

TOSHIBA TRANSISTOR SILICON NPN EPITAXIAL PLANAR TYPE

# 2SC4839

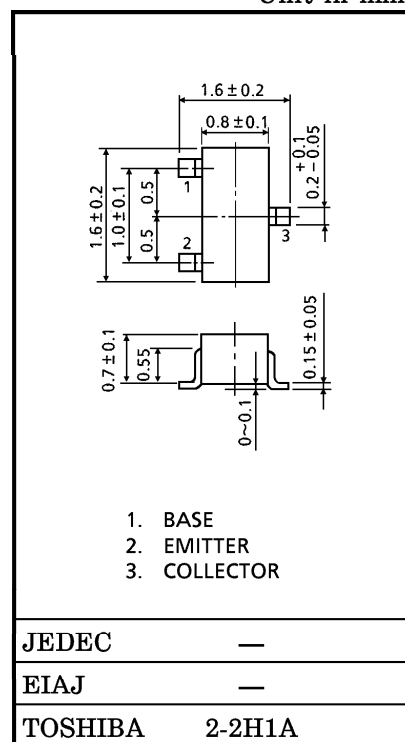
VHF~UHF BAND LOW NOISE AMPLIFIER APPLICATIONS

Unit in mm

- Low Noise Figure, High Gain.
- $NF = 1.1dB$ ,  $|S_{21e}|^2 = 12dB$  ( $f = 1GHz$ )

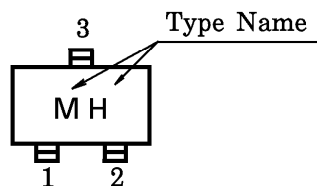
MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

| CHARACTERISTIC              | SYMBOL    | RATING  | UNIT       |
|-----------------------------|-----------|---------|------------|
| Collector-Base Voltage      | $V_{CBO}$ | 20      | V          |
| Collector-Emitter Voltage   | $V_{CEO}$ | 12      | V          |
| Emitter-Base Voltage        | $V_{EBO}$ | 3       | V          |
| Collector Current           | $I_C$     | 80      | mA         |
| Base Current                | $I_B$     | 40      | mA         |
| Collector Power Dissipation | $P_C$     | 100     | mW         |
| Junction Temperature        | $T_j$     | 125     | $^\circ C$ |
| Storage Temperature Range   | $T_{stg}$ | -55~125 | $^\circ C$ |



Weight : 2.4mg

Marking



MICROWAVE CHARACTERISTICS ( $T_a = 25^\circ C$ )

| CHARACTERISTIC       | SYMBOL            | TEST CONDITION                         | MIN. | TYP. | MAX. | UNIT |
|----------------------|-------------------|--|------|------|------|------|
| Transition Frequency | $f_T$             | $V_{CE} = 10V, I_C = 20mA$             | 5    | 7    | —    | GHz  |
| Insertion Gain       | $ S_{21e} ^2 (1)$ | $V_{CE} = 10V, I_C = 20mA, f = 500MHz$ | —    | 18   | —    | dB   |
|                      | $ S_{21e} ^2 (2)$ | $V_{CE} = 10V, I_C = 20mA, f = 1GHz$   | 7.5  | 12   | —    |      |
| Noise Figure         | NF (1)            | $V_{CE} = 10V, I_C = 5mA, f = 500MHz$  | —    | 1    | —    | dB   |
|                      | NF (2)            | $V_{CE} = 10V, I_C = 5mA, f = 1GHz$    | —    | 1.1  | 2    |      |

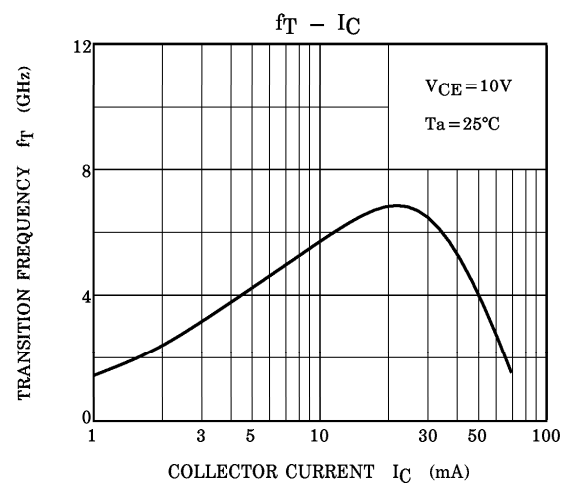
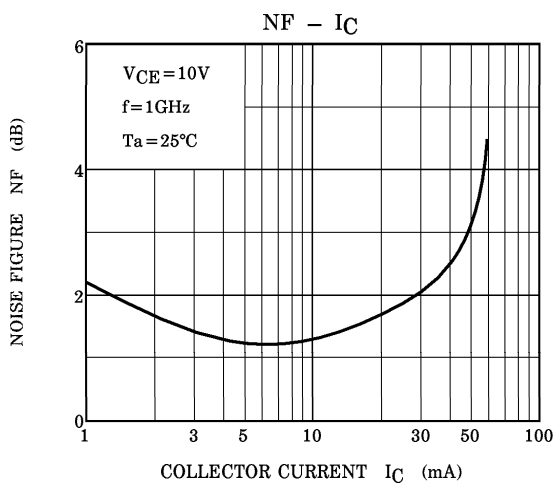
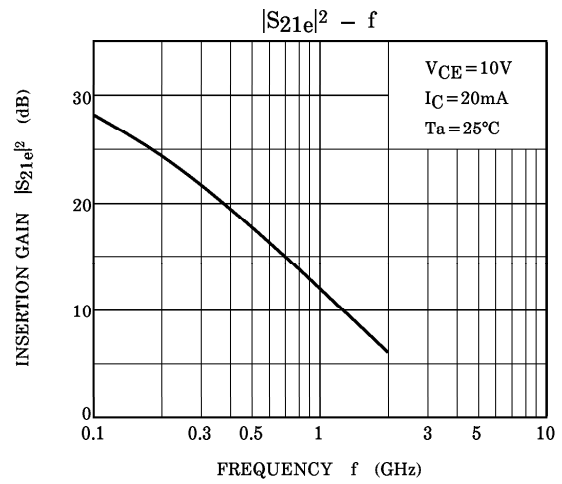
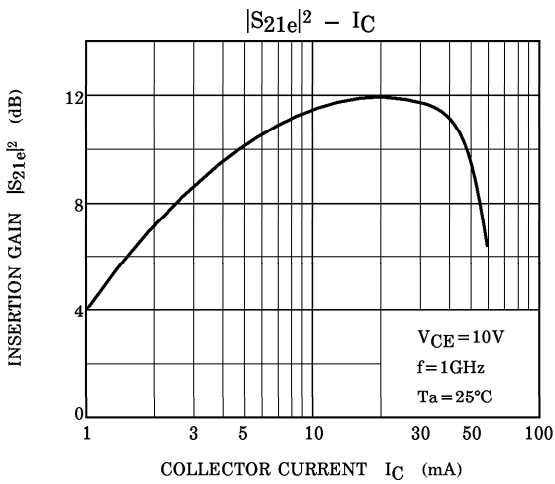
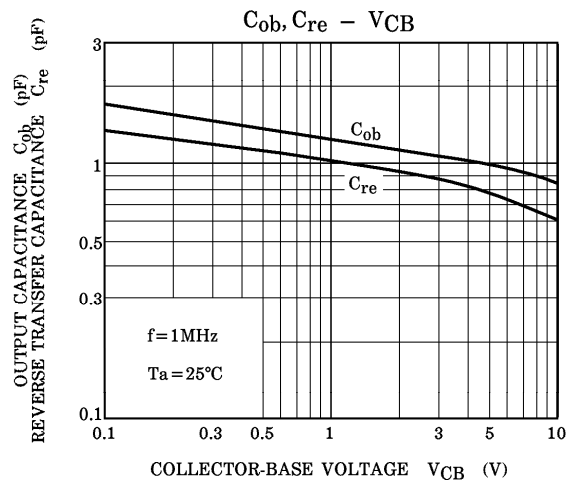
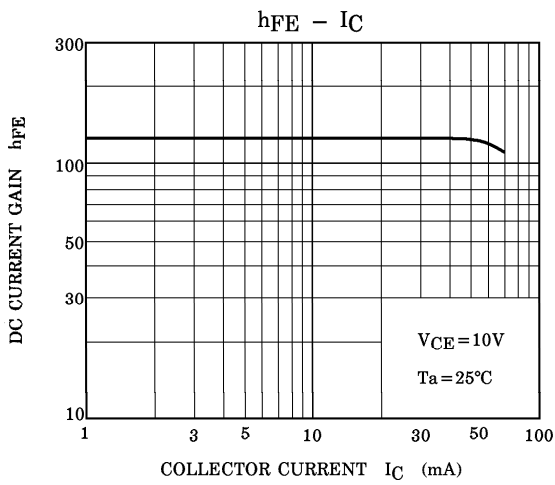
ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ C$ )

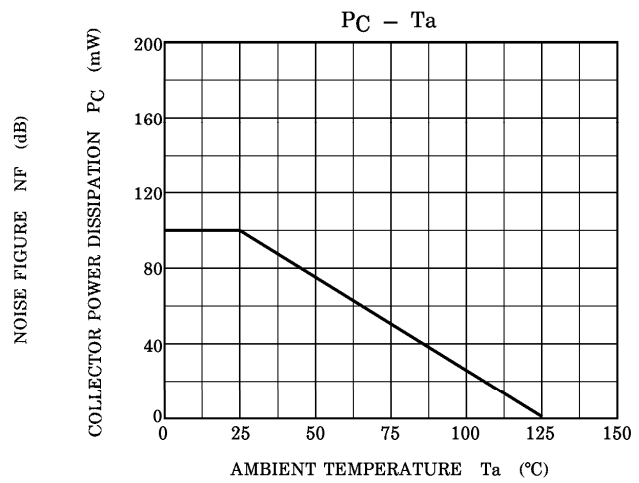
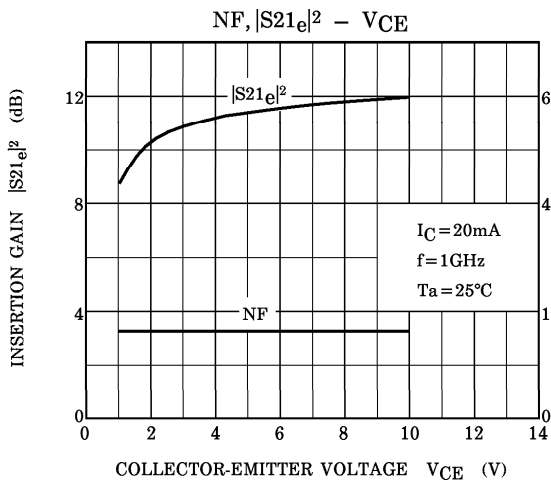
| CHARACTERISTIC               | SYMBOL    | TEST CONDITION                    | MIN.   | TYP. | MAX. | UNIT    |
|------------------------------|-----------|-----------------------------------|--------|------|------|---------|
| Collector Cut-off Current    | $I_{CBO}$ | $V_{CB} = 10V, I_E = 0$           | —      | —    | 1    | $\mu A$ |
| Emitter Cut-off Current      | $I_{EBO}$ | $V_{EB} = 1V, I_C = 0$            | —      | —    | 1    | $\mu A$ |
| DC Current Gain              | $h_{FE}$  | $V_{CE} = 10V, I_C = 20mA$        | 30     | —    | 250  | —       |
| Output Capacitance           | $C_{ob}$  | $V_{CB} = 10V, I_E = 0, f = 1MHz$ | —      | 0.85 | —    | pF      |
| Reverse Transfer Capacitance | $C_{re}$  |                                   | (Note) | —    | 0.6  | 1.15    |

(Note)  $C_{re}$  is measured by 3 terminal method with capacitance bridge.

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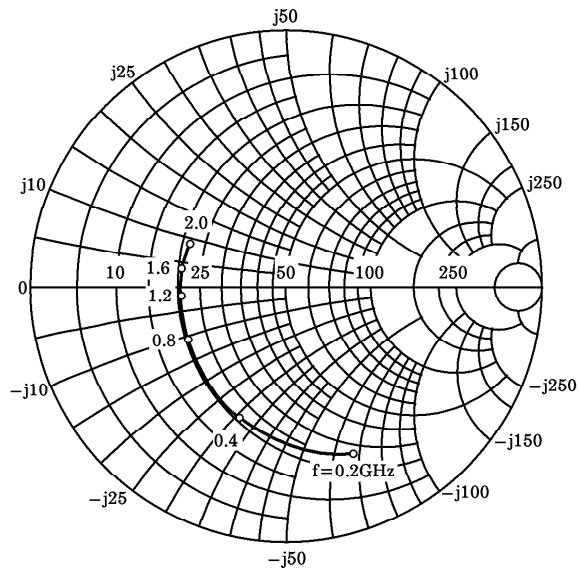
S-PARAMETER  $Z_0 = 50\Omega$ ,  $T_a = 25^\circ\text{C}$   
 $V_{CE} = 10\text{V}$ ,  $I_C = 5\text{mA}$

| FREQUENCY<br>MHz | S11   |        | S21   |         | S12   |      | S22   |       |
|------------------|-------|--------|-------|---------|-------|------|-------|-------|
|                  | MAG   | ANG    | MAG   | ANG     | MAG   | ANG  | MAG   | ANG   |
| 200              | 0.705 | -67.0  | 9.702 | 132.700 | 0.048 | 57.9 | 0.769 | -27.9 |
| 400              | 0.536 | -109.6 | 6.665 | 109.300 | 0.066 | 50.8 | 0.591 | -34.7 |
| 600              | 0.467 | -135.0 | 4.880 | 96.100  | 0.077 | 52.3 | 0.518 | -36.9 |
| 800              | 0.440 | -151.6 | 3.799 | 87.500  | 0.088 | 56.2 | 0.486 | -39.0 |
| 1000             | 0.426 | -164.9 | 3.136 | 80.600  | 0.100 | 60.3 | 0.475 | -41.5 |
| 1200             | 0.417 | -175.0 | 2.668 | 75.000  | 0.113 | 64.2 | 0.469 | -44.5 |
| 1400             | 0.412 | 176.5  | 2.349 | 69.800  | 0.129 | 67.6 | 0.469 | -47.8 |
| 1600             | 0.405 | 169.0  | 2.099 | 65.100  | 0.147 | 70.4 | 0.470 | -51.2 |
| 1800             | 0.399 | 162.8  | 1.916 | 61.100  | 0.168 | 72.2 | 0.474 | -54.1 |
| 2000             | 0.393 | 157.9  | 1.777 | 56.900  | 0.190 | 73.5 | 0.474 | -57.8 |

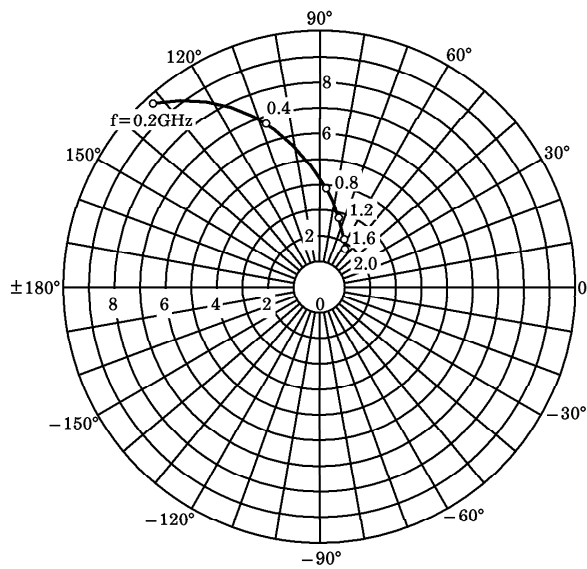
$V_{CE} = 10\text{V}$ ,  $I_C = 20\text{mA}$

| FREQUENCY<br>MHz | S11   |         | S21    |         | S12   |       | S22   |       |
|------------------|-------|---------|--------|---------|-------|-------|-------|-------|
|                  | MAG   | ANG     | MAG    | ANG     | MAG   | ANG   | MAG   | ANG   |
| 200              | 0.416 | -111.00 | 16.818 | 111.100 | 0.032 | 61.30 | 0.504 | -36.4 |
| 400              | 0.352 | -145.90 | 9.121  | 95.900  | 0.051 | 67.10 | 0.382 | -34.9 |
| 600              | 0.343 | -163.20 | 6.289  | 87.800  | 0.070 | 70.90 | 0.352 | -34.7 |
| 800              | 0.341 | -174.70 | 4.772  | 81.800  | 0.090 | 72.80 | 0.342 | -36.3 |
| 1000             | 0.341 | -175.50 | 3.903  | 76.400  | 0.111 | 73.70 | 0.341 | -39.2 |
| 1200             | 0.338 | 167.80  | 3.294  | 72.300  | 0.132 | 73.90 | 0.346 | -41.9 |
| 1400             | 0.333 | 160.90  | 2.898  | 67.800  | 0.154 | 73.90 | 0.349 | -45.8 |
| 1600             | 0.325 | 154.60  | 2.563  | 63.800  | 0.176 | 73.60 | 0.355 | -49.0 |
| 1800             | 0.314 | 150.30  | 2.322  | 60.300  | 0.200 | 72.90 | 0.361 | -51.9 |
| 2000             | 0.301 | 147.30  | 2.132  | 56.600  | 0.223 | 72.10 | 0.363 | -55.0 |

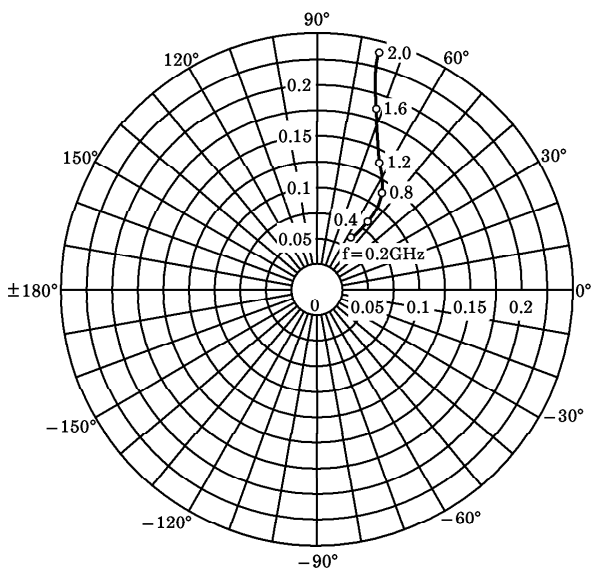
$S_{11e}$   
 $V_{CE} = 10V$   
 $I_C = 5mA$   
 $T_a = 25^\circ C$   
 (UNIT :  $\Omega$ )



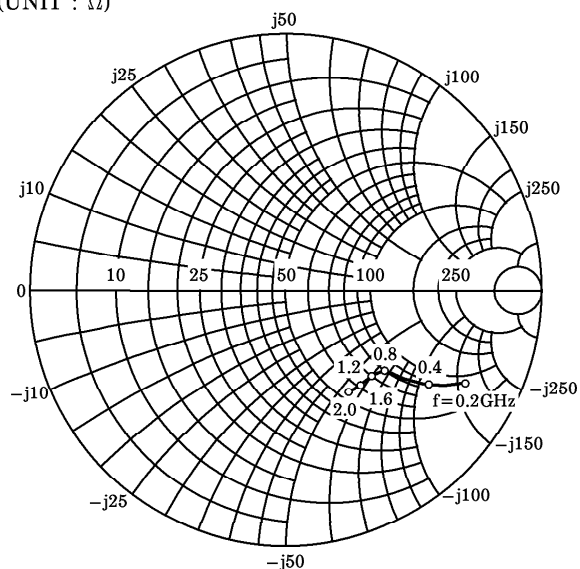
$S_{21e}$   
 $V_{CE} = 10V$   
 $I_C = 5mA$   
 $T_a = 25^\circ C$



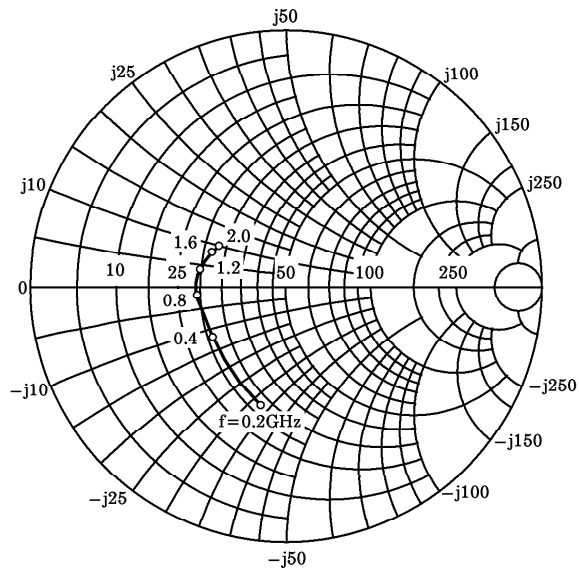
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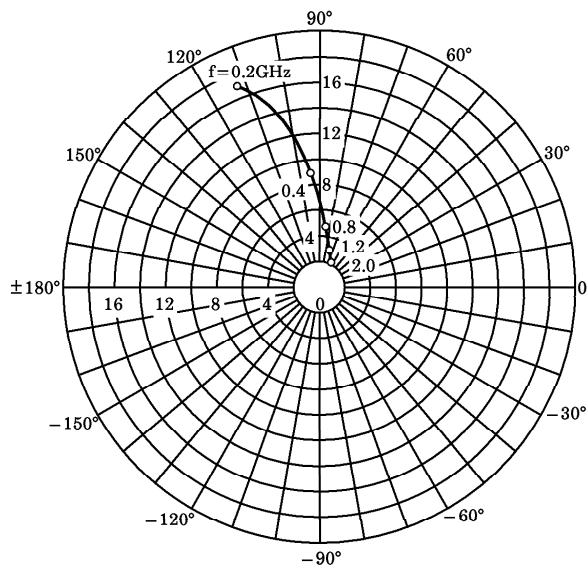
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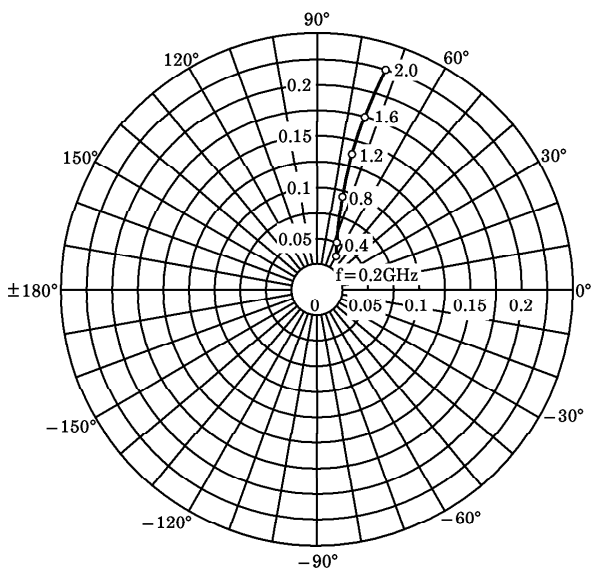
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 $V_{CE} = 10V$   
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$S_{21e}$   
 $V_{CE} = 10V$   
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 $T_a = 25^\circ C$



$S_{12e}$   
 $V_{CE} = 10V$   
 $I_C = 20mA$   
 $T_a = 25^\circ C$



$S_{22e}$   
 $V_{CE} = 10V$   
 $I_C = 20mA$   
 $T_a = 25^\circ C$   
 (UNIT :  $\Omega$ )

