

# NSB13211DW6T1G

## Dual Complementary Bias Resistor Transistors

### Complementary BRTs with Monolithic Bias Network

NSB13211DW6T1G contains a single PNP bias resistor transistor and a single NPN bias resistor transistor with a monolithic bias network; a series base resistor and a base-emitter resistor. This device is designed to replace multiple transistors and resistors on customer boards by integrating these components into a single device.

NSB13211DW6T1G is housed in a SC-88/SOT-363 package which is ideal for low power surface mount applications in space constrained applications.

#### Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Q1: PNP BRT, R1 = R2 = 4.7 k
- Q2: NPN BRT, R3 = R4 = 10 k
- This is a Pb-Free Device

#### Applications

- Logic Switching
- Amplification
- Driver Circuits
- Interface Circuits

**MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>, - minus sign for Q<sub>1</sub> (PNP) omitted)

Rating	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CB0</sub>	50	Vdc
Collector-Emitter Voltage	V <sub>CEO</sub>	50	Vdc
Collector Current	I <sub>C</sub>	100	mAdc

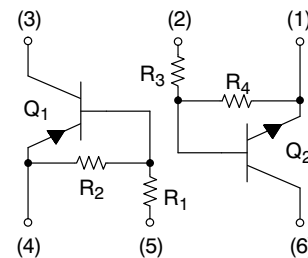
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



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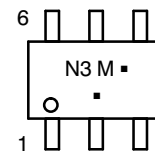
### PNP and NPN SILICON BIAS RESISTOR TRANSISTORS



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SC-88/SOT-363  
CASE 419B  
STYLE 1

#### MARKING DIAGRAM



N3 = Device Code  
M = Date Code\*  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

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

#### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NSB13211DW6T1G	SC-88 (Pb-Free)	3000/Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# NSB13211DW6T1G

## THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	180 (Note 1) 1.44 (Note 1)	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	692 (Note 1)	$^\circ\text{C/W}$
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation, $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	230 1.83	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	544	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

1. FR-4 @ Minimum Pad of 1.45 mm<sup>2</sup>, 1 oz Cu.

## ELECTRICAL CHARACTERISTICS - Q1 (PNP BRT) ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Base Cutoff Current ( $V_{CB} = 50\text{ V}, I_E = 0$ )	$I_{CBO}$	-	-	100	nA <sub>dc</sub>
Collector-Emitter Cutoff Current ( $V_{CE} = 50\text{ V}, I_B = 0$ )	$I_{CEO}$	-	-	500	nA <sub>dc</sub>
Emitter-Base Cutoff Current ( $V_{EB} = 6.0\text{ V}, I_C = 0$ )	$I_{EBO}$	-	-	1.5	mA <sub>dc</sub>
Collector-Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}, I_E = 0$ )	$V_{(BR)CBO}$	50	-	-	V <sub>dc</sub>
Collector-Emitter Breakdown Voltage (Note 2) ( $I_C = 2.0\text{ mA}, I_E = 0$ )	$V_{(BR)CEO}$	50	-	-	V <sub>dc</sub>

### ON CHARACTERISTICS (Note 2)

DC Current Gain ( $V_{CE} = 10\text{ V}, I_C = 5.0\text{ mA}$ )	$h_{FE}$	15	27	-	
Collector-Emitter Saturation Voltage ( $I_C = 10\text{ mA}, I_B = 1\text{ mA}$ )	$V_{CE(sat)}$	-	-	0.25	V <sub>dc</sub>
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	V <sub>dc</sub>
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	-	-	V <sub>dc</sub>
Input Resistor	$R_1$	3.3	4.7	6.1	k $\Omega$
Resistor Ratio	$R_1/R_2$	0.8	1.0	1.2	

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%

# NSB13211DW6T1G

## ELECTRICAL CHARACTERISTICS - Q2 (NPN BRT) ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
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 ( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )	$I_{EBO}$	-	-	0.5	mAdc
Collector-Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 3) ( $I_C = 2.0\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	50	-	-	Vdc
<b>ON CHARACTERISTICS</b> (Note 3)					
DC Current Gain ( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )	$h_{FE}$	35	60	-	
Collector-Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ )	$V_{CE(sat)}$	-	-	0.25	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	$R_1$	7.0	10	13	$\text{k}\Omega$
Resistor Ratio	$R_1/R_2$	0.8	1.0	1.2	

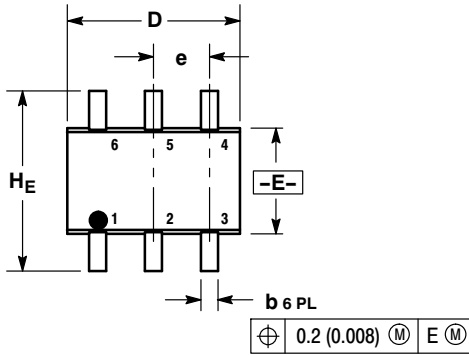
3. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%

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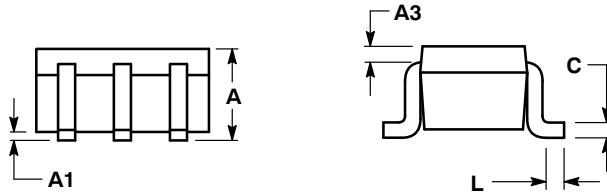
## PACKAGE DIMENSIONS

SC-88 (SOT-363)  
CASE 419B-02  
ISSUE V



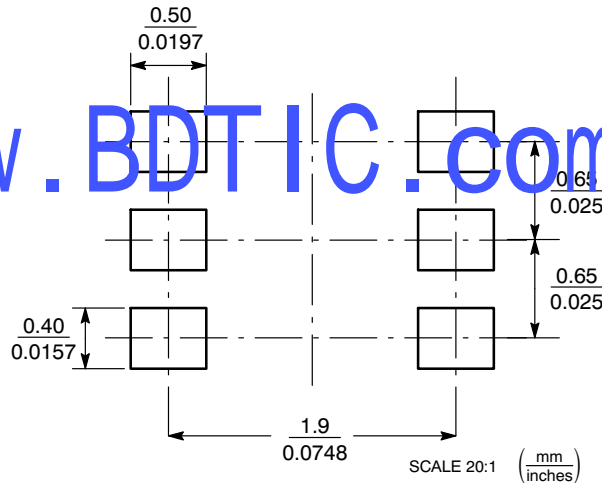
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000	0.002	0.004
A3	0.20 REF			0.008 REF		
b	0.10	0.21	0.30	0.004	0.008	0.012
C	0.10	0.14	0.25	0.004	0.005	0.010
D	1.80	2.00	2.20	0.070	0.078	0.086
E	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	2.00	2.10	2.20	0.078	0.082	0.086



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

### 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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