

NPN SILICON EPITAXIAL TRANSISTOR  
UHF TV TUNER OSC/MIXER

DESCRIPTION

The 2SC4568 is an NPN silicon epitaxial transistor intended for use as UHF oscillator and UHF mixer in a tuner of TV receiver.

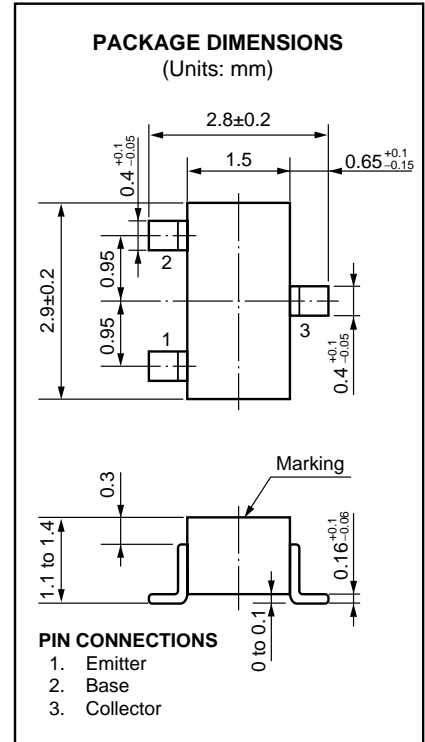
FEATURES

- High gain bandwidth product  
 $f_T = 5.5 \text{ GHz TYP.}$
- Low output capacitance  
 $C_{ob} = 0.7 \text{ pF TYP.}$
- Surface mount package  
 EIAJ: SC-59

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

Maximum Voltages and Current

|                              |           |             |                  |
|------------------------------|-----------|-------------|------------------|
| Collector to Base Voltage    | $V_{CBO}$ | 20          | V                |
| Collector to Emitter Voltage | $V_{CEO}$ | 12          | V                |
| Emitter to Base Voltage      | $V_{EBO}$ | 3.0         | V                |
| Collector Current            | $I_C$     | 30          | mA               |
| Total Power Dissipation      | $P_T$     | 150         | mW               |
| Junction Temperature         | $T_j$     | 125         | $^\circ\text{C}$ |
| Storage Temperature          | $T_{stg}$ | -55 to +125 | $^\circ\text{C}$ |



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

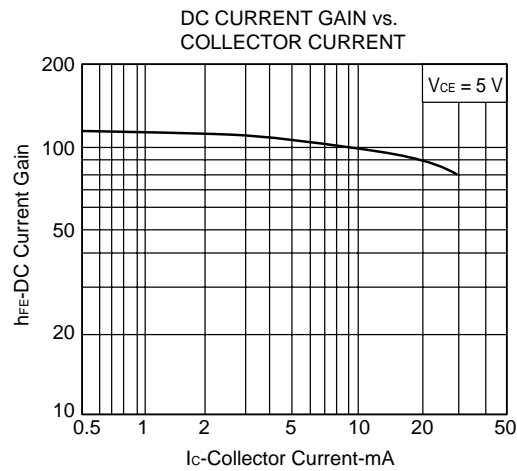
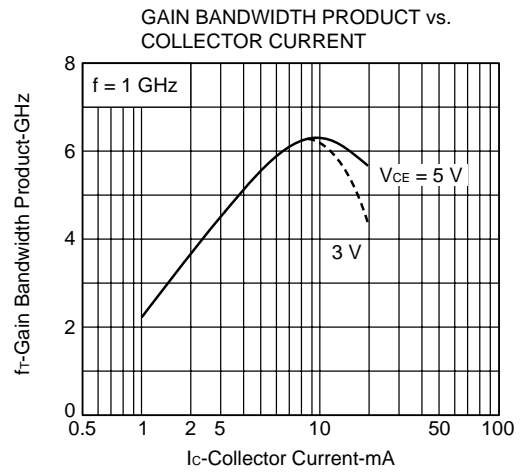
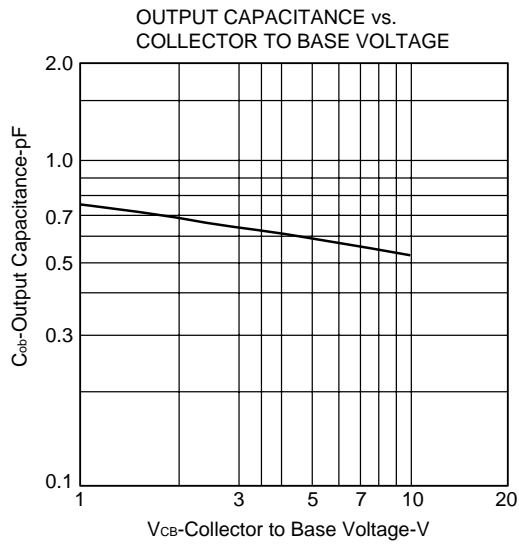
| CHARACTERISTIC               | SYMBOL        | MIN. | TYP. | MAX. | UNIT          | TEST CONDITIONS   |
|------------------------------|---------------|------|------|------|---------------|---|
| Collector Cutoff Current     | $I_{CBO}$     |      |      | 0.1  | $\mu\text{A}$ | $V_{CB} = 15 \text{ V, } I_E = 0$                                 |
| Emitter Cutoff Current       | $I_{EBO}$     |      |      | 0.1  | $\mu\text{A}$ | $V_{EB} = 1 \text{ V, } I_C = 0$                                  |
| Collector Saturation Voltage | $V_{CE(sat)}$ |      |      | 0.5  | V             | $h_{FE} = 10, I_C = 5 \text{ mA}$                                 |
| DC Current Gain              | $h_{FE}$      | 40   | 100  | 200  |               | $V_{CE} = 5 \text{ V, } I_C = 5 \text{ mA} *1$                    |
| Gain Bandwidth Product       | $f_T$         |      | 5.5  |      | GHz           | $V_{CE} = 5 \text{ V, } I_C = 5 \text{ mA, } f = 1.0 \text{ GHz}$ |
| Output Capacitance           | $C_{ob}$      |      | 0.7  | 0.9  | pF            | $V_{CB} = 5 \text{ V, } I_E = 0, f = 1.0 \text{ MHz}$             |
| Insertion Gain               | $ S_{21e} ^2$ | 5.0  |      |      | dB            | $V_{CE} = 5 \text{ V, } I_C = 5 \text{ mA, } f = 1.0 \text{ MHz}$ |

\*1 Pulsed:  $PW = 35 \mu\text{S}$ , Duty Cycle  $\leq 2 \%$

$h_{FE}$  Classification

|          |          |           |            |
|----------|----------|-----------|------------|
| Class    | T72      | T73       | T74        |
| Marking  | T72      | T73       | T74        |
| $h_{FE}$ | 40 to 80 | 60 to 120 | 100 to 200 |

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



**S-PARAMETER**

V<sub>CE</sub> = 5 V, I<sub>c</sub> = 1 mA

| FREQUENCY<br>MHz | S <sub>11</sub> |       | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |       |
|------------------|-----------------|-------|-----------------|-------|-----------------|------|-----------------|-------|
|                  | MAG             | ANG   | MAG             | ANG   | MAG             | ANG  | MAG             | ANG   |
| 100.00           | 0.957           | -12.8 | 3.310           | 168.1 | 0.029           | 81.2 | 0.988           | -5.9  |
| 200.00           | 0.930           | -24.4 | 3.179           | 157.0 | 0.056           | 74.9 | 0.958           | -12.1 |
| 300.00           | 0.878           | -35.6 | 3.059           | 145.0 | 0.080           | 67.6 | 0.933           | -18.2 |
| 400.00           | 0.832           | -46.7 | 2.887           | 136.0 | 0.100           | 61.6 | 0.900           | -22.2 |
| 500.00           | 0.777           | -56.0 | 2.712           | 127.0 | 0.117           | 56.7 | 0.858           | -26.4 |
| 600.00           | 0.714           | -64.8 | 2.533           | 118.1 | 0.130           | 51.7 | 0.823           | -30.8 |
| 700.00           | 0.656           | -73.6 | 2.397           | 111.0 | 0.140           | 49.2 | 0.791           | -33.4 |
| 800.00           | 0.611           | -81.2 | 2.231           | 104.1 | 0.150           | 46.1 | 0.764           | -36.1 |
| 900.00           | 0.570           | -89.3 | 2.109           | 97.9  | 0.156           | 43.6 | 0.751           | -38.5 |
| 1000.00          | 0.537           | -96.4 | 1.962           | 91.9  | 0.163           | 42.3 | 0.722           | -40.5 |

V<sub>CE</sub> = 5 V, I<sub>c</sub> = 3 mA

| FREQUENCY<br>MHz | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |       |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|-------|
|                  | MAG             | ANG    | MAG             | ANG   | MAG             | ANG  | MAG             | ANG   |
| 100.00           | 0.870           | -21.3  | 9.155           | 160.5 | 0.028           | 77.3 | 0.957           | -11.3 |
| 200.00           | 0.783           | -39.1  | 8.201           | 143.7 | 0.050           | 68.7 | 0.875           | -20.9 |
| 300.00           | 0.671           | -54.8  | 7.205           | 129.5 | 0.067           | 62.2 | 0.795           | -28.0 |
| 400.00           | 0.563           | -67.6  | 6.242           | 119.2 | 0.079           | 58.6 | 0.722           | -31.7 |
| 500.00           | 0.506           | -77.9  | 5.428           | 110.5 | 0.090           | 55.8 | 0.660           | -34.9 |
| 600.00           | 0.433           | -86.6  | 4.760           | 102.8 | 0.098           | 54.0 | 0.617           | -37.7 |
| 700.00           | 0.390           | -94.9  | 4.261           | 96.9  | 0.107           | 54.2 | 0.584           | -38.8 |
| 800.00           | 0.349           | -103.4 | 3.829           | 91.5  | 0.116           | 53.8 | 0.558           | -40.2 |
| 900.00           | 0.316           | -111.1 | 3.505           | 86.5  | 0.123           | 53.7 | 0.546           | -41.7 |
| 1000.00          | 0.294           | -116.3 | 3.207           | 82.2  | 0.131           | 53.4 | 0.525           | -42.7 |

V<sub>CE</sub> = 5 V, I<sub>c</sub> = 5 mA

| FREQUENCY<br>MHz | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |       |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|-------|
|                  | MAG             | ANG    | MAG             | ANG   | MAG             | ANG  | MAG             | ANG   |
| 100.00           | 0.787           | -27.6  | 13.507          | 154.8 | 0.026           | 75.7 | 0.928           | -15.2 |
| 200.00           | 0.661           | -49.1  | 11.261          | 135.2 | 0.045           | 66.7 | 0.798           | -25.7 |
| 300.00           | 0.529           | -66.0  | 9.283           | 120.5 | 0.059           | 61.6 | 0.695           | -32.1 |
| 400.00           | 0.441           | -79.3  | 7.647           | 110.8 | 0.070           | 59.5 | 0.618           | -34.3 |
| 500.00           | 0.374           | -88.9  | 6.458           | 103.1 | 0.079           | 59.4 | 0.563           | -36.5 |
| 600.00           | 0.313           | -98.4  | 5.530           | 96.5  | 0.088           | 59.1 | 0.525           | -38.0 |
| 700.00           | 0.284           | -105.7 | 4.900           | 91.2  | 0.098           | 60.0 | 0.500           | -38.6 |
| 800.00           | 0.252           | -114.2 | 4.351           | 86.7  | 0.107           | 59.9 | 0.481           | -39.6 |
| 900.00           | 0.232           | -122.5 | 3.956           | 82.3  | 0.118           | 59.7 | 0.473           | -40.7 |
| 1000.00          | 0.211           | -126.6 | 3.596           | 78.5  | 0.127           | 59.7 | 0.457           | -41.4 |

V<sub>CE</sub> = 5 V, I<sub>c</sub> = 7 mA

| FREQUENCY<br>MHz | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |       |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|-------|
|                  | MAG             | ANG    | MAG             | ANG   | MAG             | ANG  | MAG             | ANG   |
| 100.00           | 0.723           | -33.0  | 16.785          | 150.2 | 0.024           | 70.3 | 0.897           | -18.0 |
| 200.00           | 0.569           | -56.4  | 13.165          | 129.2 | 0.041           | 65.3 | 0.739           | -28.5 |
| 300.00           | 0.437           | -73.6  | 10.387          | 115.0 | 0.055           | 63.3 | 0.623           | -33.6 |
| 400.00           | 0.361           | -86.7  | 8.359           | 106.1 | 0.064           | 62.3 | 0.559           | -34.8 |
| 500.00           | 0.302           | -96.7  | 6.939           | 99.0  | 0.073           | 62.4 | 0.510           | -36.1 |
| 600.00           | 0.252           | -106.5 | 5.917           | 92.9  | 0.083           | 61.9 | 0.481           | -37.1 |
| 700.00           | 0.232           | -114.4 | 5.178           | 88.3  | 0.095           | 62.9 | 0.460           | -37.6 |
| 800.00           | 0.204           | -122.2 | 4.589           | 84.1  | 0.103           | 62.8 | 0.445           | -38.2 |
| 900.00           | 0.189           | -131.3 | 4.150           | 80.2  | 0.115           | 63.2 | 0.439           | -39.5 |
| 1000.00          | 0.175           | -136.0 | 3.774           | 76.6  | 0.126           | 62.7 | 0.427           | -40.3 |

V<sub>CE</sub> = 5 V, I<sub>c</sub> = 9 mA

| FREQUENCY<br>MHz | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |       |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|-------|
|                  | MAG             | ANG    | MAG             | ANG   | MAG             | ANG  | MAG             | ANG   |
| 100.00           | 0.662           | -37.3  | 19.267          | 146.4 | 0.024           | 75.4 | 0.870           | -20.1 |
| 200.00           | 0.497           | -62.6  | 14.383          | 124.9 | 0.038           | 66.2 | 0.693           | -30.0 |
| 300.00           | 0.374           | -80.6  | 11.350          | 111.3 | 0.050           | 63.6 | 0.587           | -33.9 |
| 400.00           | 0.307           | -93.7  | 8.733           | 102.8 | 0.061           | 64.5 | 0.522           | -34.3 |
| 500.00           | 0.254           | -103.1 | 7.194           | 96.4  | 0.075           | 64.5 | 0.479           | -34.9 |
| 600.00           | 0.213           | -114.0 | 6.093           | 90.7  | 0.081           | 64.9 | 0.455           | -36.0 |
| 700.00           | 0.197           | -121.0 | 5.331           | 86.4  | 0.092           | 65.2 | 0.438           | -36.1 |
| 800.00           | 0.178           | -129.0 | 4.702           | 82.5  | 0.103           | 65.0 | 0.426           | -36.9 |
| 900.00           | 0.170           | -138.2 | 4.243           | 78.7  | 0.113           | 64.9 | 0.421           | -38.0 |
| 1000.00          | 0.156           | -144.1 | 3.866           | 75.4  | 0.125           | 64.6 | 0.410           | -39.1 |

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