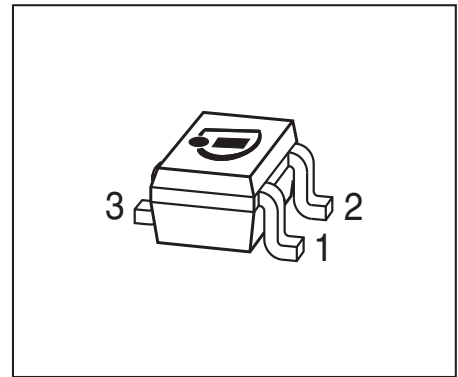


**NPN Bipolar RF Transistor**

- For low noise, high-gain amplifiers up to 2 GHz
- For linear broadband amplifiers
- $f_T = 8$  GHz,  $NF_{min} = 1$  dB at 900 MHz
- Pb-free (RoHS compliant) package
- Qualification report according to AEC-Q101 available



**ESD (Electrostatic discharge) sensitive device, observe handling precaution!**

| Type    | Marking | Pin Configuration |       |       | Package |
|---------|---------|-------------------|-------|-------|---------|
| BFR193W | RCs     | 1 = B             | 2 = E | 3 = C | SOT323  |

**Maximum Ratings** at  $T_A = 25$  °C, unless otherwise specified

| Parameter   | Symbol    | Value       | Unit |
|---|-----------|-------------|------|
| Collector-emitter voltage                                 | $V_{CEO}$ | 12          | V    |
| Collector-emitter voltage                                 | $V_{CES}$ | 20          |      |
| Collector-base voltage                                    | $V_{CBO}$ | 20          |      |
| Emitter-base voltage                                      | $V_{EBO}$ | 2           |      |
| Collector current   | $I_C$     | 80          | mA   |
| Base current  | $I_B$     | 10          |      |
| Total power dissipation <sup>1)</sup><br>$T_S \leq 63$ °C | $P_{tot}$ | 580         | mW   |
| Junction temperature                                      | $T_J$     | 150         | °C   |
| Storage temperature                                       | $T_{Stg}$ | -55 ... 150 |      |

**Thermal Resistance**

| Parameter                                | Symbol     | Value | Unit |
|--|------------|-------|------|
| Junction - soldering point <sup>2)</sup> | $R_{thJS}$ | 150   | K/W  |

<sup>1)</sup>  $T_S$  is measured on the collector lead at the soldering point to the pcb

<sup>2)</sup> For calculation of  $R_{thJA}$  please refer to Application Note AN077 (Thermal Resistance Calculation)

**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

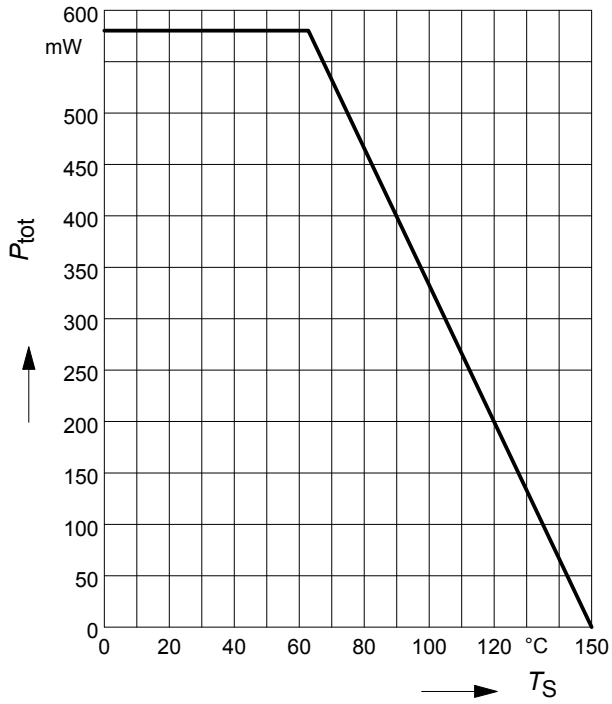
| Parameter  | Symbol        | Values |      |      | Unit          |
|--|---------------|--------|------|------|---------------|
|  |               | min.   | typ. | max. |               |
| <b>DC Characteristics</b>  |               |        |      |      |               |
| Collector-emitter breakdown voltage<br>$I_C = 1 \text{ mA}, I_B = 0$                   | $V_{(BR)CEO}$ | 12     | -    | -    | V             |
| Collector-emitter cutoff current<br>$V_{CE} = 20 \text{ V}, V_{BE} = 0$                | $I_{CES}$     | -      | -    | 100  | $\mu\text{A}$ |
| Collector-base cutoff current<br>$V_{CB} = 10 \text{ V}, I_E = 0$                      | $I_{CBO}$     | -      | -    | 100  | nA            |
| Emitter-base cutoff current<br>$V_{EB} = 1 \text{ V}, I_C = 0$                         | $I_{EBO}$     | -      | -    | 1    | $\mu\text{A}$ |
| DC current gain<br>$I_C = 30 \text{ mA}, V_{CE} = 8 \text{ V}, \text{ pulse measured}$ | $h_{FE}$      | 70     | 100  | 140  | -             |

**Electrical Characteristics at  $T_A = 25^\circ\text{C}$ , unless otherwise specified**

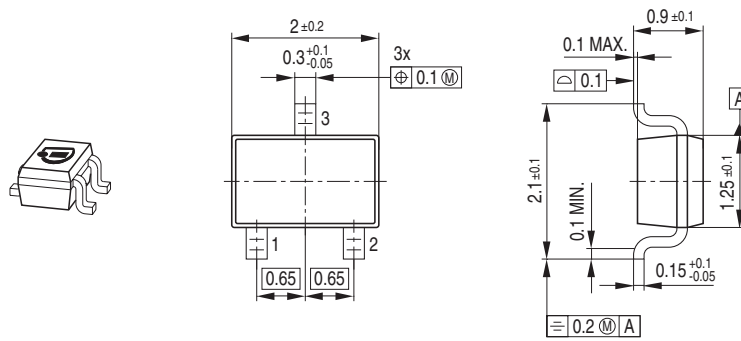
| Parameter   | Symbol        | Values |      |      | Unit |
|---|---------------|--------|------|------|------|
|   |               | min.   | typ. | max. |      |
| <b>AC Characteristics (verified by random sampling)</b>   |               |        |      |      |      |
| Transition frequency<br>$I_C = 50\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $f = 500\text{ MHz}$   | $f_T$         | 6      | 8    | -    | GHz  |
| Collector-base capacitance<br>$V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ ,<br>emitter grounded  | $C_{cb}$      | -      | 0.74 | 1    | pF   |
| Collector emitter capacitance<br>$V_{CE} = 10\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ ,<br>base grounded  | $C_{ce}$      | -      | 0.28 | -    |      |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{CB} = 0$ ,<br>collector grounded   | $C_{eb}$      | -      | 1.8  | -    |      |
| Minimum noise figure<br>$I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$f = 900\text{ MHz}$<br>$I_C = 10\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$f = 1.8\text{ GHz}$  | $NF_{min}$    | -      | 1    | -    | dB   |
|   |               | -      | 1.6  | -    |      |
| Power gain, maximum available <sup>1)</sup><br>$I_C = 30\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$Z_L = Z_{Lopt}$ , $f = 900\text{ MHz}$<br>$I_C = 30\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$ | $G_{ma}$      | -      | 16   | -    |      |
|   |               | -      | 10.5 | -    |      |
| Transducer gain<br>$I_C = 30\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 900\text{ MHz}$<br>$I_C = 30\text{ mA}$ , $V_{CE} = 8\text{ V}$ , $Z_S = Z_L = 50\Omega$ ,<br>$f = 1.8\text{ GHz}$   | $ S_{21e} ^2$ | -      | 13.5 | -    | dB   |
|   |               | -      | 8    | -    |      |

$$^1G_{ma} = |S_{21} / S_{12}| (k - (k^2 - 1)^{1/2})$$

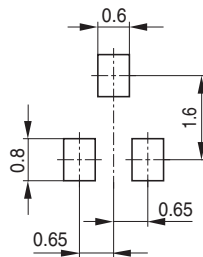
Total power dissipation  $P_{\text{tot}} = f(T_S)$



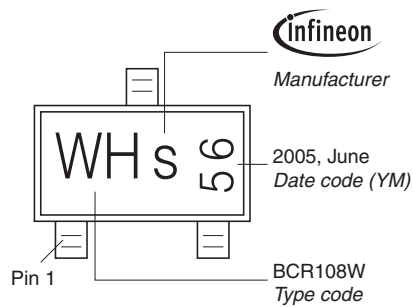
Package Outline



Foot Print

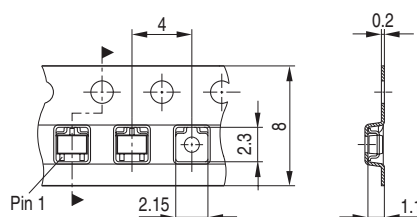


Marking Layout (Example)



Standard Packing

Reel  $\varnothing$ 180 mm = 3.000 Pieces/Reel  
 Reel  $\varnothing$ 330 mm = 10.000 Pieces/Reel



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