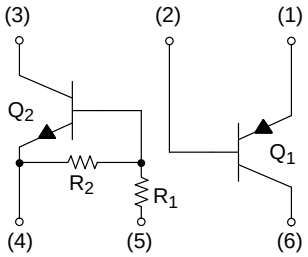
NSTB60BDW1

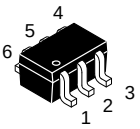
PNP General Purpose and NPN Bias Resistor Transistor Combination

- 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
- 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

ON Semiconductor®

www.onsemi.com





SOT−363
CASE 419B
STYLE 1

MAXIMUM RATINGS

(T_A = 25°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

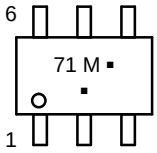
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

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

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

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
NSVTB60BDW1T1G	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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Q_1					
Collector-Base Breakdown Voltage (I_C = −50 μAdc, I_E = 0)	$V_{(BR)CBO}$	−50	−	−	Vdc
Collector-Emitter Breakdown Voltage (I_C = −1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	−50	−	−	Vdc
Emitter−Base Breakdown Voltage (I_E = −50 μAdc, I_E = 0)	$V_{(BR)EBO}$	−6.0	−	−	Vdc
Collector−Base Cutoff Current (V_{CB} = −50 Vdc, I_E = 0)	I_{CBO}	−	−	−0.1	μA
Emitter−Base Cutoff Current (V_{EB} = −6.0 Vdc, I_B = 0)	I_{EBO}	−	−	−0.1	μA
Collector-Emitter Saturation Voltage (I_C = −50 mAdc, I_B = −5.0 mAdc) (Note 3)	$V_{CE(sat)}$	−	−	−0.5	Vdc
DC Current Gain (V_{CE} = −10 V, I_C = −5.0 mA) (Note 3)	h_{FE}	120	−	560	−
Transition Frequency (V_{CE} = −12 Vdc, I_C = −2.0 mAdc, f = 100 MHz)	f_T	−	140	−	MHz
Output Capacitance (V_{CB} = −12 Vdc, I_E = 0 Adc, f = 1.0 MHz)	C_{OB}	−	3.5	−	pF
Q_2					
Collector-Base Breakdown Voltage (I_C = 50 μA, I_E = 0)	$V_{(BR)CBO}$	50	−	−	Vdc
Collector-Emitter Breakdown Voltage (I_C = 1.0 mA, I_B = 0) (Note 3)	$V_{(BR)CEO}$	50	−	−	Vdc
Collector−Base Cutoff Current (V_{CB} = 50 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 V, I_C = 0)	I_{EBO}	−	−	0.13	mAdc
Collector-Emitter Saturation Voltage (I_C = 10 mA, I_B = 5.0 mA) (Note 3)	$V_{CE(sat)}$	−	−	0.25	Vdc
DC Current Gain (V_{CE} = 10 V, I_C = 5.0 mA) (Note 3)	h_{FE}	80	−	−	
Output Voltage (on) (V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 kΩ) (Note 3)	V_{OL}	−	−	0.2	Vdc
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ) (Note 3)	V_{OH}	4.9	−	−	Vdc
Input Resistor (Note 3)	R1	15.4	22	28.6	kΩ
Resistor Ratio (Note 3)	R2/R1	1.70	2.13	2.55	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

TYPICAL ELECTRICAL CHARACTERISTICS − PNP Transistor

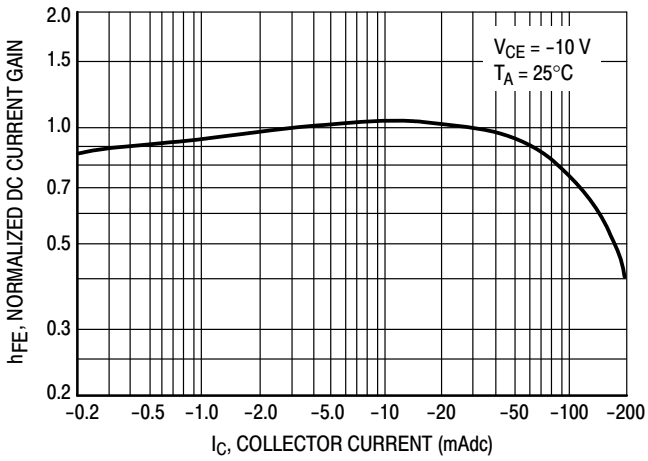


Figure 1. Normalized DC Current Gain

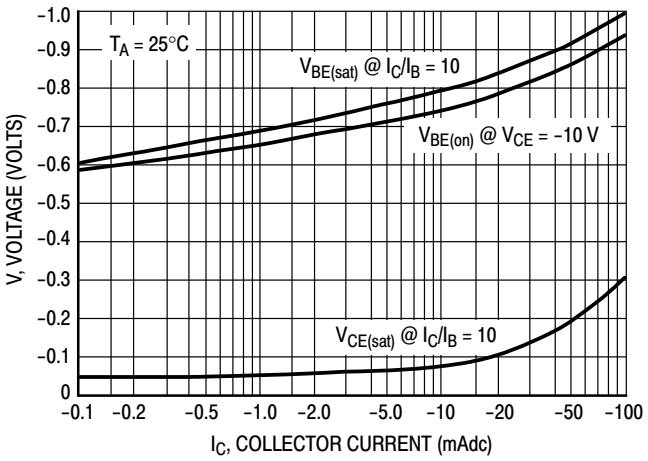


Figure 2. “Saturation” and “On” Voltages

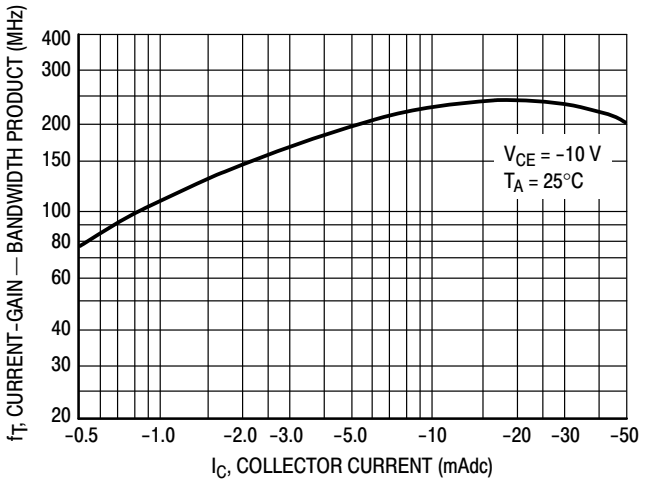


Figure 3. Current−Gain − Bandwidth Product

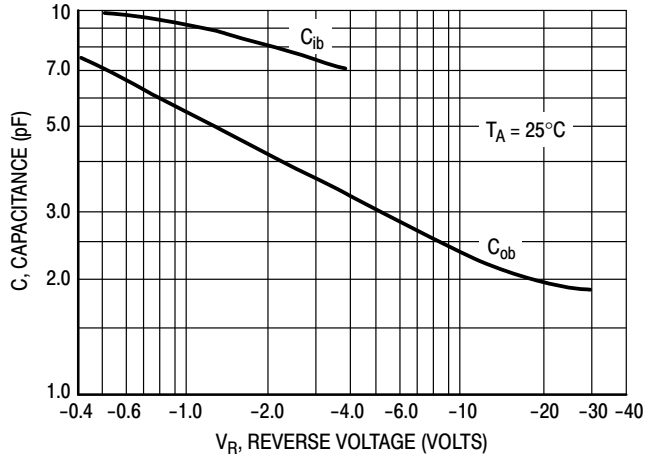


Figure 4. Capacitances

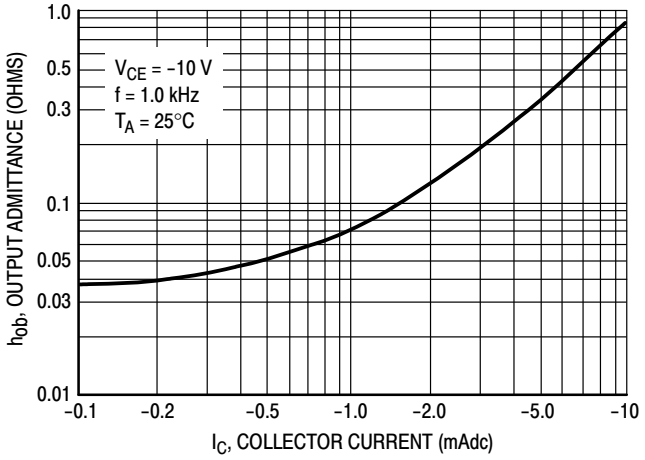


Figure 5. Output Admittance

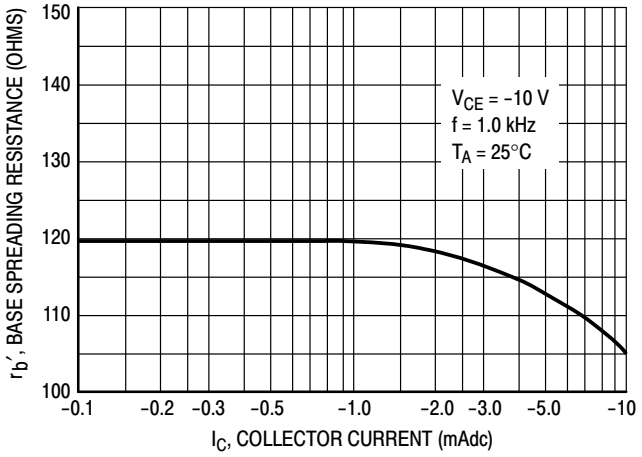


Figure 6. Base Spreading Resistance

TYPICAL ELECTRICAL CHARACTERISTICS − NPN Transistor

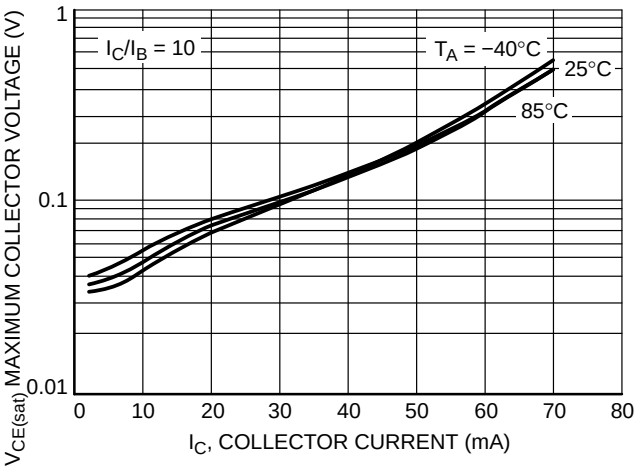


Figure 7. Maximum Collector Voltage versus Collector Current

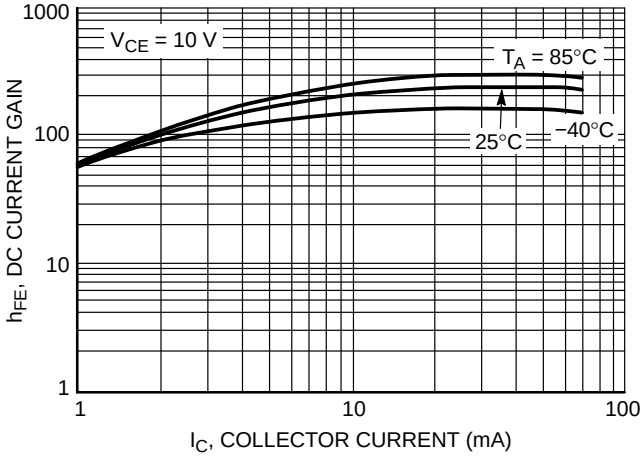


Figure 8. DC Current Gain

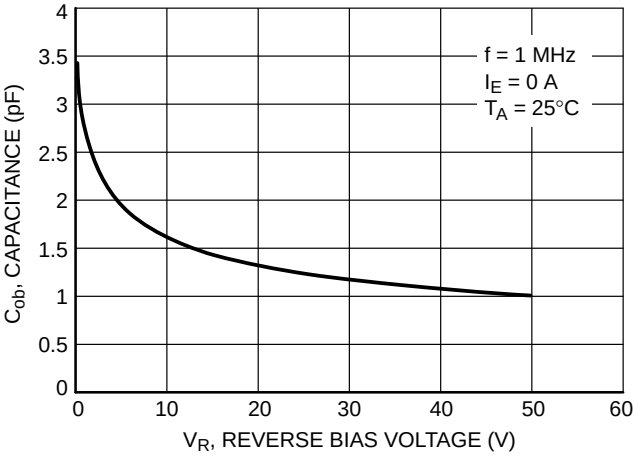


Figure 9. Output Capacitance

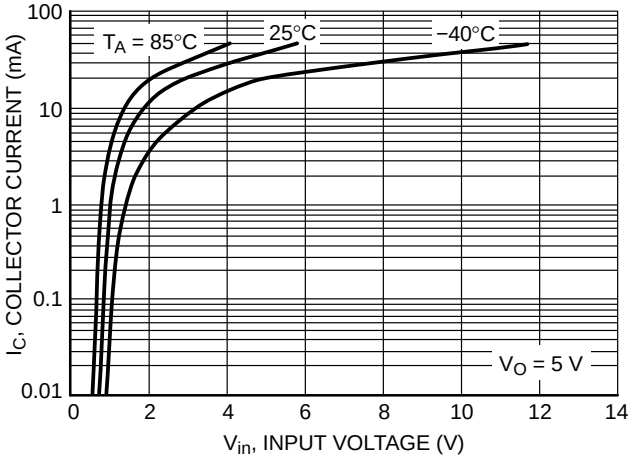


Figure 10. Output Current versus Input Voltage

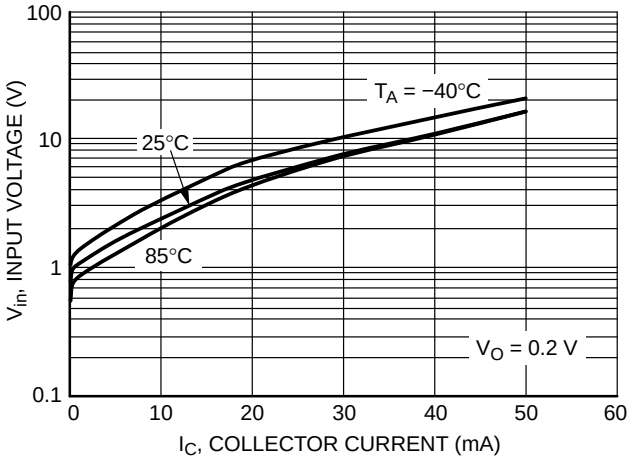
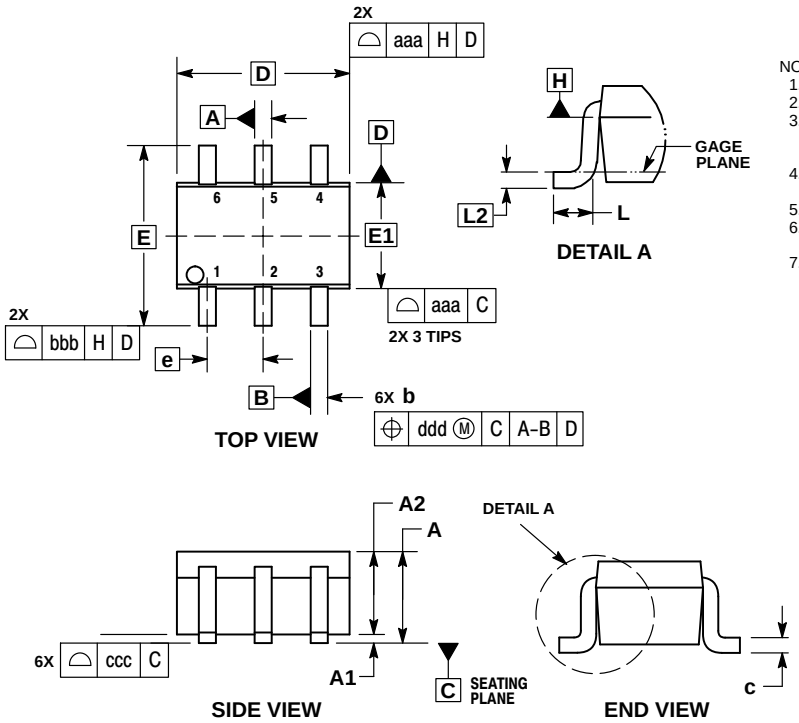


Figure 11. Input Voltage versus Output Current

NSTB60BDW1

PACKAGE DIMENSIONS

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

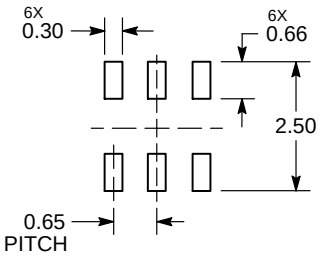


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	−−−	−−−	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
C	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
E	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
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

STYLE 1:
PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4. EMITTER 1
5. BASE 1
6. COLLECTOR 2

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

ON Semiconductor:

NSTB60BDW1T1G