

NSTB60BDW1T1G

PNP General Purpose and NPN Bias Resistor Transistor Combination

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch/3000 Unit Tape and Reel
- ESD Rating – Human Body Model: Class 1B
– Machine Model: Class B
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS

($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q_1 and Q_2)

| Rating | Symbol | Q_1 | Q_2 | Unit |
|--------------------------------|-----------|-------|-------|------|
| Collector-Emitter Voltage | V_{CEO} | -50 | 50 | Vdc |
| Collector-Base Voltage | V_{CBO} | -50 | 50 | Vdc |
| Emitter-Base Voltage | V_{EBO} | -6.0 | 5.0 | Vdc |
| Collector Current – Continuous | I_C | -150 | 150 | 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.

THERMAL CHARACTERISTICS

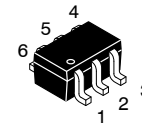
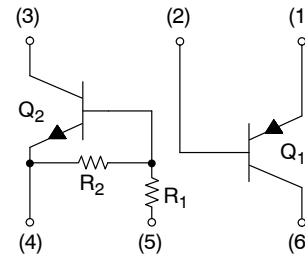
| Characteristic (One Junction Heated) | Symbol | Max | Unit |
|---|-----------------|--|----------------------------|
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 187 (Note 1) 256 (Note 2) 1.5 (Note 1) 2.0 (Note 2) | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance – Junction-to-Ambient | $R_{\theta JA}$ | 670 (Note 1) 490 (Note 2) | $^\circ\text{C}/\text{W}$ |
| Characteristic (Both Junctions Heated) | Symbol | Max | Unit |
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 250 (Note 1) 385 (Note 2) 2.0 (Note 1) 3.0 (Note 2) | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance – Junction-to-Ambient | $R_{\theta JA}$ | 493 (Note 1) 325 (Note 2) | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance – Junction-to-Lead | $R_{\theta JL}$ | 188 (Note 1) 208 (Note 2) | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

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



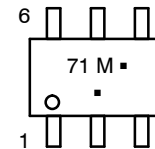
ON Semiconductor®

<http://onsemi.com>



SOT-363
CASE 419B
STYLE 1

MARKING DIAGRAM



71 = Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------------|----------------------|------------------|
| NSTB60BDW1T1G | SOT-363 (Pb-Free) | 3000/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.

NSTB60BDW1T1G

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---------------|------|-----|------|---------------|
| Q₁ | | | | | |
| Collector-Base Breakdown Voltage ($I_C = -50 \mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | -50 | - | - | Vdc |
| Collector-Emitter Breakdown Voltage ($I_C = -1.0 \text{mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | -50 | - | - | Vdc |
| Emitter-Base Breakdown Voltage ($I_E = -50 \mu\text{A}$, $I_C = 0$) | $V_{(BR)EBO}$ | -6.0 | - | - | Vdc |
| Collector-Base Cutoff Current ($V_{CB} = -50 \text{Vdc}$, $I_E = 0$) | I_{CBO} | - | - | -0.1 | μA |
| Emitter-Base Cutoff Current ($V_{EB} = -6.0 \text{Vdc}$, $I_B = 0$) | I_{EBO} | - | - | -0.1 | μA |
| Collector-Emitter Saturation Voltage ($I_C = -50 \text{mA}$, $I_B = -5.0 \text{mA}$) (Note 3) | $V_{CE(sat)}$ | - | - | -0.5 | Vdc |
| DC Current Gain ($V_{CE} = -10 \text{V}$, $I_C = -5.0 \text{mA}$) (Note 3) | h_{FE} | 120 | - | 560 | - |
| Transition Frequency ($V_{CE} = -12 \text{Vdc}$, $I_C = -2.0 \text{mA}$, $f = 100 \text{MHz}$) | f_T | - | 140 | - | MHz |
| Output Capacitance ($V_{CB} = -12 \text{Vdc}$, $I_E = 0 \text{A}$, $f = 1.0 \text{MHz}$) | C_{OB} | - | 3.5 | - | pF |

Q₂

| | | | | | |
|--|---------------|------|------|------|------------------|
| Collector-Base Breakdown Voltage ($I_C = 50 \mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | 50 | - | - | Vdc |
| Collector-Emitter Breakdown Voltage ($I_C = 1.0 \text{mA}$, $I_B = 0$) (Note 3) | $V_{(BR)CEO}$ | 50 | - | - | Vdc |
| Collector-Base Cutoff Current ($V_{CB} = 50 \text{V}$, $I_E = 0$) | I_{CBO} | - | - | 100 | nA |
| Collector-Emitter Cutoff Current ($V_{CE} = 50 \text{V}$, $I_B = 0$) | I_{CEO} | - | - | 500 | nA |
| Emitter-Base Cutoff Current ($V_{EB} = 6.0 \text{V}$, $I_C = 0$) | I_{EBO} | - | - | 0.13 | mA |
| Collector-Emitter Saturation Voltage ($I_C = 10 \text{mA}$, $I_B = 5.0 \text{mA}$) (Note 3) | $V_{CE(sat)}$ | - | - | 0.25 | Vdc |
| DC Current Gain ($V_{CE} = 10 \text{V}$, $I_C = 5.0 \text{mA}$) (Note 3) | h_{FE} | 80 | - | - | |
| Output Voltage (on) ($V_{CC} = 5.0 \text{V}$, $V_B = 4.0 \text{V}$, $R_L = 1.0 \text{k}\Omega$) (Note 3) | V_{OL} | - | - | 0.2 | Vdc |
| Output Voltage (off) ($V_{CC} = 5.0 \text{V}$, $V_B = 0.25 \text{V}$, $R_L = 1.0 \text{k}\Omega$) (Note 3) | V_{OH} | 4.9 | - | - | Vdc |
| Input Resistor (Note 3) | R1 | 15.4 | 22 | 28.6 | $\text{k}\Omega$ |
| Resistor Ratio (Note 3) | R2/R1 | 1.70 | 2.13 | 2.55 | |

3. Pulse Test: Pulse Width < 300 μs , Duty Cycle < 2.0%

NSTB60BDW1T1G

Typical Electrical Characteristics – PNP Transistor

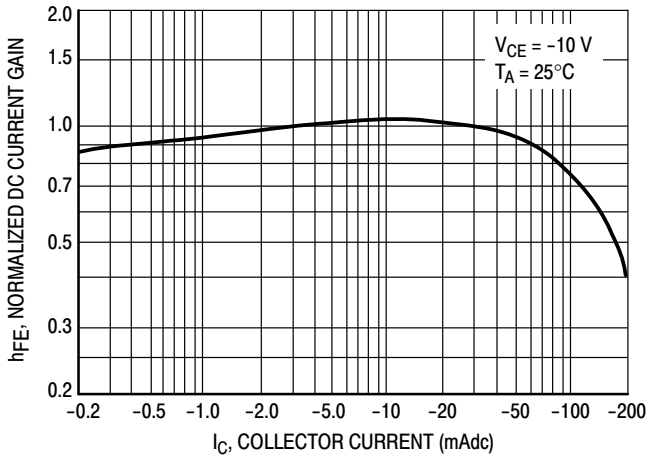


Figure 1. Normalized DC Current Gain

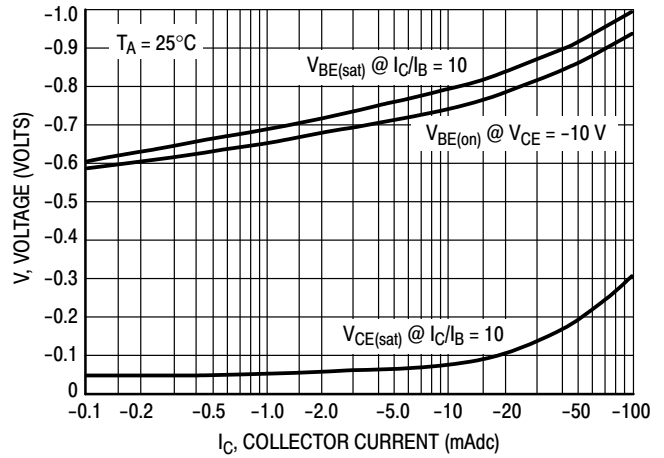


Figure 2. "Saturation" and "On" Voltages

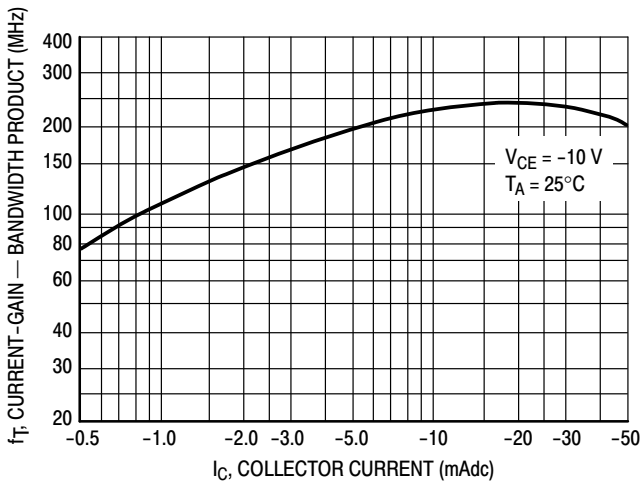


Figure 3. Current-Gain - Bandwidth Product

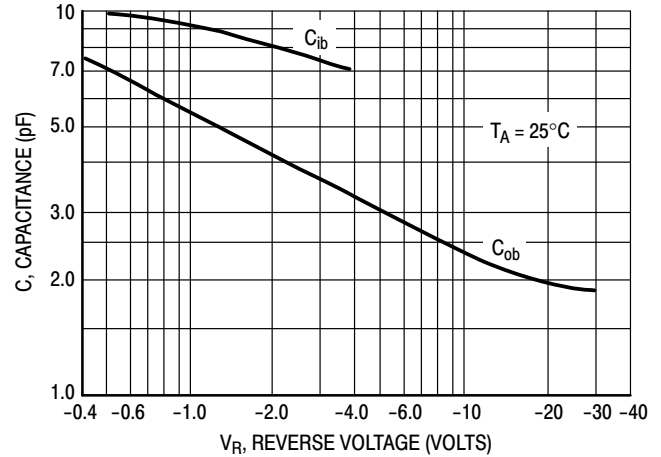


Figure 4. Capacitances

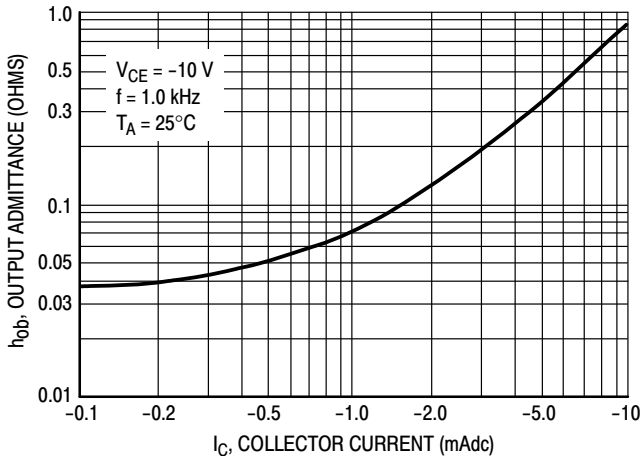


Figure 5. Output Admittance

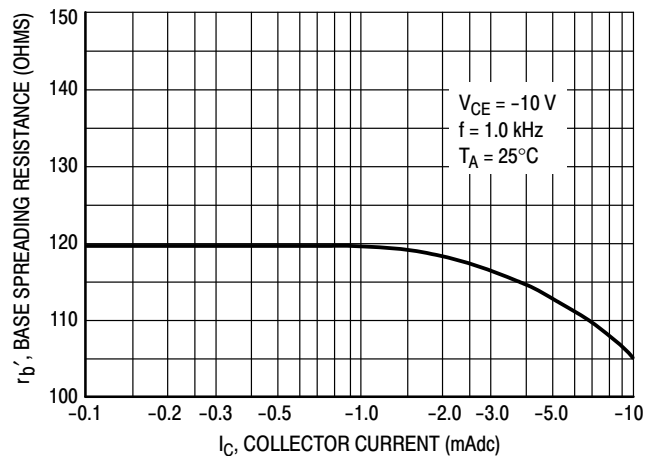


Figure 6. Base Spreading Resistance

NSTB60BDW1T1G

Typical Electrical Characteristics – NPN Transistor

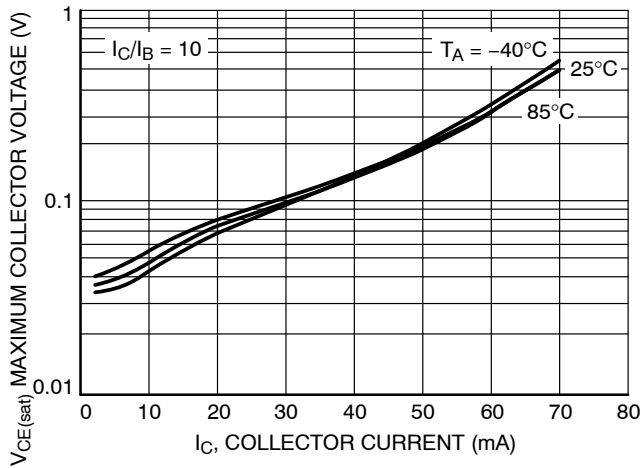


Figure 7. Maximum Collector Voltage versus Collector Current

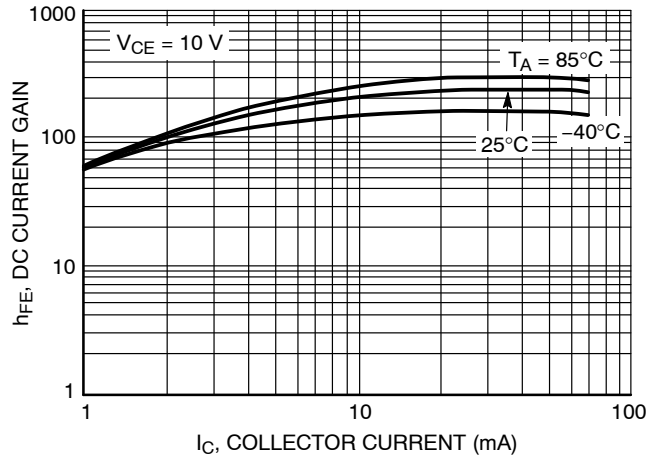


Figure 8. DC Current Gain

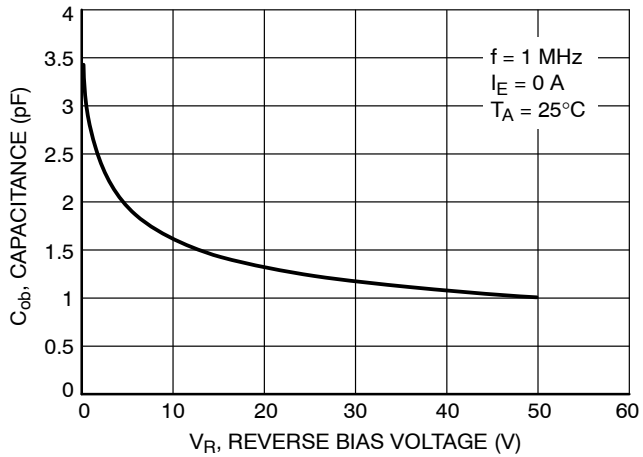


Figure 9. Output Capacitance

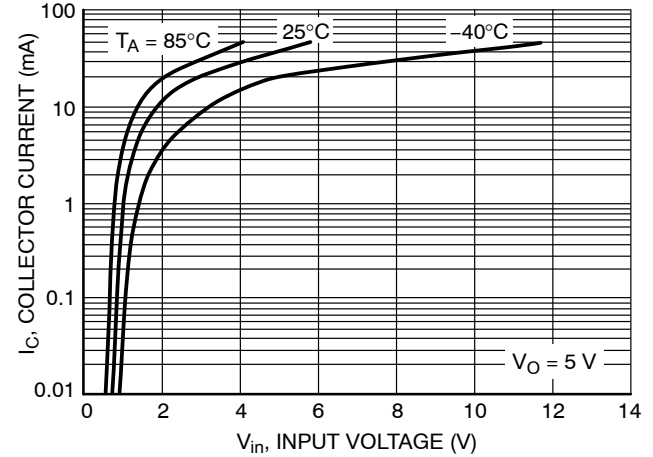


Figure 10. Output Current versus Input Voltage

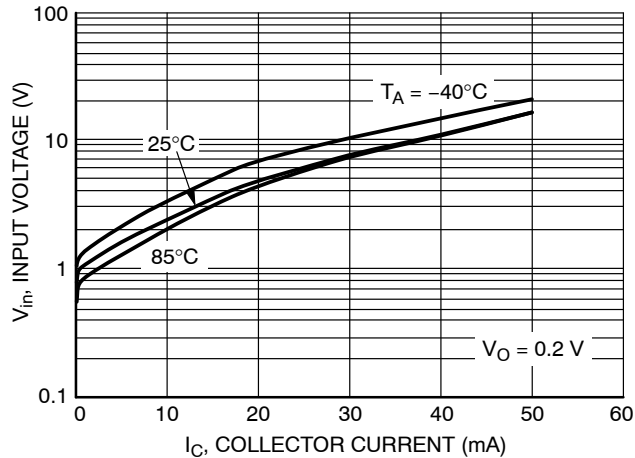
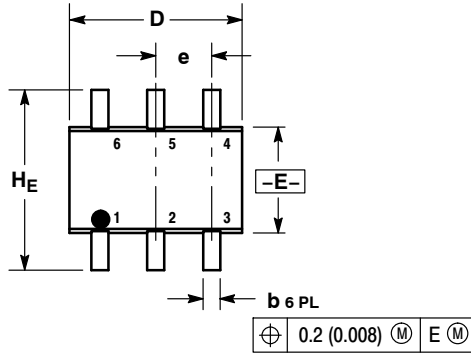


Figure 11. Input Voltage versus Output Current

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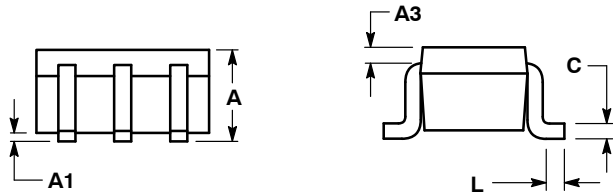
PACKAGE DIMENSIONS

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



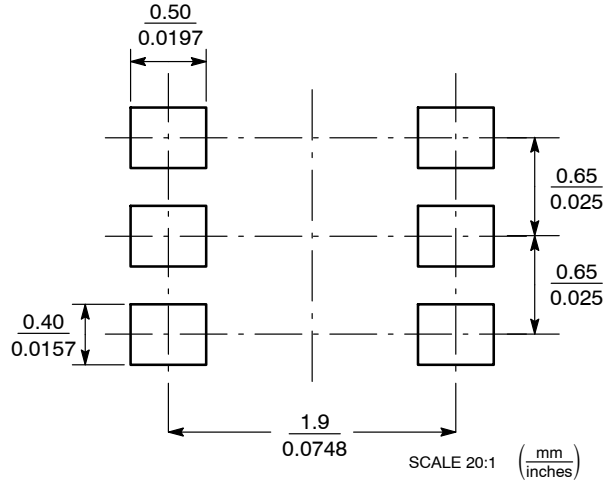
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

| 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
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

SOLDERING FOOTPRINT*



SC-88/SC70-6/SOT-363

*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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