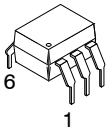
CASE 646BX



PDIP6 8.51x6.35, 2.54P
CASE 646BZ

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.

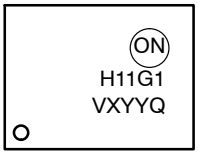
Features

- 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 μA at 80°C)
- Safety and Regulatory Approvals:
  - UL1577, 4,170 VAC_{RMS} for 1 Minute
  - DIN−EN/IEC60747−5−5, 850 V Peak Working Insulation Voltage

Application

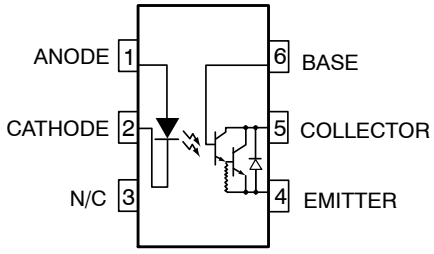
- CMOS Logic Interface
- Telephone Ring Detector
- Low Input TTL Interface
- Power Supply Isolation
- Replace Pulse Transformer

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.

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	290	mW
	Derate Above 25°C	3.5	mW/°C
EMITTER			
I_F	DC / Average Forward Input Current	60	mA
V_R	Reverse Input Voltage	6.0	V
I_F(pk)	Forward Current − Peak (1 μs pulse, 300 pps)	3.0	A
P_D	LED Power Dissipation @ T_A = 25°C	90	mW
	Derate Above 25°C	1.8	mW/°C
DETECTOR			
V_{CEO}	Collector Emitter Voltage H11G1M	100	V
	Collector Emitter Voltage H11G2M	80	V
P_D	Photodetector Power Dissipation @ T_A = 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.

ELECTRICAL CHARACTERISTICS – INDIVIDUAL COMPONENT CHARACTERISTICS

(T_A = 25°C unless otherwise noted)

Symbol	Parameter		Test Conditions	Min	Typ	Max	Unit
EMITTER							
V_F	Forward Voltage		I_F = 10 mA	–	1.3	1.5	V
$\Delta V_F/\Delta T_A$	Forward Voltage Temperature Coefficient			–	−1.8	–	mV/°C
BV_R	Reverse Breakdown Voltage		I_R = 10 μA	3.0	25	–	V
C_J	Junction Capacitance		V_F = 0 V, f = 1 MHz	–	50	–	pF
			V_F = 1 V, f = 1 MHz	–	65	–	pF
I_R	Reverse Leakage Current		V_R = 3.0 V	–	0.001	10	μA
DETECTOR							
BV_{CEO}	Breakdown Voltage Collector to Emitter	H11G1M	I_C = 1.0 mA, I_F = 0	100	–	–	V
		H11G2M		80	–	–	V
BV_{CBO}	Collector to Base	H11G1M	I_C = 100 μA	100	–	–	V
		H11G2M		80	–	–	V
BV_{EBO}	Emitter Base			7	10	–	V
I_{CEO}	Leakage Current Collector to Emitter	H11G1M	V_{CE} = 80 V, I_F = 0	–	–	100	nA
		H11G2M	V_{CE} = 60 V, I_F = 0	–	–	100	nA
		H11G1M	V_{CE} = 80 V, I_F = 0, T_A = 80°C	–	–	100	μA
		H11G2M	V_{CE} = 60 V, I_F = 0, T_A = 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_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
EMITTER						
CTR	Current Transfer Ratio, Collector to Emitter	I_F = 10 mA, V_{CE} = 1 V	100 (1000)	–	–	mA (%)
		I_F = 1 mA, V_{CE} = 5 V	5 (500)	–	–	mA (%)
$V_{CE\ (SAT)}$	Saturation Voltage	I_F = 16 mA, I_C = 50 mA,	–	0.85	1.0	V
		I_F = 1 mA, I_C = 1 mA,	–	0.75	1.0	V
SWITCHING TIMES						
t_{ON}	Turn on Time	R_L = 100 Ω, I_F = 10 mA, V_{CE} = 5 V, f ≤ 30 Hz, Pulse Width ≤ 300 μs	–	5	–	μs
t_{OFF}	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_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	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.

TYPICAL PERFORMANCE CURVES

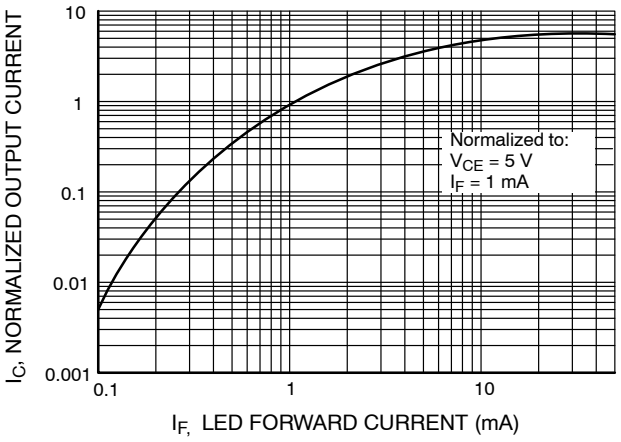


Figure 1. Output Current vs. Input Current

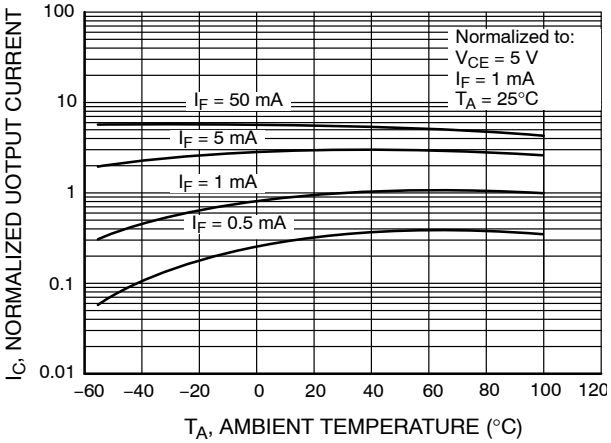


Figure 2. Normalized Output Current vs. Temperature

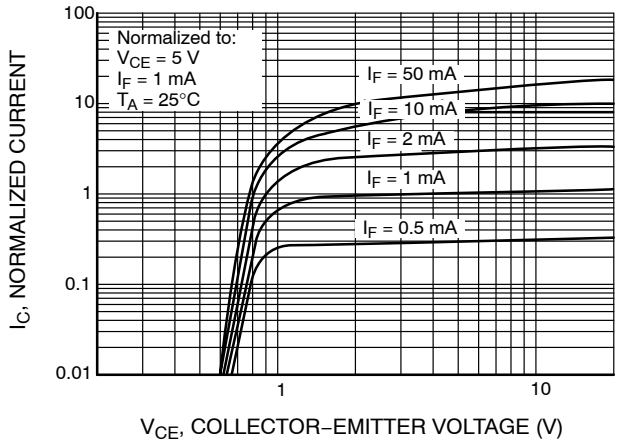


Figure 3. Output Current vs. Collector−Emitter Voltage

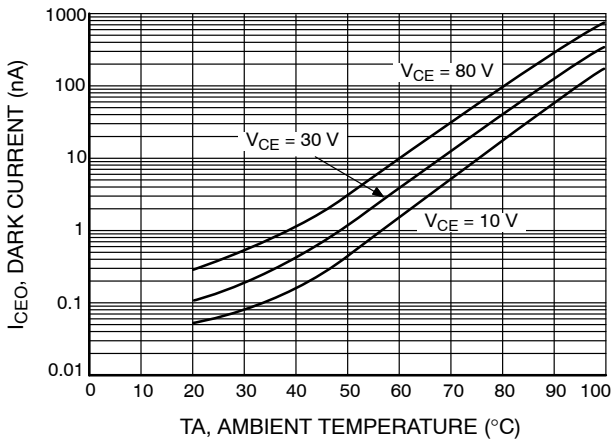


Figure 4. Collector−Emitter Dark Current vs. Ambient Temperature

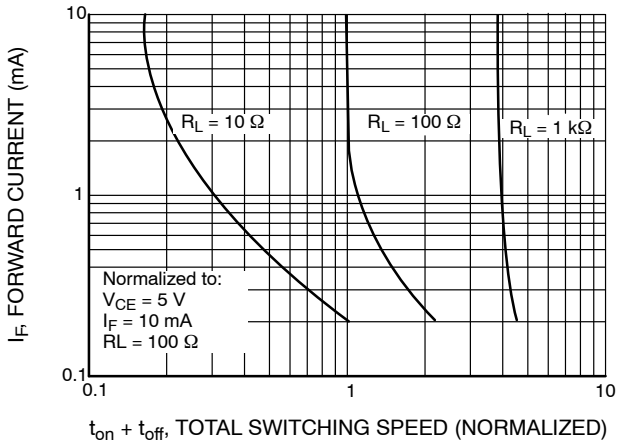
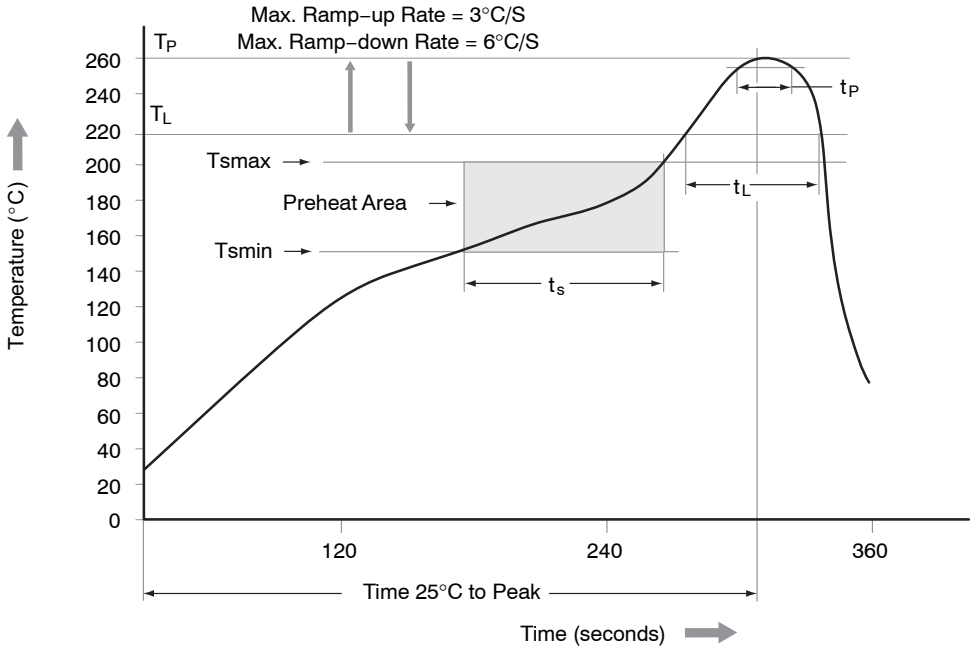


Figure 5. Input Current vs. Total Switching Speed (Typical Values)

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 6. Reflow Profile

ORDERING INFORMATION

Part Number	Package	Shipping†
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

†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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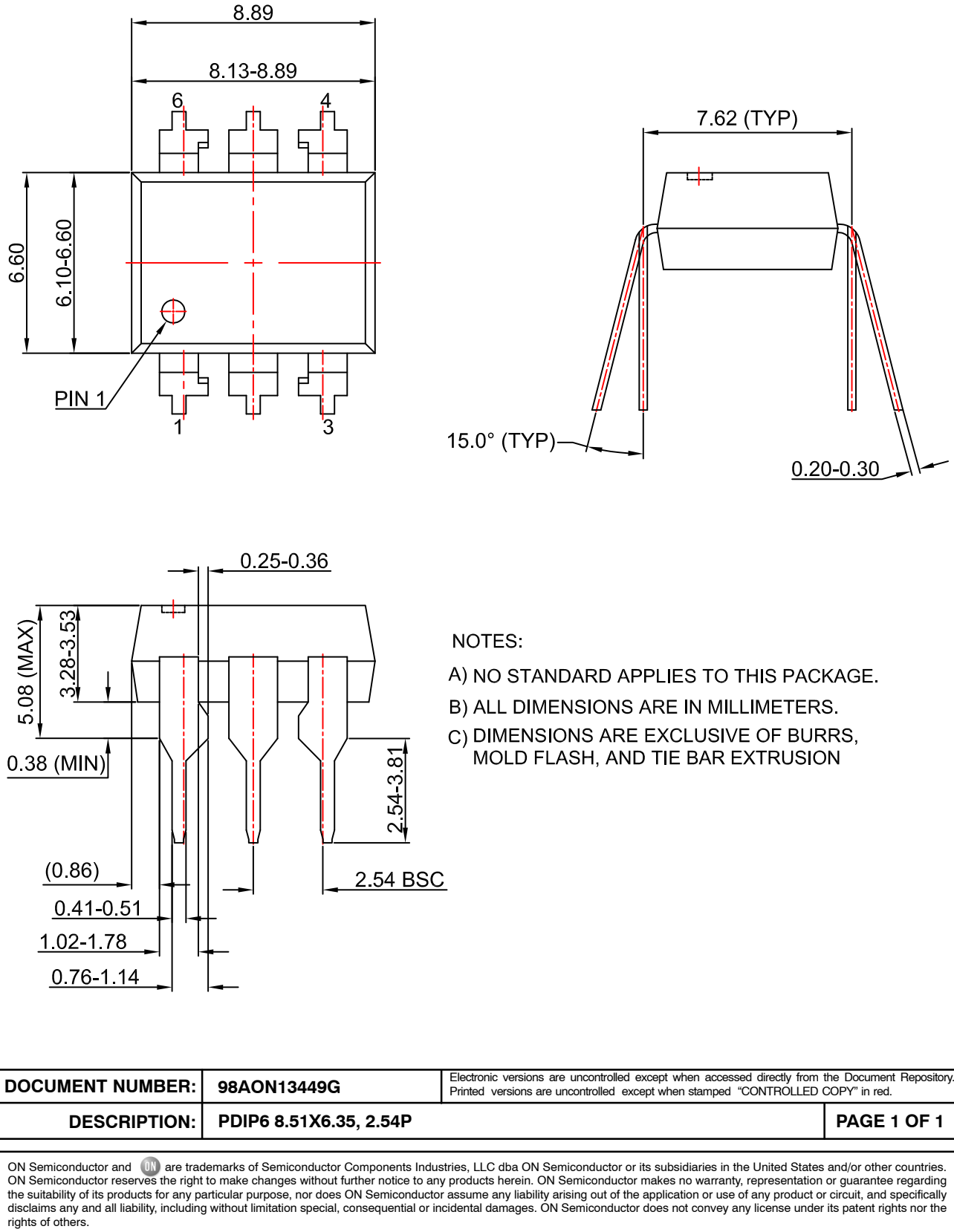
CASE 646BX
ISSUE O

DATE 31 JUL 2016



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MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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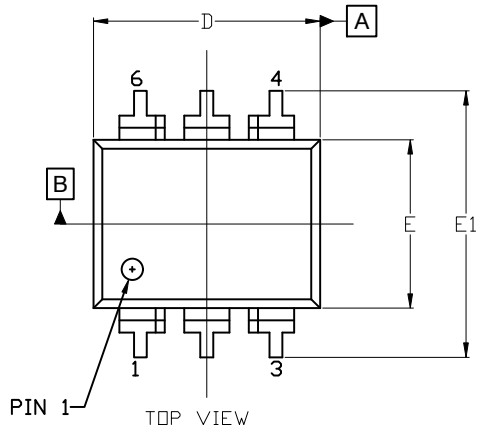
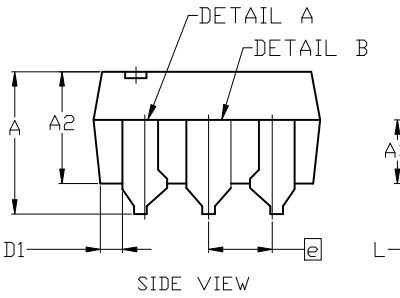
PDIP6 8.51x6.35, 2.54P
CASE 646BY
ISSUE A

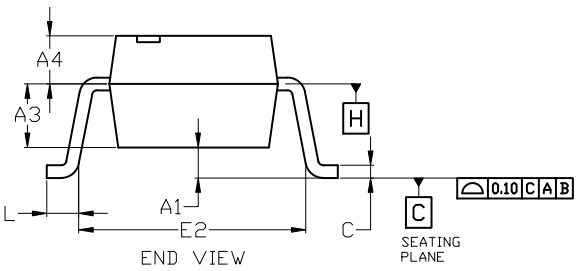
DATE 15 JUL 2019

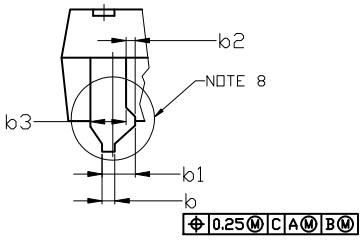


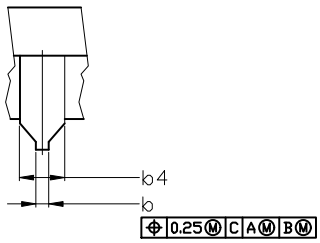
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS A, A1, AND L ARE MEASURED WITH THE PACKAGE SEATED.
4. DIMENSIONS D, D1, AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE NOT TO EXCEED 2.54mm.
5. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).
6. CENTER LINE OF CORNER LEADS ARE LOCATED BY LOCATING THE CENTER OF FEATURE b2 AND b3.

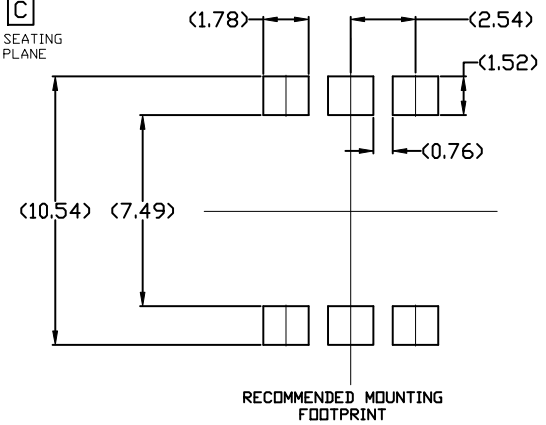
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	4.80
A1	0.38	---	---
A2	3.28	3.40	3.53
A3		2.49 REF	
A4		1.89 REF	
b	0.41	0.46	0.51
b1	0.76	0.92	1.14
b2	0.25	0.28	0.36
b3	1.02	1.40	1.78
b4		1.778 REF	
c	0.20	0.25	0.30
D	8.13	8.51	8.89
D1		0.86 REF	
E	6.10	6.35	6.60
E1	8.43	9.17	9.90
E2		8.13 REF	
e		2.54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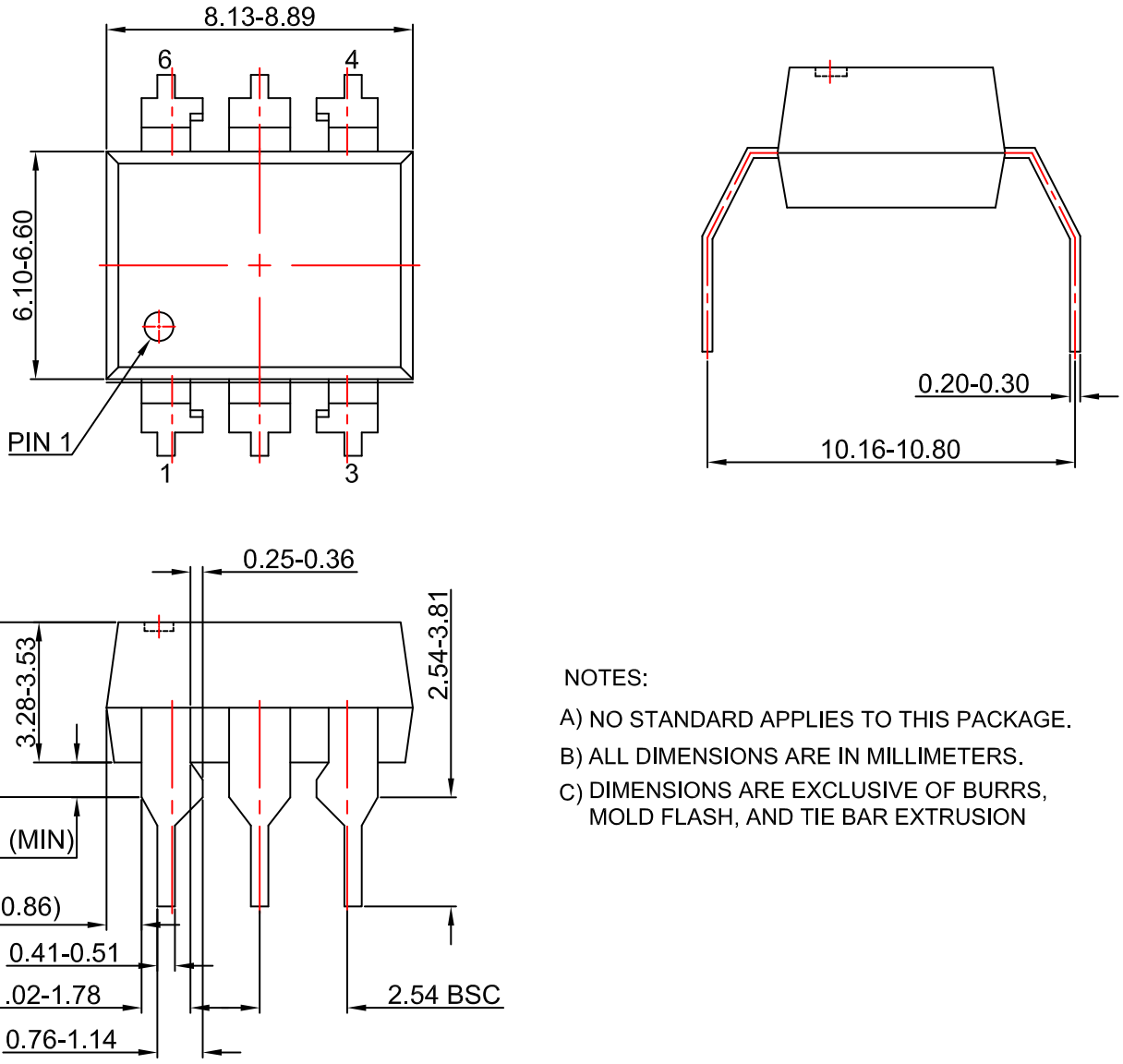

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