

HIGH FREQUENCY LOW NOISE AMPLIFIER  
NPN SILICON EPITAXIAL TRANSISTOR  
SUPER MINI MOLD

FEATURES

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

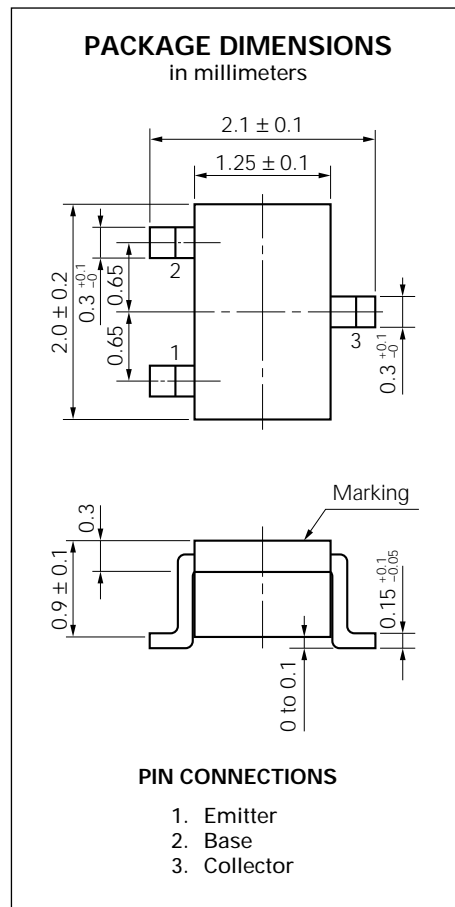
ORDERING INFORMATION

| PART NUMBER | QUANTITY     | PACKING STYLE   |
|-------------|--------------|---|
| 2SC4958-T1  | 3 Kpcs/Reel. | Embossed tape 8 mm wide.<br>Pin3 (Collector) face to perforation side of the tape.            |
| 2SC4958-T2  | 3 Kpcs/Reel. | Embossed tape 8 mm wide.<br>Pin1 (Emitter), Pin2 (Base) face to perforation side of the tape. |

\* Please contact with responsible NEC person, if you require evaluation sample.  
Unit sample quantity shall be 50 pcs. (Part No.: 2SC4958)

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

|                              |           |             |                  |
|------------------------------|-----------|-------------|------------------|
| 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 | $^\circ\text{C}$ |



Caution; Electrostatic sensitive Device.

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

| CHARACTERISTIC           | SYMBOL                          | MIN. | TYP. | MAX. | UNIT | TEST CONDITION   |
|--------------------------|---------------------------------|------|------|------|------|--|
| Collector Cutoff Current | I <sub>CBO</sub>                |      |      | 0.1  | μA   | V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0                          |
| Emitter Cutoff Current   | I <sub>EB0</sub>                |      |      | 0.1  | μA   | V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0                          |
| DC Current Gain          | h <sub>FE</sub>                 | 75   |      | 150  |      | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA <sup>*1</sup>         |
| Gain Bandwidth Product   | f <sub>T</sub>                  |      | 12   |      | GHz  | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA, f = 2.0 GHz          |
| Feed back Capacitance    | C <sub>re</sub>                 |      | 0.3  | 0.5  | pF   | V <sub>CB</sub> = 3 V, I <sub>E</sub> = 0, f = 1 MHz <sup>*2</sup> |
| Insertion Power Gain     | S <sub>21e</sub>   <sup>2</sup> | 7    | 8.5  |      | dB   | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 5 mA, f = 2.0 GHz          |
| Noise Figure             | NF                              |      | 2.5  | 4.0  | dB   | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 3 mA, f = 2.0 GHz          |

\*1 Pulse Measurement ; PW ≤ 350 μs, Duty Cycle ≤ 2 % Pulsed.

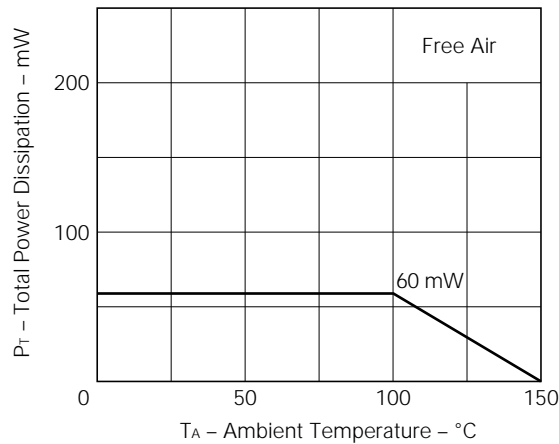
\*2 Measured with 3 terminals bridge, Emitter and Case should be grounded.

**h<sub>FE</sub> Classification**

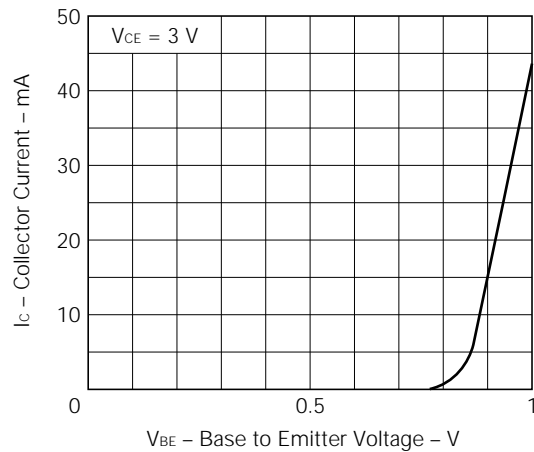
|                 |           |
|-----------------|-----------|
| Rank            | T82       |
| Marking         | T82       |
| h <sub>FE</sub> | 75 to 150 |

**TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)**

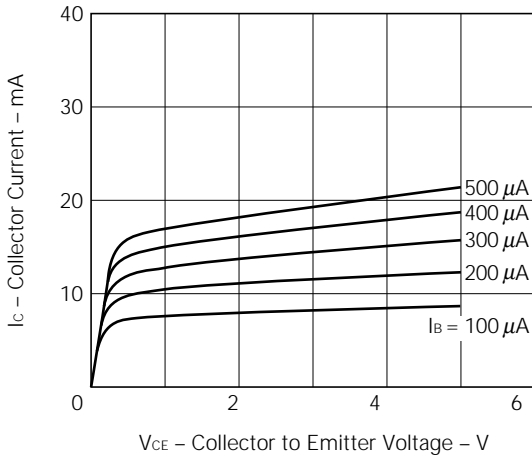
TOTAL POWER DISSIPATION vs.AMBIENT TEMPERATURE



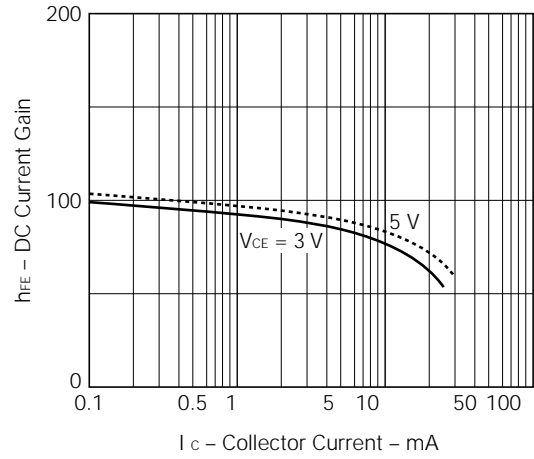
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



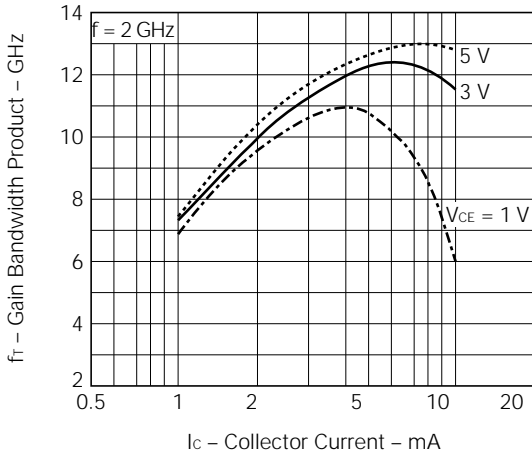
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



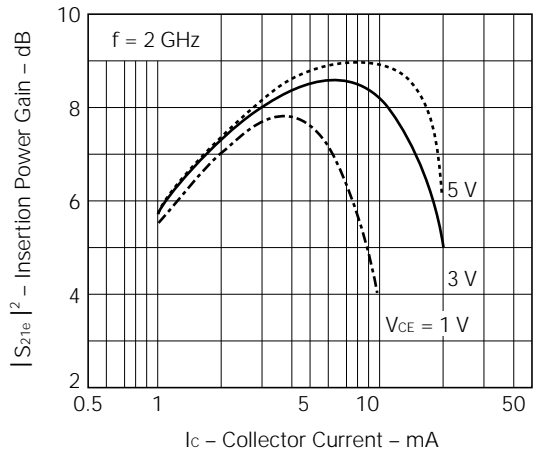
DC CURRENT GAIN vs. COLLECTOR CURRENT



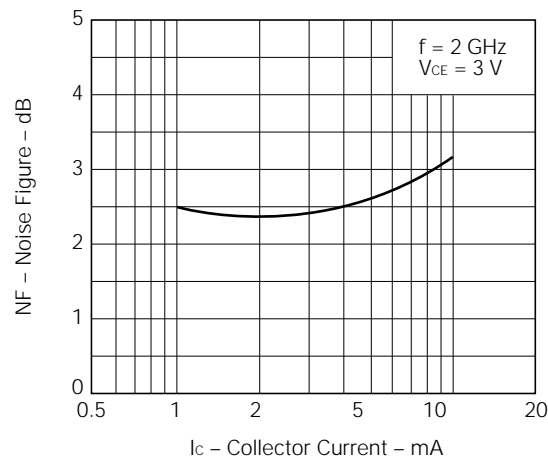
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



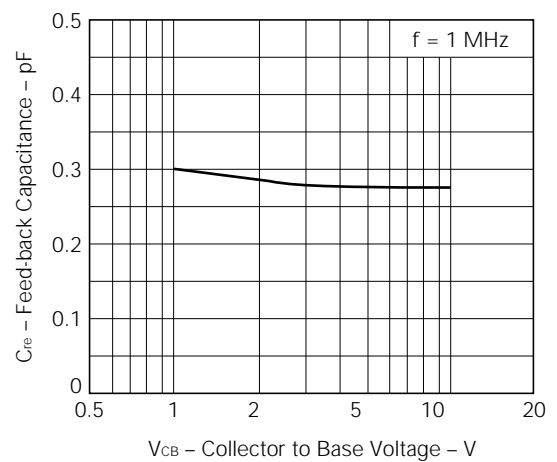
INSERTION POWER GAIN vs. COLLECTOR CURRENT



NOISE FIGURE vs. COLLECTOR CURRENT



FEED-BACK CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



**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      | 0.9410          | -9.3  | 3.3070          | 167.3 | 0.0330          | 82.8 | 0.9900          | -6.8  |
| 0.400      | 0.9280          | -17.7 | 3.1860          | 156.0 | 0.0650          | 78.5 | 0.9540          | -13.7 |
| 0.600      | 0.8670          | -26.0 | 3.0130          | 144.9 | 0.0930          | 71.1 | 0.9250          | -19.5 |
| 0.800      | 0.8150          | -33.6 | 2.8740          | 134.6 | 0.1160          | 67.0 | 0.8730          | -24.9 |
| 1.000      | 0.7280          | -41.5 | 2.6360          | 124.4 | 0.1330          | 59.7 | 0.8250          | -29.5 |
| 1.200      | 0.6700          | -47.3 | 2.5360          | 115.5 | 0.1480          | 59.1 | 0.7920          | -33.6 |
| 1.400      | 0.5970          | -51.7 | 2.3840          | 107.7 | 0.1710          | 53.6 | 0.7640          | -36.6 |
| 1.600      | 0.5430          | -56.3 | 2.2170          | 100.7 | 0.1820          | 52.0 | 0.7180          | -39.9 |
| 1.800      | 0.5040          | -60.7 | 2.0650          | 95.0  | 0.1990          | 49.8 | 0.6810          | -42.4 |
| 2.000      | 0.4350          | -64.4 | 2.0420          | 88.3  | 0.2040          | 51.6 | 0.6600          | -46.9 |
| 2.200      | 0.3920          | -69.4 | 1.9690          | 82.0  | 0.2270          | 48.3 | 0.6210          | -50.1 |
| 2.400      | 0.3560          | -71.5 | 1.8470          | 76.6  | 0.2320          | 50.1 | 0.6040          | -51.8 |
| 2.600      | 0.3240          | -81.1 | 1.7690          | 71.1  | 0.2420          | 46.4 | 0.5840          | -53.6 |
| 2.800      | 0.3120          | -76.7 | 1.7240          | 68.1  | 0.2520          | 45.1 | 0.5660          | -57.6 |
| 3.000      | 0.2450          | -85.1 | 1.6690          | 63.2  | 0.2670          | 45.3 | 0.5410          | -58.3 |

(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      | 0.8480          | -15.9 | 7.7420          | 158.5 | 0.0320          | 79.4 | 0.9640          | -11.3 |
| 0.400      | 0.7640          | -27.6 | 6.8190          | 141.1 | 0.0560          | 68.2 | 0.8730          | -20.5 |
| 0.600      | 0.6470          | -37.3 | 5.8070          | 127.1 | 0.0770          | 66.9 | 0.7950          | -26.1 |
| 0.800      | 0.5600          | -44.1 | 5.0060          | 116.0 | 0.1000          | 64.5 | 0.7140          | -30.2 |
| 1.000      | 0.4650          | -49.4 | 4.2790          | 106.6 | 0.1110          | 64.1 | 0.6540          | -33.0 |
| 1.200      | 0.4050          | -51.9 | 3.8350          | 98.8  | 0.1250          | 62.2 | 0.6250          | -34.4 |
| 1.400      | 0.3470          | -53.4 | 3.4290          | 92.4  | 0.1340          | 62.6 | 0.5850          | -36.3 |
| 1.600      | 0.3040          | -55.0 | 3.0820          | 86.6  | 0.1570          | 60.9 | 0.5530          | -38.2 |
| 1.800      | 0.2790          | -55.7 | 2.7740          | 82.3  | 0.1840          | 60.8 | 0.5450          | -39.3 |
| 2.000      | 0.2260          | -53.6 | 2.6370          | 77.1  | 0.1910          | 57.5 | 0.5140          | -42.2 |
| 2.200      | 0.2090          | -57.9 | 2.4900          | 72.2  | 0.2090          | 59.4 | 0.5020          | -45.3 |
| 2.400      | 0.1820          | -53.8 | 2.2890          | 67.9  | 0.2260          | 58.1 | 0.4850          | -46.1 |
| 2.600      | 0.1600          | -67.3 | 2.1710          | 63.7  | 0.2280          | 53.4 | 0.4680          | -47.9 |
| 2.800      | 0.1650          | -58.5 | 2.0820          | 61.3  | 0.2580          | 57.0 | 0.4650          | -51.6 |
| 3.000      | 0.1210          | -51.3 | 2.0030          | 57.3  | 0.2670          | 52.6 | 0.4490          | -51.4 |

**S-PARAMETER**

(V<sub>CE</sub> = 3 V, I<sub>c</sub> = 5 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      | 0.7750          | -19.9 | 10.2330         | 153.0 | 0.0290          | 78.0 | 0.9310          | -14.1 |
| 0.400      | 0.6530          | -32.4 | 8.4080          | 133.2 | 0.0560          | 66.1 | 0.8150          | -23.3 |
| 0.600      | 0.5270          | -39.8 | 6.7610          | 119.0 | 0.0730          | 70.0 | 0.7170          | -27.3 |
| 0.800      | 0.4470          | -45.7 | 5.5980          | 108.5 | 0.0880          | 67.6 | 0.6390          | -30.3 |
| 1.000      | 0.3590          | -49.6 | 4.6700          | 100.0 | 0.1110          | 66.9 | 0.5950          | -31.2 |
| 1.200      | 0.3140          | -50.3 | 4.1180          | 92.7  | 0.1230          | 67.5 | 0.5650          | -32.4 |
| 1.400      | 0.2790          | -48.1 | 3.6300          | 87.1  | 0.1400          | 66.8 | 0.5450          | -34.4 |
| 1.600      | 0.2460          | -46.9 | 3.2460          | 82.1  | 0.1540          | 64.1 | 0.5190          | -35.9 |
| 1.800      | 0.2190          | -46.8 | 2.8850          | 78.1  | 0.1780          | 62.0 | 0.5210          | -37.0 |
| 2.000      | 0.1780          | -43.6 | 2.7470          | 73.7  | 0.1940          | 62.9 | 0.5000          | -38.9 |
| 2.200      | 0.1650          | -44.7 | 2.5810          | 68.8  | 0.2010          | 62.0 | 0.4780          | -43.1 |
| 2.400      | 0.1490          | -37.6 | 2.3820          | 64.8  | 0.2240          | 60.1 | 0.4550          | -43.1 |
| 2.600      | 0.1370          | -50.0 | 2.2440          | 61.4  | 0.2410          | 60.9 | 0.4710          | -43.9 |
| 2.800      | 0.1320          | -47.6 | 2.1380          | 59.0  | 0.2530          | 57.7 | 0.4490          | -47.9 |
| 3.000      | 0.1030          | -33.7 | 2.0440          | 55.3  | 0.2650          | 55.3 | 0.4380          | -47.0 |

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