

# RF Transistor, NPN Single

12 V, 150 mA,  $f_T = 7$  GHz

## NSVF6003SB6

### Description

This RF Transistor is designed for low noise amplifier applications. CPH package is suitable for use under high temperature environment because it has superior heat radiation characteristics. This RF transistor is AEC-Q101 qualified and PPAP capable for automotive applications.

### Features

- High Gain ( $f_T = 7$  GHz typ)
- High Current ( $I_C = 150$  mA)
- Miniature and Thin 6 pin Package
- Large Collector Dissipation (800 mW)
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

### Typical Applications

- Low Noise Amplifier for FM Radio
- Low Noise Amplifier for TV

### SPECIFICATIONS

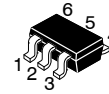
#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

| Symbol         | Parameter                                  | Value       | Unit             |
|----------------|--------------------------------------------|-------------|------------------|
| $V_{CBO}$      | Collector-to-Base Voltage                  | 20          | V                |
| $V_{CEO}$      | Collector-to-Emitter Voltage               | 12          | V                |
| $V_{EBO}$      | Emitter-to-Base Voltage                    | 2           | V                |
| $I_C$          | Collector Current                          | 150         | mA               |
| $P_C$          | Collector Dissipation (Note 1)             | 800         | mW               |
| $T_j, T_{stg}$ | Operating Junction and Storage Temperature | -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.

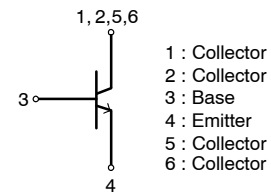
1. Surface mounted on ceramic substrate (250 mm<sup>2</sup> x 0.8 mm).

12 V, 150 mA  
 $f_T = 7$  GHz typ.  
 RF Transistor

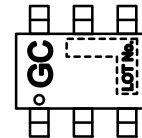


CPH6  
CASE 318BD

### ELECTRICAL CONNECTION NPN



### MARKING DIAGRAM



### ORDERING INFORMATION

| Device         | Package                            | Shipping <sup>†</sup> |
|----------------|------------------------------------|-----------------------|
| NSVF6003SB6T1G | CPH6<br>(Pb-Free,<br>Halogen Free) | 3000 /<br>Tape & Reel |

<sup>†</sup>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](http://www.onsemi.com/BRD8011/D).

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## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C) (Note 3)

| Symbol                          | Parameter                    | Conditions                                                | Value |     |     | Unit |
|---------------------------------|------------------------------|-----------------------------------------------------------|-------|-----|-----|------|
|                                 |                              |                                                           | Min   | Typ | Max |      |
| I <sub>CBO</sub>                | Collector Cutoff Current     | V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 A              | –     | –   | 1.0 | μA   |
| I <sub>EB0</sub>                | Emitter Cutoff Current       | V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0 A               | –     | –   | 10  | μA   |
| h <sub>FE</sub>                 | DC Current Gain              | V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA             | 100   | –   | 180 | –    |
| f <sub>T</sub>                  | Gain–Bandwidth Product       |                                                           | –     | 7   | –   | GHz  |
| C <sub>ob</sub>                 | Output Capacitance           | V <sub>CB</sub> = 10 V, f = 1 MHz                         | –     | 1.3 | 2.0 | pF   |
| C <sub>re</sub>                 | Reverse Transfer Capacitance |                                                           | –     | 0.9 | –   | pF   |
| S <sub>21e</sub>   <sup>2</sup> | Forward Transfer Gain        | V <sub>CE</sub> = 5 V, I <sub>C</sub> = 50 mA, f = 1 GHz  | –     | 9.0 | –   | dB   |
| NF                              | Noise Figure                 | V <sub>CE</sub> = 5 V, I <sub>C</sub> = 5.0 mA, f = 1 GHz | –     | 1.8 | 3.0 | dB   |

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. Pay attention to handling since it is liable to be affected by static electricity due to the high-frequency process adopted.

TYPICAL CHARACTERISTICS

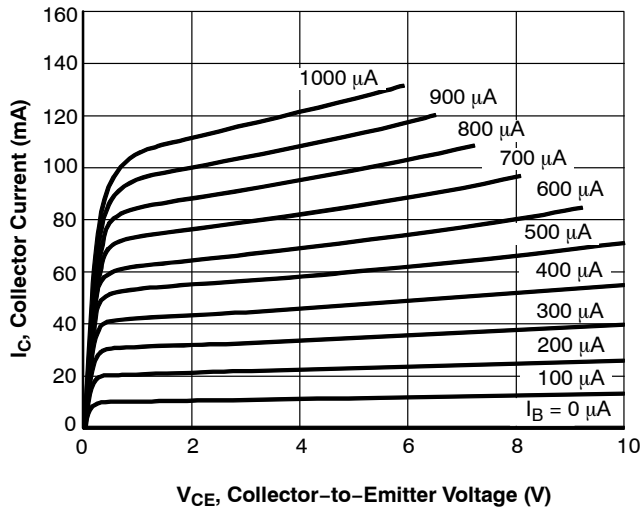


Figure 1.  $I_C - V_{CE}$

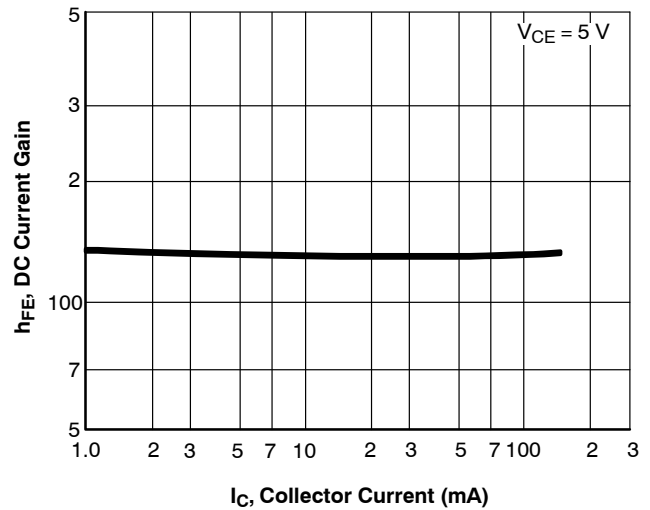


Figure 2.  $h_{FE} - I_C$

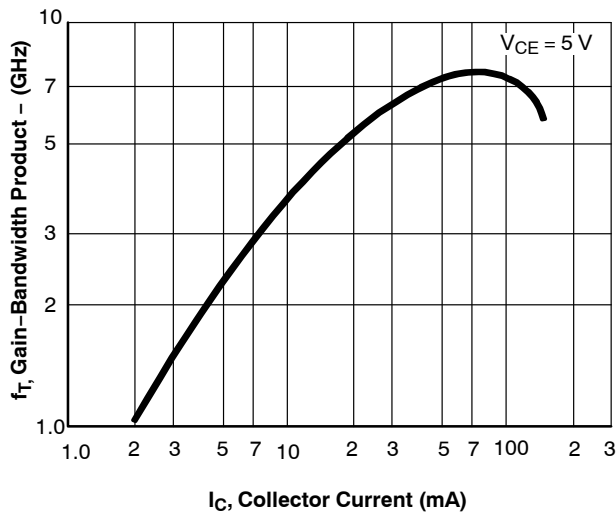


Figure 3.  $f_T - I_C$

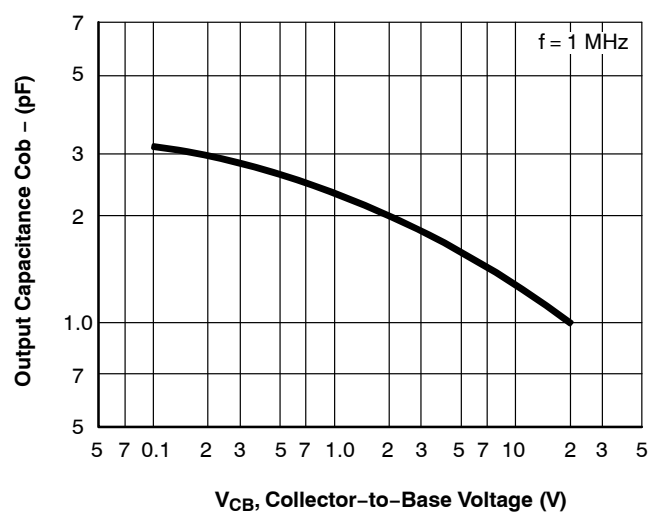


Figure 4.  $C_{ob} - V_{CB}$

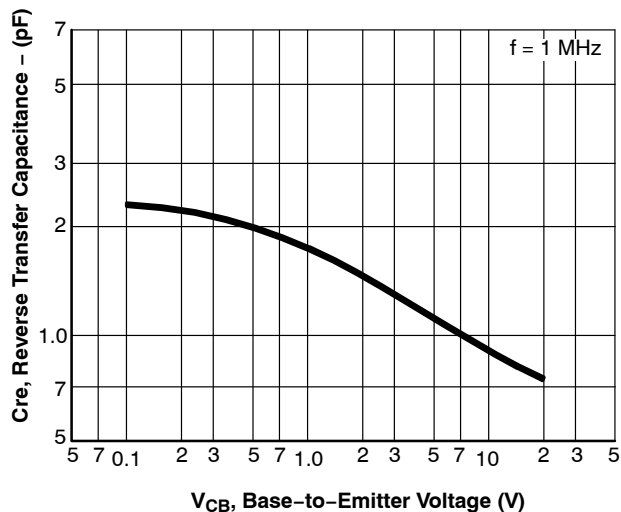


Figure 5.  $C_{re} - V_{CB}$

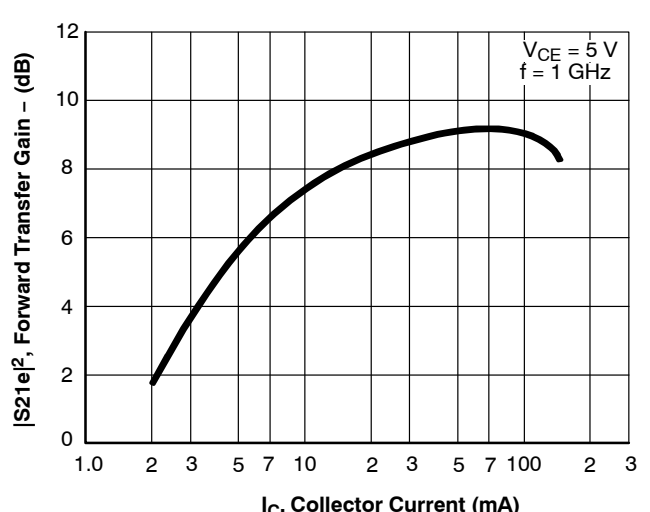
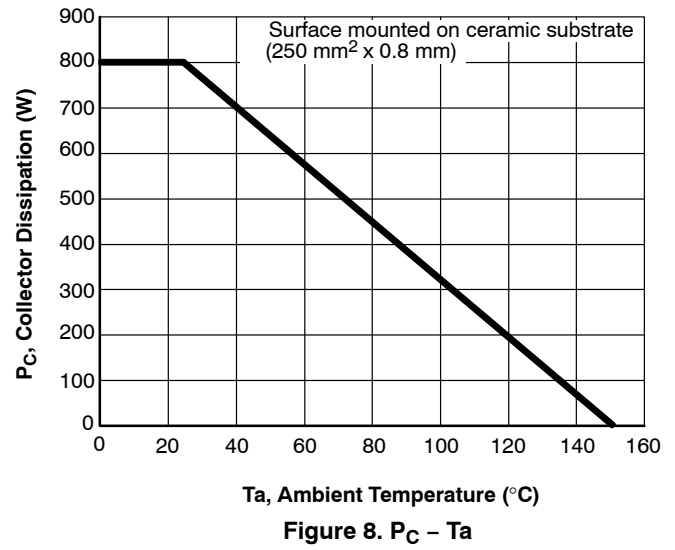
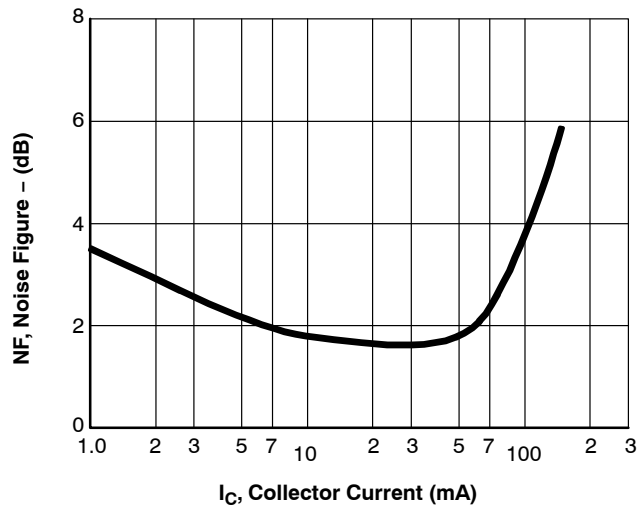


Figure 6.  $|S_{21e}|^2 - I_C$

TYPICAL CHARACTERISTICS (CONTINUED)



# NSVF6003SB6

## S Parameters (Common emitter)

$V_{CE} = 5\text{ V}$ ,  $I_C = 20\text{ mA}$ ,  $Z_O = 50\ \Omega$

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.550           | 254.1            | 21.532          | 119.9            | 0.036           | 54.6             | 0.527           | -62.8            |
| 200       | 0.492           | 218.1            | 12.273          | 103.0            | 0.050           | 56.5             | 0.332           | -80.3            |
| 300       | 0.477           | 201.9            | 8.448           | 95.3             | 0.063           | 61.7             | 0.267           | -88.3            |
| 400       | 0.470           | 192.4            | 6.427           | 90.4             | 0.078           | 65.3             | 0.242           | 268.1            |
| 500       | 0.518           | 181.0            | 5.015           | 86.8             | 0.089           | 68.2             | 0.217           | 245.3            |
| 600       | 0.513           | 175.8            | 4.221           | 83.9             | 0.104           | 70.2             | 0.216           | 245.8            |
| 700       | 0.510           | 171.5            | 3.658           | 81.3             | 0.120           | 71.7             | 0.214           | 247.2            |
| 800       | 0.508           | 167.6            | 3.234           | 78.9             | 0.135           | 72.7             | 0.220           | 249.3            |
| 900       | 0.503           | 163.7            | 2.900           | 76.7             | 0.150           | 73.2             | 0.225           | 251.3            |
| 1000      | 0.497           | 160.1            | 2.636           | 74.4             | 0.166           | 73.7             | 0.231           | 254.6            |
| 1100      | 0.493           | 156.8            | 2.419           | 72.5             | 0.181           | 73.9             | 0.239           | 256.3            |
| 1200      | 0.489           | 153.4            | 2.243           | 70.5             | 0.196           | 74.1             | 0.247           | 258.8            |

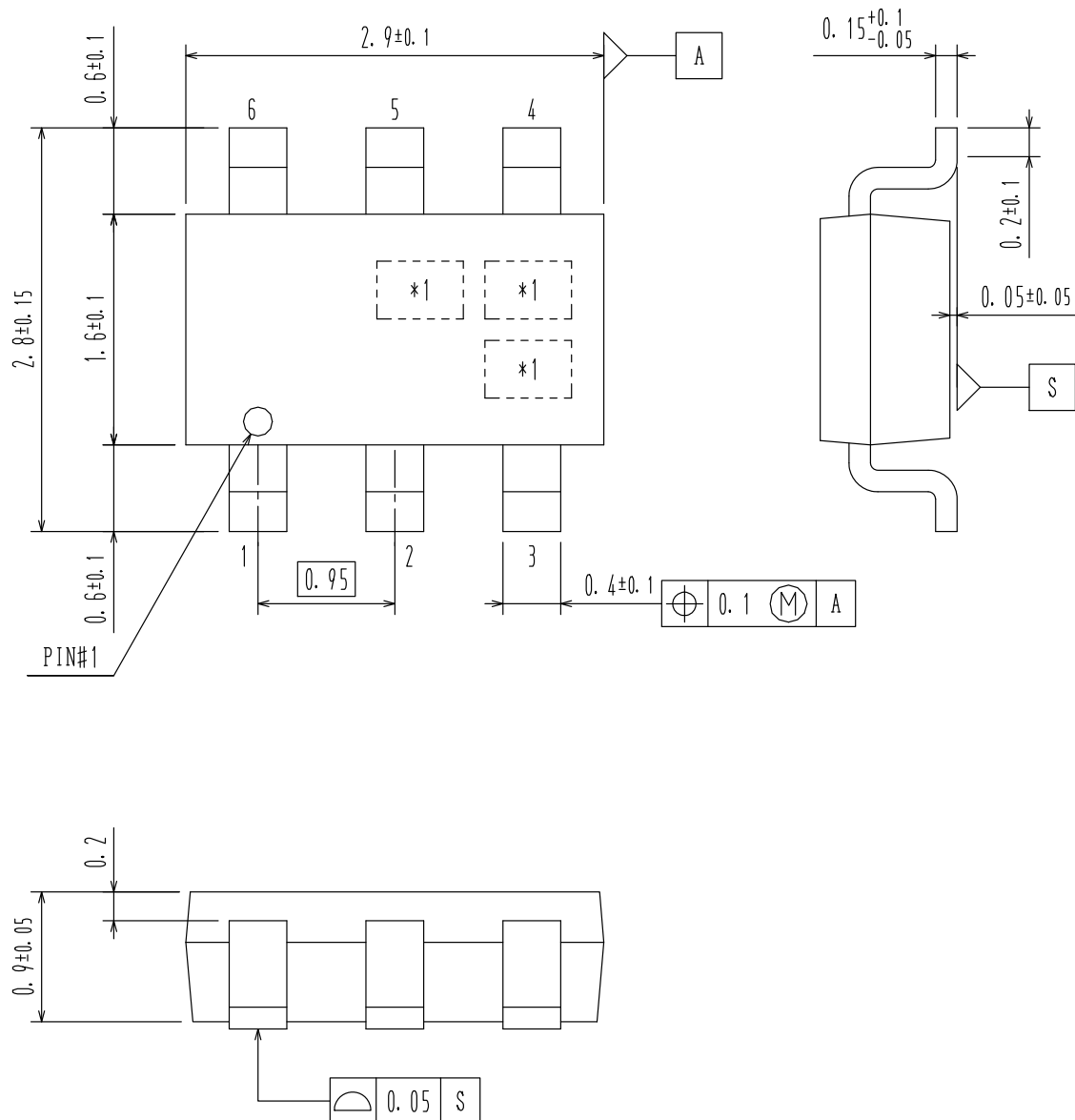
$V_{CE} = 5\text{ V}$ ,  $I_C = 50\text{ mA}$ ,  $Z_O = 50\ \Omega$

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.465           | 231.1            | 25.203          | 111.9            | 0.029           | 59.2             | 0.413           | -79.9            |
| 200       | 0.449           | 203.4            | 13.519          | 98.7             | 0.045           | 65.7             | 0.269           | 259.6            |
| 300       | 0.445           | 191.6            | 9.177           | 92.7             | 0.061           | 70.4             | 0.230           | 250.7            |
| 400       | 0.443           | 184.2            | 6.947           | 88.8             | 0.078           | 72.8             | 0.218           | 247.3            |
| 500       | 0.502           | 175.0            | 5.407           | 86.1             | 0.092           | 74.7             | 0.231           | 224.3            |
| 600       | 0.497           | 170.3            | 4.550           | 83.7             | 0.110           | 75.6             | 0.229           | 225.5            |
| 700       | 0.494           | 166.4            | 3.944           | 81.5             | 0.127           | 76.2             | 0.225           | 227.1            |
| 800       | 0.490           | 162.8            | 3.483           | 79.4             | 0.144           | 76.4             | 0.228           | 229.9            |
| 900       | 0.485           | 159.1            | 3.127           | 77.4             | 0.161           | 76.2             | 0.230           | 232.4            |
| 1000      | 0.478           | 155.5            | 2.845           | 75.5             | 0.178           | 76.1             | 0.230           | 236.1            |
| 1100      | 0.473           | 152.3            | 2.608           | 73.6             | 0.195           | 75.9             | 0.236           | 238.6            |
| 1200      | 0.468           | 149.0            | 2.423           | 71.9             | 0.211           | 75.5             | 0.239           | 242.0            |

$V_{CE} = 5\text{ V}$ ,  $I_C = 100\text{ mA}$ ,  $Z_O = 50\ \Omega$

| Freq(MHz) | S <sub>11</sub> | ∠S <sub>11</sub> | S <sub>21</sub> | ∠S <sub>21</sub> | S <sub>12</sub> | ∠S <sub>12</sub> | S <sub>22</sub> | ∠S <sub>22</sub> |
|-----------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
| 100       | 0.451           | 219.5            | 25.808          | 108.5            | 0.026           | 62.4             | 0.359           | -86.7            |
| 200       | 0.448           | 196.7            | 13.593          | 96.8             | 0.043           | 69.8             | 0.240           | 253.1            |
| 300       | 0.448           | 187.0            | 9.193           | 91.4             | 0.060           | 73.8             | 0.212           | 244.9            |
| 400       | 0.446           | 180.7            | 6.953           | 87.8             | 0.078           | 75.5             | 0.205           | 242.3            |
| 500       | 0.508           | 172.6            | 5.408           | 85.5             | 0.093           | 76.9             | 0.228           | 219.9            |
| 600       | 0.503           | 168.3            | 4.550           | 83.1             | 0.110           | 77.5             | 0.226           | 221.5            |
| 700       | 0.500           | 164.6            | 3.944           | 81.0             | 0.128           | 77.8             | 0.223           | 223.4            |
| 800       | 0.497           | 161.2            | 3.480           | 79.0             | 0.145           | 77.8             | 0.226           | 226.5            |
| 900       | 0.490           | 157.6            | 3.132           | 77.0             | 0.163           | 77.4             | 0.228           | 229.1            |
| 1000      | 0.484           | 154.2            | 2.842           | 75.0             | 0.180           | 77.1             | 0.227           | 233.1            |
| 1100      | 0.479           | 151.0            | 2.614           | 73.3             | 0.197           | 76.7             | 0.232           | 235.8            |
| 1200      | 0.473           | 147.8            | 2.423           | 71.6             | 0.214           | 76.3             | 0.236           | 239.3            |

## ON



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