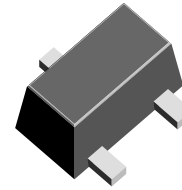
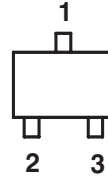


## Silicon NPN Planar RF Transistor

### Description

The main purpose of this bipolar transistor is broadband amplification up to 2 GHz. In the space-saving 3-pin surface-mount SOT-490 package electrical performance and reliability are taken to a new level covering a smaller footprint on PC boards than previous packages. In addition to space savings, the SOT-490 provides a higher level of reliability than other 3-pin packages, such as more resistance to moisture. Due to the short length of its leads the SOT-490 is also reducing package inductances resulting in some bet-



16867



Electrostatic sensitive device.  
Observe precautions for handling.

ter electrical performance. All of these aspects make this device an ideal choice for demanding RF applications.

### Applications

For low noise and high gain broadband amplifiers at collector currents from 0.5 mA to 12 mA.

### Features

- Small feedback capacitance
- Low noise figure
- High power gain
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



### Mechanical Data

**Typ:** BFR181TF

**Case:** SOT-490 Plastic case

**Weight:** approx. 2.5 mg

**Pinning:** 1 = Collector, 2 = Base, 3 = Emitter

### Parts Table

| Part     | Marking | Package |
|----------|---------|---------|
| BFR181TF | RF      | SOT-490 |

### Absolute Maximum Ratings

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

| Parameter                 | Test condition                            | Symbol    | Value         | Unit               |
|---------------------------|---|-----------|---------------|--------------------|
| Collector-base voltage    |   | $V_{CBO}$ | 15            | V                  |
| Collector-emitter voltage |   | $V_{CEO}$ | 10            | V                  |
| Emitter-base voltage      |   | $V_{EBO}$ | 2             | V                  |
| Collector current         |   | $I_C$     | 20            | mA                 |
| Base current              |   | $I_B$     | 2             | mA                 |
| Total power dissipation   | $T_{amb} \leq 78\text{ }^{\circ}\text{C}$ | $P_{tot}$ | 160           | mW                 |
| Junction temperature      |   | $T_j$     | 150           | $^{\circ}\text{C}$ |
| Storage temperature range |   | $T_{stg}$ | - 65 to + 150 | $^{\circ}\text{C}$ |

### Maximum Thermal Resistance

| Parameter        | Test condition | Symbol     | Value | Unit |
|------------------|----------------|------------|-------|------|
| Junction ambient | 1)             | $R_{thJA}$ | 450   | K/W  |

1) on glass fibre printed board (25 x 20 x 1.5) mm<sup>3</sup> plated with 35 μm Cu

### Electrical DC Characteristics

$T_{amb} = 25\text{ °C}$ , unless otherwise specified

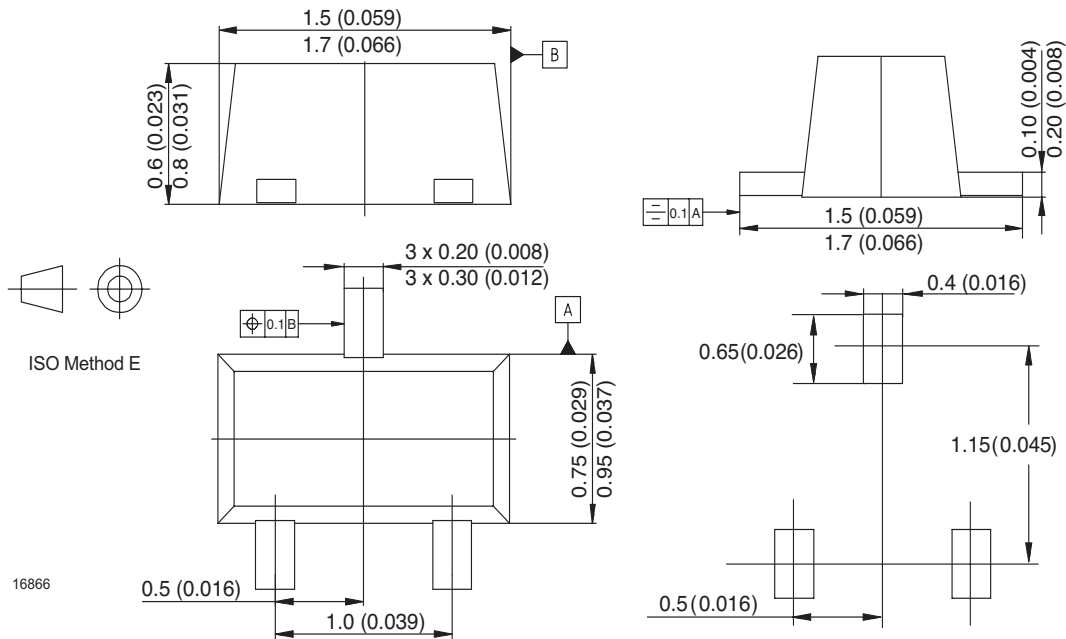
| Parameter                            | Test condition                            | Symbol        | Min | Typ. | Max | Unit |
|--------------------------------------|---|---------------|-----|------|-----|------|
| Collector-emitter cut-off current    | $V_{CE} = 15\text{ V}, V_{BE} = 0$        | $I_{CES}$     |     |      | 100 | μA   |
| Collector-base cut-off current       | $V_{CB} = 10\text{ V}, I_E = 0$           | $I_{CBO}$     |     |      | 100 | nA   |
| Emitter-base cut-off current         | $V_{EB} = 1\text{ V}, I_C = 0$            | $I_{EBO}$     |     |      | 1   | μA   |
| Collector-emitter breakdown voltage  | $I_C = 1\text{ mA}, I_B = 0$              | $V_{(BR)CEO}$ | 10  |      |     | V    |
| Collector-emitter saturation voltage | $I_C = 15\text{ mA}, I_B = 1.5\text{ mA}$ | $V_{CEsat}$   |     | 0.1  | 0.4 | V    |
| DC forward current transfer ratio    | $V_{CE} = 6\text{ V}, I_C = 5\text{ mA}$  | $h_{FE}$      | 50  | 100  |     |      |
|                                      | $V_{CE} = 6\text{ V}, I_C = 10\text{ mA}$ | $h_{FE}$      |     | 100  |     |      |

## Electrical AC Characteristics

T<sub>amb</sub> = 25 °C, unless otherwise specified

| Parameter                     | Test condition  | Symbol                          | Min | Typ. | Max | Unit |
|-------------------------------|---|---------------------------------|-----|------|-----|------|
| Transition frequency          | V <sub>CE</sub> = 3 V, I <sub>C</sub> = 6 mA,<br>f = 500 MHz  | f <sub>T</sub>                  |     | 7    |     | GHz  |
|                               | V <sub>CE</sub> = 8 V, I <sub>C</sub> = 20 mA,<br>f = 500 MHz   | f <sub>T</sub>                  |     | 8    |     | GHz  |
| Collector-base capacitance    | V <sub>CB</sub> = 10 V, f = 1 MHz   | C <sub>cb</sub>                 |     | 0.3  |     | pF   |
| Collector-emitter capacitance | V <sub>CE</sub> = 10 V, f = 1 MHz   | C <sub>ce</sub>                 |     | 0.2  |     | pF   |
| Emitter-base capacitance      | V <sub>EB</sub> = 0.5 V, f = 1 MHz  | C <sub>eb</sub>                 |     | 0.4  |     | pF   |
| Noise figure                  | V <sub>CE</sub> = 5 V, I <sub>C</sub> = 3 mA, Z <sub>S</sub> = Z <sub>Sopt</sub> ,<br>f = 900 MHz                         | F                               |     | 1.4  |     | dB   |
|                               | V <sub>CE</sub> = 5 V, I <sub>C</sub> = 3 mA, Z <sub>S</sub> = Z <sub>Sopt</sub> ,<br>f = 1.75 GHz                        | F                               |     | 2.2  |     | dB   |
| Power gain                    | V <sub>CE</sub> = 8 V, Z <sub>S</sub> = 50 Ω, Z <sub>L</sub> = Z <sub>Lopt</sub> ,<br>I <sub>C</sub> = 8 mA, f = 900 MHz  | G <sub>pe</sub>                 |     | 16   |     | dB   |
|                               | V <sub>CE</sub> = 8 V, Z <sub>S</sub> = 50 Ω, Z <sub>L</sub> = Z <sub>Lopt</sub> ,<br>I <sub>C</sub> = 8 mA, f = 1.75 GHz | G <sub>pe</sub>                 |     | 12.5 |     | dB   |
| Transducer gain               | V <sub>CE</sub> = 8 V, I <sub>C</sub> = 8 mA,<br>f = 900 MHz, Z <sub>O</sub> = 50 Ω                                       | S <sub>21e</sub>   <sup>2</sup> |     | 15   |     | dB   |

## Package Dimensions in mm



### Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor 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.

Vishay Semiconductor GmbH 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.

Vishay Semiconductor GmbH 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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Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany



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