

**NPN SILICON RF TRANSISTOR**

**Applications**

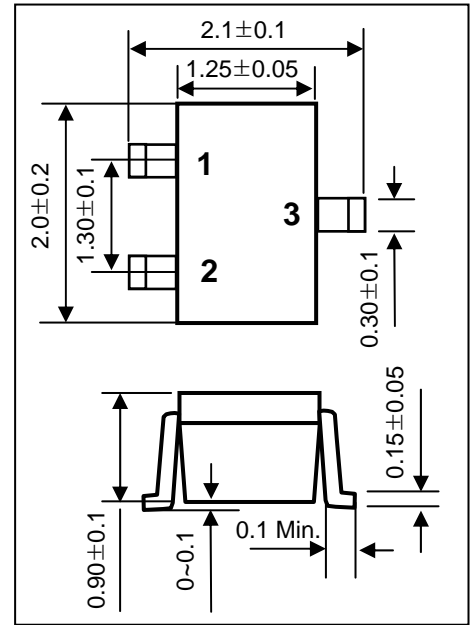
- UHF and VHF wide band amplifier

**Features**

- High gain bandwidth product  
 $f_T = 6 \text{ GHz @ } V_{CE} = 3 \text{ V, } I_C = 10 \text{ mA}$   
 $f_T = 7.5 \text{ GHz @ } V_{CE} = 5 \text{ V, } I_C = 20 \text{ mA}$
- High power gain  
 $|S_{21}|^2 = 9 \text{ dB @ } V_{CE} = 3 \text{ V, } I_C = 10 \text{ mA, } f = 1 \text{ GHz}$
- Low noise figure  
 $NF = 1.4 \text{ dB @ } V_{CE} = 3 \text{ V, } I_C = 10 \text{ mA, } f = 1 \text{ GHz}$

SOT323

Unit in mm



Pin Configuration (TBN6301U)

1. Base
2. Emitter
3. Collector

**Absolute Maximum Ratings (T<sub>A</sub> = 25 °C)**

| 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       | °C   |
| Storage Temperature            | $T_{stg}$  | -65 ~ 150 | °C   |

**Caution** : Electro Static Discharge sensitive device

**Electrical Characteristics ( $T_A = 25\text{ }^\circ\text{C}$ )**

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

**$h_{FE}$  Classification**

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

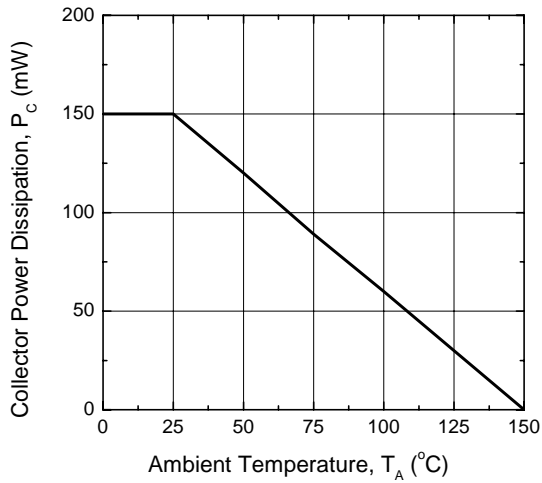
**Available Package**

Unit in mm

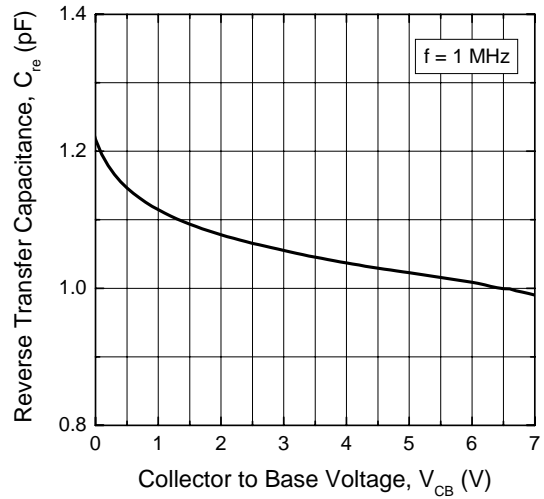
| Product   | Package | Dimension        |
|-----------|---------|------------------|
| TBN6301S  | SOT23   | 2.9 x 1.3, 1.2t  |
| TBN6301U  | SOT323  | 2.0 x 1.25, 1.0t |
| TBN6301E  | SOT523  | 1.6 x 0.8, 0.8t  |
| TBN6301KF | SOT623F | 1.4 x 0.8, 0.6t  |

□ Typical Characteristics ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

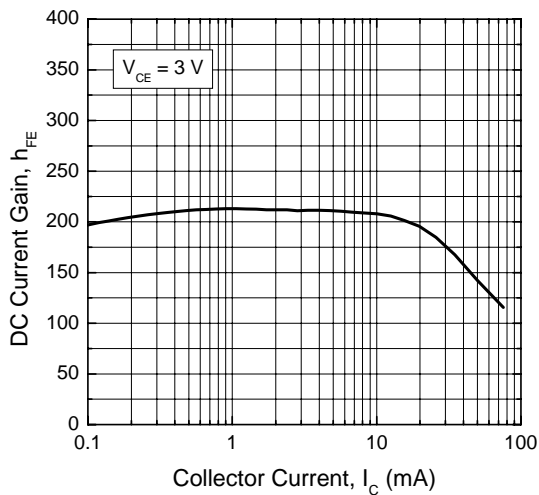
Power Dissipation vs. Ambient Temperature



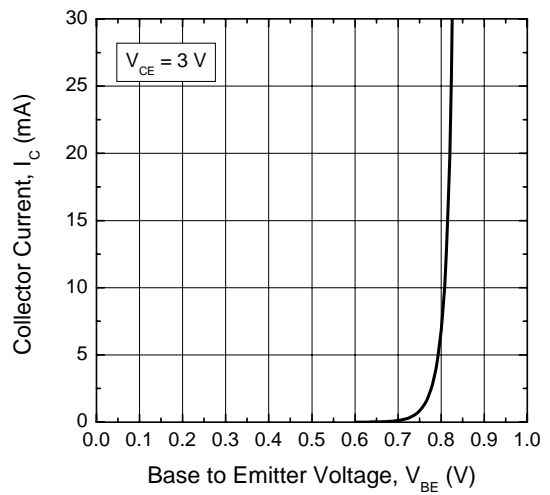
Reverse Transfer Capacitance vs. Collector to Base Voltage



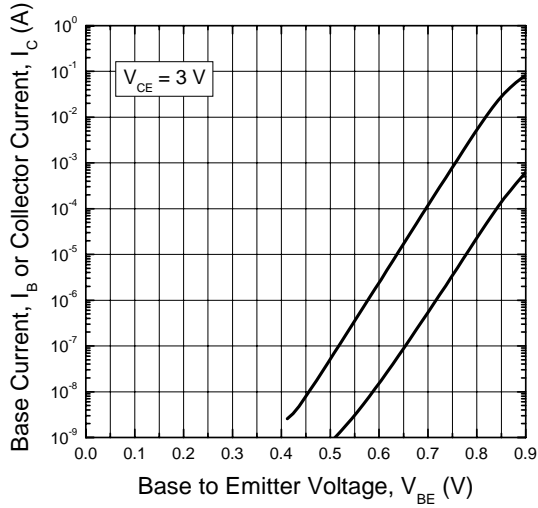
DC Current Gain vs. Collector Current



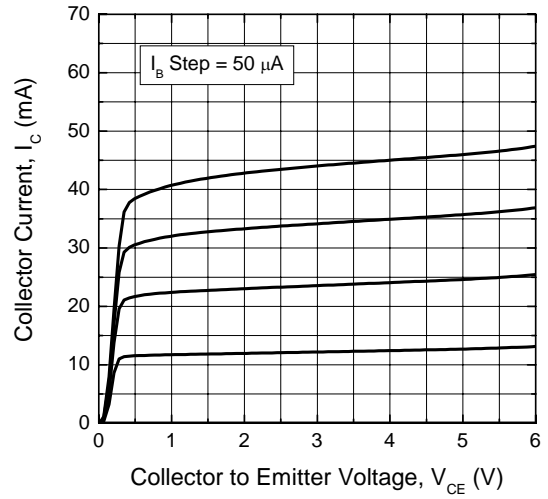
Collector Current vs. Base to Emitter Voltage



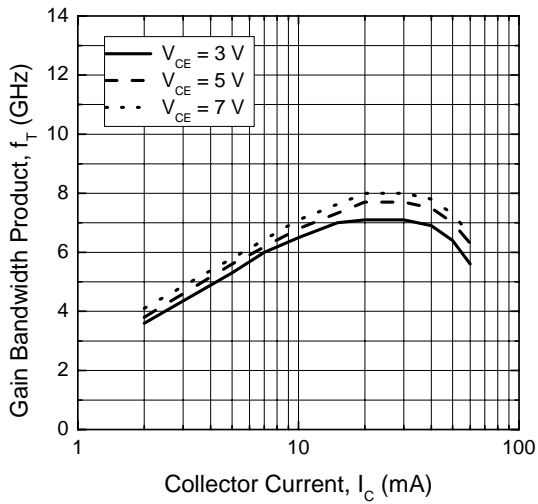
Base Current, Collector Current vs. Base to Emitter Voltage



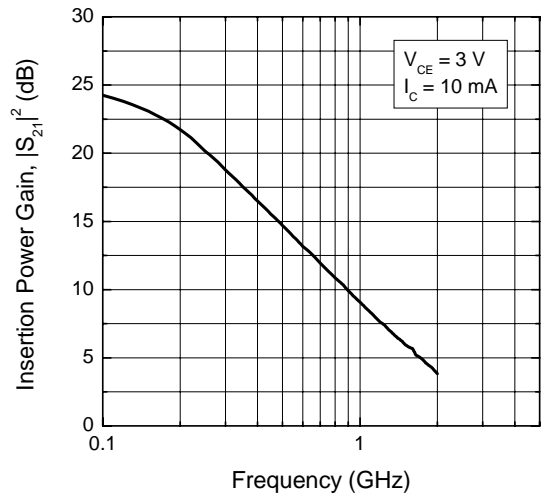
Collector Current vs. Collector to Emitter Voltage



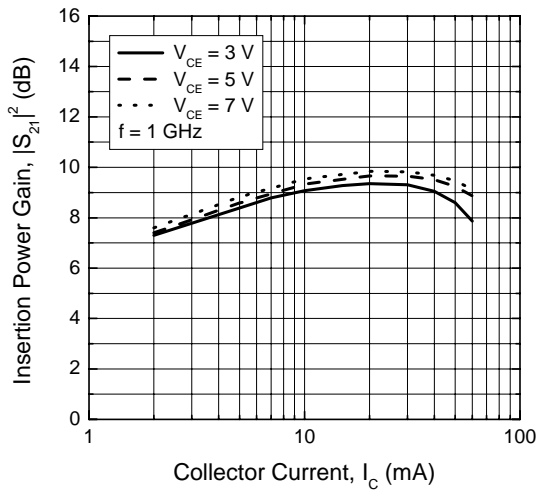
Gain Bandwidth Product vs. Collector Current



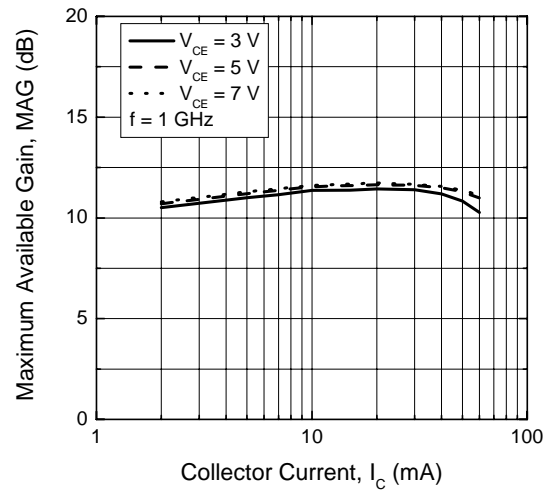
Insertion Power Gain vs. Frequency



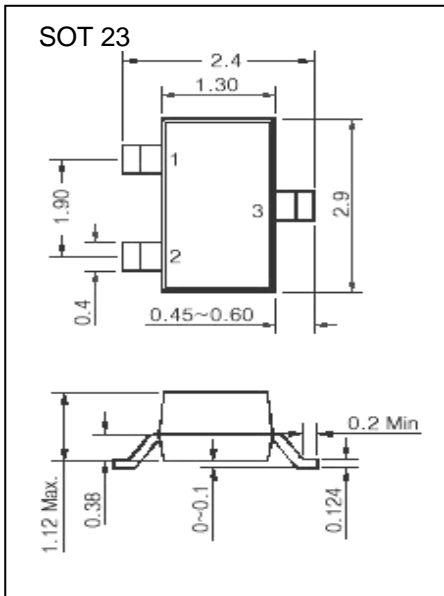
Insertion Power Gain vs. Collector Current



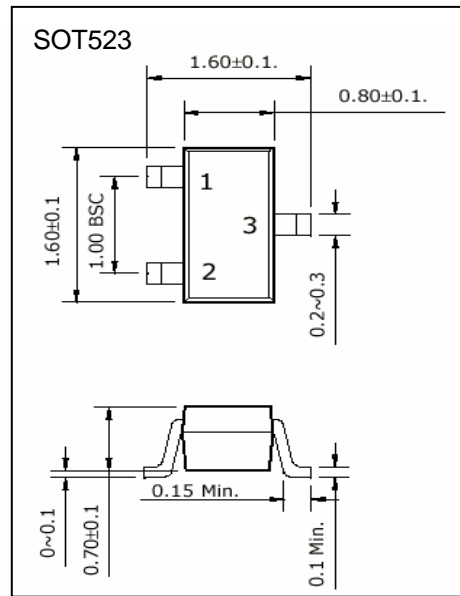
Maximum Available Gain vs. Collector Current



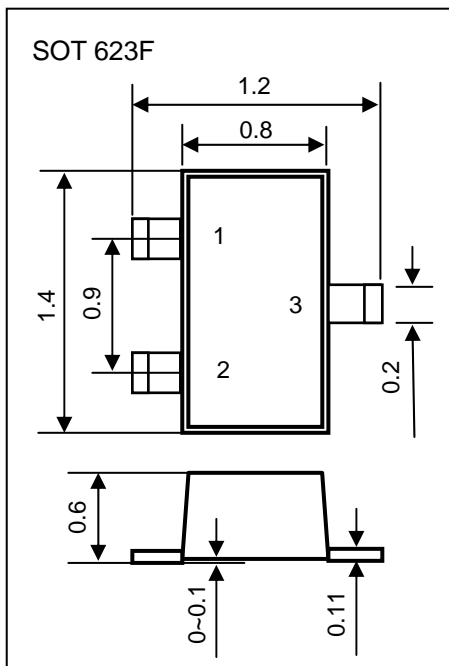
□ Dimensions of TBN6301S in mm



□ 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   |