

MUN2240, MMUN2240L, MUN5240, DTC144TE, DTC144TM3, NSBC144TF3

Digital Transistors (BRT) R1 = 47 kΩ, R2 = ∞ 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
- 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)}	40	Vdc
Input Reverse Voltage	V _{IN(rev)}	6	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.



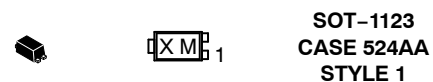
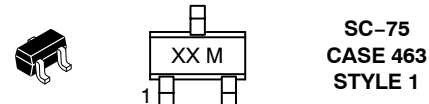
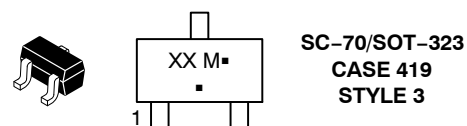
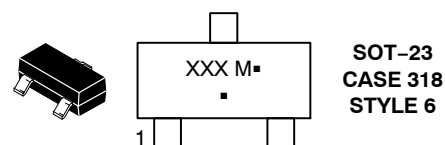
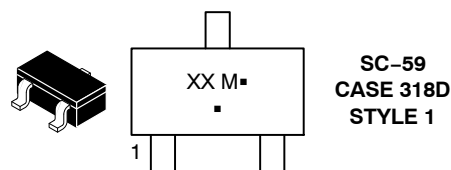
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PIN CONNECTIONS



MARKING DIAGRAMS



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.

MUN2240, MMUN2240L, MUN5240, DTC144TE, DTC144TM3, NSBC144TF3

Table 1. ORDERING INFORMATION

Device	Part Marking	Package	Shipping†
MUN2240T1G, SMUN2240T1G	8T	SC-59 (Pb-Free)	3000 / Tape & Reel
MMUN2240LT1G	AA4	SOT-23 (Pb-Free)	3000 / Tape & Reel
MUN5240T1G	AR	SC-70/SOT-323 (Pb-Free)	3000 / Tape & Reel
DTC144TET1G	7T	SC-75 (Pb-Free)	3000 / Tape & Reel
DTC144TM3T5G	8T	SOT-723 (Pb-Free)	8000 / Tape & Reel
NSBC144TF3T5G	K (180°)	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.



- (1) SC-75 and SC-70/SOT323; Minimum Pad
- (2) SC-59; Minimum Pad
- (3) SOT-23; Minimum Pad
- (4) SOT-1123; 100 mm², 1 oz. copper trace
- (5) SOT-723; Minimum Pad

Figure 1. Derating Curve

MUN2240, MMUN2240L, MUN5240, DTC144TE, DTC144TM3, NSBC144TF3

Table 2. THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
THERMAL CHARACTERISTICS (SC-59) (MUN2240)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2)	P_D 230 338 1.8 2.7	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$ 540 370	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{\theta JL}$ 264 287	$^\circ\text{C/W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
THERMAL CHARACTERISTICS (SOT-23) (MMUN2240L)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2)	P_D 246 400 2.0 3.2	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$ 508 311	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{\theta JL}$ 174 208	$^\circ\text{C/W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
THERMAL CHARACTERISTICS (SC-70/SOT-323) (MUN5240)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2)	P_D 202 310 1.6 2.5	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$ 618 403	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{\theta JL}$ 280 332	$^\circ\text{C/W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
THERMAL CHARACTERISTICS (SC-75) (DTC144TE)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2)	P_D 200 300 1.6 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$ 600 400	$^\circ\text{C/W}$
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
THERMAL CHARACTERISTICS (SOT-723) (DTC144TM3)			
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2)	P_D 260 600 2.0 4.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{\theta JA}$ 480 205	$^\circ\text{C/W}$
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.
- FR-4 @ 100 mm², 1 oz. copper traces, still air.
- FR-4 @ 500 mm², 1 oz. copper traces, still air.

MUN2240, MMUN2240L, MUN5240, DTC144TE, DTC144TM3, NSBC144TF3

Table 2. THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
THERMAL CHARACTERISTICS (SOT-1123) (NSBC144TF3)			
Total Device Dissipation $T_A = 25^\circ\text{C}$	P_D	254 297	mW
Derate above 25°C		2.0 2.4	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	493 421	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	193	$^\circ\text{C/W}$
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.
- FR-4 @ 100 mm², 1 oz. copper traces, still air.
- FR-4 @ 500 mm², 1 oz. copper traces, still air.

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}	-	-	0.2	mAdc
Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}, I_E = 0$)	$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 5) ($I_C = 2.0\text{ mA}, I_B = 0$)	$V_{(BR)CEO}$	50	-	-	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 5) ($I_C = 5.0\text{ mA}, V_{CE} = 10\text{ V}$)	h_{FE}	160	350	-	
Collector-Emitter Saturation Voltage (Note 5) ($I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$)	$V_{CE(sat)}$	-	-	0.25	Vdc
Input Voltage (off) ($V_{CE} = 5.0\text{ V}, I_C = 100\ \mu\text{A}$)	$V_{i(off)}$	-	0.6	0.5	Vdc
Input Voltage (on) ($V_{CE} = 0.3\text{ V}, I_C = 10\text{ mA}$)	$V_{i(on)}$	4.0	2.6	-	Vdc
Output Voltage (on) ($V_{CC} = 5.0\text{ V}, V_B = 3.5\text{ V}, R_L = 1.0\text{ k}\Omega$)	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	R1	32.9	47	61.1	k Ω
Resistor Ratio	R_1/R_2	-	-	-	

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

TYPICAL CHARACTERISTICS – MUN2240, MMUN2240L, MUN5240, DTC144TE, DTC144TM3

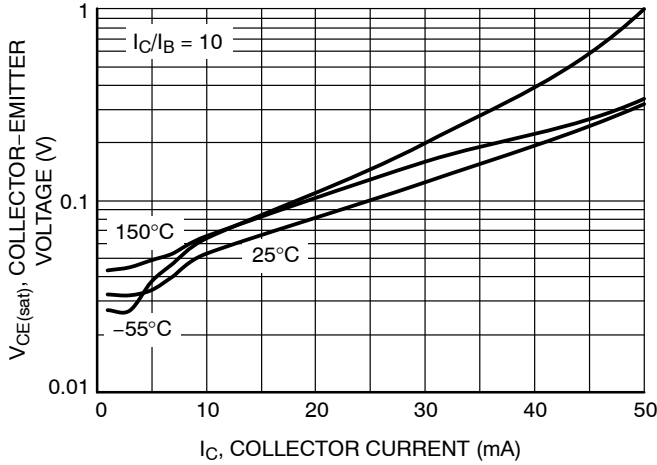


Figure 2. $V_{CE(sat)}$ vs. I_C

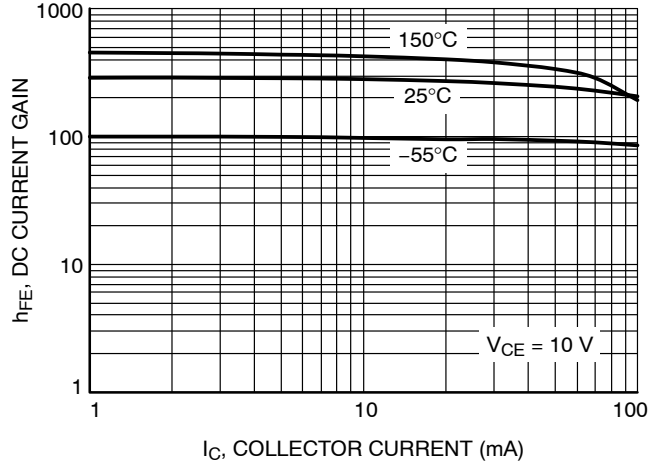


Figure 3. DC Current Gain

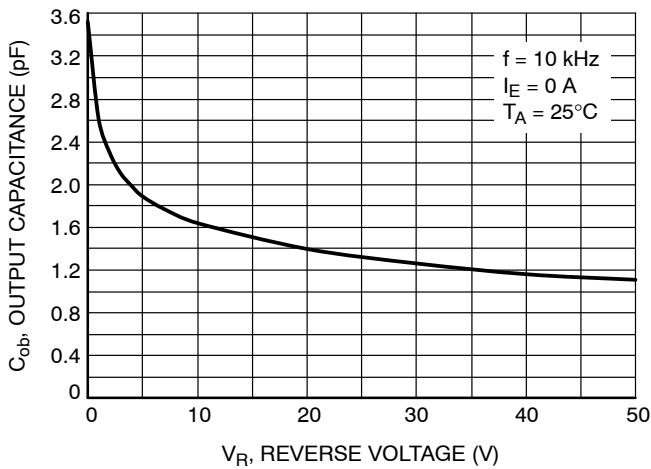


Figure 4. Output Capacitance

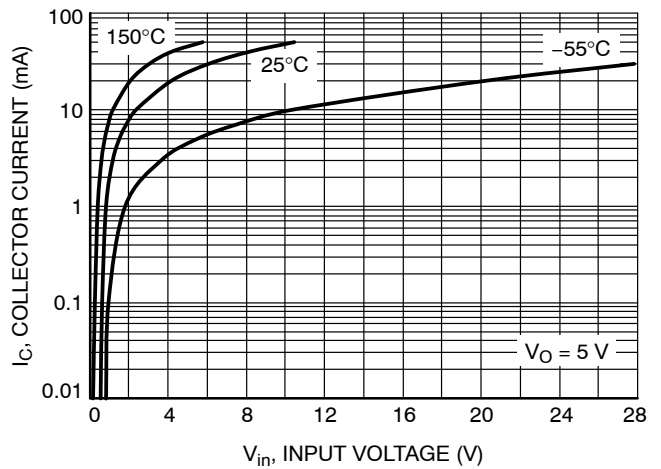


Figure 5. Output Current vs. Input Voltage

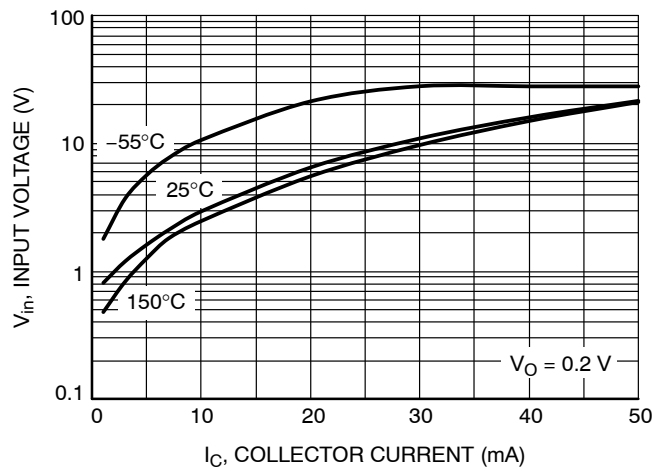
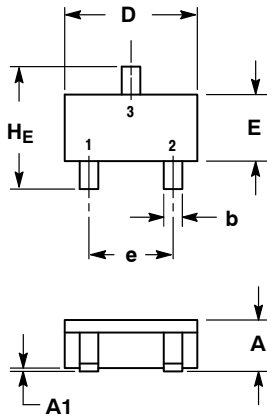


Figure 6. Input Voltage vs. Output Current

PACKAGE DIMENSIONS

SC-59
CASE 318D-04
ISSUE H

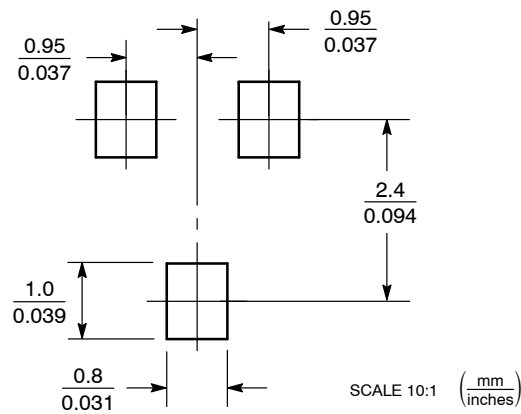


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

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 AP

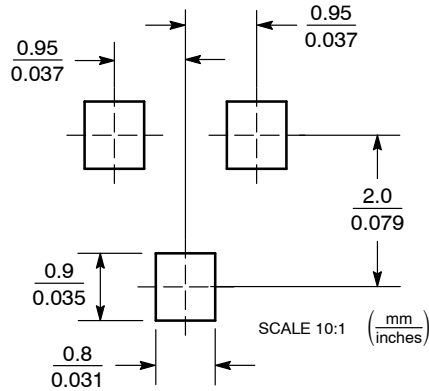


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	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
HE	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

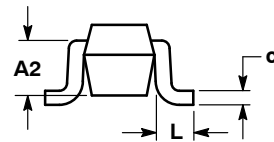
SOLDERING FOOTPRINT*



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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*



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PACKAGE DIMENSIONS

SC-75/SOT-416
CASE 463
ISSUE F



- 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	0.059	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
HE	1.50	1.60	1.70	0.061	0.063	0.065

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

SOLDERING FOOTPRINT*

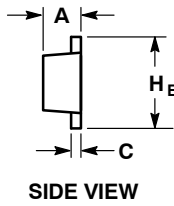
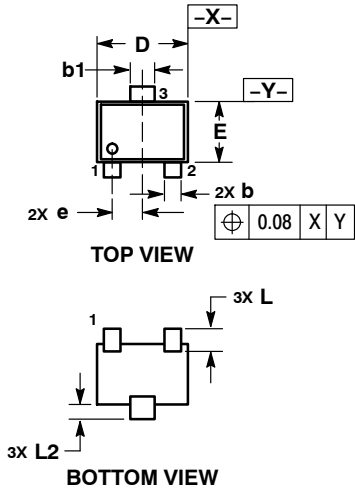


SCALE 10:1 ($\frac{\text{mm}}{\text{inches}}$)

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PACKAGE DIMENSIONS

SOT-723
CASE 631AA-01
ISSUE D



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

RECOMMENDED
SOLDERING FOOTPRINT*



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PACKAGE DIMENSIONS

SOT-1123
CASE 524AA
ISSUE C



TOP VIEW

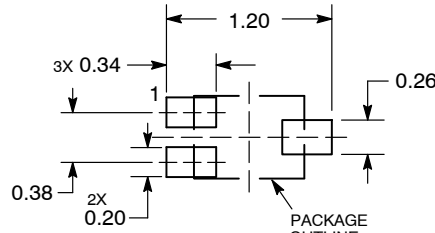


SIDE VIEW



BOTTOM VIEW

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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
HE	0.95	1.05
L	0.185	REF
L2	0.05	0.15

STYLE 1:

- PIN 1. BASE
- EMITTER
- COLLECTOR

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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331