Dual NPN Bias Resistor Transistors R1 = 4.7 k Ω , R2 = 4.7 k Ω

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, common for Q₁ and Q₂, unless otherwise noted)

Rating	Symbol	Max	Unit
Collector-Base Voltage	V _{CBO}	50	Vdc
Collector-Emitter Voltage	V _{CEO}	50	Vdc
Collector Current - Continuous	Ic	100	mAdc
Input Forward Voltage	V _{IN(fwd)}	30	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.

ORDERING INFORMATION

Device	Package	Shipping [†]
MUN5232DW1T1G, SMUN5232DW1T1G	SOT-363	3,000/Tape & Reel
NSBC143EDXV6T1G	SOT-563	4,000/Tape & Reel
NSBC143EDP6T5G	SOT-963	8,000/Tape & Reel

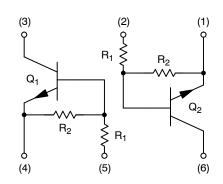
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



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PIN CONNECTIONS



MARKING DIAGRAMS



SOT-363 CASE 419B-02





SOT-563 CASE 463A





SOT-963 CASE 527AD



7J/T = 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.

THERMAL CHARACTERISTICS

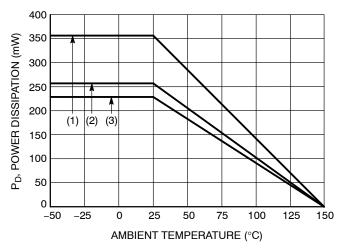
	Characteristic	Symbol	Max	Unit
MUN5232DW1 (SOT-363) ON	E JUNCTION HEATED			
Total Device Dissipation T _A = 25°C (Note 37) (Note 38) Derate above 25°C (Note 38)	(Note 37)	P _D	187 256 1.5 2.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 37) (Note 38)	$R_{ heta JA}$	670 490	°C/W
MUN5232DW1 (SOT-363) BO	TH JUNCTION HEATED (Note 39)			
Total Device Dissipation T _A = 25°C (Note 37) (Note 38) Derate above 25°C (Note 38)	(Note 37)	P _D	250 385 2.0 3.0	mW mW/°C
Thermal Resistance, Junction to Ambient (Note 38)	(Note 37)	$R_{ heta JA}$	493 325	°C/W
Thermal Resistance, Junction to Lead (Note 37) (Note 38)		$R_{ heta JL}$	188 208	°C/W
Junction and Storage Tempera	ature Range	T _J , T _{stg}	-55 to +150	°C
NSBC143EDXV6 (SOT-563) (ONE JUNCTION HEATED			
Total Device Dissipation T _A = 25°C (Note 37) Derate above 25°C	(Note 37)	P _D	357 2.9	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 37)	$R_{ hetaJA}$	350	°C/W
NSBC143EDXV6 (SOT-563) E	BOTH JUNCTION HEATED (Note 39)			
Total Device Dissipation T _A = 25°C (Note 37) Derate above 25°C	(Note 37)	P _D	500 4.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 37)	$R_{ heta JA}$	250	°C/W
Junction and Storage Tempera	ature Range	T _J , T _{stg}	-55 to +150	°C
NSBC143EDP6 (SOT-963) OI	NE JUNCTION HEATED			
Total Device Dissipation $T_A = 25^{\circ}C \qquad \text{(Note 40)}$ (Note 41) Derate above 25°C (Note 41)	(Note 40)	P _D	231 269 1.9 2.2	MW mW/°C
Thermal Resistance, Junction to Ambient (Note 41)	(Note 40)	$R_{ hetaJA}$	540 464	°C/W
NSBC143EDP6 (SOT-963) B0	OTH JUNCTION HEATED (Note 39)			
Total Device Dissipation TA = 25°C (Note 40) (Note 41) Derate above 25°C (Note 41)	(Note 40)	P _D	339 408 2.7 3.3	MW mW/°C
Thermal Resistance, Junction to Ambient (Note 41)	(Note 40)	$R_{ heta JA}$	369 306	°C/W
Junction and Storage Tempera	ature Range	T _J , T _{stg}	-55 to +150	°C
	· · · · · · · · · · · · · · · · · · ·			

^{37.}FR-4 @ Minimum Pad.
38.FR-4 @ 1.0 × 1.0 Inch Pad.
39. Both junction heated values assume total power is sum of two equally powered channels.
40.FR-4 @ 100 mm², 1 oz. copper traces, still air.
41.FR-4 @ 500 mm², 1 oz. copper traces, still air.

ELECTRICAL CHARACTERISTICS (T_A = 25°C, common for Q₁ and Q₂, unless otherwise noted)

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS			1	1	•
Collector-Base Cutoff Current $(V_{CB} = 50 \text{ V}, I_E = 0)$	I _{CBO}	-	-	100	nAdc
Collector-Emitter Cutoff Current (V _{CE} = 50 V, I _B = 0)	I _{CEO}	-	-	500	nAdc
Emitter-Base Cutoff Current $(V_{EB} = 6.0 \text{ V}, I_C = 0)$	I _{EBO}	-	-	1.5	mAdc
Collector-Base Breakdown Voltage ($I_C = 10 \mu A, I_E = 0$)	V _(BR) CBO	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 42) (I _C = 2.0 mA, I _B = 0)	V _{(BR)CEO}	50	-	-	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 42) (I _C = 5.0 mA, V _{CE} = 10 V)	h _{FE}	15	30	-	
Collector-Emitter Saturation Voltage (Note 42) (I _C = 10 mA, I _B = 1.0 mA)	V _{CE(sat)}	-	-	0.25	V
Input Voltage (Off) ($V_{CE} = 5.0 \text{ V}, I_C = 100 \mu\text{A}$)	V _{i(off)}	-	1.2	-	Vdc
Input Voltage (On) (V _{CE} = 0.2 V, I _C = 20 mA)	V _{i(on)}	-	2.4	-	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 V, V _B = 0.25 V, R _L = 1.0 k Ω)	V _{OH}	4.9	-	-	Vdc
Input Resistor	R1	3.3	4.7	6.1	kΩ
Resistor Ratio	R ₁ /R ₂	0.8	1.0	1.2	

^{42.} Pulsed Condition: Pulse Width = 300 ms, Duty Cycle ≤ 2%.



(1) SOT-363; 1.0×1.0 Inch Pad

Figure 98. Derating Curve

⁽²⁾ SOT-563; Minimum Pad

⁽³⁾ SOT-963; 100 mm², 1 oz. Copper Trace

TYPICAL CHARACTERISTICS MUN5232DW1, NSBC143EDXV6

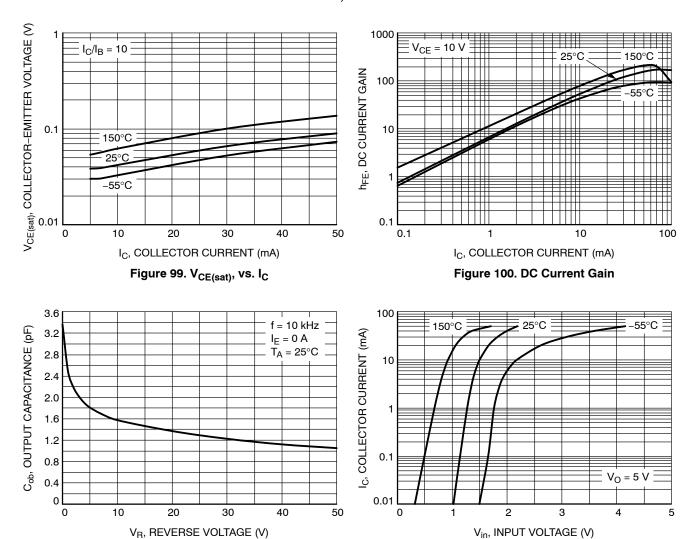


Figure 101. Output Capacitance

Figure 102. Output Current vs. Input Voltage

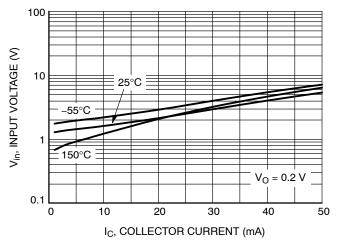
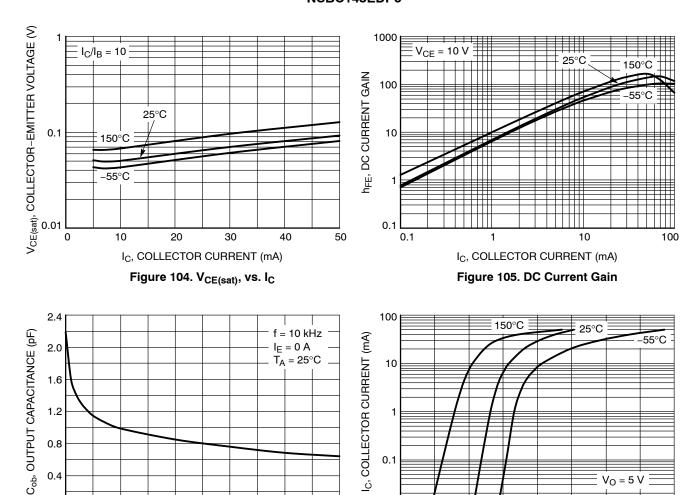


Figure 103. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS NSBC143EDP6



 V_R , REVERSE VOLTAGE (V) Figure 106. Output Capacitance

30

40

20

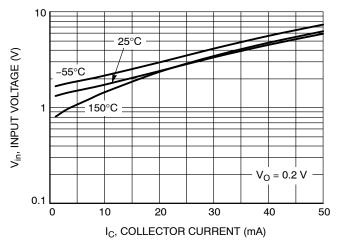
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0

10

 $\label{eq:Vin} V_{in}, \mbox{INPUT VOLTAGE (V)}$ Figure 107. Output Current vs. Input Voltage

3



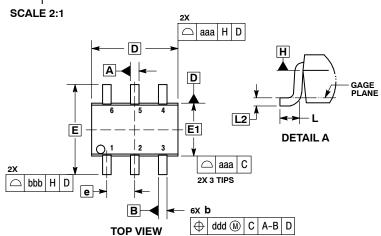
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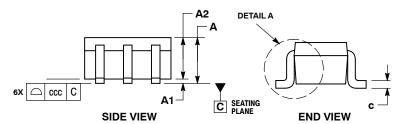
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Figure 108. Input Voltage vs. Output Current

SC-88/SC70-6/SOT-363 CASE 419B-02 **ISSUE Y**

DATE 11 DEC 2012





NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 CONTROLLING DIMENSION: MILLIMETERS
- CONTROLLING DIMENSION: MILLIMETERS.
 DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H. DATUMS A AND B ARE DETERMINED AT DATUM H. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.

- DIMENSION & DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION 6 AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MIL	LIMETE	RS		INCHES	3
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α			1.10			0.043
A1	0.00		0.10	0.000		0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
С	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
Е	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
е	0.65 BSC			0	.026 BS	С
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC 0.006 BSC			SC		
aaa	0.15 0.006					
bbb		0.30			0.012	
ccc		0.10			0.004	
ddd		0.10			0.004	

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code

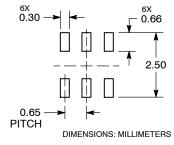
= Date Code*

= Pb-Free Package

(Note: Microdot may be in either location)

- *Date Code orientation and/or position may vary depending upon manufacturing location.
- *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 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.

STYLES ON PAGE 2

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DESCRIPTION:	SC-88/SC70-6/SOT-363		PAGE 1 OF 2

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SC-88/SC70-6/SOT-363 CASE 419B-02 ISSUE Y

DATE 11 DEC 2012

STYLE 1: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2	STYLE 2: CANCELLED	STYLE 3: CANCELLED	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. COLLECTOR 4. EMITTER 5. BASE 6. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 6: PIN 1. ANODE 2 2. N/C 3. CATHODE 1 4. ANODE 1 5. N/C 6. CATHODE 2
STYLE 7: PIN 1. SOURCE 2 2. DRAIN 2 3. GATE 1 4. SOURCE 1 5. DRAIN 1 6. GATE 2	STYLE 8: CANCELLED	STYLE 9: PIN 1. EMITTER 2 2. EMITTER 1 3. COLLECTOR 1 4. BASE 1 5. BASE 2 6. COLLECTOR 2	STYLE 10: PIN 1. SOURCE 2 2. SOURCE 1 3. GATE 1 4. DRAIN 1 5. DRAIN 2 6. GATE 2	STYLE 11: PIN 1. CATHODE 2 2. CATHODE 2 3. ANODE 1 4. CATHODE 1 5. CATHODE 1 6. ANODE 2	STYLE 12: PIN 1. ANODE 2 2. ANODE 2 3. CATHODE 1 4. ANODE 1 5. ANODE 1 6. CATHODE 2
STYLE 13: PIN 1. ANODE 2. N/C 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 14: PIN 1. VREF 2. GND 3. GND 4. IOUT 5. VEN 6. VCC	STYLE 15: PIN 1. ANODE 1 2. ANODE 2 3. ANODE 3 4. CATHODE 3 5. CATHODE 2 6. CATHODE 1	STYLE 16: PIN 1. BASE 1 2. EMITTER 2 3. COLLECTOR 2 4. BASE 2 5. EMITTER 1 6. COLLECTOR 1	STYLE 17: PIN 1. BASE 1 2. EMITTER 1 3. COLLECTOR 2 4. BASE 2 5. EMITTER 2 6. COLLECTOR 1	STYLE 18: PIN 1. VIN1 2. VCC 3. VOUT2 4. VIN2 5. GND 6. VOUT1
STYLE 19: PIN 1. I OUT 2. GND 3. GND 4. V CC 5. V EN 6. V REF	STYLE 20: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR	STYLE 21: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. N/C 6. CATHODE 1	STYLE 22: PIN 1. D1 (i) 2. GND 3. D2 (i) 4. D2 (c) 5. VBUS 6. D1 (c)	STYLE 23: PIN 1. Vn 2. CH1 3. Vp 4. N/C 5. CH2 6. N/C	STYLE 24: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE
STYLE 25: PIN 1. BASE 1 2. CATHODE 3. COLLECTOR 2 4. BASE 2 5. EMITTER 6. COLLECTOR 1	STYLE 26: PIN 1. SOURCE 1 2. GATE 1 3. DRAIN 2 4. SOURCE 2 5. GATE 2 6. DRAIN 1	STYLE 27: PIN 1. BASE 2 2. BASE 1 3. COLLECTOR 1 4. EMITTER 1 5. EMITTER 2 6. COLLECTOR 2	STYLE 28: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN	STYLE 29: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE/ANODE 6. CATHODE	STYLE 30: PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



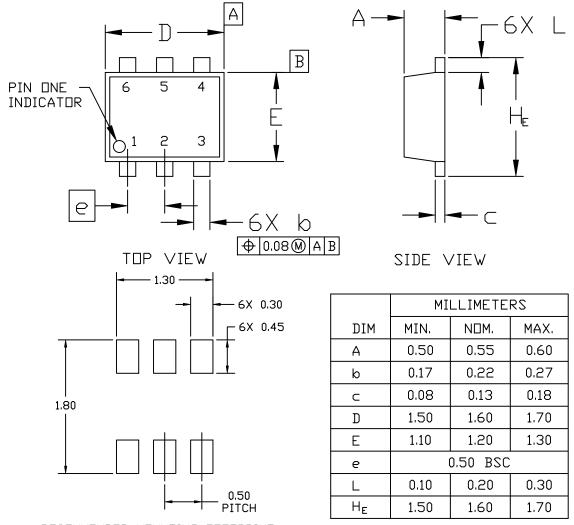


SOT-563, 6 LEAD CASE 463A ISSUE H

DATE 26 JAN 2021

NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
- 2. CONTROLLING DIMENSION: MILLIMETERS
- 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.



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.

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DESCRIPTION:	SOT-563, 6 LEAD		PAGE 1 OF 2

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SOT-563, 6 LEAD

CASE 463A ISSUE H

2

1

DATE 26 JAN 2021

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

GENERIC MARKING DIAGRAM*



XX = Specific Device Code M = Month 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.

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MECHANICAL CASE OUTLINE

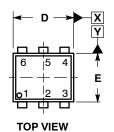


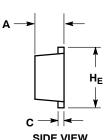


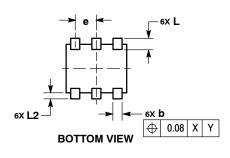
SOT-963 CASE 527AD-01 **ISSUE E**

DATE 09 FEB 2010







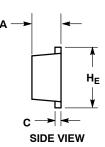


STYLE 1: PIN 1. EMITTER 1 2. BASE 1 3. COLLECTOR 2 4. EMITTER 2 5. BASE 2 6. COLLECTOR 1
STYLE 4: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR
STYLE 7: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. CATHODE 5. ANODE 6. CATHODE
STYLE 10: PIN 1. CATHODE 1 2. N/C 3. CATHODE 2

4. ANODE 2
 5. N/C

6. ANODE 1

STYLE 2: PIN 1. EMITTER 1 2. EMITTER2 3. BASE 2 4. COLLECTOR 2 5. BASE 1 6. COLLECTOR 1	STYLE 3: PIN 1. CATHODE 1 2. CATHODE 1 3. ANODE/ANODE 2 4. CATHODE 2 5. CATHODE 2 6. ANODE/ANODE 1
STYLE 5:	STYLE 6:
PIN 1. CATHODE	PIN 1. CATHODE
2. CATHODE	2. ANODE 3. CATHODE
4. ANODE	4. CATHODE
2. CATHODE 3. ANODE 4. ANODE 5. CATHODE 6. CATHODE	5. CATHODE
6. CATHODE	6. CATHODE
STYLE 8:	STYLE 9:
PIN 1. DRAIN	PIN 1. SOURCE 1
2. DRAIN	2. GATE 1
3. GATE 4. SOURCE	3. DRAIN 2 4. SOURCE 2
5. DRAIN	5. GATE 2
6. DRAIN	6. DRAIN 1



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ASME
- DIMENSIONING AND TOLEHANCING PER ASM Y14.5M, 1994.
 CONTROLLING DIMENSION: MILLIMETERS
 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			
DIM	MIN	NOM	MAX	
Α	0.34	0.37	0.40	
b	0.10	0.15	0.20	
С	0.07	0.12	0.17	
D	0.95	1.00	1.05	
Е	0.75	0.80	0.85	
е	0.35 BSC			
HE	0.95	1.00	1.05	
Ĺ	0.19 REF			
L2	0.05	0.10	0.15	

GENERIC MARKING DIAGRAM*



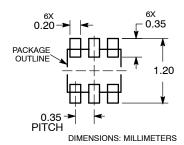
= Specific Device Code

= Month Code Μ

*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.

RECOMMENDED MOUNTING FOOTPRINT



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