

MUN2236, MMUN2236L, MUN5236, DTC115EE, DTC115EM3

Digital Transistors (BRT) R1 = 100 kΩ, R2 = 100 kΩ

NPN Transistors with Monolithic Bias Resistor Network

This series of digital transistors is designed to replace a single device and its external resistor bias network. The Bias Resistor Transistor (BRT) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space.

Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS (T_A = 25°C)

Rating	Symbol	Max	Unit
Collector-Base Voltage	V _{CBO}	50	Vdc
Collector-Emitter Voltage	V _{CEO}	50	Vdc
Collector Current - Continuous	I _C	100	mAdc
Input Forward Voltage	V _{IN(fwd)}	40	Vdc
Input Reverse Voltage	V _{IN(rev)}	10	Vdc

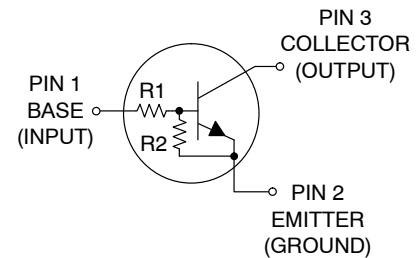
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



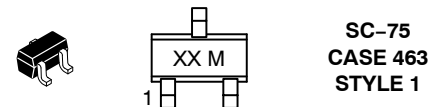
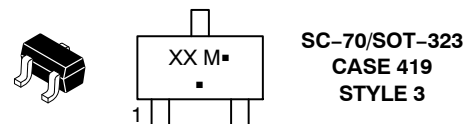
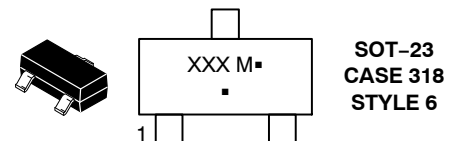
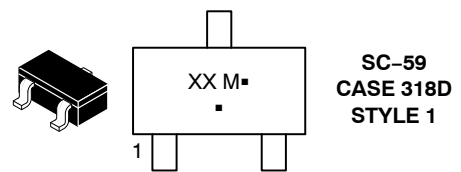
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PIN CONNECTIONS



MARKING DIAGRAMS



XXX = Specific Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering, marking, and shipping information in the package dimensions section on page 2 of this data sheet.

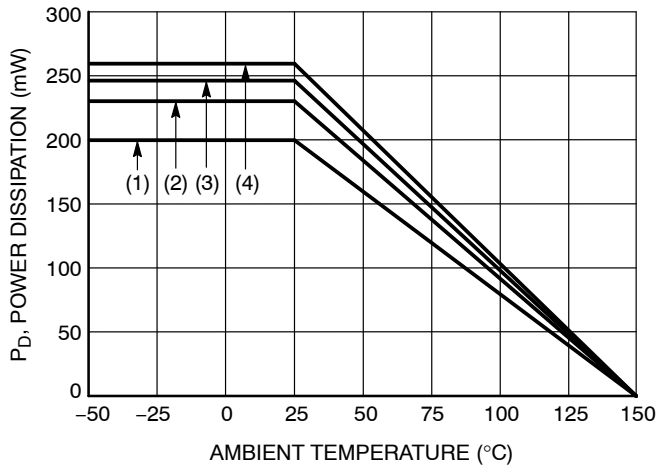
MUN2236, MMUN2236L, MUN5236, DTC115EE, DTC115EM3

Table 1. ORDERING INFORMATION

Device	Part Marking	Package	Shipping†
MUN2236T1G, NSVMUN2236T1G*	8N	SC-59 (Pb-Free)	3000 / Tape & Reel
MMUN2236LT1G, NSVMMUN2236LT1G*	AA5	SOT-23 (Pb-Free)	3000 / Tape & Reel
MUN5236T1G, NSVMUN5236T1G*	8N	SC-70/SOT-323 (Pb-Free)	3000 / Tape & Reel
DTC115EET1G	8N	SC-75 (Pb-Free)	3000 / Tape & Reel
DTC115EM3T5G	8N	SOT-723 (Pb-Free)	8000 / Tape & Reel

†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.

*NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.



- (1) SC-75 and SC-70/SOT323; Minimum Pad
- (2) SC-59; Minimum Pad
- (3) SOT-23; Minimum Pad
- (4) SOT-723; Minimum Pad

Figure 1. Derating Curve

MUN2236, MMUN2236L, MUN5236, DTC115EE, DTC115EM3

Table 2. THERMAL CHARACTERISTICS

Characteristic		Symbol	Max	Unit
THERMAL CHARACTERISTICS (SC-59) (MUN2236)				
Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 1)	P_D	230	mW
	(Note 2)		338	
Derate above 25°C	(Note 1)		1.8	mW/ $^\circ\text{C}$
	(Note 2)		2.7	
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	540	$^\circ\text{C}/\text{W}$
	(Note 2)		370	
Thermal Resistance, Junction to Lead	(Note 1)	$R_{\theta JL}$	264	$^\circ\text{C}/\text{W}$
	(Note 2)		287	
Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS (SOT-23) (MMUN2236L)

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 1)	P_D	246	mW
	(Note 2)		400	
Derate above 25°C	(Note 1)		2.0	mW/ $^\circ\text{C}$
	(Note 2)		3.2	
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	508	$^\circ\text{C}/\text{W}$
	(Note 2)		311	
Thermal Resistance, Junction to Lead	(Note 1)	$R_{\theta JL}$	174	$^\circ\text{C}/\text{W}$
	(Note 2)		208	
Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS (SC-70/SOT-323) (MUN5236)

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 1)	P_D	202	mW
	(Note 2)		310	
Derate above 25°C	(Note 1)		1.6	mW/ $^\circ\text{C}$
	(Note 2)		2.5	
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	618	$^\circ\text{C}/\text{W}$
	(Note 2)		403	
Thermal Resistance, Junction to Lead	(Note 1)	$R_{\theta JL}$	280	$^\circ\text{C}/\text{W}$
	(Note 2)		332	
Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS (SC-75) (DTC115EE)

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 1)	P_D	200	mW
	(Note 2)		300	
Derate above 25°C	(Note 1)		1.6	mW/ $^\circ\text{C}$
	(Note 2)		2.4	
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	600	$^\circ\text{C}/\text{W}$
	(Note 2)		400	
Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS (SOT-723) (DTC115EM3)

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 1)	P_D	260	mW
	(Note 2)		600	
Derate above 25°C	(Note 1)		2.0	mW/ $^\circ\text{C}$
	(Note 2)		4.8	
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	480	$^\circ\text{C}/\text{W}$
	(Note 2)		205	
Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

- FR-4 @ Minimum Pad.
- FR-4 @ 1.0 x 1.0 Inch Pad.

MUN2236, MMUN2236L, MUN5236, DTC115EE, DTC115EM3

Table 3. ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$)	I_{CBO}	-	-	100	nAdc
Collector-Emitter Cutoff Current ($V_{CE} = 50\text{ V}$, $I_B = 0$)	I_{CEO}	-	-	500	nAdc
Emitter-Base Cutoff Current ($V_{EB} = 6.0\text{ V}$, $I_C = 0$)	I_{EBO}	-	-	0.05	mAdc
Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 3) ($I_C = 2.0\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	50	-	-	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 3) ($I_C = 5.0\text{ mA}$, $V_{CE} = 10\text{ V}$)	h_{FE}	80	150	-	
Collector-Emitter Saturation Voltage (Note 3) ($I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$)	$V_{CE(sat)}$	-	-	0.25	Vdc
Input Voltage (off) ($V_{CE} = 5.0\text{ V}$, $I_C = 100\ \mu\text{A}$)	$V_{i(off)}$	-	1.2	0.5	Vdc
Input Voltage (on) ($V_{CE} = 0.3\text{ V}$, $I_C = 1.0\text{ mA}$)	$V_{i(on)}$	3.0	1.7	-	Vdc
Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 5.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	V_{OL}	-	-	0.2	Vdc
Output Voltage (off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	V_{OH}	4.9	-	-	Vdc
Input Resistor	R_1	70	100	130	$\text{k}\Omega$
Resistor Ratio	R_1/R_2	0.8	1.0	1.2	

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.

3. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS
 MUN2236, MMUN2236L, MUN5236, NSVMUN5236, DTC115EE, DTC115EM3

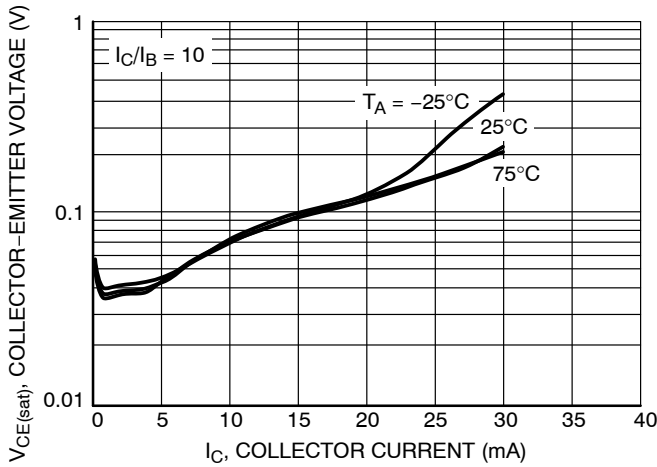


Figure 2. $V_{CE(sat)}$ versus I_C

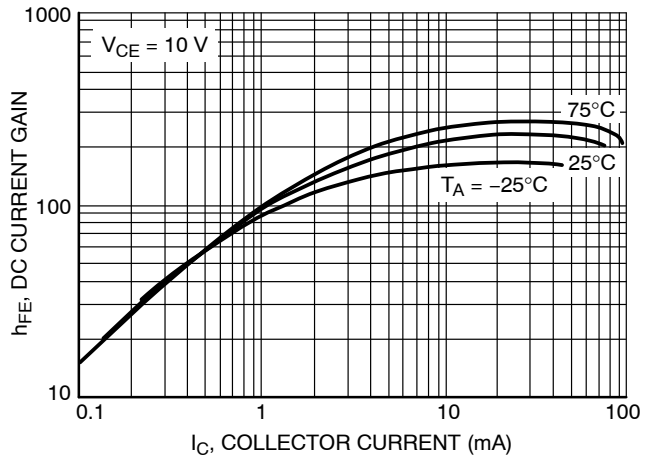


Figure 3. DC Current Gain

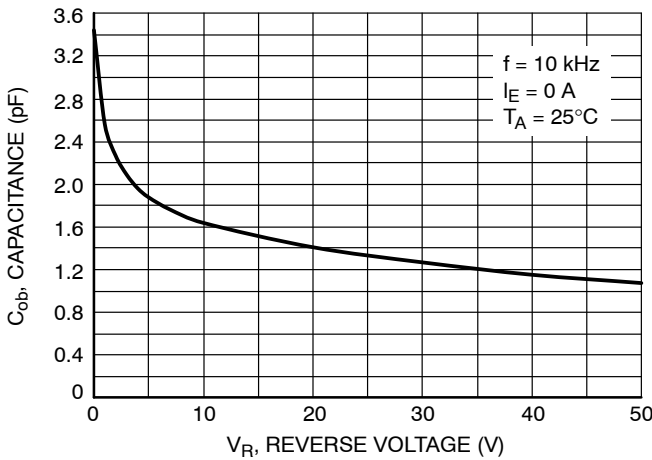


Figure 4. Output Capacitance

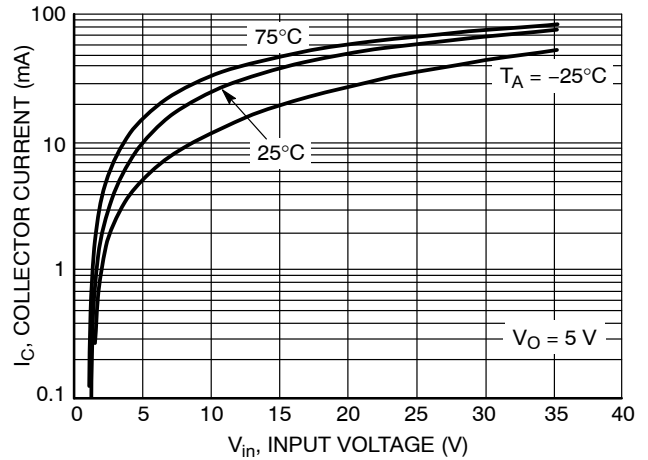


Figure 5. Output Current versus Input Voltage

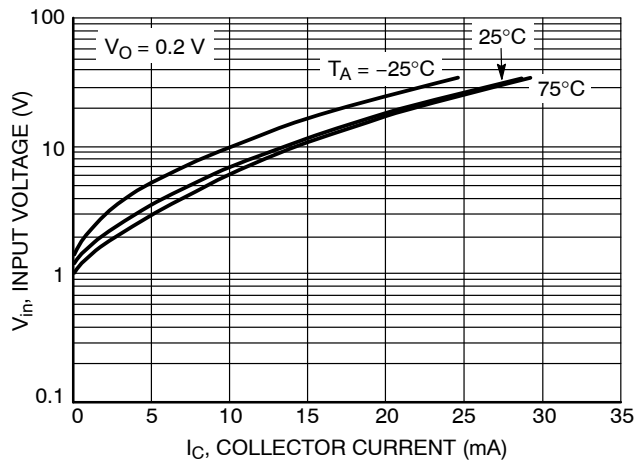
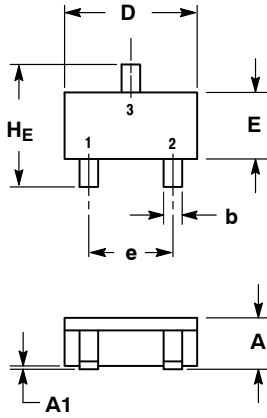


Figure 6. Input Voltage versus Output Current

PACKAGE DIMENSIONS

SC-59
CASE 318D-04
ISSUE H

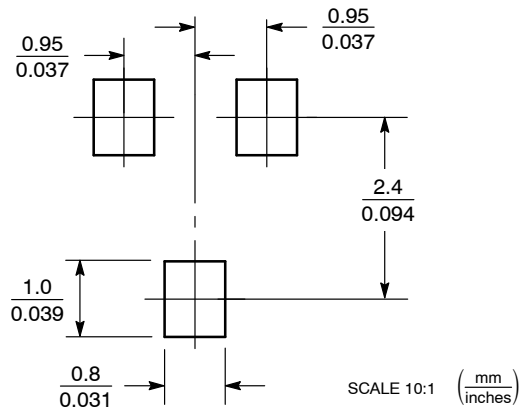


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.00	1.15	1.30	0.039	0.045	0.051
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.35	0.43	0.50	0.014	0.017	0.020
c	0.09	0.14	0.18	0.003	0.005	0.007
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	1.70	1.90	2.10	0.067	0.075	0.083
L	0.20	0.40	0.60	0.008	0.016	0.024
HE	2.50	2.80	3.00	0.099	0.110	0.118

STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

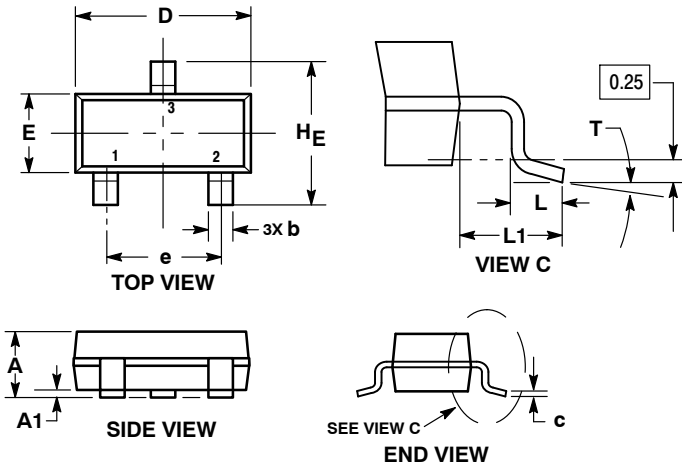
SOLDERING FOOTPRINT*



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

PACKAGE DIMENSIONS

SOT-23 (TO-236)
CASE 318-08
ISSUE AS

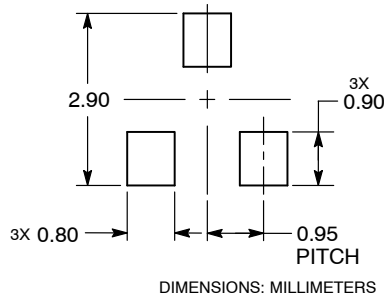


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
HE	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

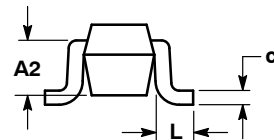
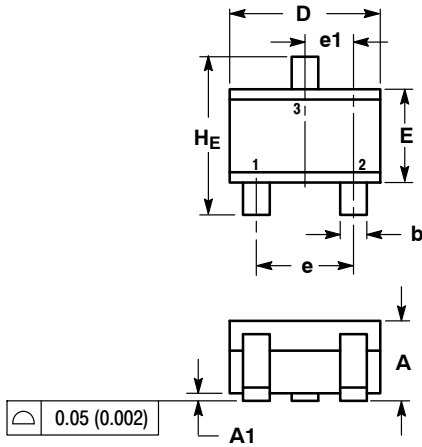
RECOMMENDED
SOLDERING FOOTPRINT*



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

PACKAGE DIMENSIONS

SC-70 (SOT-323)
CASE 419-04
ISSUE N



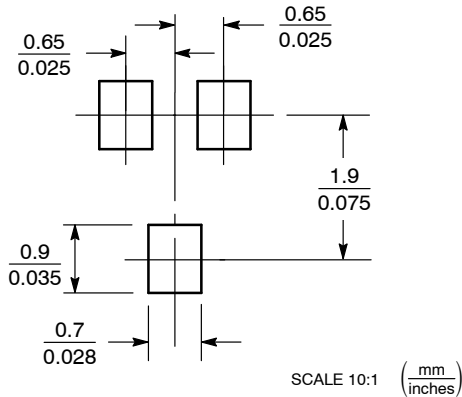
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70 REF			0.028 REF		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.10	2.20	0.071	0.083	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.20	0.38	0.56	0.008	0.015	0.022
HE	2.00	2.10	2.40	0.079	0.083	0.095

STYLE 3:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

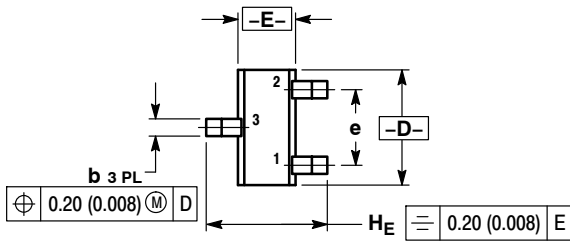
SOLDERING FOOTPRINT*



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

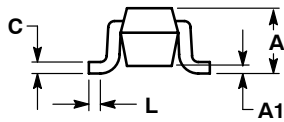
PACKAGE DIMENSIONS

SC-75/SOT-416
CASE 463
ISSUE G



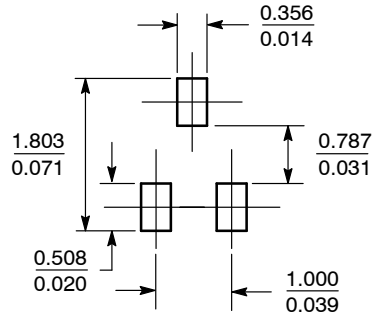
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.80	0.90	0.027	0.031	0.035
A1	0.00	0.05	0.10	0.000	0.002	0.004
b	0.15	0.20	0.30	0.006	0.008	0.012
C	0.10	0.15	0.25	0.004	0.006	0.010
D	1.55	1.60	1.65	0.061	0.063	0.065
E	0.70	0.80	0.90	0.027	0.031	0.035
e	1.00 BSC			0.04 BSC		
L	0.10	0.15	0.20	0.004	0.006	0.008
H _E	1.50	1.60	1.70	0.060	0.063	0.067



- STYLE 1:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

SOLDERING FOOTPRINT*

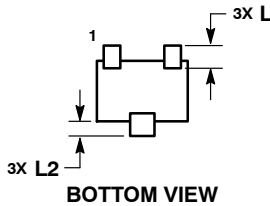
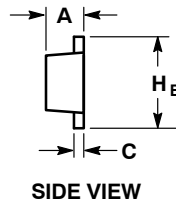
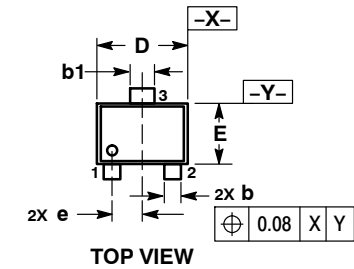


SCALE 10:1 ($\frac{\text{mm}}{\text{inches}}$)

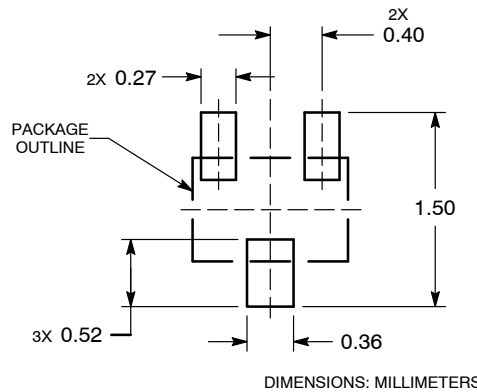
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PACKAGE DIMENSIONS

SOT-723
CASE 631AA
ISSUE D



RECOMMENDED
SOLDERING FOOTPRINT*



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.45	0.50	0.55
b	0.15	0.21	0.27
b1	0.25	0.31	0.37
C	0.07	0.12	0.17
D	1.15	1.20	1.25
E	0.75	0.80	0.85
e	0.40 BSC		
H E	1.15	1.20	1.25
L	0.29 REF		
L2	0.15	0.20	0.25

STYLE 1:

1. BASE
2. EMITTER
3. COLLECTOR

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