Digital Transistors (BRT) R1 = 4.7 k Ω , R2 = 47 k Ω

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 $(T_A = 25^{\circ}C)$

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

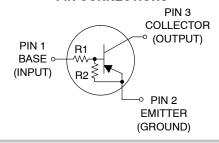
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



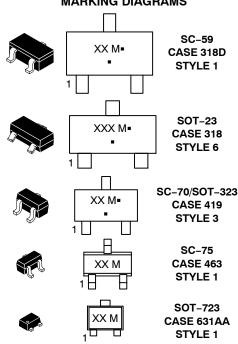
ON Semiconductor®

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PIN CONNECTIONS



MARKING DIAGRAMS



STYLE 1 XXX = Specific Device Code

X ML 1

= 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.

SOT-1123

CASE 524AA

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.

 $^{*(}XX^{\circ})$ = Degree rotation in the clockwise direction.

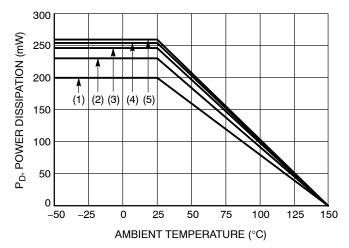


Figure 1. Derating Curve

- (1) SC-75 and SC-70/SOT-323; 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

Table 2. THERMAL CHARACTERISTICS

Characteristic		Symbol	Max	Unit
THERMAL CHARACTERISTICS (SC-59) (MUN2133)				
Total Device Dissipation $T_A = 25^{\circ}C$ Derate above $25^{\circ}C$	(Note 1) (Note 2) (Note 1) (Note 2)	P _D	230 338 1.8 2.7	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{ heta JA}$	540 370	°C/W
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{ hetaJL}$	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 $T_A = 25^{\circ}C$ Derate above $25^{\circ}C$	(Note 1) (Note 2) (Note 1) (Note 2)	P _D	246 400 2.0 3.2	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{ heta JA}$	508 311	°C/W
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{ hetaJL}$	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 $T_A = 25^{\circ}C$ Derate above $25^{\circ}C$	(Note 1) (Note 2) (Note 1) (Note 2)	P _D	202 310 1.6 2.5	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	R_{\thetaJA}	618 403	°C/W
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{ heta JL}$	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 $T_A = 25^{\circ}C$ Derate above $25^{\circ}C$	(Note 1) (Note 2) (Note 1) (Note 2)	P_D	200 300 1.6 2.4	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{ heta JA}$	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 $T_A = 25^{\circ}C$ Derate above $25^{\circ}C$	(Note 1) (Note 2) (Note 1) (Note 2)	P _D	260 600 2.0 4.8	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{ heta JA}$	480 205	°C/W

- 1. FR-4 @ Minimum Pad.
- 2. FR-4 @ 1.0 x 1.0 Inch Pad.
- 3. FR 4 @ 100 mm², 1 oz. copper traces, still air. 4. FR 4 @ 500 mm², 1 oz. copper traces, still air.

Table 2. THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit	
Thermal Characteristics (SOT-1123) (NSBA143ZF3)				
Total Device Dissipation $T_A = 25^{\circ}C$ Derate above 25°C	(Note 3) (Note 4) (Note 3) (Note 4)	P _D	254 297 2.0 2.4	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 3) (Note 4)	$R_{ hetaJA}$	493 421	°C/W
Thermal Resistance, Junction to Lead	(Note 3)	$R_{ hetaJL}$	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 mm², 1 oz. copper traces, still air. 4. FR -4 @ 500 mm², 1 oz. copper traces, still air.

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

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS		-	•	•	
Collector-Base Cutoff Current (V _{CB} = 50 V, I _E = 0)	Ісво	-	_	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 ($I_C = 10 \mu A, I_E = 0$)	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 mA, V _{CE} = 10 V)	h _{FE}	80	140	_	
Collector – Emitter Saturation Voltage (Note 5) (I _C = 10 mA, I _B = 0.3 mA)	VCE(sat)	-	_	0.25	Vdc
Input Voltage (off) $(V_{CE} = 5.0 \text{ V}, I_C = 100 \mu\text{A})$	V _{i(off)}	-	0.7	0.5	Vdc
Input Voltage (on) $(V_{CE} = 0.3 \text{ V}, I_C = 5.0 \text{ mA})$	V _{i(on)}	1.3	0.9	_	Vdc
Output Voltage (on) ($V_{CC} = 5.0 \text{ V}$, $V_B = 2.5 \text{ V}$, $R_L = 1.0 \text{ k}\Omega$)	V _{OL}	_	_	0.2	Vdc
Output Voltage (off) $(V_{CC} = 5.0 \text{ V}, V_B = 0.5 \text{ V}, R_L = 1.0 \text{ k}\Omega)$	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%.

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 CHARACTERISTICS MUN2133, MMUN2133L, MUN5133, DTA143ZE, DTA143ZM3

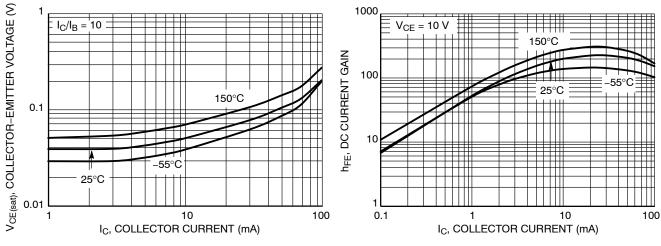


Figure 2. V_{CE(sat)} vs. I_C

Figure 3. DC Current Gain

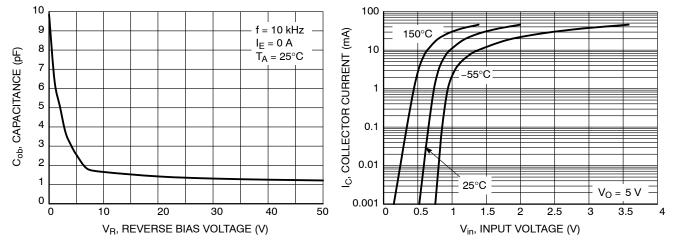


Figure 4. Output Capacitance

Figure 5. Output Current vs. Input Voltage

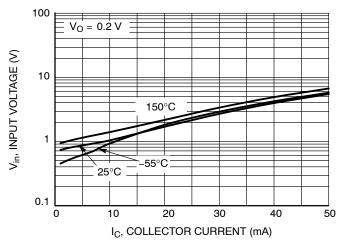


Figure 6. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS NSBA143ZF3

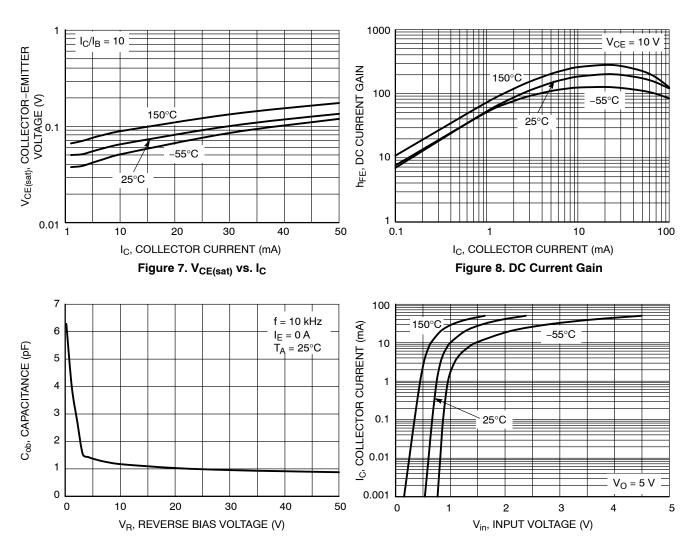


Figure 9. Output Capacitance

Figure 10. Output Current vs. Input Voltage

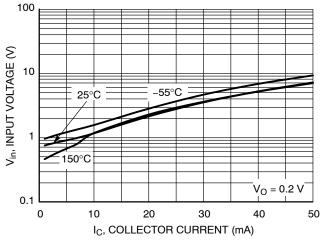
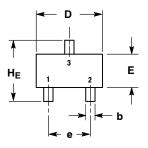
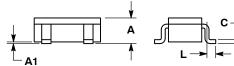


Figure 11. Input Voltage vs. Output Current

PACKAGE DIMENSIONS

SC-59 CASE 318D-04 **ISSUE H**



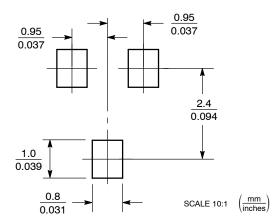


- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	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
O	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
Е	1.30	1.50	1.70	0.051	0.059	0.067
е	1.70	1.90	2.10	0.067	0.075	0.083
٦	0.20	0.40	0.60	0.008	0.016	0.024
ΗE	2.50	2.80	3.00	0.099	0.110	0.118

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

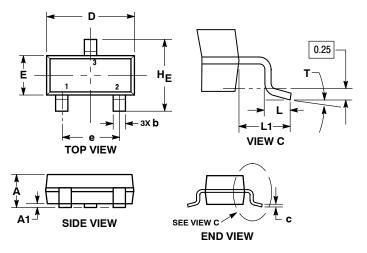
SOLDERING FOOTPRINT*



^{*}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 AR**



- DISS.

 DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

 CONTROLLING DIMENSION: MILLIMETERS.

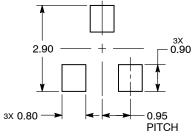
 MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH.

 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.

	MILLIMETERS				INCHES	
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	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
С	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
е	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
ΗE	2.10	2.40	2.64	0.083	0.094	0.104
Т	0°		10 °	0 °		10 °
STYLE 6: PIN 1. BASE 2. EMITTER 3. COLLECTOR						

RECOMMENDED SOLDERING FOOTPRINT*

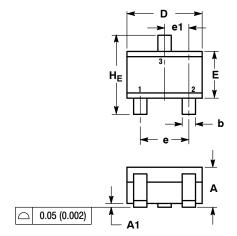


DIMENSIONS: MILLIMETERS

^{*}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

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



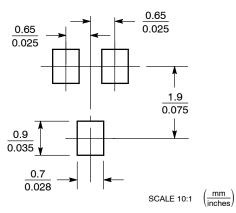
NOTES:

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

	MILLIMETERS INCHES					
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	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
С	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
е	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

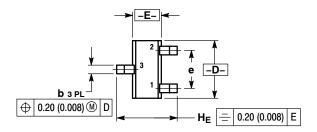
SOLDERING FOOTPRINT*

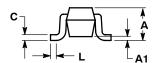


*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

SC-75/SOT-416 CASE 463 **ISSUE G**



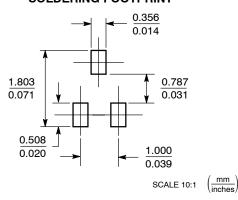


- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.

	MIL	LIMETE	ERS		INCHES	;
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	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
С	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
Е	0.70	0.80	0.90	0.027	0.031	0.035
е	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	0.060	0.063	0.067

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

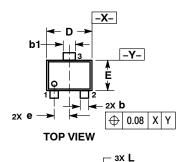
SOLDERING FOOTPRINT*



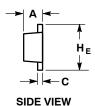
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

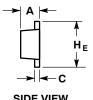
PACKAGE DIMENSIONS

SOT-723 CASE 631AA ISSUE D



BOTTOM VIEW





- NOTES:

 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

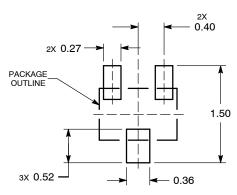
 2. CONTROLLING DIMENSION: MILLIMETERS.

 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH, MINIMUM LEAD THICKNESS IS THE MINIMUM THEORY AND THE PER AND THE PER
- THICKNESS OF BASE MATERIAL.
 DIMENSIONS D AND E DO NOT INCLUDE MOLD
 FLASH, PROTRUSIONS OR GATE BURRS.

	MILLIMETERS			
DIM	MIN	NOM	MAX	
Α	0.45	0.50	0.55	
b	0.15	0.21	0.27	
b1	0.25	0.31	0.37	
С	0.07	0.12	0.17	
D	1.15	1.20	1.25	
Е	0.75	0.80	0.85	
е		0.40 BS0		
ΗE	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*

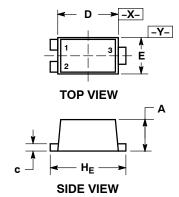


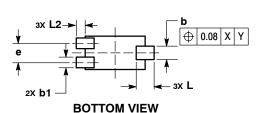
DIMENSIONS: MILLIMETERS

^{*}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





NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14 5M 1994
- 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD
- 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.

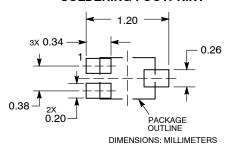
	MILLIMETERS		
DIM	MIN	MAX	
Α	0.34	0.40	
b	0.15	0.28	
b1	0.10	0.20	
U	0.07	0.17	
D	0.75	0.85	
Е	0.55	0.65	
e	0.35	0.40	
HE	0.95	1.05	
L	0.185 REF		
L2	0.05	0.15	

STYLE 1:

PIN 1. BASE 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.

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