# *NPN SILICON RF TRANSISTOR*

## ☐ *Applications*

- UHF and VHF wide band amplifier

## ☐ *Features*

- High gain bandwidth product

  $f_T$ = 6 GHz @ $V_{CE}$ = 3 V, $I_C$ = 10 mA

  $f_T$ = 7.5 GHz @ $V_{CE}$ = 5 V, $I_C$ = 20 mA

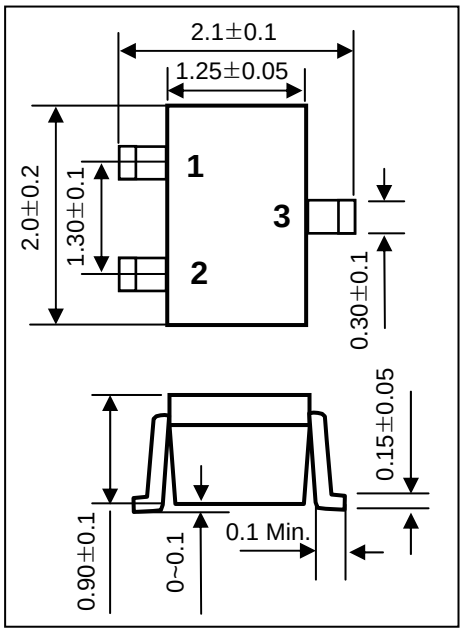
- High power gain

  $|S_{21}|^2$ = 9 dB @ $V_{CE}$ = 3 V, $I_C$ = 10 mA, f = 1 GHz

- Low noise figure

  NF = 1.4 dB @ $V_{CE}$ = 3 V, $I_C$ = 10 mA, f = 1 GHz

**SOT323** **Unit in mm**




**Pin Configuration** (TBN6301U)

1. Base
2. Emitter
3. Collector

## ☐ *Absolute Maximum Ratings* ($T_A$ = 25 ℃)

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Collector to Base Voltage | $BV_{CBO}$ | 20 | V |
| Collector to Emitter Voltage | $BV_{CEO}$ | 8 | V |
| Emitter to Base Voltage | $BV_{EBO}$ | 3 | V |
| Collector Current | $I_C$ | 75 | mA |
| Total Power Dissipation | $P_{tot}$ | 150 | mW |
| Operating Junction Temperature | $T_j$ | 150 | ℃ |
| Storage Temperature | $T_{stg}$ | -65 ~ 150 | ℃ |

**Caution** : **E**lectro **S**tatic **D**ischarge sensitive device

## ☐ *Electrical Characteristics* ($T_A$ = 25 ℃)

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Collector Cut-off Current | $I_{CBO}$ | $V_{CB}$ = 15 V, $I_E$ = 0 mA | | | 0.5 | ㎂ |
| | $I_{CEO}$ | $V_{CE}$ = 8 V, $I_B$ = 0 mA | | | 10 | ㎂ |
| Emitter Cut-off Current | $I_{EBO}$ | $V_{EB}$ = 2 V, $I_C$ = 0 mA | | | 0.5 | ㎂ |
| DC Current Gain | $h_{FE}$ | $V_{CE}$ = 3 V, $I_C$ = 10 mA | 50 | | 250 | |
| Gain Bandwidth Product | $f_T$ | $V_{CE}$ = 3 V, $I_C$ = 10 mA | 5 | 6 | | GHz |
| | | $V_{CE}$ = 5 V, $I_C$ = 20 mA | 6 | 7.5 | | GHz |
| Insertion Power Gain | $\|S_{21}\|^2$ | $V_{CE}$ = 3 V, $I_C$ = 10 mA, f = 1 GHz | 7 | 9 | | dB |
| | | $V_{CE}$ = 5 V, $I_C$ = 20 mA, f = 1 GHz | 7 | 9.5 | | dB |
| Noise Figure | NF | $V_{CE}$ = 3 V, $I_C$ = 10 mA, f = 1 GHz | | 1.4 | 1.8 | |
| Reverse Transfer Capacitance | $C_{re}$ | $V_{CB}$ = 3 V, $I_E$ = 0 mA, f = 1 MHz | | 1.1 | | pF |

## ☐ *$h_{FE}$ Classification*

| Marking | SB2 | SB1 |
|---|---|---|
| $h_{FE}$ Value | 50 - 160 | 125 - 250 |

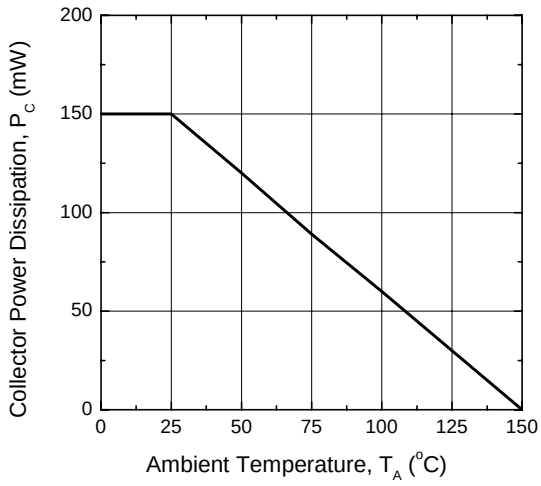
## ☐ *Available Package*

Unit in mm

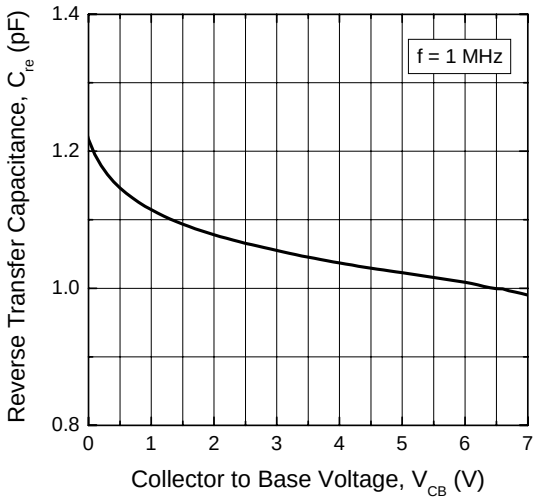
| Product | Package | Dimension |
|---|---|---|
| TBN6301S | SOT23 | 2.9 x 1.3, 1.2t |
| TBN6301U | SOT323 | 2.0 x 1.25, 1.0t |
| TBN6301E | SOT523 | 1.6 x 0.8, 0.8t |
| TBN6301KF | SOT623F | 1.4 x 0.8, 0.6t |

## ☐ *Typical Characteristics ( $T_A$ = 25 ℃, unless otherwise specified)*

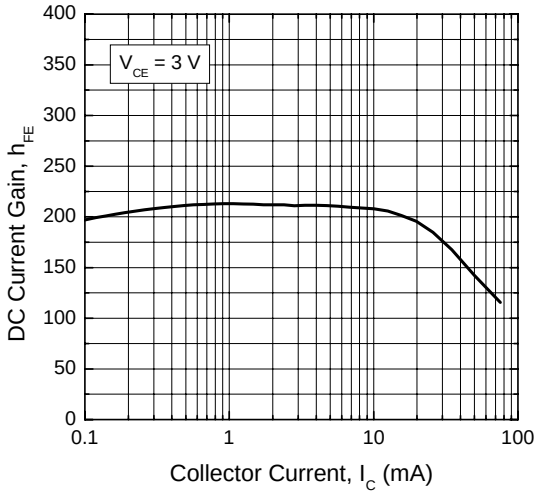
**Power Dissipation vs. Ambient Temperature**



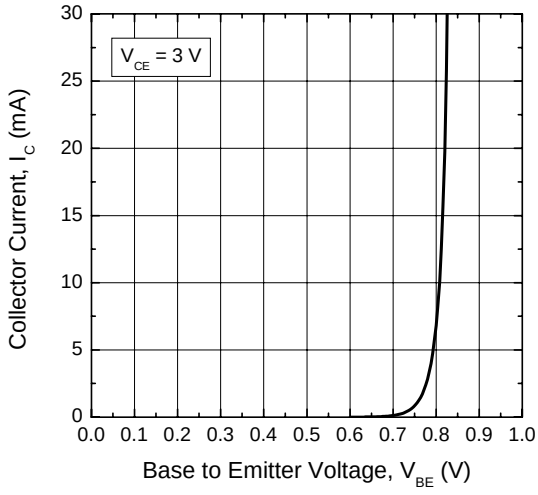

**Reverse Transfer Capacitance vs. Collector to Base Voltage**



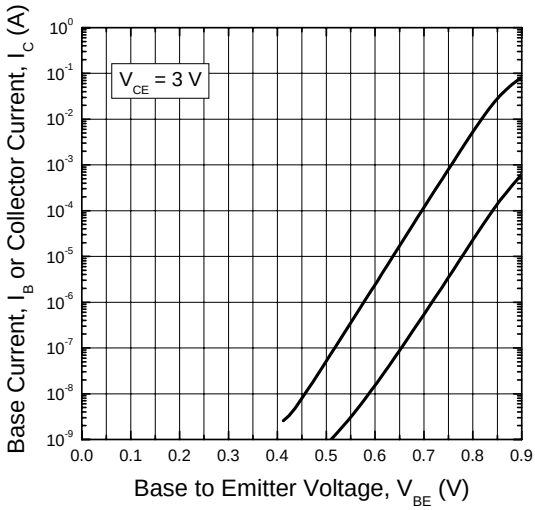

**DC Current Gain vs. Collector Current**



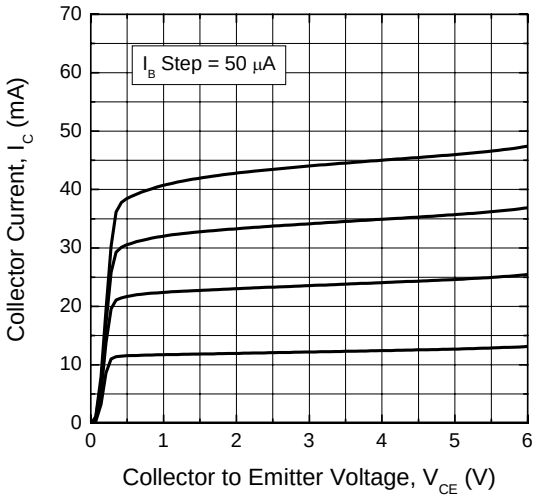

**Collector Current vs. Base to Emitter Voltage**



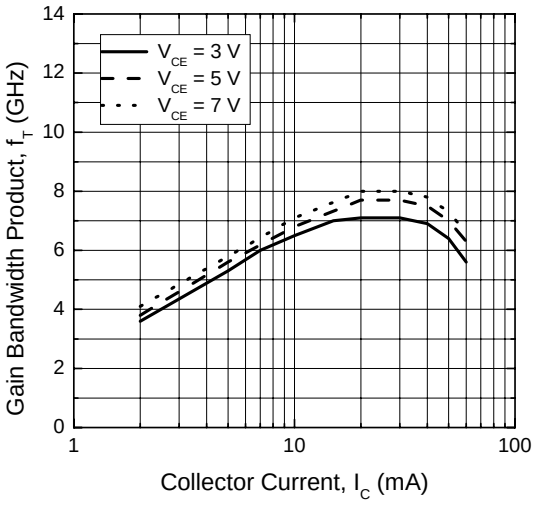
**Base Current, Collector Current vs. Base to Emitter Voltage**



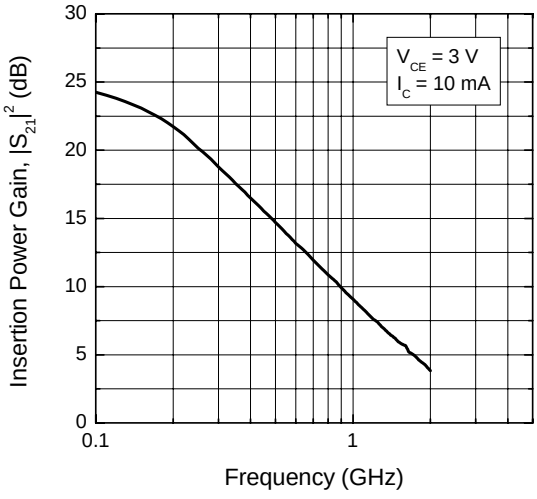

**Collector Current vs. Collector to Emitter Voltage**



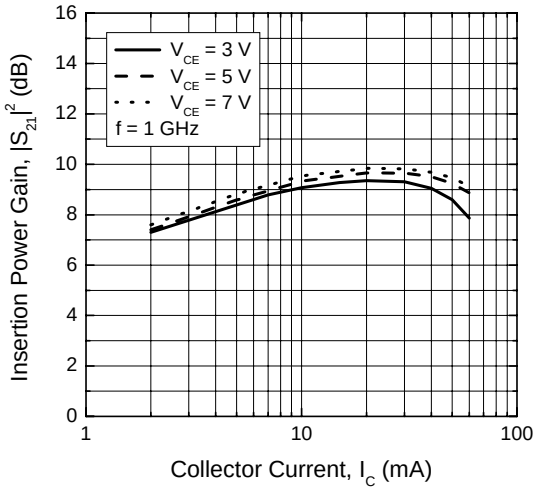

**Gain Bandwidth Product vs. Collector Current**



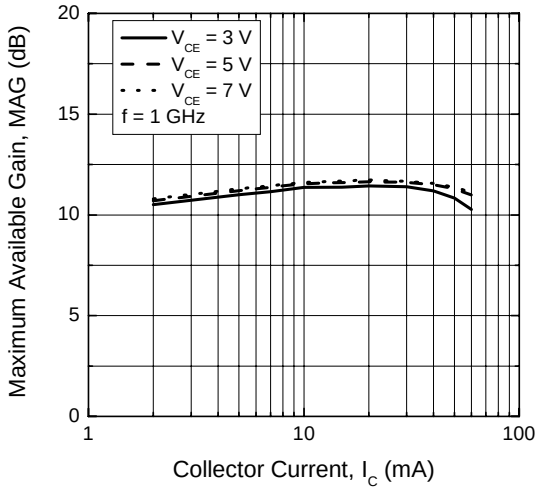

**Insertion Power Gain vs. Frequency**



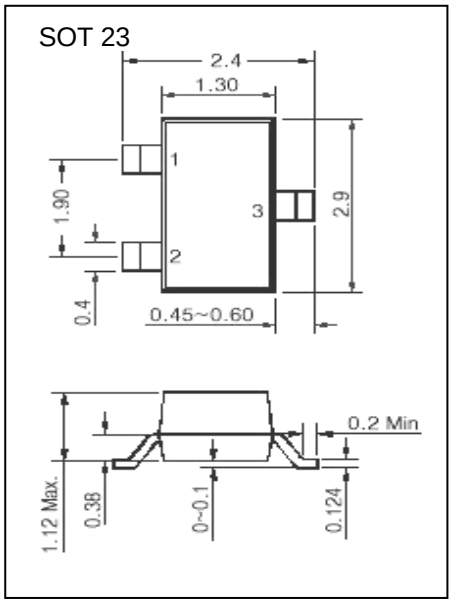
**Insertion Power Gain vs. Collector Current**



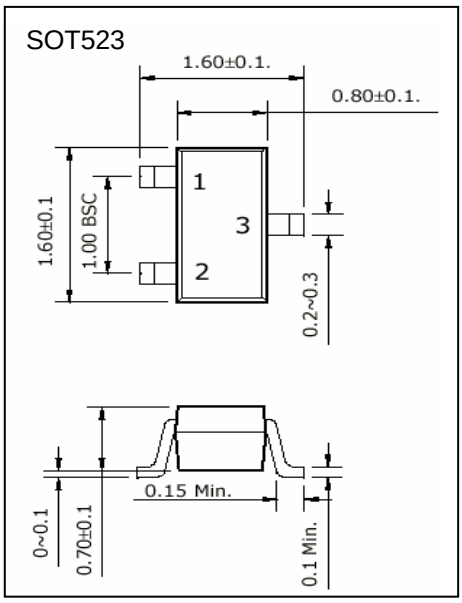

**Maximum Available Gain vs. Collector Current**



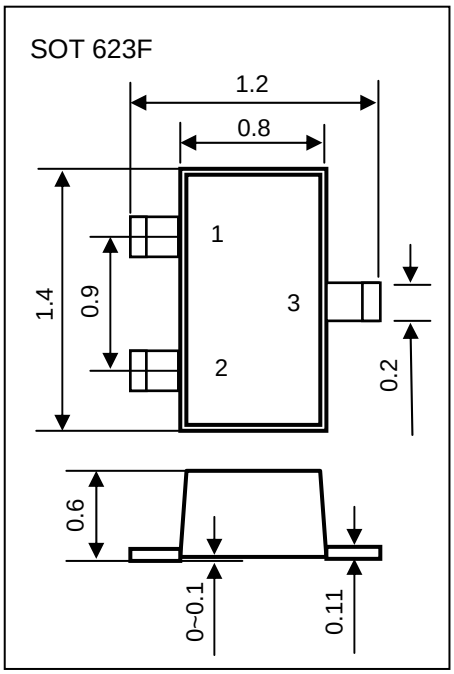
## ☐ Dimensions of TBN6301S in mm




## ☐ Dimensions of TBN6301E in mm




## ☐ Dimensions of TBN6301KF in mm




## Pin Configuration

(SOT23, SOT523, SOT623F)

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | B | Base |
| 2 | E | Emitter |
| 3 | C | Collector |