Micropower Voltage Reference Diodes

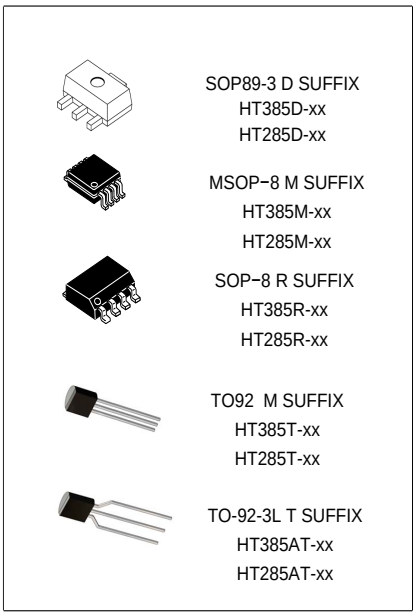
The HT285/HT385 series are micropower two−terminal bandgap voltage regulator diodes. Designed to operate over a wide current range of 10 A to 20 mA, these devices feature exceptionally low dynamic impedance, low noise and stable operation over time and temperature. Tight voltage tolerances are achieved by on−chip trimming. The large dynamic operating range enables these devices to be used in applications with widely varying supplies with excellent regulation. Extremely low operating current make these devices ideal for micropower circuitry like portable instrumentation, regulators and other analog circuitry where extended battery life is required.

The HT285/HT385 series are packaged in a low cost TO−226 plastic case and are available in two voltage versions of 1.235 V and 2.500 V as denoted by the device suffix (see Ordering Information table). The HT285 is specified over a −40°C to +85°C temperature range while the HT385 is rated from 0°C to +70°C.

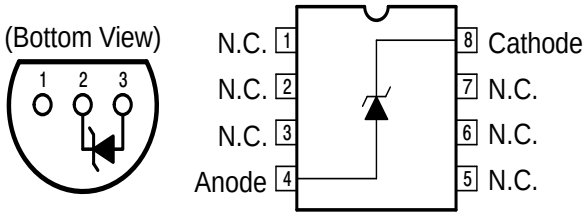
The HT385 is also available in a surface mount plastic package in voltages of 1.235 V and 2.500 V.

Features

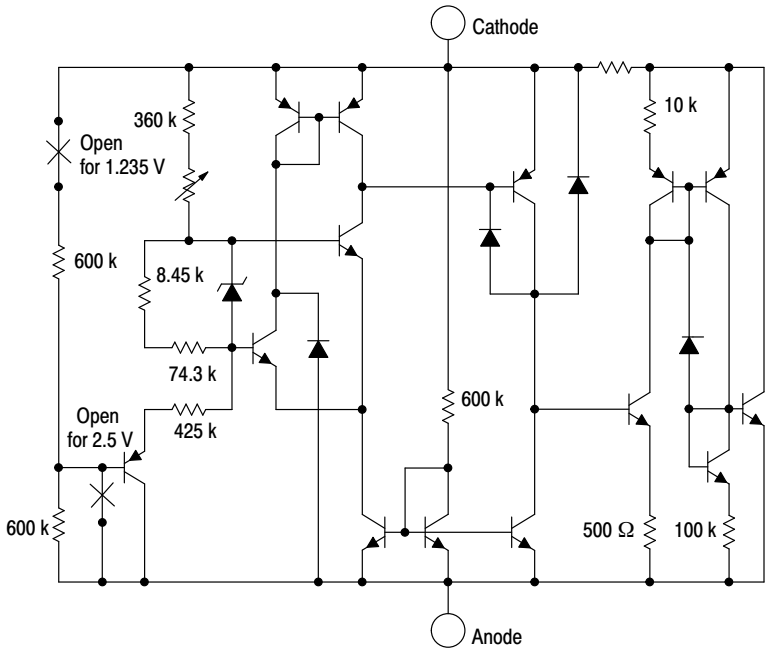
- Operating Current from 10 μA to 20 mA
- 1.0%, 1.5%, 2.0% and 3.0% Initial Tolerance Grades
- Low Temperature Coefficient
- 1.0 Ω Dynamic Impedance
- Surface Mount Package Available
- These Devices are Pb−Free and are RoHS Compliant



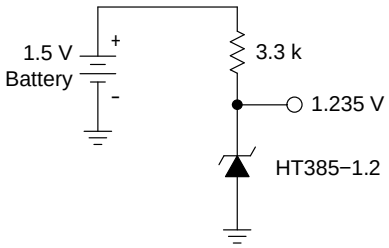
PIN CONNECTIONS



Representative Schematic Diagram



Standard Application



MAXIMUM RATINGS (T_A = 25°C, unless otherwise noted)

Rating	Symbol	Value	Unit
Reverse Current	I_R	30	mA
Forward Current	I_F	10	mA
Operating Ambient Temperature Range HT285 HT385	T_A	 −40 to +85 0 to +70	°C
Operating Junction Temperature	T_J	+150	°C
Storage Temperature Range	T_{stg}	−65 to + 150	°C
Electrostatic Discharge Sensitivity (ESD) Human Body Model (HBM) Machine Model (MM) Charged Device Model (CDM)	ESD	 4000 400 2000	V

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_A = 25°C, unless otherwise noted)

Characteristic	Symbol	HT285−1.2			HT385−1.2/HT385R−1.2			Unit
		Min	Typ	Max	Min	Typ	Max	
Reverse Breakdown Voltage ($I_{Rmin} \le I_R \le$ 20 mA) HT285−1.2/HT385R−1.2 $T_A = T_{low}$ to T_{high} (Note 1) HT385−1.2 $T_A = T_{low}$ to T_{high} (Note 1)	$V_{(BR)R}$	 1.223 1.200 – –	 1.235 – – –	 1.247 1.270 – –	 1.223 1.210 1.205 1.192	 1.235 – 1.235 –	 1.247 1.260 1.260 1.273	V
Minimum Operating Current T_A = 25°C $T_A = T_{low}$ to T_{high} (Note 1)	I_{Rmin}	 – –	 8.0 –	 10 20	 –	 8.0 –	 15 20	μA
Reverse Breakdown Voltage Change with Current $I_{Rmin} \le I_R \le$ 1.0 mA, T_A = +25°C $T_A = T_{low}$ to T_{high} (Note 1) 1.0 mA $\le I_R \le$ 20 mA, T_A = +25°C $T_A = T_{low}$ to T_{high} (Note 1)	$\Delta V_{(BR)R}$	 – – – –	 – – – –	 1.0 1.5 10 20	 – – – –	 – – – –	 1.0 1.5 20 25	mV
Reverse Dynamic Impedance I_R = 100 μA, T_A = +25°C	Z	–	0.6	–	–	0.6	–	Ω
Average Temperature Coefficient 10 μA $\le I_R \le$ 20 mA, $T_A = T_{low}$ to T_{high} (Note 1)	$\Delta V_{(BR)}/\Delta T$	–	80	–	–	80	–	ppm/°C
Wideband Noise (RMS) I_R = 100 μA, 10 Hz $\le$ f $\le$ 10 kHz	n	–	60	–	–	60	–	μV
Long Term Stability I_R = 100 μA, T_A = +25°C ± 0.1°C	S	–	20	–	–	20	–	ppm/kHR
Reverse Breakdown Voltage ($I_{Rmin} \le I_R \le$ 20 mA) HT285−2.5/HT385R−2.5 $T_A = T_{low}$ to T_{high} (Note 1) HT385−2.5 $T_A = T_{low}$ to T_{high} (Note 1)	$V_{(BR)R}$	 2.462 2.415 – –	 2.5 – – –	 2.538 2.585 – –	 2.462 2.436 2.425 2.400	 2.5 – 2.5 –	 2.538 2.564 2.575 2.600	V
Minimum Operating Current T_A = 25°C $T_A = T_{low}$ to T_{high} (Note 1)	I_{Rmin}	 – –	 13 –	 20 30	 – –	 13 –	 20 30	μA

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

Characteristic	Symbol	HT285−1.2			HT385−1.2/HT385R−1.2			Unit
		Min	Typ	Max	Min	Typ	Max	
Reverse Breakdown Voltage Change with Current	$\Delta V_{(BR)R}$							mV
$I_{Rmin} \le I_R \le 1.0$ mA, T_A = +25°C		–	–	1.0	–	–	2.0	
$T_A = T_{low}$ to T_{high} (Note 2)		–	–	1.5	–	–	2.5	
1.0 mA $\le I_R \le$ 20 mA, T_A = +25°C		–	–	10	–	–	20	
$T_A = T_{low}$ to T_{high} (Note 2)		–	–	20	–	–	25	
Reverse Dynamic Impedance	Z							Ω
I_R = 100 μA, T_A = +25°C		–	0.6	–	–	0.6	–	
Average Temperature Coefficient	$\Delta V_{(BR)}/\Delta T$							ppm/°C
20 μA $\le I_R \le$ 20 mA, $T_A = T_{low}$ to T_{high} (Note 2)		–	80	–	–	80	–	
Wideband Noise (RMS)	n							μV
I_R = 100 μA, 10 Hz $\le$ f $\le$ 10 kHz		–	120	–	–	120	–	
Long Term Stability	S							ppm/kHR
I_R = 100 μA, T_A = +25°C ± 0.1°C		–	20	–	–	20	–	

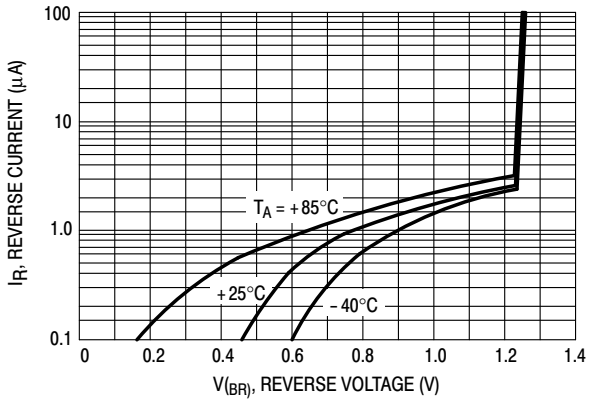


Figure 2. Reverse Characteristics

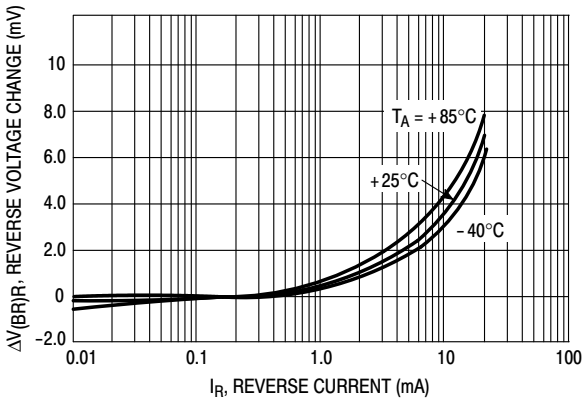


Figure 3. Reverse Characteristics

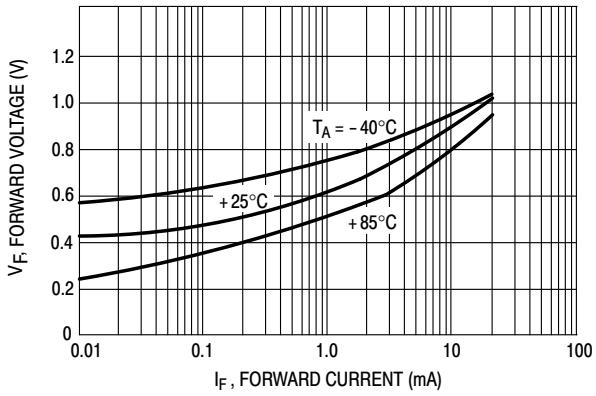


Figure 4. Forward Characteristics

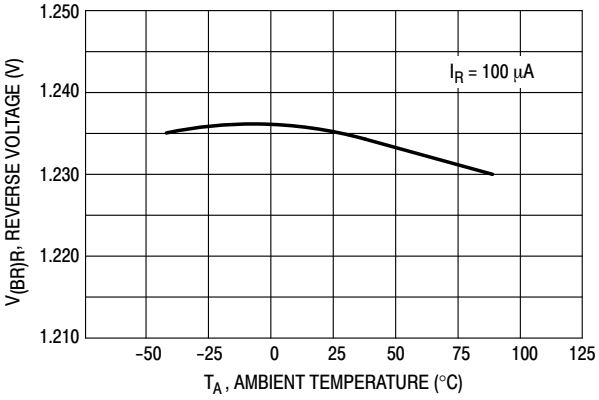


Figure 5. Temperature Drift

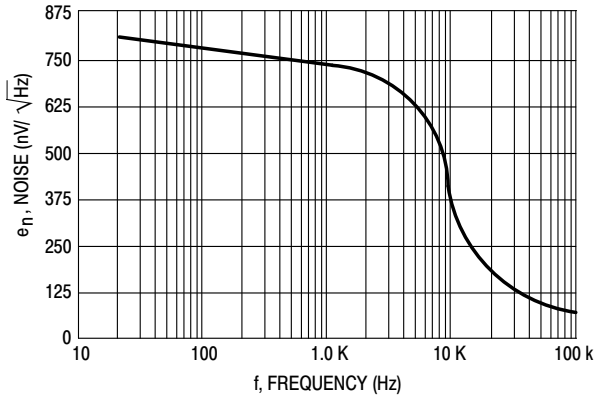


Figure 6. Noise Voltage

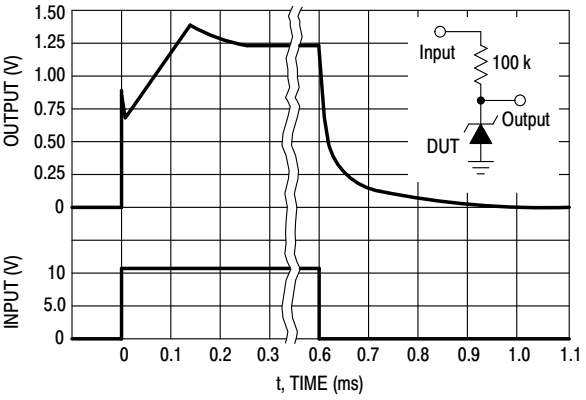


Figure 7. Response Time

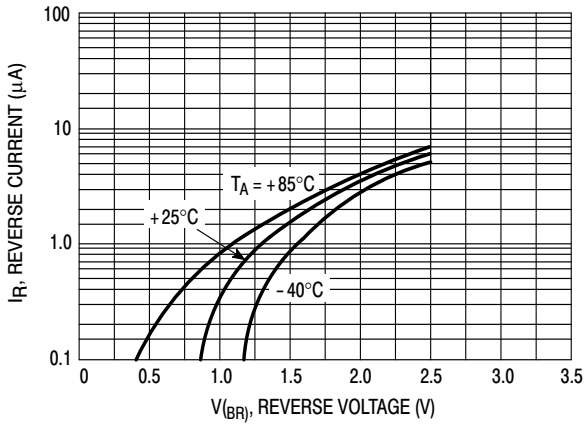


Figure 8. Reverse Characteristics

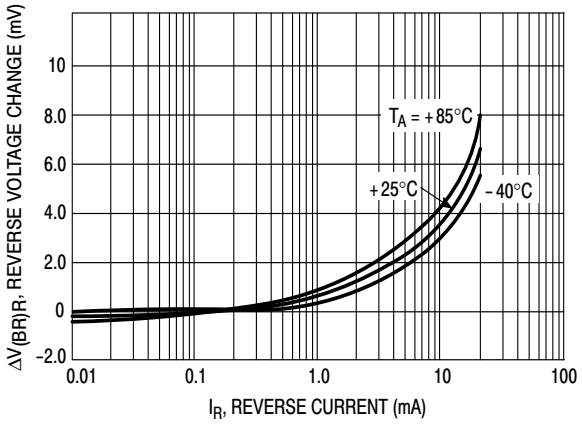


Figure 9. Reverse Characteristics

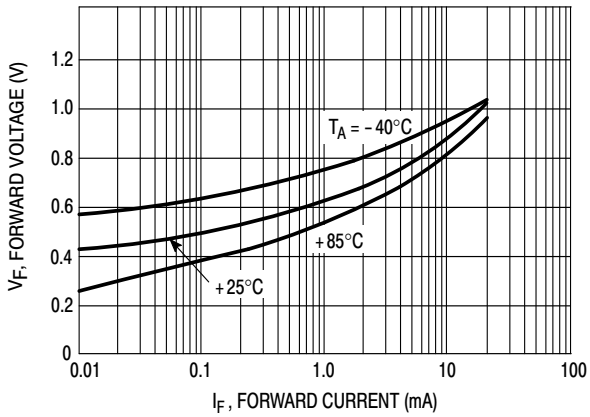


Figure 10. Forward Characteristics

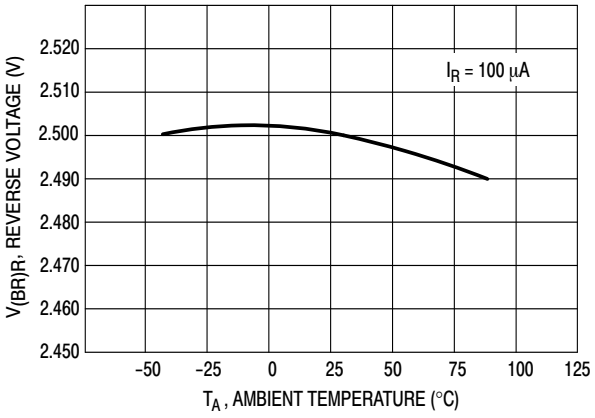


Figure 11. Temperature Drift

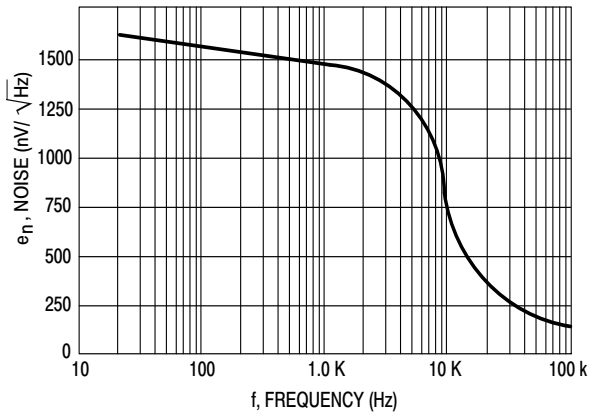


Figure 12. Noise Voltage

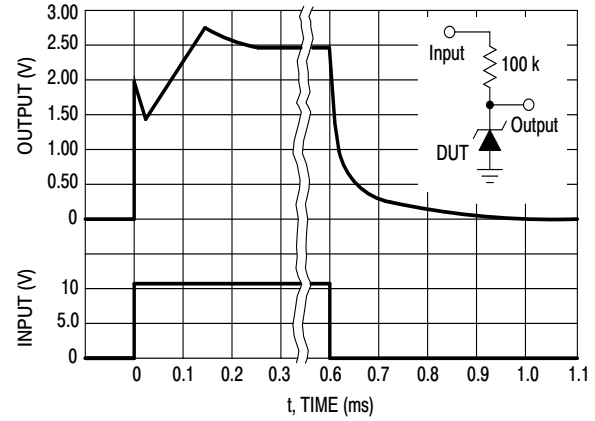
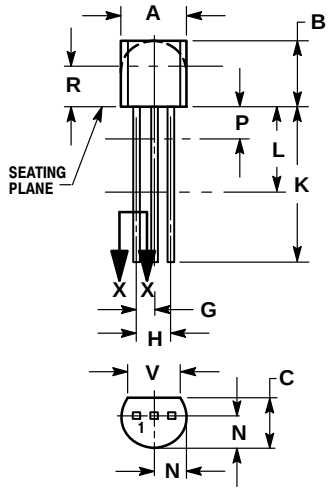


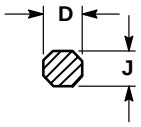
Figure 13. Response Time

PACKAGE DIMENSIONS

TO−92 (TO−226)
CASE 29−11
ISSUE AM



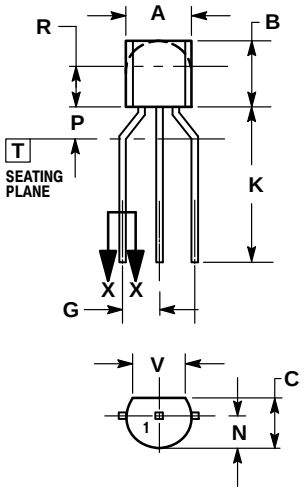
STRAIGHT LEAD
BULK PACK



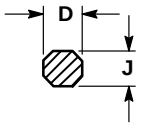
SECTION X−X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---



BENT LEAD
TAPE & REEL
AMMO PACK



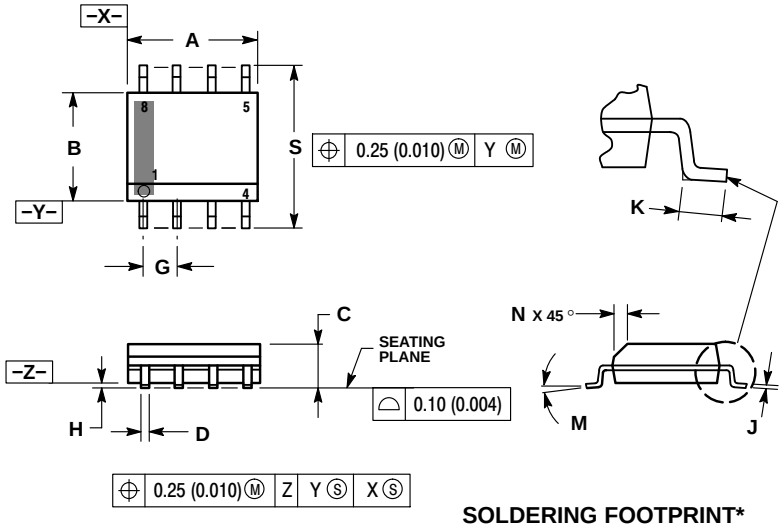
SECTION X−X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	MILLIMETERS	
DIM	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

PACKAGE DIMENSIONS

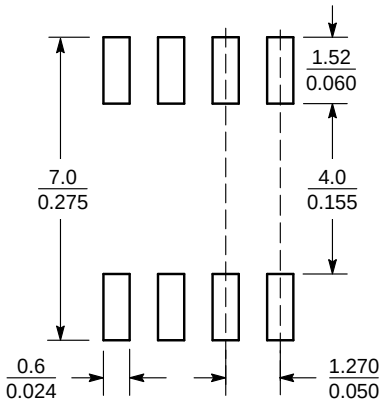
SOIC−8 NB
CASE 751−07
ISSUE AK



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

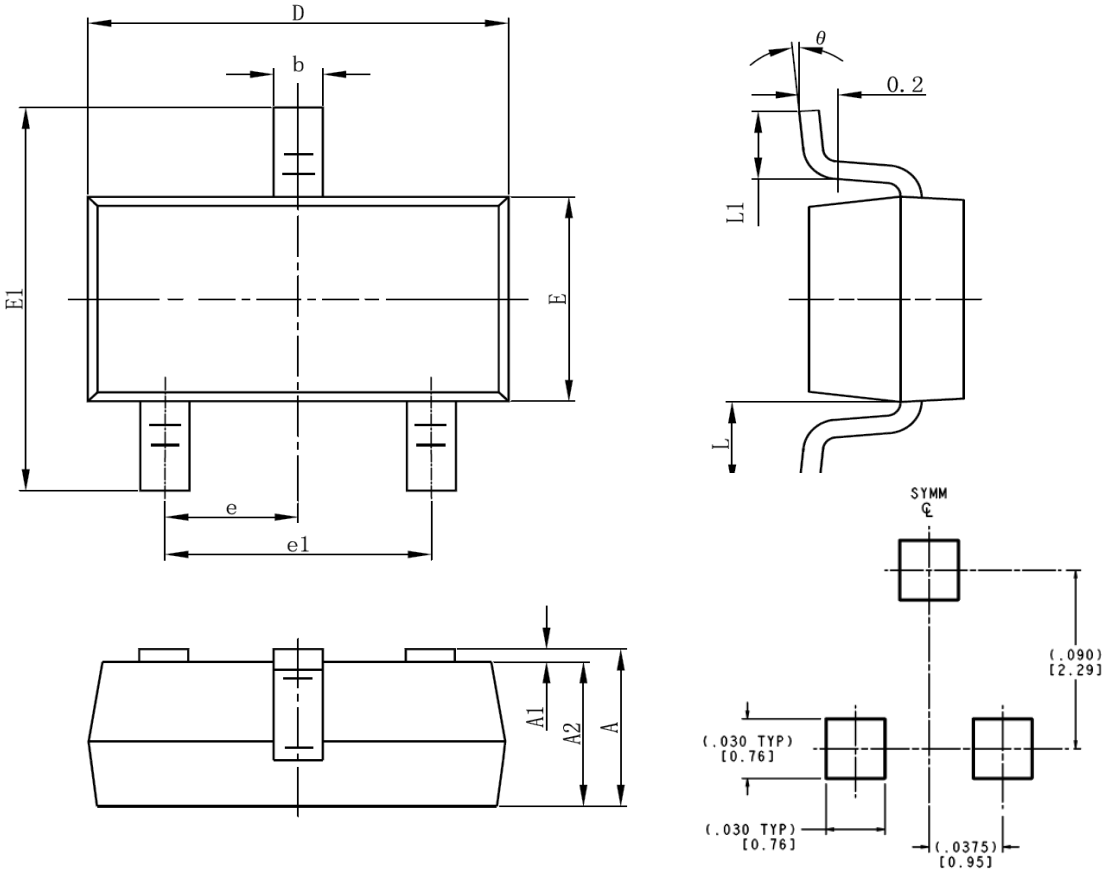
SOLDERING FOOTPRINT*



SCALE 6:1 (mm / inches)

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

SOT-23-3L PACKAGE OUTLINE DIMENSIONS



LAND PATTERN RECOMMENDATION

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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Click to view products by HTCSEMI ***manufacturer:***

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