

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

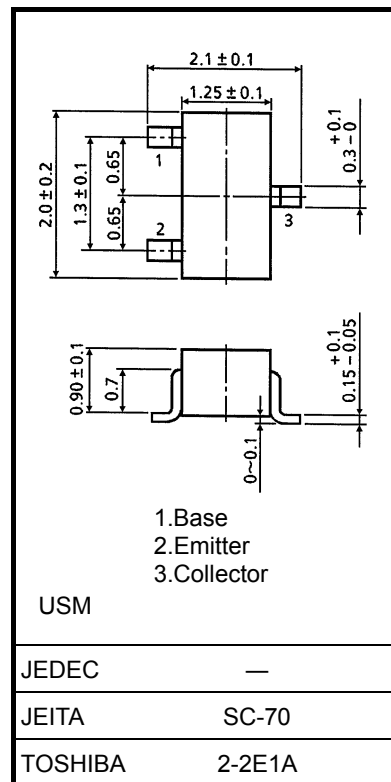
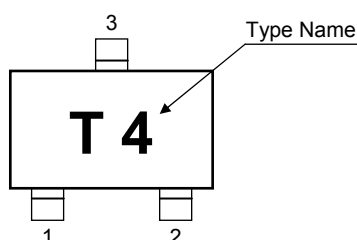
## MT3S16U

Unit: mm

### ○ UHF Band Oscillator and Amplifier Applications

- $f_T$  is high and current dependability is excellent.
- The characteristic of Reverse transfer capacitance ( $C_{re}$ ) is flat.  
 $:NF = 2.4\text{dB(Typ.) (@ 2V, 5mA, 1 GHz)}$   
 $:|S_{21e}|^2 = 4.5\text{dB(Typ.) (@ 2V, 10mA, 1 GHz)}$

### Marking



Weight : 6 mg (Typ.)

### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

| Characteristics             | Symbol               | Rating  | Unit             |
|-----------------------------|----------------------|---------|------------------|
| Collector-base voltage      | $V_{CBO}$            | 10      | V                |
| Collector-emitter voltage   | $V_{CEO}$            | 5       | V                |
| Emitter-base voltage        | $V_{EBO}$            | 2       | V                |
| Collector current           | $I_C$                | 60      | mA               |
| Base current                | $I_B$                | 10      | mA               |
| Collector power dissipation | $P_C$                | 100     | mW               |
|                             | $P_C(\text{Note.1})$ | 180     | mW               |
| Junction temperature        | $T_j$                | 125     | $^\circ\text{C}$ |
| Storage temperature range   | $T_{stg}$            | -55~125 | $^\circ\text{C}$ |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note.1: The device is mounted on a FR4 board (20mm X 25mm X 1.55 mm (t))

**Microwave Characteristics (Ta = 25°C)**

| Characteristics      | Symbol            | Condition                                                         | Min | Typ. | Max | Unit |
|----------------------|-------------------|-------------------------------------------------------------------|-----|------|-----|------|
| Transition frequency | $f_T$             | $V_{CE} = 3\text{ V}$ , $I_C = 10\text{ mA}$                      | 2   | 4    | —   | GHz  |
| Insertion gain       | $ S_{21e} ^2 (1)$ | $V_{CE} = 2\text{ V}$ , $I_C = 10\text{ mA}$ , $f = 1\text{ GHz}$ | —   | 4.5  | —   | dB   |
|                      | $ S_{21e} ^2 (2)$ | $V_{CE} = 3\text{ V}$ , $I_C = 30\text{ mA}$ , $f = 1\text{ GHz}$ | 3   | 5.5  | —   |      |
| Noise figure         | NF                | $V_{CE} = 2\text{ V}$ , $I_C = 5\text{ mA}$ , $f = 1\text{ GHz}$  | —   | 2.4  | 3.2 | dB   |

**Electrical Characteristics (Ta = 25°C)**

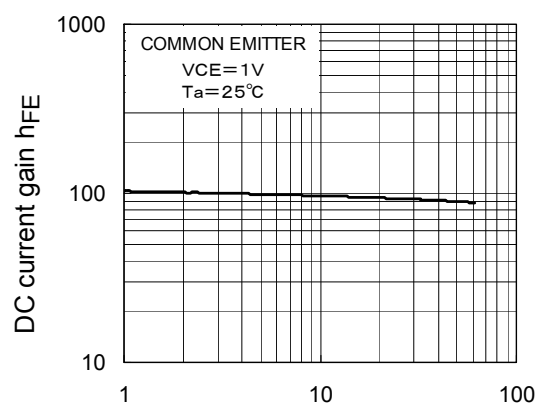
| Characteristics              | Symbol    | Condition                                                       | Min | Typ. | Max | Unit          |
|------------------------------|-----------|-----------------------------------------------------------------|-----|------|-----|---------------|
| Collector cut-off current    | $I_{CBO}$ | $V_{CB} = 5\text{ V}$ , $I_E = 0$                               | —   | —    | 0.1 | $\mu\text{A}$ |
| Emitter cut-off current      | $I_{EBO}$ | $V_{EB} = 1\text{ V}$ , $I_C = 0$                               | —   | —    | 1   | $\mu\text{A}$ |
| DC current gain              | $h_{FE}$  | $V_{CE} = 1\text{ V}$ , $I_C = 5\text{ mA}$                     | 80  | —    | 140 | —             |
| Reverse transfer capacitance | $C_{re}$  | $V_{CB} = 1\text{ V}$ , $I_E = 0$ , $f = 1\text{ MHz}$ (Note.2) | —   | 2.4  | 3   | pF            |

Note.2:  $C_{re}$  is measured with a three-terminal method using a capacitance bridge.

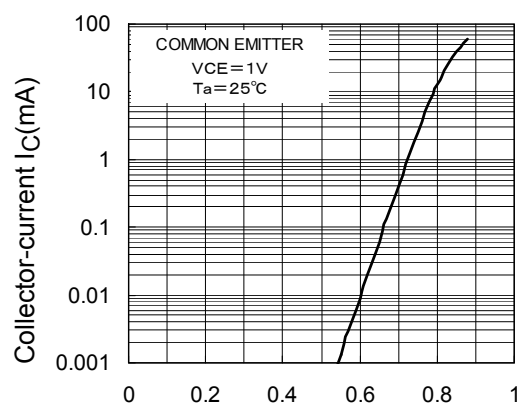
**Caution**

This device is sensitive to electrostatic discharge. Ensure that tools and equipment are sufficiently grounded before handling. When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic materials.

$h_{FE}-I_C$



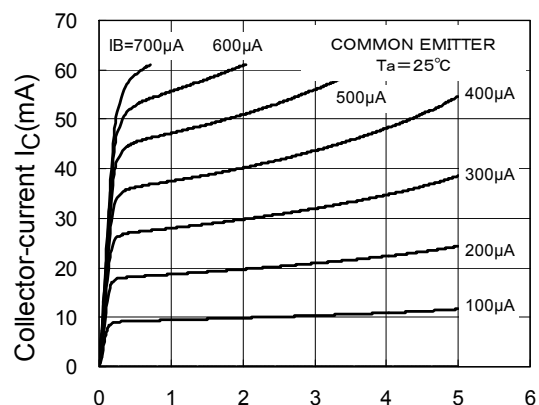
$I_C-V_{BE}$



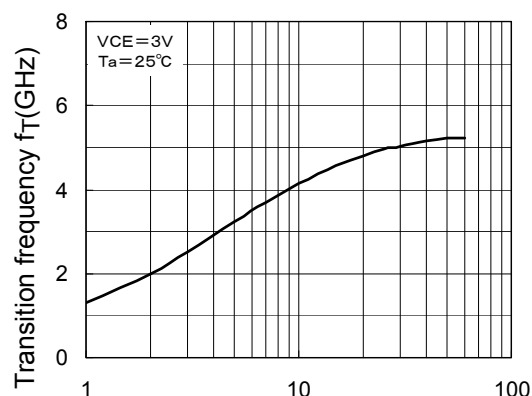
Collector-current  $I_C (mA)$

Base-emitter voltage  $V_{BE} (V)$

$I_C-V_{CE}$



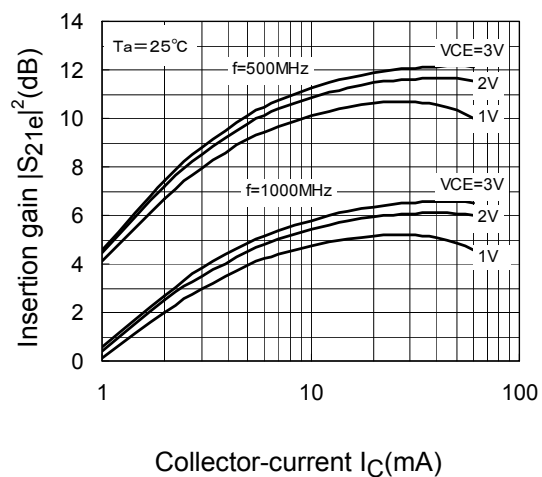
$f_T-I_C$



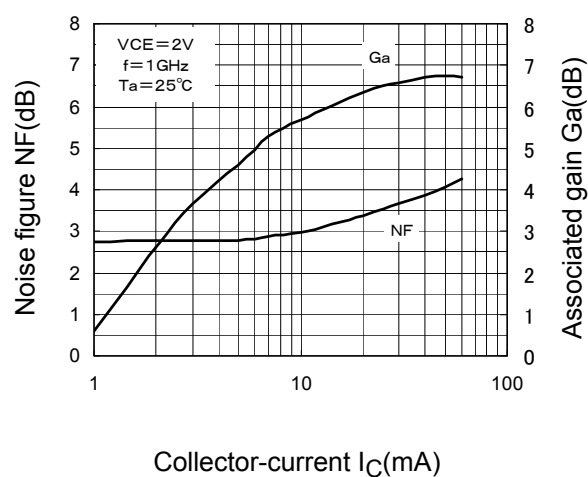
Collector-emitter voltage  $V_{CE} (V)$

Collector-current  $I_C (mA)$

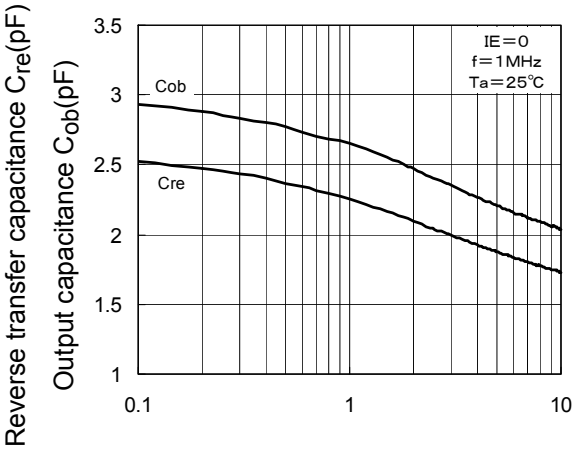
$|S_{21e}|^2-I_C$



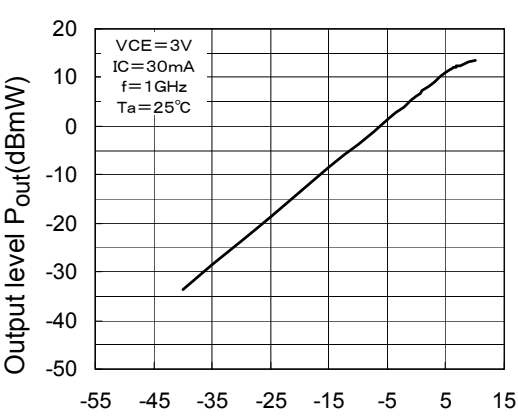
NF, Ga -  $I_C$



$C_{re}, C_{ob}-V_{CB}$



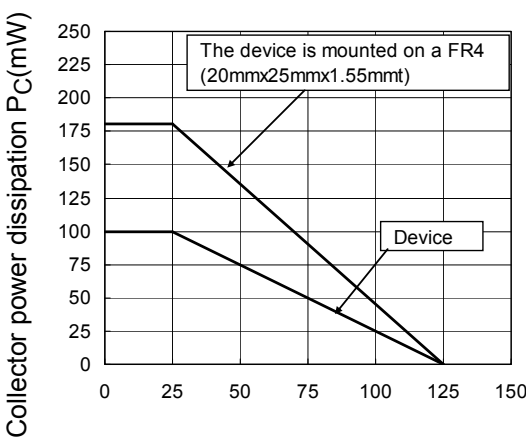
$P_{out} - P_{in}$



Collector-base voltage  $V_{CB}$ (V)

Input level  $P_{in}$ (dBmW)

$P_C-T_a$



Ambient temperature  $T_a(^{\circ}\text{C})$

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