

# High Current Bias Resistor Transistor

PNP Silicon

**NSB9435T1G,  
NSV9435T1G**

## Features

- Collector–Emitter Sustaining Voltage –  
 $V_{CE(sus)} = 30 \text{ Vdc (Min) @ } I_C = 10 \text{ mAdc}$
- High DC Current Gain –  
 $h_{FE} = 125 \text{ (Min) @ } I_C = 0.8 \text{ Adc}$   
 $= 90 \text{ (Min) @ } I_C = 3.0 \text{ Adc}$
- Low Collector–Emitter Saturation Voltage –  
 $V_{CE(sat)} = 0.275 \text{ Vdc (Max) @ } I_C = 1.2 \text{ Adc}$   
 $= 0.55 \text{ Vdc (Max) @ } I_C = 3.0 \text{ Adc}$
- SOT–223 Surface Mount Packaging
- ESD Rating – Human Body Model: Class 1B  
– Machine Model: Class B
- AEC–Q101 Qualified and PPAP Capable
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant\*

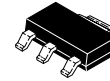
## MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	30	Vdc
Collector–Base Voltage	$V_{CB}$	45	Vdc
Emitter–Base Voltage	$V_{EB}$	$\pm 6.0$	Vdc
Base Current – Continuous	$I_B$	1.0	Adc
Collector Current Continuous Peak	$I_C$	3.0 5.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$ Total $P_D$ @ $T_A = 25^\circ\text{C}$ mounted on 1" sq. (645 sq. mm) Collector pad on FR–4 bd material Total $P_D$ @ $T_A = 25^\circ\text{C}$ mounted on 0.012" sq. (7.6 sq. mm) Collector pad on FR–4 bd material	$P_D$	3.0 24 1.56  0.72	W mW/ $^\circ\text{C}$ W  W
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–55 to +150	$^\circ\text{C}$

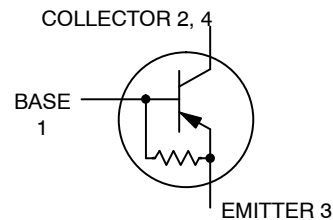
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

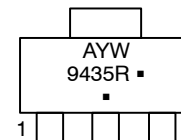
**POWER BJT**  
 $I_C = 3.0 \text{ AMPERES}$   
 $BV_{CEO} = 30 \text{ VOLTS}$   
 $V_{CE(sat)} = 0.275 \text{ VOLTS}$



**SOT–223  
CASE 318E  
STYLE 1**



## MARKING DIAGRAM



A = Assembly Location  
Y = Year  
W = Work Week  
9435R = Device Code  
▪ = Pb–Free Package  
(Note: Microdot may be in either location)

## ORDERING INFORMATION

Device	Package	Shipping†
NSV9435T1G	SOT–223 (Pb–Free)	1,000/Tape & Reel

## DISCONTINUED (Note 1)

Device	Package	Shipping†
NSB9435T1G	SOT–223 (Pb–Free)	1,000/Tape & Reel

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

- DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on [www.onsemi.com](http://www.onsemi.com).

# NSB9435T1G, NSV9435T1G

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance Junction-to-Case Junction-to-Ambient on 1" sq. (645 sq. mm) Collector pad on FR-4 board material Junction-to-Ambient on 0.012" sq. (7.6 sq. mm) Collector pad on FR-4 board material	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	42 80 174	$^{\circ}\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 s	$T_L$	260	$^{\circ}\text{C}$

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

Characteristics	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0\text{ A}$ )	$V_{CE(sus)}$	30	–	–	Vdc
Emitter-Base Voltage ( $I_E = 50\text{ }\mu\text{A}$ , $I_C = 0\text{ A}$ )	$V_{EBO}$	6.0	–	–	Vdc
Collector Cutoff Current ( $V_{CE} = 25\text{ Vdc}$ ) ( $V_{CE} = 25\text{ Vdc}$ , $T_J = 125^{\circ}\text{C}$ )	$I_{CER}$	– –	– –	20 200	$\mu\text{A}$
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ )	$I_{EBO}$	–	–	700	$\mu\text{A}$

### ON CHARACTERISTICS (Note 2)

Collector-Emitter Saturation Voltage ( $I_C = 0.8\text{ A}$ , $I_B = 20\text{ mA}$ ) ( $I_C = 1.2\text{ A}$ , $I_B = 20\text{ mA}$ ) ( $I_C = 3.0\text{ A}$ , $I_B = 0.3\text{ A}$ )	$V_{CE(sat)}$	– – –	0.155 – –	0.210 0.275 0.550	Vdc
Base-Emitter Saturation Voltage ( $I_C = 3.0\text{ A}$ , $I_B = 0.3\text{ A}$ )	$V_{BE(sat)}$	–	–	1.25	Vdc
Base-Emitter On Voltage ( $I_C = 1.2\text{ A}$ , $V_{CE} = 4.0\text{ Vdc}$ )	$V_{BE(on)}$	–	–	1.10	Vdc
DC Current Gain ( $I_C = 0.8\text{ A}$ , $V_{CE} = 1.0\text{ Vdc}$ ) ( $I_C = 1.2\text{ A}$ , $V_{CE} = 1.0\text{ Vdc}$ ) ( $I_C = 3.0\text{ A}$ , $V_{CE} = 1.0\text{ Vdc}$ )	$h_{FE}$	125 110 90	220 – –	– – –	–
Resistor	R1	7.5	10	12.5	k $\Omega$

### DYNAMIC CHARACTERISTICS

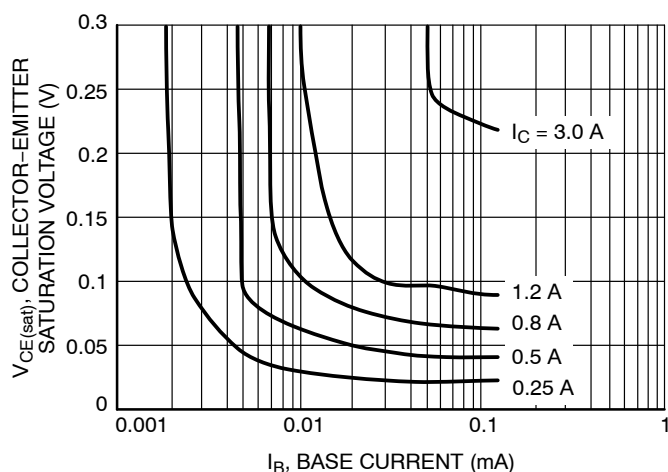
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0\text{ A}$ , $f = 1.0\text{ MHz}$ )	$C_{ob}$	–	100	150	pF
Input Capacitance ( $V_{EB} = 8.0\text{ Vdc}$ )	$C_{ib}$	–	135	–	pF
Current-Gain – Bandwidth Product (Note 3) ( $I_C = 500\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f_{test} = 1.0\text{ MHz}$ )	$f_T$	–	110	–	MHz

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.

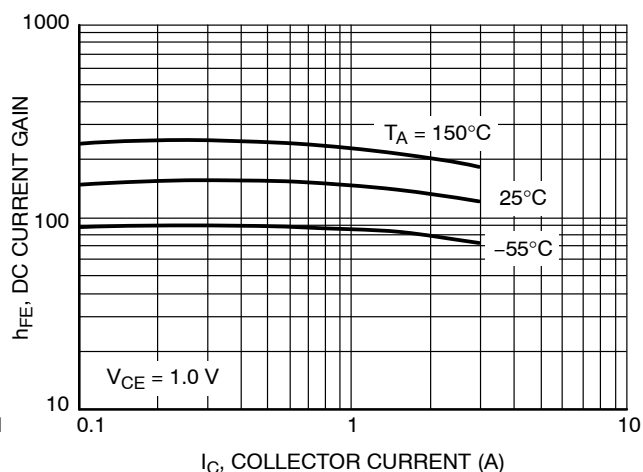
2. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

3.  $f_T = |h_{FE}| \cdot f_{test}$

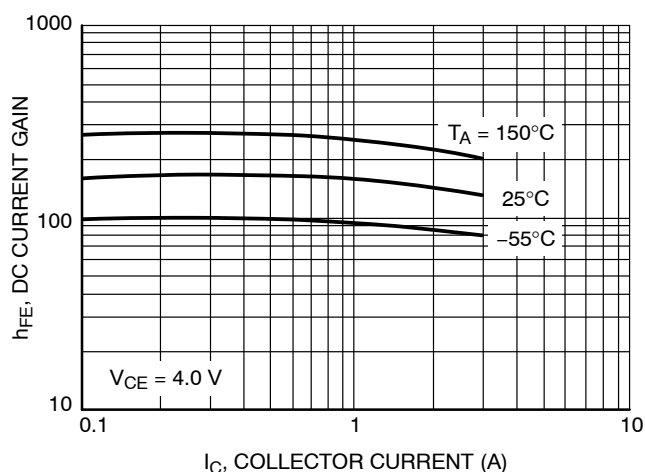
# NSB9435T1G, NSV9435T1G



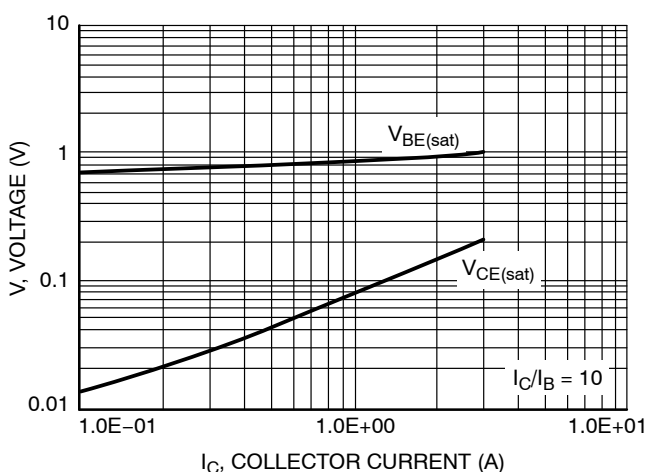
**Figure 1. Collector Saturation Region**



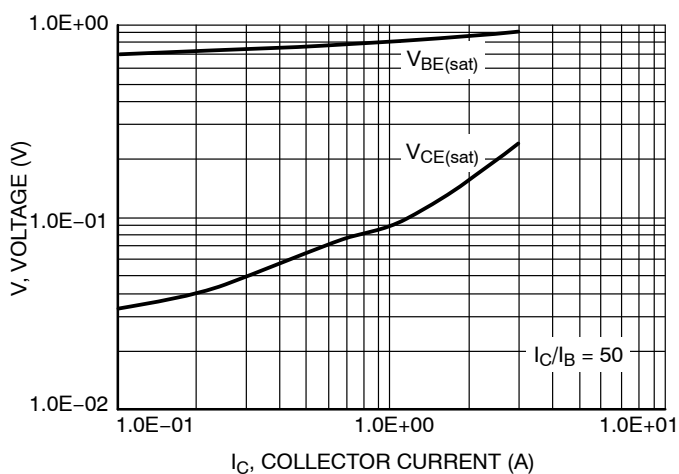
**Figure 2. DC Current Gain**



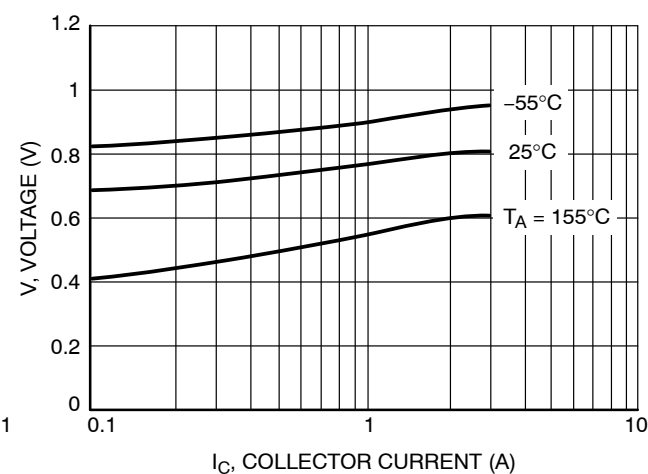
**Figure 3. DC Current Gain**



**Figure 4. "ON" Voltages**



**Figure 5. "ON" Voltages**



**Figure 6.  $V_{BE(on)}$  Voltage**

# NSB9435T1G, NSV9435T1G

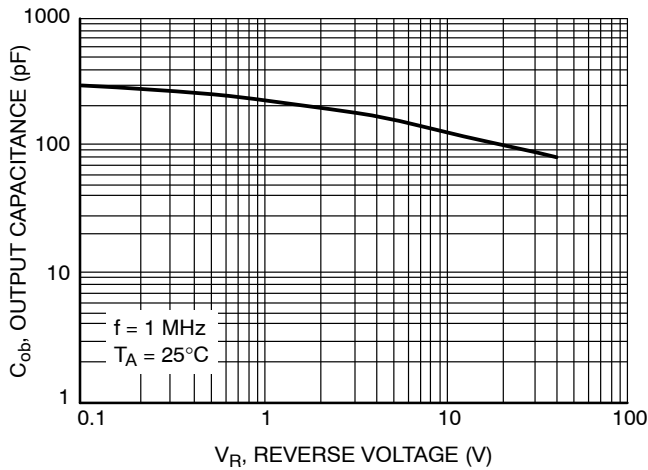


Figure 7. Output Capacitance

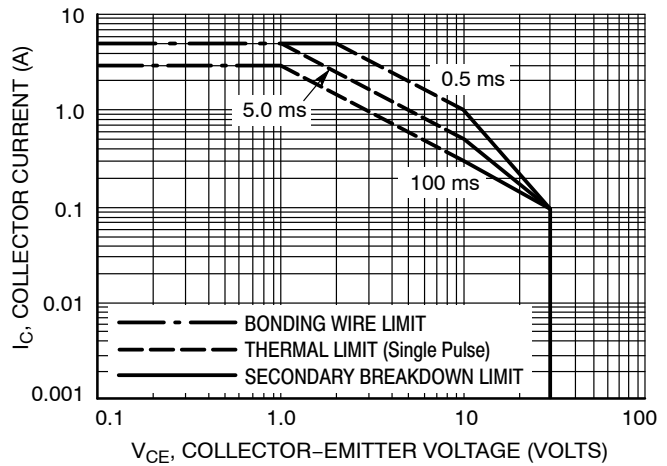


Figure 8. Active Region Safe Operating Area

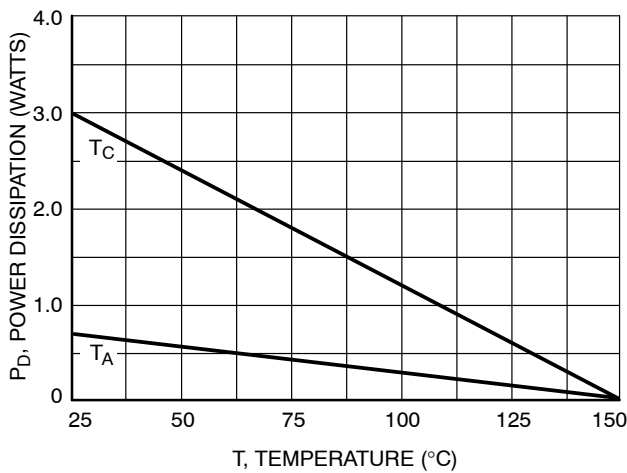


Figure 9. Power Derating

There are two limitations on the power handling ability of a transistor: average junction temperature and secondary breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 8 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Secondary breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 10. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.

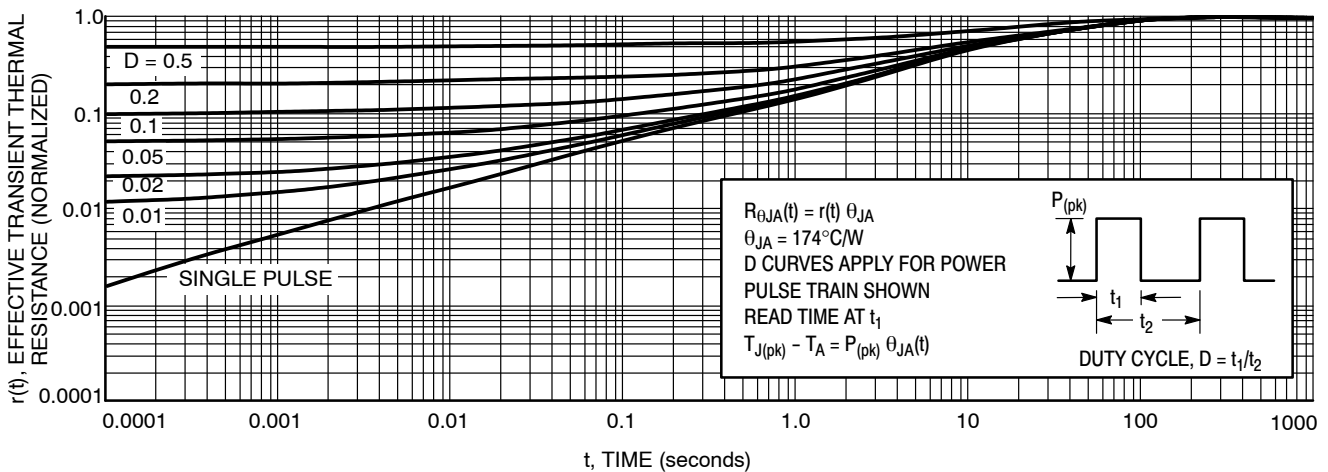


Figure 10. Thermal Response

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