MUN2133, MMUN2133L, MUN5133, DTA143ZE, DTA143ZM3, NSBA143ZF3

Digital Transistors (BRT) R1 = 4.7 kΩ, R2 = 47 kΩ

PNP 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
- S and 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	$V_{IN(fwd)}$	30	Vdc
Input Reverse Voltage	$V_{IN(rev)}$	5	Vdc

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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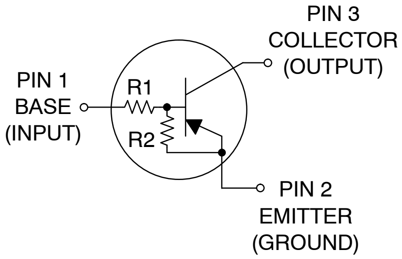
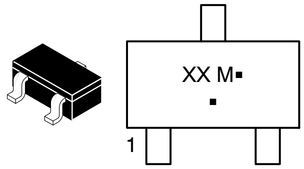
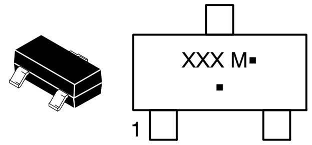
PIN CONNECTIONS



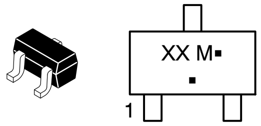
MARKING DIAGRAMS



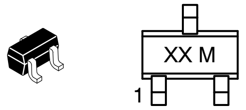
**SC−59
CASE 318D
STYLE 1**



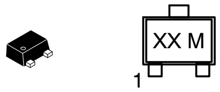
**SOT−23
CASE 318
STYLE 6**



**SC−70/SOT−323
CASE 419
STYLE 3**



**SC−75
CASE 463
STYLE 1**



**SOT−723
CASE 631AA
STYLE 1**

**SOT−1123
CASE 524AA
STYLE 1**

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 on page 2 of this data sheet.

Table 1. ORDERING INFORMATION

Device	Part Marking	Package	Shipping†
MUN2133T1G	6K	SC−59 (Pb−Free)	3000 / Tape & Reel
MMUN2133LT1G, NSVMMUN2133LT1G	A6K	SOT−23 (Pb−Free)	3000 / Tape & Reel
MUN5133T1G, SMUN5133T1G	6K	SC−70/SOT−323 (Pb−Free)	3000 / Tape & Reel
DTA143ZET1G, NSVDTA143ZET1G	6K	SC−75 (Pb−Free)	3000 / Tape & Reel
DTA143ZM3T5G	6K	SOT−723 (Pb−Free)	8000 / Tape & Reel
NSBA143ZF3T5G	E(90°)*	SOT−1123 (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.

*(XX°) = Degree rotation in the clockwise direction.

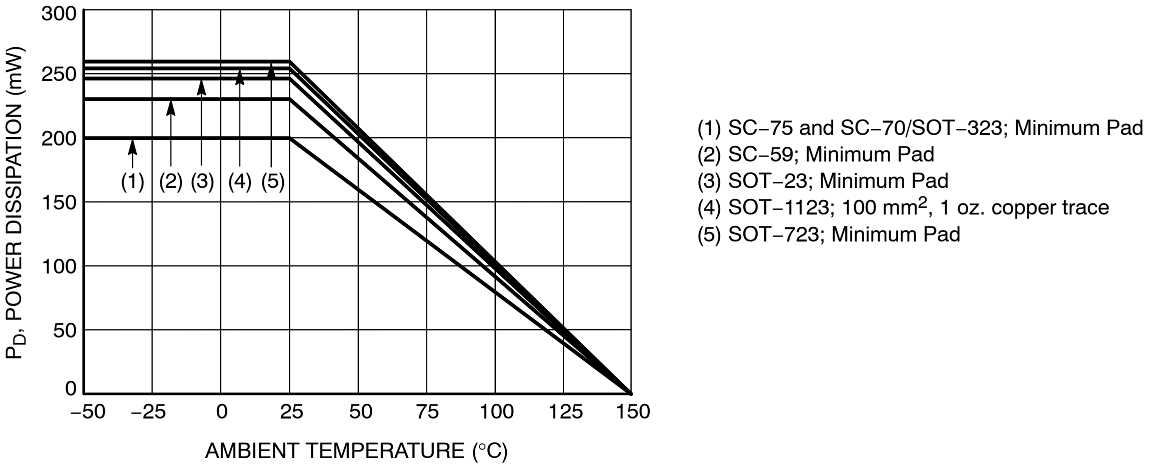


Figure 1. Derating Curve

Table 2. THERMAL CHARACTERISTICS

Characteristic		Symbol	Max	Unit
THERMAL CHARACTERISTICS (SC−59) (MUN2133)				
Total Device Dissipation		P_D		
T_A = 25°C	(Note 1)		230	mW
	(Note 2)		338	
Derate above 25°C	(Note 1)		1.8	mW/°C
	(Note 2)		2.7	
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$	540 370	°C/W
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{\theta JL}$	264 287	°C/W
Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +150	°C
THERMAL CHARACTERISTICS (SOT−23) (MMUN2133L)				
Total Device Dissipation		P_D		
T_A = 25°C	(Note 1)		246	mW
	(Note 2)		400	
Derate above 25°C	(Note 1)		2.0	
	(Note 2)		3.2	mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$	508 311	°C/W
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{\theta JL}$	174 208	°C/W
Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +150	°C
Thermal Characteristics (SC−70/SOT−323) (MUN5133)				
Total Device Dissipation		P_D		
T_A = 25°C	(Note 1)		202	mW
	(Note 2)		310	
Derate above 25°C	(Note 1)		1.6	mW/°C
	(Note 2)		2.5	
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$	618 403	°C/W
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{\theta JL}$	280 332	°C/W
Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +150	°C
Thermal Characteristics (SC−75) (DTA143ZE)				
Total Device Dissipation		P_D		
T_A = 25°C	(Note 1)		200	mW
	(Note 2)		300	
Derate above 25°C	(Note 1)		1.6	mW/°C
	(Note 2)		2.4	
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$	600 400	°C/W
Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +150	°C
Thermal Characteristics (SOT−723) (DTA143ZM3)				
Total Device Dissipation		P_D		
T_A = 25°C	(Note 1)		260	mW
	(Note 2)		600	
Derate above 25°C	(Note 1)		2.0	mW/°C
	(Note 2)		4.8	
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$	480 205	°C/W
Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +150	°C

1. FR−4 @ Minimum Pad.
2. FR−4 @ 1.0 x 1.0 Inch Pad.
3. FR − 4 @ 100 mm^2, 1 oz. copper traces, still air.
4. FR − 4 @ 500 mm^2, 1 oz. copper traces, still air.

Table 2. THERMAL CHARACTERISTICS

Characteristic		Symbol	Max	Unit
Thermal Characteristics (SOT−1123) (NSBA143ZF3)				
Total Device Dissipation T_A = 25°C	 (Note 3) (Note 4)	P_D	 254 297	 mW
Derate above 25°C	(Note 3) (Note 4)		2.0 2.4	mW/°C
Thermal Resistance, Junction to Ambient	(Note 3) (Note 4)	$R_{\theta JA}$	493 421	°C/W
Thermal Resistance, Junction to Lead	(Note 3)	$R_{\theta JL}$	193	°C/W
Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +150	°C

1. FR−4 @ Minimum Pad.
2. FR−4 @ 1.0 x 1.0 Inch Pad.
3. FR − 4 @ 100 mm^2, 1 oz. copper traces, still air.
4. FR − 4 @ 500 mm^2, 1 oz. copper traces, still air.

Table 3. ELECTRICAL CHARACTERISTICS (T_A = 25°C, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector−Base Cutoff Current (V_{CB} = 50 V, I_E = 0)	I_{CBO}	–	–	100	nAdc
Collector−Emitter Cutoff Current (V_{CE} = 50 V, I_B = 0)	I_{CEO}	–	–	500	nAdc
Emitter−Base Cutoff Current (V_{EB} = 6.0 V, I_C = 0)	I_{EBO}	–	–	0.18	mAdc
Collector−Base Breakdown Voltage (I_C = 10 μA, I_E = 0)	$V_{(BR)CBO}$	50	–	–	Vdc
Collector−Emitter Breakdown Voltage (Note 5) (I_C = 2.0 mA, I_B = 0)	$V_{(BR)CEO}$	50	–	–	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 5) (I_C = 5.0 mA, V_{CE} = 10 V)	h_{FE}	80	140	–	
Collector − Emitter Saturation Voltage (Note 5) (I_C = 10 mA, I_B = 0.3 mA)	$V_{CE(sat)}$	–	–	0.25	Vdc
Input Voltage (off) (V_{CE} = 5.0 V, I_C = 100 μA)	$V_{i(off)}$	–	0.7	0.5	Vdc
Input Voltage (on) (V_{CE} = 0.3 V, I_C = 5.0 mA)	$V_{i(on)}$	1.3	0.9	–	Vdc
Output Voltage (on) (V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	V_{OL}	–	–	0.2	Vdc
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)	V_{OH}	4.9	–	–	Vdc
Input Resistor	R1	3.3	4.7	6.1	kΩ
Resistor Ratio	R_1/R_2	0.08	0.1	0.14	

5. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle ≤ 2%.

TYPICAL CHARACTERISTICS
MUN2133, MMUN2133L, MUN5133, DTA143ZE, DTA143ZM3

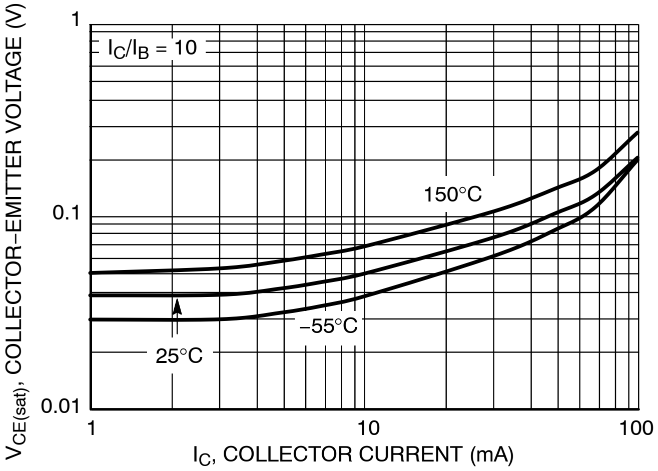


Figure 2. $V_{CE(sat)}$ vs. I_C

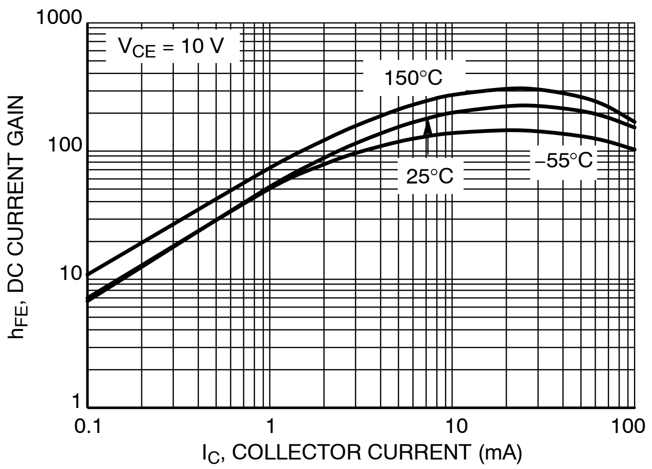


Figure 3. DC Current Gain

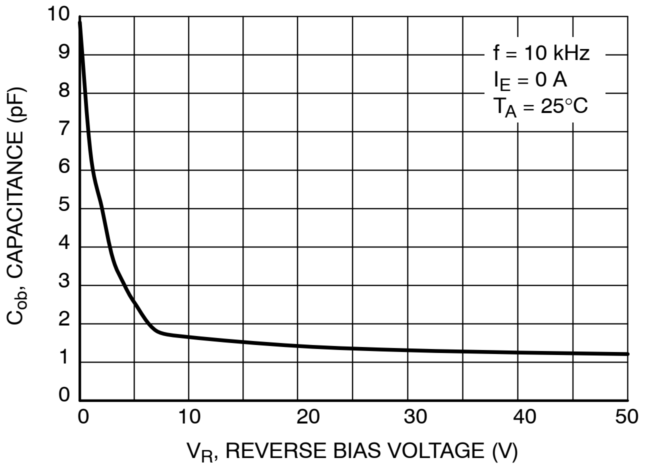


Figure 4. Output Capacitance

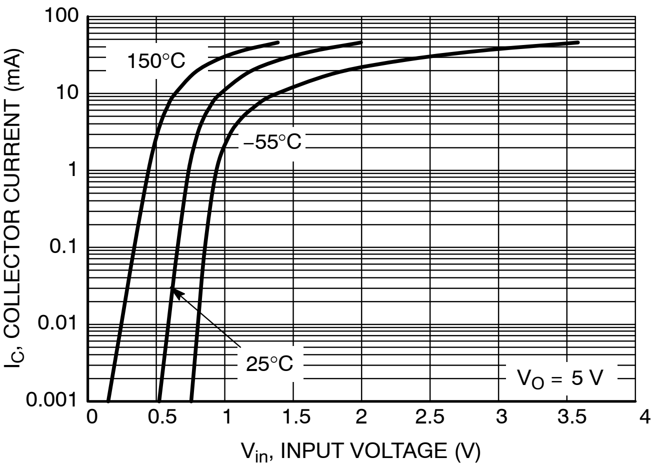


Figure 5. Output Current vs. Input Voltage

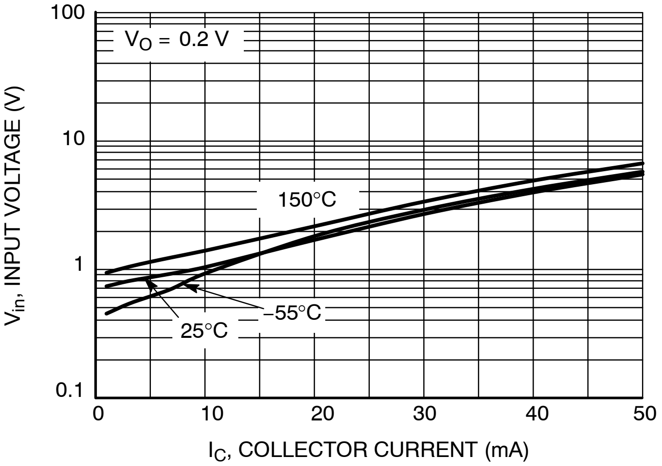


Figure 6. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS
NSBA143ZF3

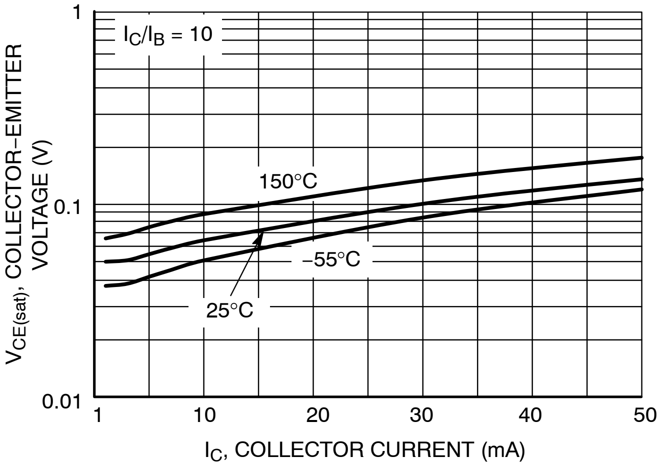


Figure 7. $V_{CE(sat)}$ vs. I_C

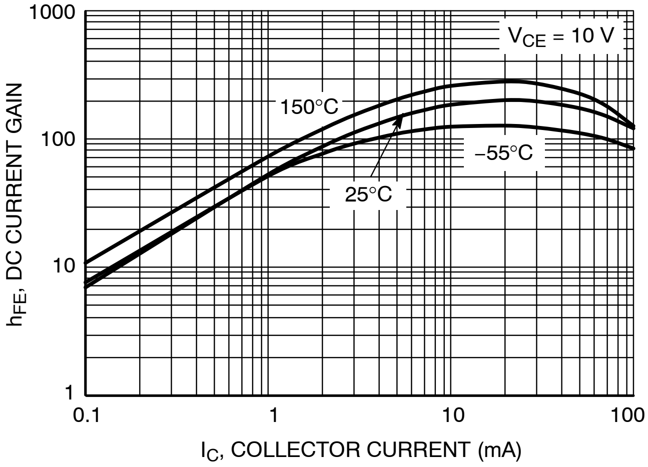


Figure 8. DC Current Gain

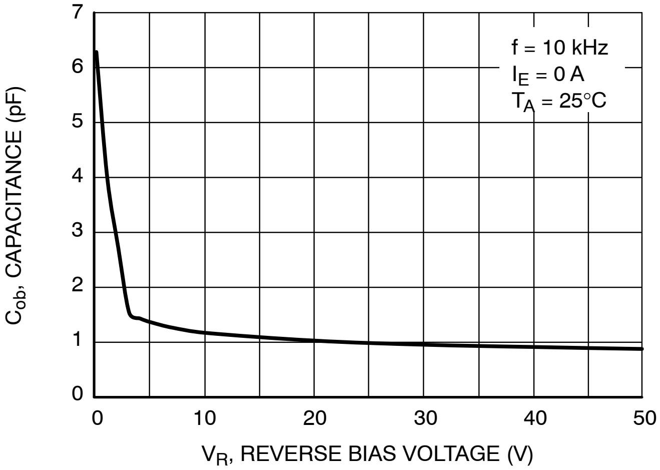


Figure 9. Output Capacitance

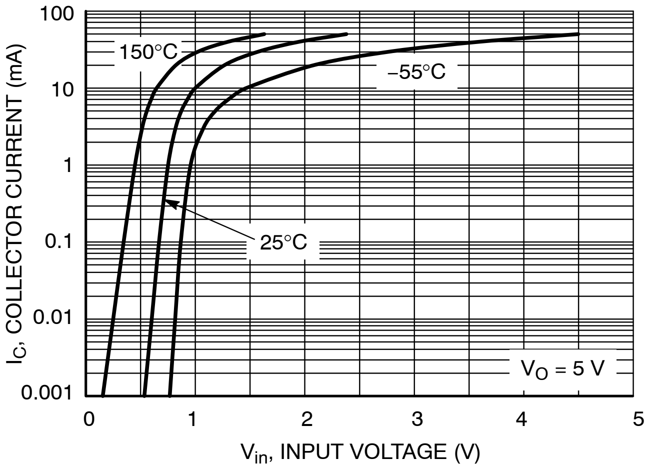


Figure 10. Output Current vs. Input Voltage

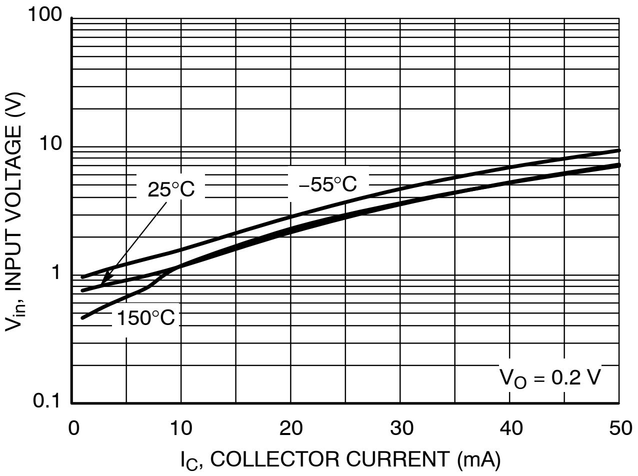
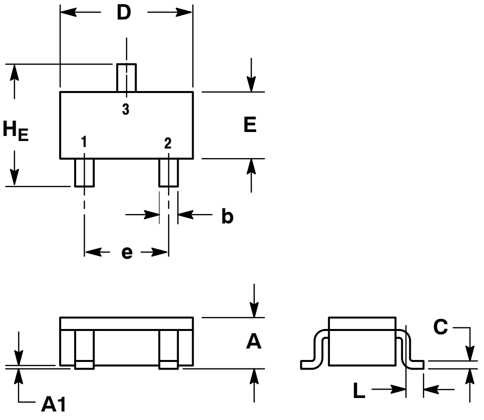


Figure 11. Input Voltage vs. Output Current

PACKAGE DIMENSIONS

SC−59

CASE 318D−04
ISSUE H

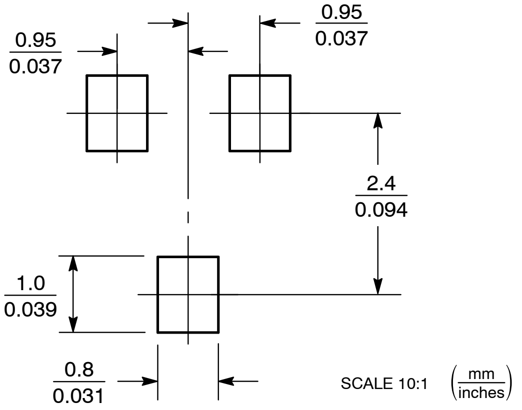


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS			INCHES		
DIM	**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
H_E	2.50	2.80	3.00	0.099	0.110	0.118

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

SOLDERING FOOTPRINT*

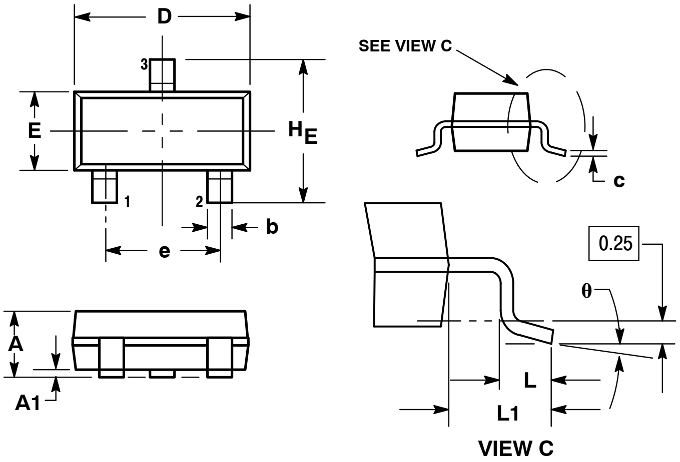


*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

SOT−23 (TO−236)

CASE 318−08
ISSUE AP

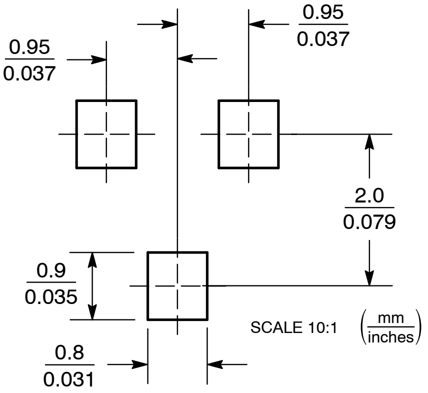


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	**MIN**	**NOM**	**MAX**	**MIN**	**NOM**	**MAX**
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
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	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
H_E	2.10	2.40	2.64	0.083	0.094	0.104
θ	0°	−−−	10°	0°	−−−	10°

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

SOLDERING FOOTPRINT*

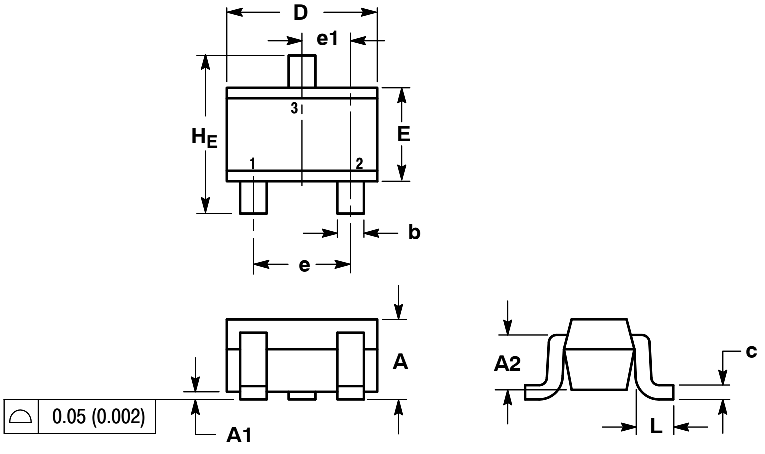


*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

SC−70 (SOT−323)

CASE 419−04
ISSUE N

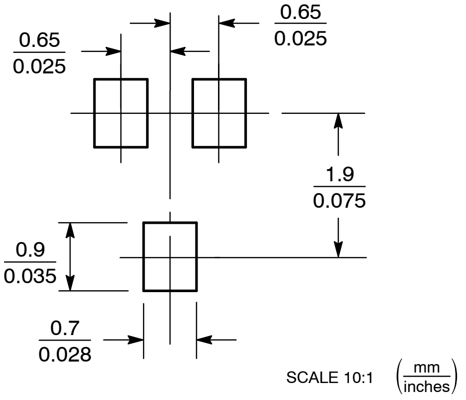


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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
H_E	2.00	2.10	2.40	0.079	0.083	0.095

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

SOLDERING FOOTPRINT*

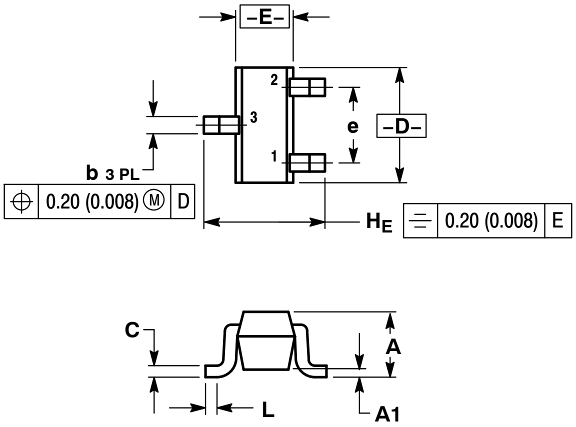


*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

SC−75/SOT−416

CASE 463
ISSUE F

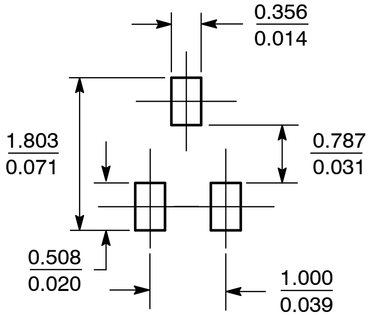


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS			INCHES		
DIM	**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	0.059	0.063	0.067
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	0.061	0.063	0.065

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

SOLDERING FOOTPRINT*

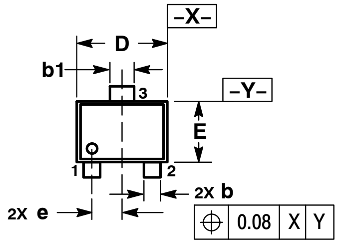


SCALE 10:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

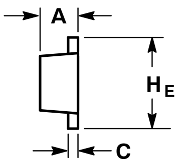
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

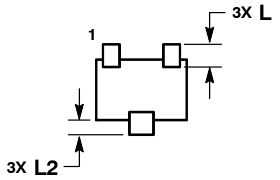
SOT−723
CASE 631AA
ISSUE D



TOP VIEW



SIDE VIEW



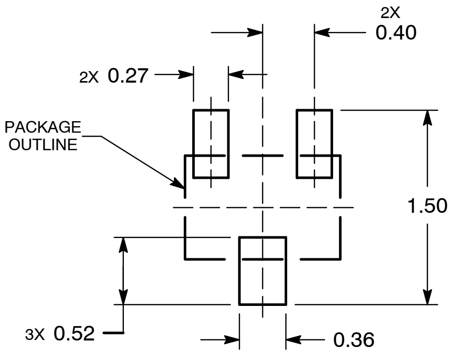
BOTTOM VIEW

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.

	MILLIMETERS		
DIM	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:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

RECOMMENDED SOLDERING FOOTPRINT*

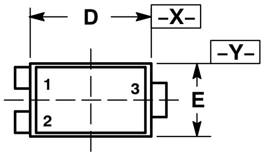


DIMENSIONS: MILLIMETERS

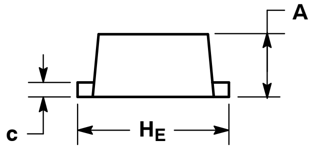
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

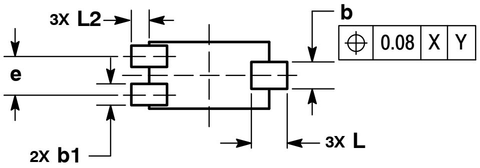
SOT−1123
CASE 524AA
ISSUE C



TOP VIEW



SIDE VIEW



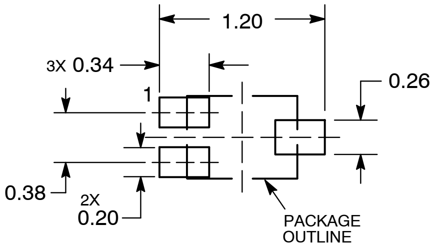
BOTTOM VIEW

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.

	MILLIMETERS	
DIM	MIN	MAX
A	0.34	0.40
b	0.15	0.28
b1	0.10	0.20
c	0.07	0.17
D	0.75	0.85
E	0.55	0.65
e	0.35	0.40
H_E	0.95	1.05
L	0.185 REF	
L2	0.05	0.15

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

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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