

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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# SILICON TRANSISTOR

## 2SC4954

### HIGH FREQUENCY LOW NOISE AMPLIFIER

### NPN SILICON EPITAXIAL TRANSISTOR

### MINI MOLD

#### FEATURES

- Low Noise, High Gain
  - Low Voltage Operation
  - Low Feedback Capacitance
- $C_{re} = 0.3 \text{ pF TYP.}$

#### ORDERING INFORMATION

| PART NUMBER | QUANTITY     | PACKING STYLE   |
|-------------|--------------|---|
| 2SC4954-T1  | 3 Kpcs/Reel. | Embossed tape 8 mm wide.<br>Pin3 (Collector) face to perforation side of the tape.            |
| 2SC4954-T2  | 3 Kpcs/Reel. | Embossed tape 8 mm wide.<br>Pin1 (Emitter), Pin2 (Base) face to perforation side of the tape. |

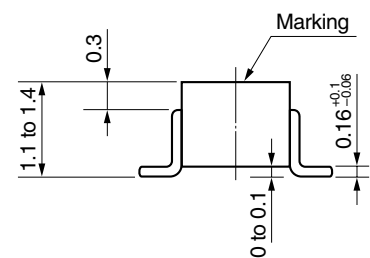
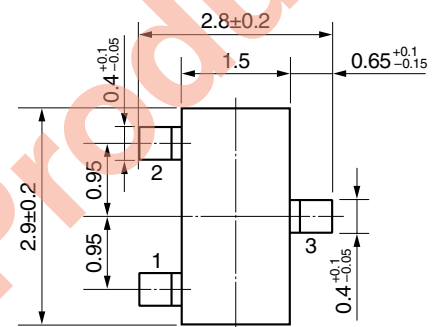
\* To order evaluation samples, contact your nearby sales office.  
Unit sample quantity shall be 50 pcs. (Part No.: 2SC4954)

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

|                              |           |             |                  |
|------------------------------|-----------|-------------|------------------|
| Collector to Base Voltage    | $V_{CBO}$ | 9           | V                |
| Collector to Emitter Voltage | $V_{CEO}$ | 6           | V                |
| Emitter to Base Voltage      | $V_{EBO}$ | 2           | V                |
| Collector Current            | $I_C$     | 10          | mA               |
| Total Power Dissipation      | $P_T$     | 60          | mW               |
| Junction Temperature         | $T_j$     | 150         | $^\circ\text{C}$ |
| Storage Temperature          | $T_{stg}$ | -65 to +150 | $^\circ\text{C}$ |

#### PACKAGE DIMENSIONS

in millimeters



#### PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

**Caution;** Electrostatic Sensitive Device.

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**ELECTRICAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$ )**

| CHARACTERISTIC           | SYMBOL        | MIN. | TYP. | MAX. | UNIT          | TEST CONDITION  |
|--------------------------|---------------|------|------|------|---------------|---|
| Collector Cutoff Current | $I_{CBO}$     |      |      | 0.1  | $\mu\text{A}$ | $V_{CB} = 5\text{ V}$ , $I_E = 0$                                     |
| Emitter Cutoff Current   | $I_{EBO}$     |      |      | 0.1  | $\mu\text{A}$ | $V_{EB} = 1\text{ V}$ , $I_C = 0$                                     |
| DC Current Gain          | $h_{FE}$      | 75   |      | 150  |               | $V_{CE} = 3\text{ V}$ , $I_C = 5\text{ mA}$ * <sup>1</sup>            |
| Gain Bandwidth Product   | $f_T$         |      | 12   |      | GHz           | $V_{CE} = 3\text{ V}$ , $I_C = 5\text{ mA}$ , $f = 2.0\text{ GHz}$    |
| Feed-back Capacitance    | $C_{re}$      |      | 0.3  | 0.5  | pF            | $V_{CB} = 3\text{ V}$ , $I_E = 0$ , $f = 1\text{ MHz}$ * <sup>2</sup> |
| Insertion Power Gain     | $ S_{21e} ^2$ | 7    | 8.5  |      | dB            | $V_{CE} = 3\text{ V}$ , $I_C = 5\text{ mA}$ , $f = 2.0\text{ GHz}$    |
| Noise Figure             | NF            |      | 2.5  | 4.0  | dB            | $V_{CE} = 3\text{ V}$ , $I_C = 3\text{ mA}$ , $f = 2.0\text{ GHz}$    |

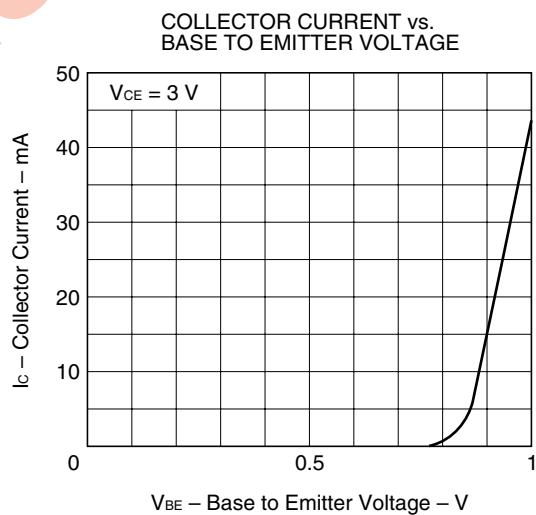
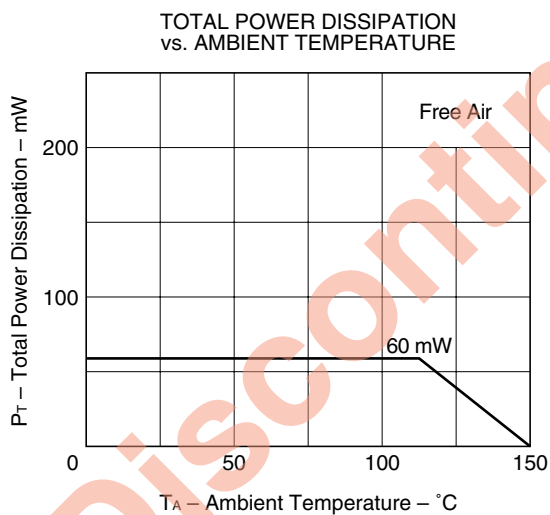
\*<sup>1</sup> Pulse Measurement;  $PW \leq 350\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$  Pulsed.

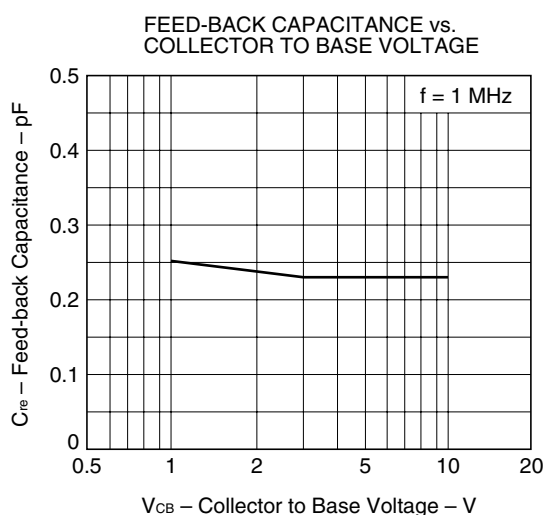
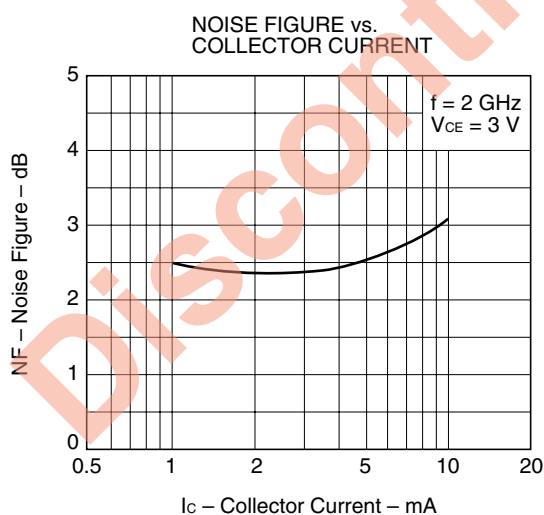
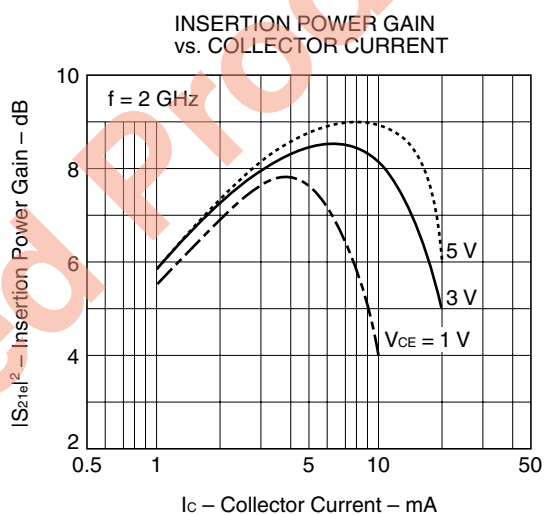
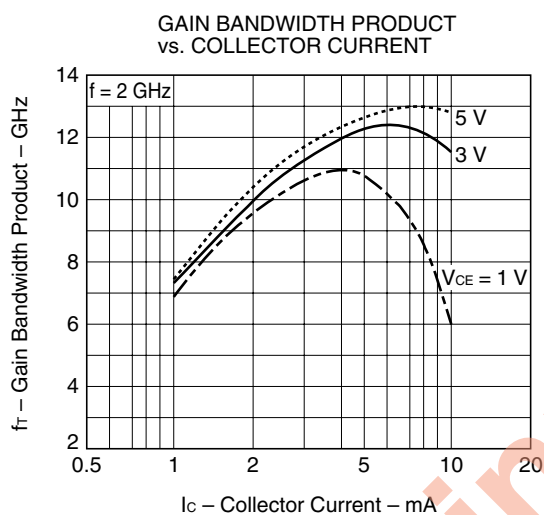
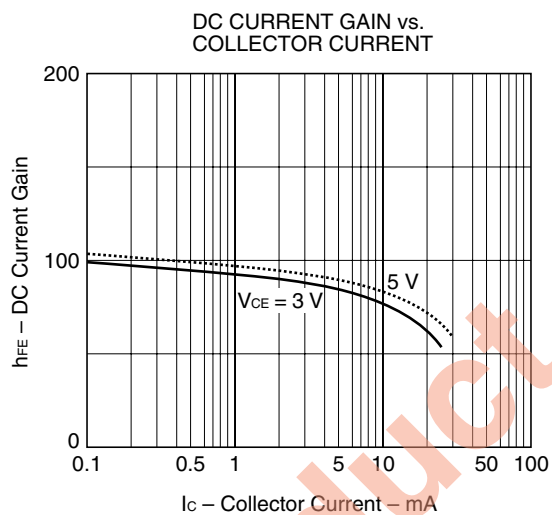
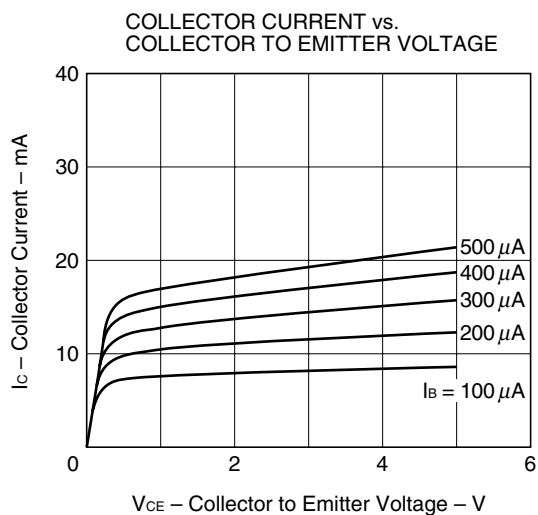
\*<sup>2</sup> Measured with 3 terminals bridge, Emitter and Case should be grounded.

★  **$h_{FE}$  Classification**

|          |           |
|----------|-----------|
| Rank     | T82/FB*   |
| Marking  | T82       |
| $h_{FE}$ | 75 to 150 |

\* Old Specification/New Specification

**TYPICAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$ )**



# S-PARAMETER

(V<sub>CE</sub> = 3 V, I<sub>C</sub> = 1 mA, Z<sub>O</sub> = 50 Ω)

| f<br>(GHz) | S <sub>11</sub> |       | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |       |
|------------|-----------------|-------|-----------------|-------|-----------------|------|-----------------|-------|
|            | MAG             | ANG   | MAG             | ANG   | MAG             | ANG  | MAG             | ANG   |
| 0.200      | 0.9550          | −9.0  | 3.2340          | 168.1 | 0.0340          | 77.3 | 0.9870          | −6.8  |
| 0.400      | 0.9140          | −17.3 | 3.0460          | 154.7 | 0.0650          | 76.7 | 0.9640          | −13.4 |
| 0.600      | 0.8630          | −25.8 | 2.9630          | 144.2 | 0.0930          | 71.6 | 0.9250          | −19.5 |
| 0.800      | 0.7880          | −33.1 | 2.7870          | 133.1 | 0.1180          | 66.7 | 0.8850          | −24.3 |
| 1.000      | 0.7320          | −39.1 | 2.6480          | 123.5 | 0.1360          | 63.7 | 0.8330          | −28.9 |
| 1.200      | 0.6720          | −45.2 | 2.5390          | 114.4 | 0.1570          | 57.2 | 0.7820          | −33.2 |
| 1.400      | 0.5910          | −50.5 | 2.3460          | 106.8 | 0.1780          | 56.3 | 0.7570          | −37.1 |
| 1.600      | 0.5430          | −55.0 | 2.2000          | 99.0  | 0.1870          | 51.7 | 0.7250          | −40.1 |
| 1.800      | 0.4830          | −57.4 | 2.0710          | 91.6  | 0.2030          | 51.3 | 0.6720          | −43.2 |
| 2.000      | 0.4240          | −60.7 | 1.9590          | 85.7  | 0.2090          | 50.4 | 0.6490          | −46.1 |
| 2.200      | 0.3710          | −66.9 | 1.8970          | 79.8  | 0.2240          | 50.9 | 0.6230          | −49.1 |
| 2.400      | 0.3390          | −68.0 | 1.8100          | 74.8  | 0.2440          | 47.8 | 0.5970          | −49.4 |
| 2.600      | 0.3030          | −71.3 | 1.6980          | 70.2  | 0.2530          | 47.7 | 0.5740          | −54.1 |
| 2.800      | 0.2460          | −72.2 | 1.6530          | 64.7  | 0.2550          | 44.5 | 0.5610          | −56.8 |
| 3.000      | 0.1990          | −68.9 | 1.5750          | 59.9  | 0.2830          | 43.0 | 0.5130          | −61.6 |

(V<sub>CE</sub> = 3 V, I<sub>C</sub> = 3 mA, Z<sub>O</sub> = 50 Ω)

| f<br>(GHz) | S <sub>11</sub> |       | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |       |
|------------|-----------------|-------|-----------------|-------|-----------------|------|-----------------|-------|
|            | MAG             | ANG   | MAG             | ANG   | MAG             | ANG  | MAG             | ANG   |
| 0.200      | 0.8730          | −15.0 | 7.3980          | 159.5 | 0.0340          | 74.6 | 0.9590          | −11.1 |
| 0.400      | 0.7600          | −26.2 | 6.3600          | 140.6 | 0.0580          | 71.3 | 0.8830          | −18.9 |
| 0.600      | 0.6530          | −35.6 | 5.5680          | 127.0 | 0.0840          | 69.6 | 0.7970          | −25.7 |
| 0.800      | 0.6530          | −35.6 | 5.5680          | 127.0 | 0.0840          | 69.6 | 0.7970          | −25.7 |
| 1.000      | 0.4750          | −45.3 | 4.1940          | 105.8 | 0.1160          | 64.0 | 0.6690          | −32.7 |
| 1.200      | 0.4110          | −48.3 | 3.7680          | 98.0  | 0.1330          | 64.0 | 0.6690          | −32.7 |
| 1.400      | 0.3470          | −49.3 | 3.3170          | 91.8  | 0.1510          | 61.9 | 0.6060          | −36.3 |
| 1.600      | 0.3190          | −50.4 | 3.0080          | 85.7  | 0.1600          | 62.5 | 0.5720          | −37.6 |
| 1.800      | 0.2830          | −46.5 | 2.7180          | 79.4  | 0.1820          | 58.0 | 0.5510          | −39.9 |
| 2.000      | 0.2510          | −45.6 | 2.5040          | 74.9  | 0.1980          | 57.5 | 0.5290          | −41.8 |
| 2.200      | 0.2020          | −48.2 | 2.3810          | 70.4  | 0.2150          | 56.6 | 0.5170          | −44.1 |
| 2.400      | 0.1940          | −47.4 | 2.2280          | 66.0  | 0.2290          | 53.2 | 0.5070          | −45.2 |
| 2.600      | 0.1850          | −47.8 | 2.0580          | 62.7  | 0.2310          | 56.3 | 0.4920          | −49.6 |
| 2.800      | 0.1710          | −39.0 | 1.9740          | 57.8  | 0.2620          | 54.7 | 0.4670          | −51.7 |
| 3.000      | 0.1430          | −31.7 | 1.8480          | 54.4  | 0.2940          | 53.6 | 0.4160          | −54.9 |

S-PARAMETER

( $V_{CE} = 3\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $Z_0 = 50\ \Omega$ )

| f<br>(GHz) | S <sub>11</sub> |       | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |       |
|------------|-----------------|-------|-----------------|-------|-----------------|------|-----------------|-------|
|            | MAG             | ANG   | MAG             | ANG   | MAG             | ANG  | MAG             | ANG   |
| 0.200      | .775            | -19.9 | 10.233          | 153.0 | .029            | 78.0 | .931            | -14.1 |
| 0.400      | .653            | -32.4 | 8.408           | 133.2 | .056            | 66.1 | .815            | -23.3 |
| 0.600      | .527            | -39.8 | 6.761           | 119.0 | .073            | 70.0 | .717            | -27.3 |
| 0.800      | .447            | -45.7 | 5.598           | 108.5 | .088            | 67.6 | .639            | -30.3 |
| 1.000      | .359            | -49.6 | 4.670           | 100.0 | .111            | 66.9 | .595            | -31.2 |
| 1.200      | .314            | -50.3 | 4.118           | 92.7  | .123            | 67.5 | .565            | -32.4 |
| 1.400      | .279            | -48.1 | 3.630           | 87.1  | .140            | 66.8 | .545            | -34.4 |
| 1.600      | .246            | -46.9 | 3.246           | 82.1  | .154            | 64.1 | .519            | -35.9 |
| 1.800      | .219            | -46.8 | 2.885           | 78.1  | .178            | 62.0 | .521            | -37.0 |
| 2.000      | .178            | -43.6 | 2.747           | 73.7  | .194            | 62.9 | .500            | -38.9 |
| 2.200      | .165            | -44.7 | 2.581           | 68.8  | .201            | 62.0 | .478            | -43.1 |
| 2.400      | .149            | -37.6 | 2.382           | 64.8  | .224            | 60.1 | .455            | -43.1 |
| 2.600      | .137            | -50.0 | 2.244           | 61.4  | .241            | 60.9 | .471            | -43.9 |
| 2.800      | .132            | -47.6 | 2.138           | 59.0  | .253            | 57.7 | .449            | -47.9 |
| 3.000      | .103            | -33.7 | 2.044           | 55.3  | .265            | 55.3 | .438            | -47.0 |

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