

# NSB1706DMW5T1G, NSVB1706DMW5T1G

## Dual Bias Resistor Transistor

### NPN Silicon Surface Mount Transistors with Monolithic Bias Resistor 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. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the NSB1706DMW5T1G, two BRT devices are housed in the SC-88A package which is ideal for low power surface mount applications where board space is at a premium.

#### Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

(T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

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

#### THERMAL CHARACTERISTICS

| Characteristic<br>(One Junction Heated)                                | Symbol                            | Max                                                          | Unit        |
|------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------------|-------------|
| Total Device Dissipation<br>T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 187 (Note 1)<br>256 (Note 2)<br>1.5 (Note 1)<br>2.0 (Note 2) | mW<br>mW/°C |
| Thermal Resistance, Junction-to-Ambient                                | R <sub>θJA</sub>                  | 670 (Note 1)<br>490 (Note 2)                                 | °C/W        |
| Characteristic<br>(Both Junctions Heated)                              | Symbol                            | Max                                                          | Unit        |
| Total Device Dissipation<br>T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 250 (Note 1)<br>385 (Note 2)<br>2.0 (Note 1)<br>3.0 (Note 2) | mW<br>mW/°C |
| Thermal Resistance, Junction-to-Ambient                                | R <sub>θJA</sub>                  | 493 (Note 1)<br>325 (Note 2)                                 | °C/W        |
| Thermal Resistance, Junction-to-Lead                                   | R <sub>θJL</sub>                  | 188 (Note 1)<br>208 (Note 2)                                 | °C/W        |
| Junction and Storage Temperature                                       | T <sub>J</sub> , T <sub>stg</sub> | -55 to +150                                                  | °C          |

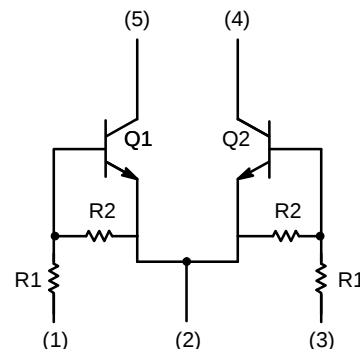
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-4 @ Minimum Pad.
2. FR-4 @ 1.0 x 1.0 inch Pad.



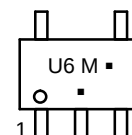
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SC-88A  
CASE 419A  
STYLE 1

#### MARKING DIAGRAM



U6 = Device Marking  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device          | Package             | Shipping†             |
|-----------------|---------------------|-----------------------|
| NSB1706DMW5T1G  | SC-88A<br>(Pb-Free) | 3000 /<br>Tape & Reel |
| NSVB1706DMW5T1G | SC-88A<br>(Pb-Free) | 3000 /<br>Tape & Reel |

†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.

# NSB1706DMW5T1G, NSVB1706DMW5T1G

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

| Characteristic                                                                        | Symbol        | Min | Typ | Max  | Unit |
|---------------------------------------------------------------------------------------|---------------|-----|-----|------|------|
| <b>OFF CHARACTERISTICS</b>                                                            |               |     |     |      |      |
| Collector-Base Cutoff Current<br>( $V_{CB} = 50\text{ V}$ , $I_E = 0$ )               | $I_{CBO}$     | –   | –   | 100  | nAdc |
| Collector-Emitter Cutoff Current<br>( $V_{CE} = 50\text{ V}$ , $I_B = 0$ )            | $I_{CEO}$     | –   | –   | 500  | nAdc |
| Emitter-Base Cutoff Current<br>( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )                | $I_{EBO}$     | –   | –   | 0.18 | mAdc |
| Collector-Base Breakdown Voltage<br>( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ )     | $V_{(BR)CBO}$ | 50  | –   | –    | Vdc  |
| Collector-Emitter Breakdown Voltage (Note 3)<br>( $I_C = 2.0\text{ mA}$ , $I_B = 0$ ) | $V_{(BR)CEO}$ | 50  | –   | –    | Vdc  |

## ON CHARACTERISTICS (Note 3)

|                                                                                                          |               |       |     |       |            |
|----------------------------------------------------------------------------------------------------------|---------------|-------|-----|-------|------------|
| DC Current Gain<br>( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )                                    | $h_{FE}$      | 80    | 200 | –     |            |
| Collector-Emitter Saturation Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$ )                   | $V_{CE(sat)}$ | –     | –   | 0.25  | Vdc        |
| Input Voltage (off)<br>( $V_{CE} = 5.0\text{ V}$ , $I_C = 100\text{ }\mu\text{A}$ )                      | $V_{i(off)}$  | –     | 0.6 | 0.5   | Vdc        |
| Input Voltage (on)<br>( $V_{CE} = 0.3\text{ V}$ , $I_C = 5\text{ mA}$ )                                  | $V_{i(on)}$   | 1.3   | 0.9 | –     | Vdc        |
| Output Voltage (on)<br>( $V_{CC} = 5.0\text{ V}$ , $V_B = 2.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )   | $V_{OL}$      | –     | –   | 0.2   | Vdc        |
| Output Voltage (off)<br>( $V_{CC} = 5.0\text{ V}$ , $V_B = 0.25\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ ) | $V_{OH}$      | 4.9   | –   | –     | Vdc        |
| Input Resistor                                                                                           | R1            | 3.3   | 4.7 | 6.1   | k $\Omega$ |
| Resistor Ratio                                                                                           | R1/R2         | 0.055 | 0.1 | 0.185 |            |

NOTE: New resistor combinations. Updated curves to follow in subsequent data sheets.

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

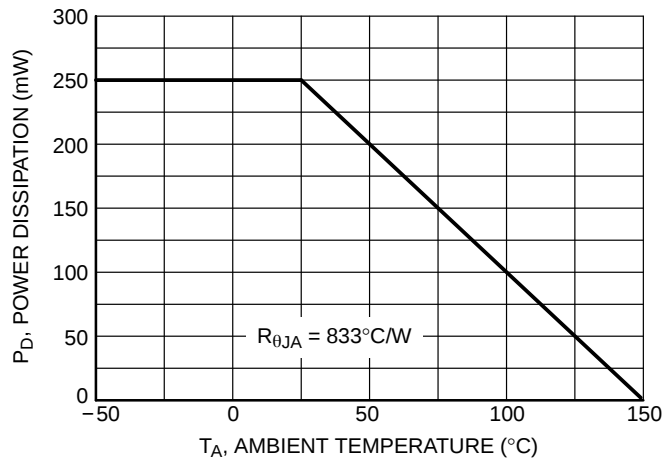


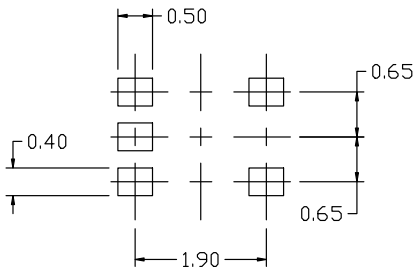
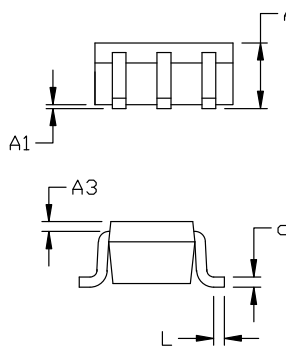
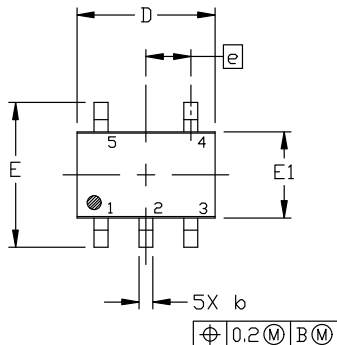
Figure 1. Derating Curve



SCALE 2:1

SC-88A (SC-70-5/SOT-353)  
CASE 419A-02  
ISSUE M

DATE 11 APR 2023



RECOMMENDED  
MOUNTING FOOTPRINT

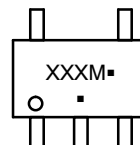
\* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.80        | 0.95 | 1.10 |
| A1  | ---         | ---  | 0.10 |
| A3  | 0.20 REF    |      |      |
| b   | 0.10        | 0.20 | 0.30 |
| c   | 0.10        | ---  | 0.25 |
| D   | 1.80        | 2.00 | 2.20 |
| E   | 2.00        | 2.10 | 2.20 |
| E1  | 1.15        | 1.25 | 1.35 |
| e   | 0.65 BSC    |      |      |
| L   | 0.10        | 0.15 | 0.30 |

GENERIC MARKING  
DIAGRAM\*



\*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.

XXX = Specific Device Code

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

STYLE 1:

- PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 2:

- PIN 1. ANODE
2. EMITTER
3. BASE
4. COLLECTOR
5. CATHODE

STYLE 3:

- PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. CATHODE 1

STYLE 4:

- PIN 1. SOURCE 1
2. DRAIN 1/2
3. SOURCE 1
4. GATE 1
5. GATE 2

STYLE 5:

- PIN 1. CATHODE
2. COMMON ANODE
3. CATHODE 2
4. CATHODE 3
5. CATHODE 4

STYLE 6:

- PIN 1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR
5. COLLECTOR 2/BASE 1

STYLE 7:

- PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 8:

- PIN 1. CATHODE
2. COLLECTOR
3. N/C
4. BASE
5. EMITTER

STYLE 9:

- PIN 1. ANODE
2. CATHODE
3. ANODE
4. ANODE
5. ANODE

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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| DESCRIPTION:     | SC-88A (SC-70-5/SOT-353) | PAGE 1 OF 1                                                                                                                                                                      |

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