Digital Transistors (BRT) $R1 = 47 k\Omega$, $R2 = 22 k\Omega$

NPN Transistors with Monolithic Bias Resistor Network

MUN2237, MMUN2237L, **MUN5237, DTC144WE,** DTC144WM3, NSBC144WF3

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

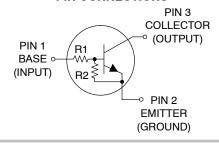
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



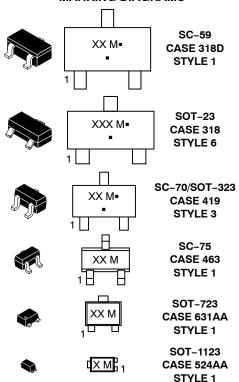
ON Semiconductor®

www.onsemi.com

PIN CONNECTIONS



MARKING DIAGRAMS



XXX = Specific Device Code Date Code*

M = 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.

Table 1. ORDERING INFORMATION

Device	Part Marking	Package	Shipping [†]
MUN2237T1G, NSVMUN2237T1G*	8P	SC-59 (Pb-Free)	3000 / Tape & Reel
MMUN2237LT1G, NSVMMUN2237LT1G*	AA3	SOT-23 (Pb-Free)	3000 / Tape & Reel
MUN5237T1G, NSVMUN5237T1G*	8P	SC-70/SOT-323 (Pb-Free)	3000 / Tape & Reel
DTC144WET1G, NSVDTC144WET1G*	8P	SC-75 (Pb-Free)	3000 / Tape & Reel
DTC144WM3T5G	8P	SOT-723 (Pb-Free)	8000 / Tape & Reel
NSBC144WF3T5G	Q	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.

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

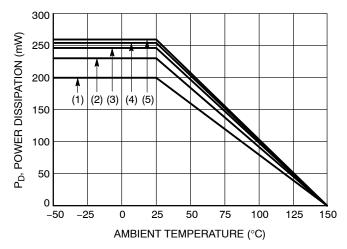


Figure 1. Derating Curve

- (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

Table 2 THERMAL CHARACTERISTICS

Characteristic		Symbol	Max	Unit
THERMAL CHARACTERISTICS (SC-59) (MUN2237)				
Total Device Dissipation $T_A = 25^{\circ}C$ Derate above 25°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)	$R_{\theta JA}$	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) (MMUN2237L)				
Total Device Dissipation $T_A = 25^{\circ}C$ Derate above 25°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_{\thetaJA}	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) (MUN5237)				
Total Device Dissipation $T_A = 25^{\circ}C$ Derate above 25°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)	$R_{ hetaJL}$	280 332	°C/W
Junction and Storage Temperature Range		T _J , T _{stg}	-55 to +150	°C
THERMAL CHARACTERISTICS (SC-75) (DTC144WE)				
Total Device Dissipation $T_A = 25^{\circ}C$ Derate above 25°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) (DTC144WM3)				
Total Device Dissipation T _A = 25°C	(Note 1) (Note 2)	P _D	260 600	mW
Derate above 25°C	(Note 1) (Note 2)		2.0 4.8	mW/°C
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.
- 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 2. THERMAL CHARACTERISTICS

Characteristic		Symbol	Max	Unit
THERMAL CHARACTERISTICS (SOT-1123) (NSBC144WF3)				
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.
- FR-4 @ 100 mm², 1 oz. copper traces, still air.
 FR-4 @ 500 mm², 1 oz. copper traces, still air.

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

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS					
Collector-Base Cutoff Current $(V_{CB} = 50 \text{ V}, I_{E} = 0)$	Ісво	-	_	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}	-	_	0.13	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 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 = 5.0 mA)	VCE(sat)	-	_	0.25	Vdc
Input Voltage (off) $(V_{CE} = 5.0 \text{ V, } I_{C} = 100 \mu\text{A})$	V _{i(off)}	-	1.8	1.2	Vdc
Input Voltage (on) (V _{CE} = 0.3 V, I _C = 2.0 mA)	V _{i(on)}	4.0	2.3	-	Vdc
Output Voltage (on) (V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 k Ω)	V _{OL}	-	_	0.2	Vdc
Output Voltage (off) (V _{CC} = 5.0 V, V _B = 0.25 V, R _L = 1.0 k Ω)	V _{ОН}	4.9	_	_	Vdc
Input Resistor	R1	32.9	47	61.1	kΩ
Resistor Ratio	R ₁ /R ₂	1.7	2.1	2.6	

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.

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

TYPICAL CHARACTERISTICS MUN2237, MMUN2237L, MUN5237, DTC144WE, DTC144WM3

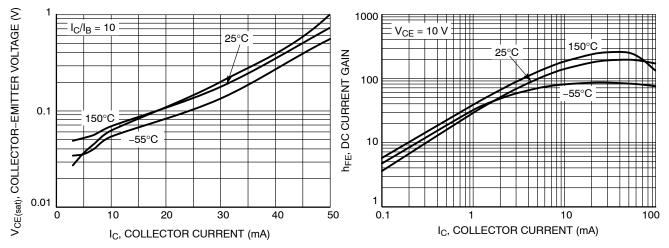


Figure 2. V_{CE(sat)} vs. I_C

Figure 3. DC Current Gain

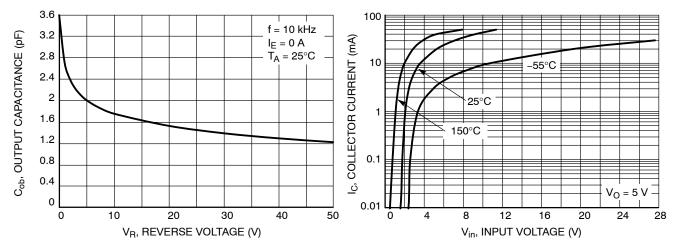


Figure 4. Output Capacitance

Figure 5. Output Current vs. Input Voltage

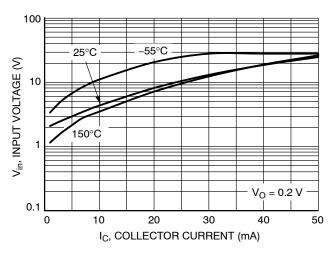


Figure 6. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS NSBC144WF3

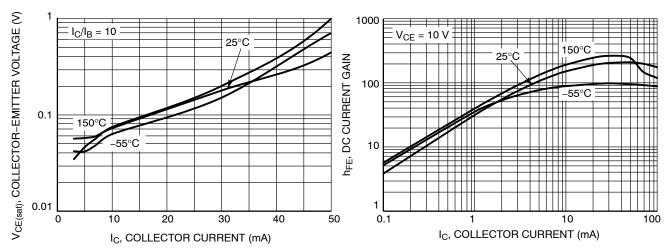


Figure 7. $V_{CE(sat)}$ vs. I_{C}

Figure 8. DC Current Gain

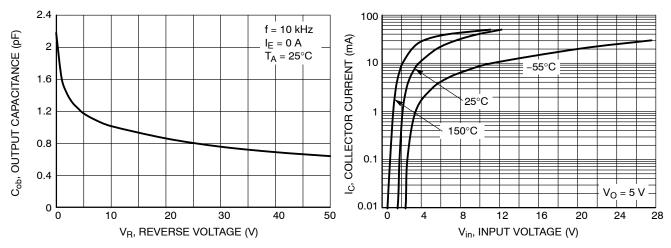


Figure 9. Output Capacitance

Figure 10. Output Current vs. Input Voltage

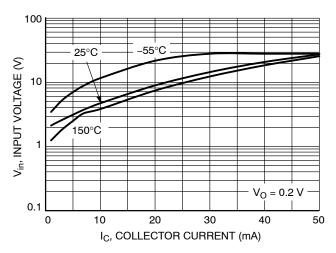


Figure 11. Input Voltage vs. Output Current

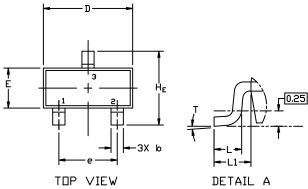




SOT-23 (TO-236) CASE 318 ISSUE AT

DATE 01 MAR 2023









NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
- 2. 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.

	MILLIM	IMETERS INCHES				
DIM	MIN.	N□M.	MAX.	MIN.	N□M.	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
Ε	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
Т	0*		10°	0*		10°

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code

M = Date Code

■ = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.



RECOMMENDED MOUNTING FOOTPRINT

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

STYLES ON PAGE 2

DOCUMENT NUMBER:	98ASB42226B	Electronic versions are uncontrolled except when accessed directly from the Document Repo Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	SOT-23 (TO-236)		PAGE 1 OF 2	

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SOT-23 (TO-236) CASE 318 ISSUE AT

DATE 01 MAR 2023

STYLE 1 THRU 5: CANCELLED	STYLE 6: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 7: PIN 1. EMITTER 2. BASE 3. COLLECTOR	STYLE 8: PIN 1. ANODE 2. NO CONNECTION 3. CATHODE	N	
STYLE 9: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 10: PIN 1. DRAIN 2. SOURCE 3. GATE	STYLE 11: PIN 1. ANODE 2. CATHODE 3. CATHODE-ANODE	STYLE 12: PIN 1. CATHODE 2. CATHODE 3. ANODE	STYLE 13: PIN 1. SOURCE 2. DRAIN 3. GATE	STYLE 14: PIN 1. CATHODE 2. GATE 3. ANODE
STYLE 15: PIN 1. GATE 2. CATHODE 3. ANODE	STYLE 16: PIN 1. ANODE 2. CATHODE 3. CATHODE	STYLE 17: PIN 1. NO CONNECTION 2. ANODE 3. CATHODE	STYLE 18: PIN 1. NO CONNECTION 2. CATHODE 3. ANODE	STYLE 19: N PIN 1. CATHODE 2. ANODE 3. CATHODE-ANODE	STYLE 20: PIN 1. CATHODE 2. ANODE 3. GATE
STYLE 21: PIN 1. GATE 2. SOURCE 3. DRAIN	STYLE 22: PIN 1. RETURN 2. OUTPUT 3. INPUT	STYLE 23: PIN 1. ANODE 2. ANODE 3. CATHODE	STYLE 24: PIN 1. GATE 2. DRAIN 3. SOURCE	STYLE 25: PIN 1. ANODE 2. CATHODE 3. GATE	STYLE 26: PIN 1. CATHODE 2. ANODE 3. NO CONNECTION
STYLE 27: PIN 1. CATHODE 2. CATHODE 3. CATHODE	STYLE 28: PIN 1. ANODE 2. ANODE 3. ANODE				

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DESCRIPTION:	SOT-23 (TO-236)		PAGE 2 OF 2	

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SC-70 (SOT-323) **CASE 419** ISSUE R

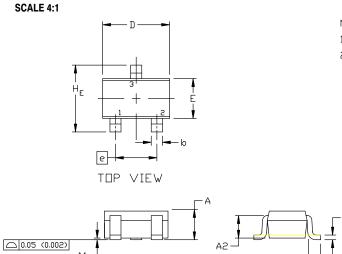
END VIEW

DATE 11 OCT 2022

NOTES:

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

	M:	MILLIMETERS			INCHES	
DIM	MIN.	N□M.	MAX.	MIN.	N□M.	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 BS	C
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	2.00	2.20	0.071	0.080	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 BS	C
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



GENERIC MARKING DIAGRAM

SIDE VIEW

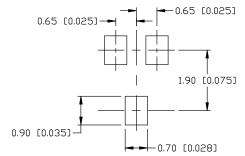


= Specific Device Code XX

Μ = Date Code

= Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.



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

SOLDERING FOOTPRINT

STYLE 1: CANCELLED	STYLE 2: PIN 1. ANODE 2. N.C. 3. CATHODE	STYLE 3: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. CATHODE	
STYLE 6:	STYLE 7:	STYLE 8:	STYLE 9:	STYLE 10:	STYLE 11:
PIN 1. EMITTER	PIN 1. BASE	PIN 1. GATE	PIN 1. ANODE	PIN 1. CATHODE	PIN 1. CATHODE
2. BASE	2. EMITTER	2. SOURCE	2. CATHODE	2. ANODE	CATHODE
COLLECTOR	COLLECTOR	3. DRAIN	CATHODE-ANODE	3. ANODE-CATHODE	CATHODE

DOCUMENT NUMBER:	98ASB42819B	Electronic versions are uncontrolled except when accessed directly from the Document Reposi Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	SC-70 (SOT-323)		PAGE 1 OF 1	

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SC75-3 1.60x0.80x0.80, 1.00P **CASE 463 ISSUE H**

DATE 01 FEB 2024

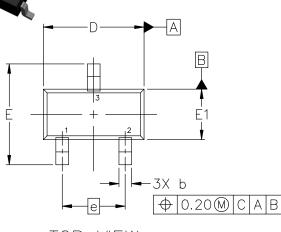
NOTES:

- DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
- ALL DIMENSION ARE IN MILLIMETERS.

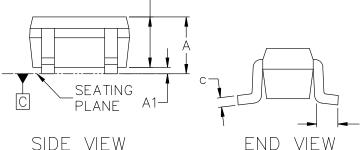
DIM	MILLIMETERS			
	MIN.	NOM.	MAX.	
А	0.70	0.80	0.90	
A1	0.00	0.05	0.10	
A2	0.80 REF.			
b	0.15	0.20	0.30	
С	0.10	0.15	0.25	
D	1.55	1.60	1.65	
E	1.50	1.60	1.70	
E1	0.70	0.80	0.90	
е	1.00 BSC			
L	0.10	0.15	0.20	

0.356

0.787



VIEW



A2

SIDE VIEW

GENERIC MARKING DIAGRAM*



XX= Specific Device Code

Μ = Date Code

= Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

STYLE 1: PIN 1. BASE 2. EMITTER

PIN 1. CATHODE 2. CATHODE

3. ANODE

STYLE 4:

STYLE 2: PIN 1. ANODE 2. N/C 3. COLLECTOR 3. CATHODE

STYLE 5:

PIN 1. GATE 2. SOURCE

3. DRAIN

STYLE 3: PIN 1. ANODE 2. ANODE

3. CATHODE

1.000 RECOMMENDED MOUNTING FOOTPRINT*

1.803

0.508

FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

DOCUMENT NUMBER:	98ASB15184C Electronic versions are uncontrolled except when accessed directly from the Document Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	SC75-3 1.60x0.80x0.80, 1.00P		PAGE 1 OF 1

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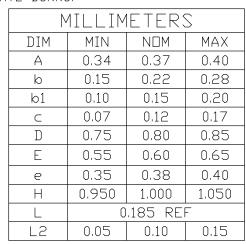


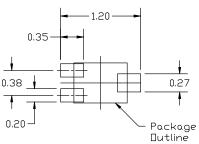
SOT-1123 0.80x0.60x0.37, 0.35P CASE 524AA ISSUE D

DATE 18 JAN 2024

NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
- 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.



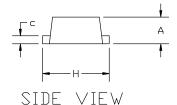


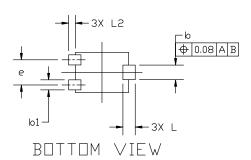
RECOMMENDED MOUNTING FOOTPRINT

*For additional information on our Pb-Free strategy and soldering details, please download th e □N Semiconductor Soldering and Mounting Techniques Reference manual, S□L□ERRM/□.

- I	B I
	E U

THP VIFW





GENERIC MARKING DIAGRAM*



X = Specific Device Code

M = Date Code

^{*}This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

YLE 1:	STYLE 2:	STYLE 3:	STYLE 4:	STYLE 5:
PIN 1. BASE	PIN 1. ANODE	PIN 1. ANODE	PIN 1. CATHODE	PIN 1. GATE
EMITTER	2. N/C	2. ANODE	2. CATHODE	SOURCE
COLLECTOR	CATHODE	CATHODE	3. ANODE	3. DRAIN

DOCUMENT NUMBER:	98AON23134D	Electronic versions are uncontrolled except when accessed directly from the Document Repositor Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	SOT-1123 0.80x0.60x0.37,	SOT-1123 0.80x0.60x0.37, 0.35P		

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MILLIMETERS

 $N\square M$.

0.50



SOT-723 1.20x0.80x0.50, 0.40P CASE 631AA ISSUE E

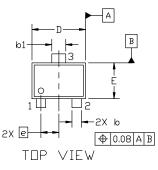
DATE 24 JAN 2024

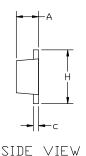
MAX.

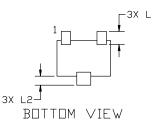
0.55

NOTES:

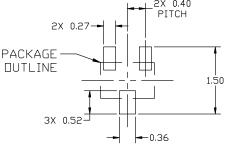
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018. CONTROLLING DIMENSION: MILLIMETERS.
- MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
- DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.







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 BSC		
Н	1.15	1.20	1.25
L		0.29 REF	-
L2	0.15	0.20	0.25
0.27			



DIM

Α

MIN.

0.45

RECOMMENDED MOUNTING FUUTPRINT

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

GENERIC MARKING DIAGRAM*



XX = Specific Device Code = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "=", may or may not be present. Some products may not follow the Generic Marking.

STYLE 1:	STYLE 2:	STYLE 3:	STYLE 4:	STYLE 5:
PIN 1. BASE	PIN 1. ANODE	PIN 1. ANODE	PIN 1. CATHODE	PIN 1. GATE
EMITTER	2. N/C	2. ANODE	2. CATHODE	SOURCE
COLLECTOR	CATHODE	CATHODE	ANODE	DRAIN

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DESCRIPTION:	SOT-723 1.20x0.80x0.50, 0.40P		PAGE 1 OF 1

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