

# 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

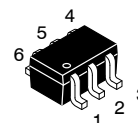
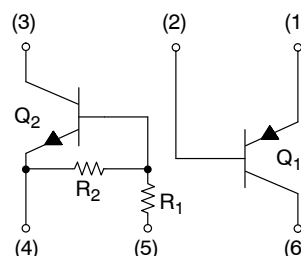
Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	187 (Note 1) 256 (Note 2) 1.5 (Note 1) 2.0 (Note 2)	mW mW/ $^\circ\text{C}$
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	670 (Note 1) 490 (Note 2)	$^\circ\text{C}/\text{W}$
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	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



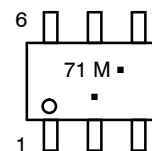
ON Semiconductor®

<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
<b>Q<sub>1</sub></b>					
Collector-Base Breakdown Voltage ( $I_C = -50 \mu\text{Adc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	-50	-	-	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = -1.0 \text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	-50	-	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E = -50 \mu\text{Adc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	-6.0	-	-	Vdc
Collector-Base Cutoff Current ( $V_{CB} = -50 \text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	-	-	-0.1	$\mu\text{A}$
Emitter-Base Cutoff Current ( $V_{EB} = -6.0 \text{ Vdc}$ , $I_B = 0$ )	$I_{EBO}$	-	-	-0.1	$\mu\text{A}$
Collector-Emitter Saturation Voltage ( $I_C = -50 \text{ mAdc}$ , $I_B = -5.0 \text{ mAdc}$ ) (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 ( $V_{CE} = -12 \text{ Vdc}$ , $I_C = -2.0 \text{ mAdc}$ , $f = 100 \text{ MHz}$ )	$f_T$	-	140	-	MHz
Output Capacitance ( $V_{CB} = -12 \text{ Vdc}$ , $I_E = 0 \text{ Adc}$ , $f = 1.0 \text{ MHz}$ )	$C_{OB}$	-	3.5	-	pF

## Q<sub>2</sub>

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	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-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  $\mu\text{s}$ , Duty Cycle < 2.0%

# NSTB60BDW1T1G

## Typical Electrical Characteristics – PNP Transistor

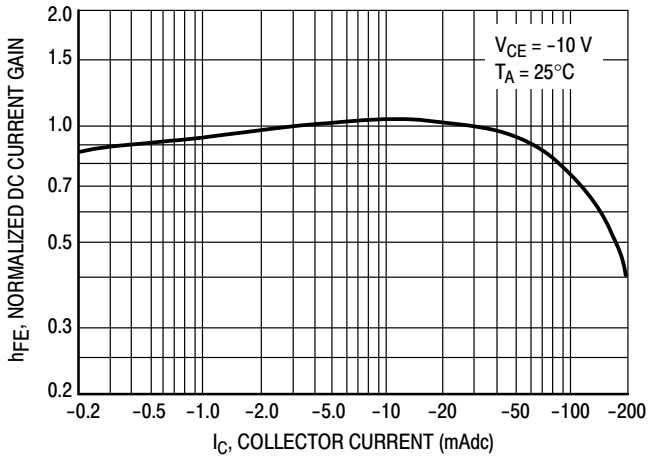


Figure 1. Normalized DC Current Gain

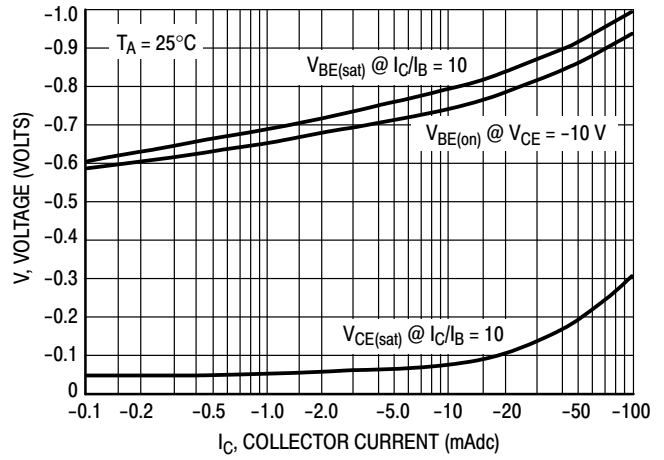


Figure 2. "Saturation" and "On" Voltages

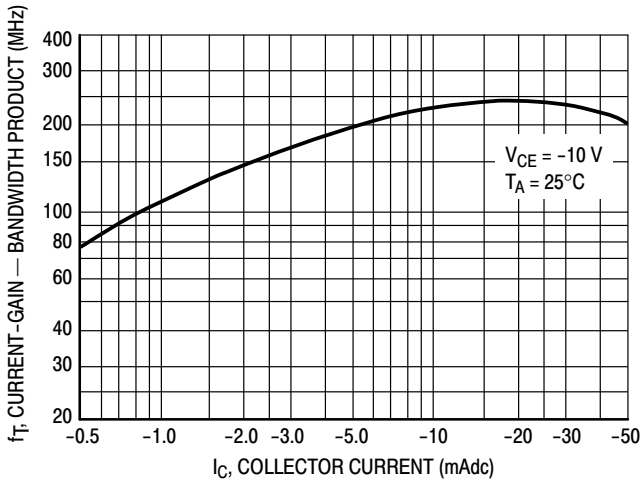


Figure 3. Current-Gain - Bandwidth Product

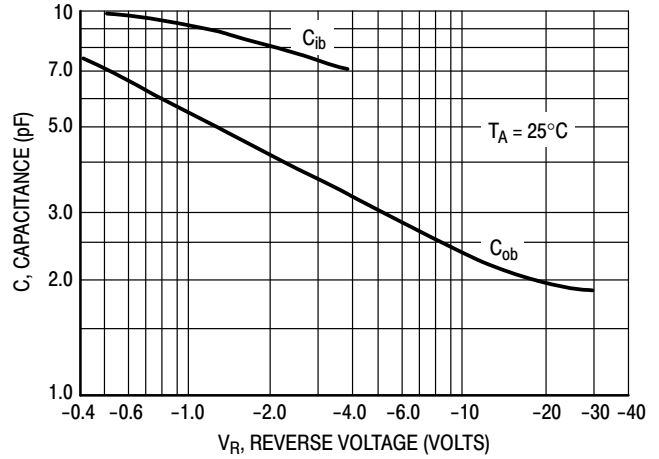


Figure 4. Capacitances

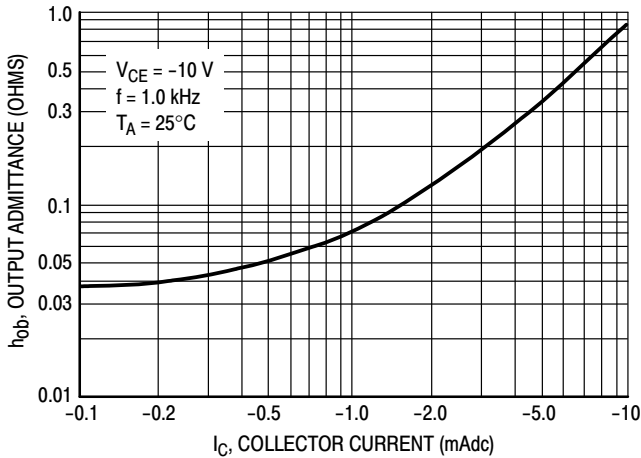


Figure 5. Output Admittance

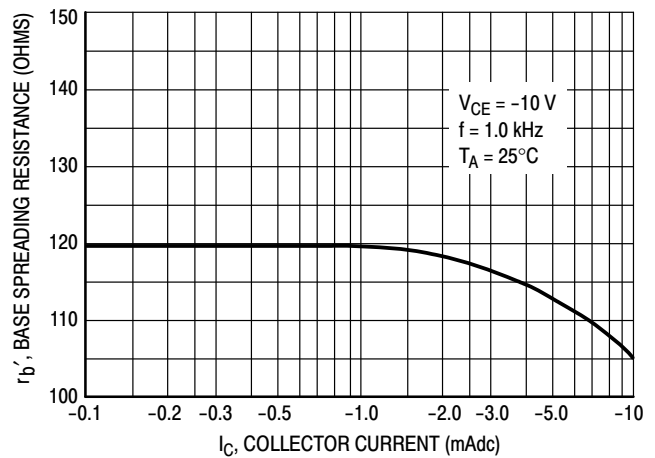
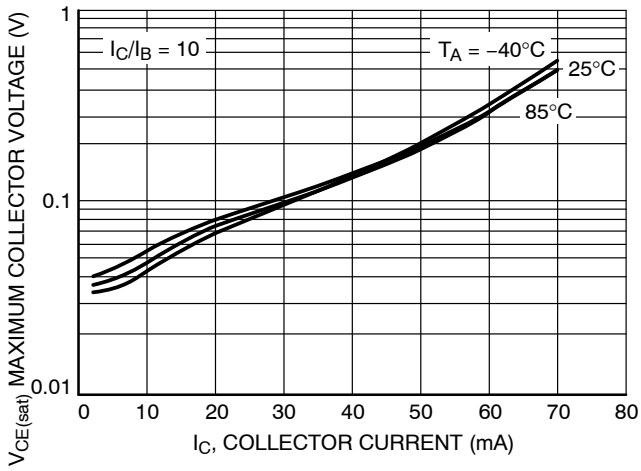


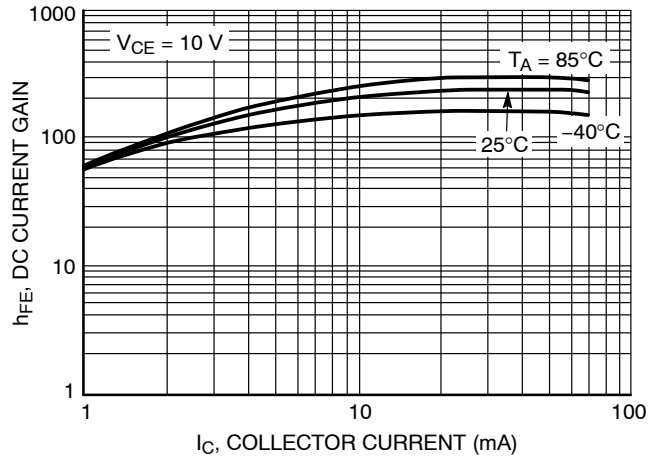
Figure 6. Base Spreading Resistance

# NSTB60BDW1T1G

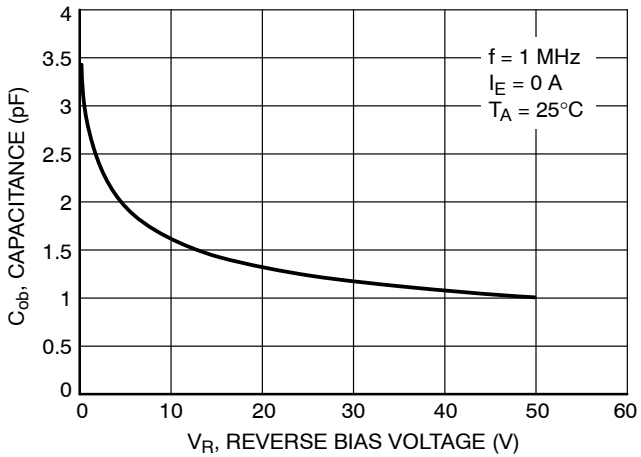
## Typical Electrical Characteristics – NPN Transistor



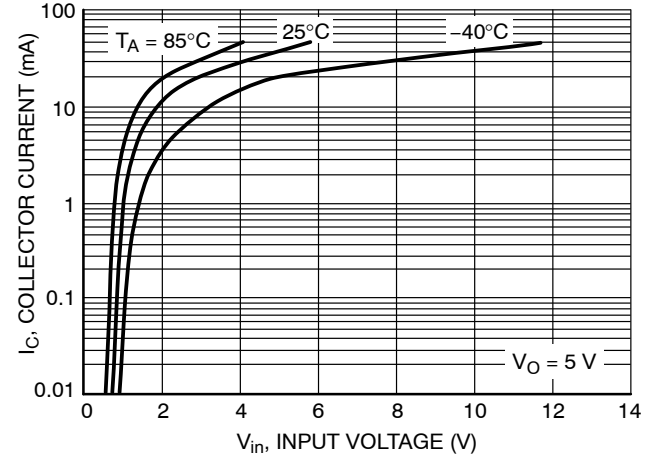
**Figure 7. Maximum Collector Voltage versus Collector Current**



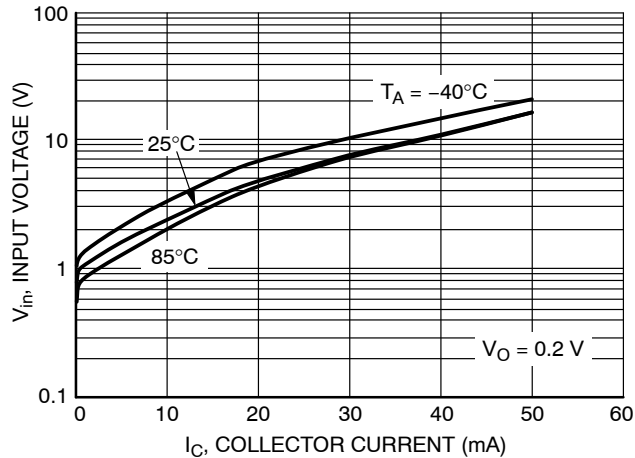
**Figure 8. DC Current Gain**



**Figure 9. Output Capacitance**



**Figure 10. Output Current versus Input Voltage**

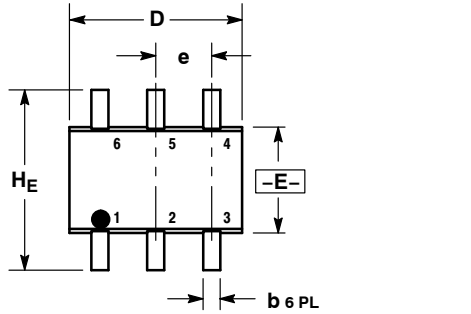


**Figure 11. Input Voltage versus Output Current**

# NSTB60BDW1T1G

## PACKAGE DIMENSIONS

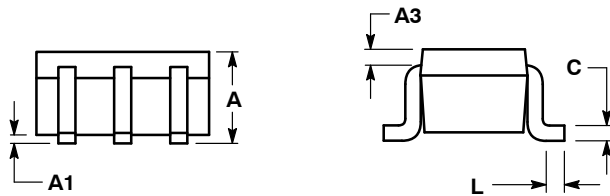
SOT-363/SC-88/SC70-6  
CASE 419B-02  
ISSUE W



NOTES:

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

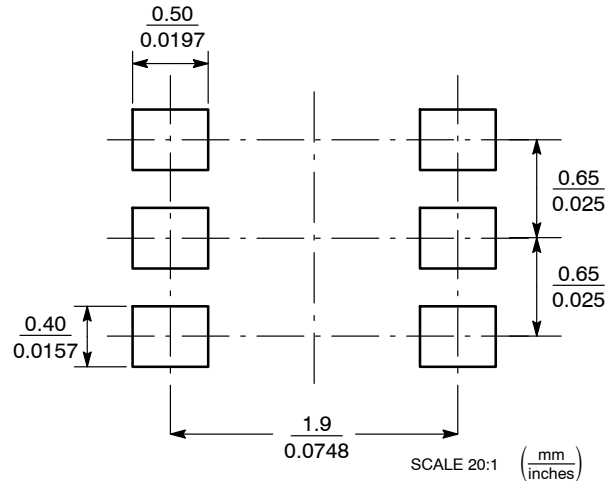
DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000	0.002	0.004
A3	0.20 REF			0.008 REF		
b	0.10	0.21	0.30	0.004	0.008	0.012
C	0.10	0.14	0.25	0.004	0.005	0.010
D	1.80	2.00	2.20	0.070	0.078	0.086
E	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC	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