

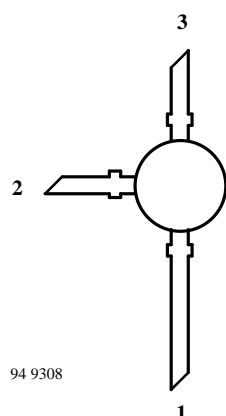
Silicon NPN Planar RF Transistor

Applications

RF-amplifier up to GHz range specially for wide band antenna amplifier.

Features

- High power gain
- Low noise figure
- High transition frequency



BFR90A Marking: BFR90A

Plastic case (TO 50)

1= Collector; 2= Emitter; 3= Base

Absolute Maximum Ratings

| Parameters | Symbol | Value | Unit |
|---|-----------|-------------|------------------|
| Collector-base voltage | V_{CBO} | 20 | V |
| Collector-emitter voltage | V_{CEO} | 15 | V |
| Emitter-base voltage | V_{EBO} | 2 | V |
| Collector current | I_C | 30 | mA |
| Total power dissipation $T_{amb} \leq 60^\circ\text{C}$ | P_{tot} | 300 | mW |
| Junction temperature | T_j | 150 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -65 to +150 | $^\circ\text{C}$ |

Maximum Thermal Resistance

| Parameters | Symbol | Value | Unit |
|--|------------|-------|------|
| Junction ambient on glass fibre printed board (40 x 25 x 1.5) mm ³ plated with 35 μm Cu | R_{thJA} | 300 | K/W |

Electrical DC Characteristics

$T_j = 25^\circ\text{C}$, unless otherwise specified

| Parameters / Test Conditions | Symbol | Min. | Typ. | Max. | Unit |
|---|---------------|------|------|------|---------------|
| Collector-emitter cut-off current $V_{CE} = 20\text{ V}, V_{BE} = 0$ | I_{CES} | | | 100 | μA |
| Collector-base cut-off current $V_{CB} = 15\text{ V}, I_E = 0$ | I_{CBO} | | | 100 | nA |
| Emitter-base cut-off current $V_{EB} = 2\text{ V}, I_C = 0$ | I_{EBO} | | | 10 | μA |
| Collector-emitter breakdown voltage $I_C = 1\text{ mA}, I_B = 0$ | $V_{(BR)CEO}$ | 15 | | | V |
| DC forward current transfer ratio $V_{CE} = 10\text{ V}, I_C = 14\text{ mA}$ | h_{FE} | 50 | 100 | 150 | |

Electrical AC Characteristics

$T_{amb} = 25^\circ\text{C}$

| Parameters / Test Conditions | Symbol | Min. | Typ. | Max. | Unit |
|---|-------------|------|------|------|------|
| Transition frequency $V_{CE} = 10\text{ V}, I_C = 14\text{ mA}, f = 500\text{ MHz}$ | f_T | | 6 | | GHz |
| Collector-emitter capacitance $V_{CE} = 10\text{ V}, f = 1\text{ MHz}$ | C_{ce} | | 0.25 | | pF |
| Collector-base capacitance $V_{CB} = 10\text{ V}, f = 1\text{ MHz}$ | C_{cb} | | 0.3 | | pF |
| Emitter-base capacitance $V_{EB} = 0.5\text{ V}, f = 1\text{ MHz}$ | C_{eb} | | 0.9 | | pF |
| Noise figure $V_{CE} = 10\text{ V}, I_C = 2\text{ mA}, f = 800\text{ MHz}, Z_S = 50\ \Omega$ | F | | 1.8 | | dB |
| Power gain $V_{CE} = 10\text{ V}, I_C = 14\text{ mA}, Z_L = Z_{Lopt}, f = 800\text{ MHz}$ | G_{pe} | | 16 | | dB |
| Linear output voltage – two tone intermodulation test $V_{CE} = 10\text{ V}, I_C = 14\text{ mA}, d_{IM} = 60\text{ dB},$ $Z_S = Z_L = 50\ \Omega, f_1 = 806\text{ MHz}, f_2 = 810\text{ MHz}$ | $V_1 = V_2$ | | 120 | | mV |
| Third order intercept point $V_{CE} = 10\text{ V}, I_C = 14\text{ mA}, f = 800\text{ MHz}$ | IP_3 | | 24 | | dBm |

Common Emitter S-Parameters

$Z_0 = 50 \Omega$

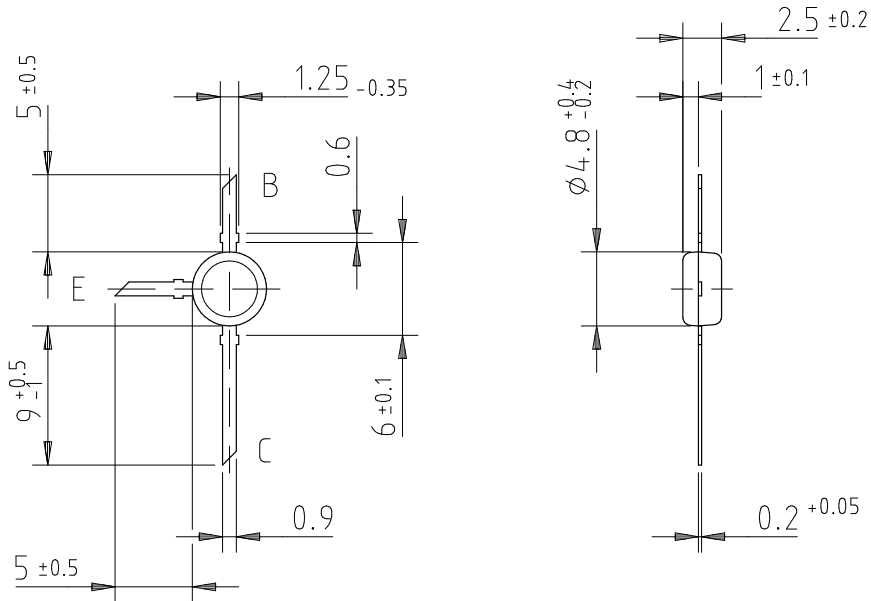
| V_{CE}/V | I_C/mA | f/MHz | S_{11} | | S_{21} | | S_{12} | | S_{22} | |
|------------|----------|-------|------------|--------|------------|-------|------------|-------|------------|-------|
| | | | LIN MAG | ANG | LIN MAG | ANG | LIN MAG | ANG | LIN MAG | ANG |
| | | | | deg | | deg | | deg | | deg |
| 5 | 2 | 100 | 0.90 | -17.7 | 6.25 | 165.4 | 0.02 | 81.1 | 0.98 | -6.8 |
| | | 300 | 0.80 | -50.4 | 5.51 | 140.9 | 0.05 | 65.5 | 0.91 | -18.2 |
| | | 500 | 0.67 | -78.1 | 4.66 | 121.6 | 0.07 | 56.7 | 0.84 | -25.8 |
| | | 800 | 0.52 | -111.2 | 3.56 | 99.9 | 0.08 | 51.2 | 0.77 | -33.8 |
| | | 1000 | 0.45 | -128.8 | 2.99 | 89.0 | 0.09 | 51.0 | 0.75 | -38.4 |
| | | 1200 | 0.40 | -144.1 | 2.58 | 80.3 | 0.10 | 52.1 | 0.74 | -42.7 |
| | | 1500 | 0.34 | -164.2 | 2.11 | 69.3 | 0.11 | 54.6 | 0.74 | -49.4 |
| | | 1800 | 0.30 | 176.6 | 1.80 | 59.3 | 0.12 | 57.8 | 0.75 | -56.3 |
| | 2000 | 0.28 | 165.9 | 1.64 | 54.2 | 0.13 | 59.4 | 0.76 | -61.0 | |
| | 5 | 100 | 0.77 | -27.0 | 13.24 | 156.9 | 0.02 | 76.2 | 0.95 | -10.9 |
| | | 300 | 0.56 | -69.4 | 9.72 | 125.0 | 0.04 | 63.9 | 0.79 | -23.5 |
| | | 500 | 0.41 | -97.4 | 7.01 | 106.7 | 0.05 | 61.8 | 0.70 | -28.5 |
| | | 800 | 0.30 | -126.9 | 4.76 | 89.9 | 0.07 | 63.5 | 0.65 | -34.1 |
| | | 1000 | 0.26 | -142.7 | 3.89 | 81.8 | 0.08 | 64.6 | 0.64 | -38.3 |
| | | 1200 | 0.24 | -155.8 | 3.29 | 75.1 | 0.10 | 65.7 | 0.63 | -42.5 |
| | | 1500 | 0.21 | -174.3 | 2.67 | 66.5 | 0.12 | 66.2 | 0.64 | -49.3 |
| | | 1800 | 0.19 | 167.7 | 2.27 | 58.1 | 0.14 | 66.0 | 0.66 | -56.2 |
| | 2000 | 0.18 | 158.7 | 2.06 | 53.8 | 0.16 | 65.5 | 0.67 | -60.6 | |
| | 10 | 100 | 0.61 | -38.3 | 20.89 | 147.5 | 0.02 | 74.8 | 0.89 | -15.0 |
| | | 300 | 0.36 | -85.3 | 12.29 | 113.4 | 0.03 | 67.7 | 0.68 | -24.6 |
| | | 500 | 0.26 | -111.7 | 8.10 | 98.2 | 0.05 | 69.4 | 0.61 | -27.5 |
| | | 800 | 0.20 | -139.9 | 5.28 | 84.9 | 0.07 | 71.4 | 0.58 | -32.8 |
| | | 1000 | 0.18 | -154.3 | 4.28 | 78.0 | 0.08 | 71.8 | 0.58 | -37.0 |
| | | 1200 | 0.17 | -166.5 | 3.61 | 72.3 | 0.10 | 71.6 | 0.58 | -41.5 |
| | | 1500 | 0.16 | 177.7 | 2.91 | 64.7 | 0.12 | 70.3 | 0.59 | -48.7 |
| | | 1800 | 0.14 | 160.4 | 2.48 | 57.1 | 0.15 | 68.7 | 0.61 | -55.7 |
| | 2000 | 0.14 | 153.6 | 2.26 | 53.1 | 0.17 | 67.5 | 0.62 | -60.4 | |
| | 14 | 100 | 0.51 | -44.8 | 24.51 | 142.5 | 0.01 | 74.5 | 0.86 | -16.7 |
| 300 | | 0.28 | -93.9 | 13.01 | 108.9 | 0.03 | 71.0 | 0.65 | -24.1 | |
| 500 | | 0.20 | -120.2 | 8.36 | 95.3 | 0.05 | 72.9 | 0.59 | -26.2 | |
| 800 | | 0.17 | -147.3 | 5.40 | 83.0 | 0.07 | 74.0 | 0.57 | -31.8 | |
| 1000 | | 0.15 | -160.1 | 4.36 | 76.6 | 0.08 | 74.0 | 0.57 | -36.2 | |
| 1200 | | 0.15 | -172.1 | 3.69 | 71.3 | 0.10 | 73.4 | 0.57 | -40.7 | |
| 1500 | | 0.14 | 172.8 | 2.98 | 63.9 | 0.13 | 71.7 | 0.58 | -48.0 | |
| 1800 | | 0.13 | 155.7 | 2.52 | 56.5 | 0.15 | 69.8 | 0.60 | -55.1 | |
| 2000 | 0.13 | 147.1 | 2.29 | 52.8 | 0.17 | 68.3 | 0.61 | -59.8 | | |
| 20 | 100 | 0.41 | -53.2 | 27.71 | 137.2 | 0.01 | 74.0 | 0.82 | -18.0 | |
| | 300 | 0.22 | -105.4 | 13.38 | 104.9 | 0.03 | 74.1 | 0.62 | -22.9 | |
| | 500 | 0.17 | -131.2 | 8.45 | 92.6 | 0.04 | 75.6 | 0.58 | -24.8 | |
| | 800 | 0.15 | -156.4 | 5.41 | 81.3 | 0.07 | 76.1 | 0.56 | -30.7 | |
| | 1000 | 0.14 | -170.4 | 4.36 | 75.2 | 0.09 | 75.4 | 0.56 | -35.3 | |
| | 1200 | 0.14 | 177.4 | 3.68 | 69.8 | 0.10 | 74.5 | 0.57 | -40.0 | |
| | 1500 | 0.14 | 164.4 | 2.96 | 62.5 | 0.13 | 72.5 | 0.58 | -47.3 | |
| | 1800 | 0.14 | 147.5 | 2.51 | 55.4 | 0.15 | 70.4 | 0.59 | -54.5 | |
| 2000 | 0.13 | 141.0 | 2.28 | 51.5 | 0.17 | 68.8 | 0.60 | -59.3 | | |

Common Emitter S-Parameters

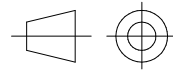
$Z_0 = 50 \Omega$

| V_{CE}/V | I_C/mA | f/MHz | S_{11} | | S_{21} | | S_{12} | | S_{22} | |
|------------|----------|-------|------------|--------|------------|-------|------------|------|------------|-------|
| | | | LIN MAG | ANG | LIN MAG | ANG | LIN MAG | ANG | LIN MAG | ANG |
| | | | | deg | | deg | | deg | | deg |
| 5 | 30 | 100 | 0.30 | -67.7 | 29.72 | 131.4 | 0.01 | 74.3 | 0.78 | -18.4 |
| | | 300 | 0.19 | -125.3 | 13.17 | 101.2 | 0.03 | 76.3 | 0.61 | -20.7 |
| | | 500 | 0.16 | -149.8 | 8.19 | 90.0 | 0.04 | 78.0 | 0.58 | -22.8 |
| | | 800 | 0.16 | -171.3 | 5.23 | 79.2 | 0.07 | 77.8 | 0.57 | -29.0 |
| | | 1000 | 0.16 | 177.6 | 4.21 | 73.3 | 0.08 | 77.1 | 0.57 | -33.9 |
| | | 1200 | 0.16 | 167.5 | 3.54 | 68.2 | 0.10 | 76.0 | 0.58 | -38.6 |
| | | 1500 | 0.16 | 156.2 | 2.85 | 60.9 | 0.126 | 73.9 | 0.59 | -46.1 |
| | | 1800 | 0.16 | 139.1 | 2.41 | 53.8 | 0.15 | 71.7 | 0.61 | -53.5 |
| | | 2000 | 0.16 | 133.3 | 2.19 | 49.9 | 0.17 | 70.0 | 0.62 | -58.3 |
| 10 | 2 | 100 | 0.92 | -16.7 | 6.23 | 166.0 | 0.01 | 80.6 | 0.98 | -5.7 |
| | | 300 | 0.87 | -47.6 | 5.55 | 142.1 | 0.03 | 67.1 | 0.93 | -15.5 |
| | | 500 | 0.69 | -74.0 | 4.75 | 123.3 | 0.05 | 58.8 | 0.87 | -22.2 |
| | | 800 | 0.53 | -106.0 | 3.67 | 101.9 | 0.06 | 54.1 | 0.82 | -29.5 |
| | | 1000 | 0.45 | -122.8 | 3.10 | 90.9 | 0.07 | 54.4 | 0.80 | -33.9 |
| | | 1200 | 0.39 | -138.0 | 2.67 | 82.3 | 0.08 | 56.0 | 0.79 | -38.0 |
| | | 1500 | 0.33 | -158.2 | 2.19 | 71.2 | 0.09 | 59.8 | 0.80 | -44.3 |
| | | 1800 | 0.29 | -177.6 | 1.87 | 61.2 | 0.10 | 63.6 | 0.81 | -50.8 |
| | | 2000 | 0.27 | 172.2 | 1.70 | 56.1 | 0.11 | 65.5 | 0.83 | -55.3 |
| | 5 | 100 | 0.80 | -24.7 | 13.17 | 158.0 | 0.01 | 77.5 | 0.96 | -8.8 |
| | | 300 | 0.58 | -63.9 | 9.89 | 126.8 | 0.03 | 65.7 | 0.83 | -19.3 |
| | | 500 | 0.43 | -89.9 | 7.21 | 108.5 | 0.04 | 63.5 | 0.76 | -23.7 |
| | | 800 | 0.30 | -117.6 | 4.94 | 91.6 | 0.06 | 65.9 | 0.72 | -29.2 |
| | | 1000 | 0.26 | -132.1 | 4.04 | 83.4 | 0.07 | 67.5 | 0.71 | -33.2 |
| | | 1200 | 0.22 | -145.9 | 3.42 | 76.8 | 0.08 | 69.1 | 0.71 | -37.2 |
| | | 1500 | 0.19 | -163.0 | 2.77 | 68.0 | 0.10 | 70.2 | 0.72 | -43.6 |
| | | 1800 | 0.17 | 177.9 | 2.36 | 59.8 | 0.12 | 70.7 | 0.79 | -50.3 |
| | | 2000 | 0.15 | 168.8 | 2.15 | 55.6 | 0.13 | 70.4 | 0.75 | -54.7 |
| | 10 | 100 | 0.65 | -34.2 | 20.73 | 149.1 | 0.01 | 74.8 | 0.92 | -11.8 |
| | | 300 | 0.39 | -77.0 | 12.60 | 115.1 | 0.03 | 68.7 | 0.75 | -19.8 |
| | | 500 | 0.27 | -99.8 | 8.38 | 99.9 | 0.04 | 70.7 | 0.69 | -22.6 |
| | | 800 | 0.19 | -124.7 | 5.50 | 86.3 | 0.06 | 73.2 | 0.67 | -27.8 |
| | | 1000 | 0.17 | -138.1 | 4.45 | 79.4 | 0.07 | 74.3 | 0.67 | -31.9 |
| | | 1200 | 0.15 | -151.4 | 3.76 | 74.0 | 0.08 | 74.2 | 0.67 | -36.2 |
| | | 1500 | 0.13 | -167.7 | 3.04 | 66.4 | 0.11 | 74.1 | 0.68 | -42.7 |
| | | 1800 | 0.18 | 174.5 | 2.58 | 58.8 | 0.13 | 73.1 | 0.70 | -49.5 |
| | | 2000 | 0.11 | 165.6 | 2.35 | 54.8 | 0.14 | 72.3 | 0.72 | -53.9 |
| | 14 | 100 | 0.56 | -39.9 | 24.49 | 144.2 | 0.01 | 74.3 | 0.89 | -13.1 |
| | | 300 | 0.31 | -83.1 | 13.40 | 110.5 | 0.03 | 71.4 | 0.72 | -19.3 |
| | | 500 | 0.21 | -104.9 | 8.66 | 96.8 | 0.04 | 74.1 | 0.67 | -21.6 |
| | | 800 | 0.16 | -129.3 | 5.62 | 84.4 | 0.06 | 76.0 | 0.66 | -26.9 |
| | | 1000 | 0.14 | -142.2 | 4.55 | 78.0 | 0.07 | 76.3 | 0.66 | -31.0 |
| | | 1200 | 0.13 | -155.9 | 3.83 | 72.7 | 0.08 | 76.1 | 0.66 | -35.5 |
| | | 1500 | 0.12 | -170.8 | 3.10 | 65.4 | 0.10 | 75.3 | 0.68 | -42.2 |
| | | 1800 | 0.11 | 169.7 | 2.63 | 58.1 | 0.13 | 74.0 | 0.70 | -49.1 |
| | | 2000 | 0.11 | 162.3 | 2.39 | 54.3 | 0.14 | 73.0 | 0.71 | -53.5 |

Dimensions in mm



96 12244



technical drawings
according to DIN
specifications

Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

TEMIC TELEFUNKEN microelectronic GmbH semiconductor division has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

TEMIC can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design and may do so without further notice.

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