

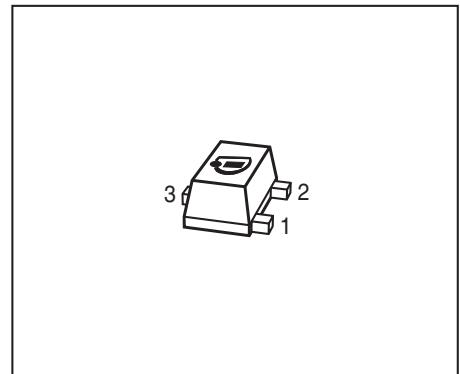


**THE DATASHEET OF
BFR193FH6327XTSA1**



Low Noise Silicon 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) and halogen-free product
- Qualification report according to AEC-Q101 available



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

| Type | Marking | Pin Configuration | | | Package |
|---------|---------|-------------------|-------|-------|---------|
| BFR193F | RCs | 1 = B | 2 = E | 3 = C | TSFP-3 |

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 ¹⁾ $T_S \leq 72$ °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 ²⁾ | R_{thJS} | 135 | K/W |

¹⁾ T_S is measured on the collector lead at the soldering point to the pcb

²⁾ For the definition of R_{thJS} please refer to Application Note AN077 (Thermal Resistance Calculation)

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

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

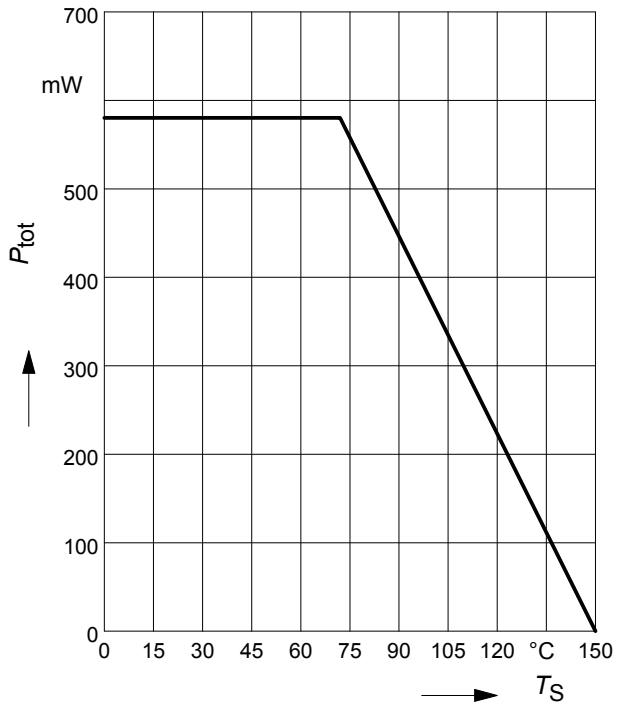
Electrical Characteristics at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---------------|--------|-------------|------|------|
| | | min. | typ. | max. | |
| AC Characteristics (verified by random sampling) | | | | | |
| Transition frequency $I_C = 50\text{ mA}$, $V_{CE} = 8\text{ V}$, $f = 500\text{ MHz}$ | f_T | 6 | 8 | - | GHz |
| Collector-base capacitance $V_{CB} = 10\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, emitter grounded | C_{cb} | - | 0.63 | 1 | pF |
| Collector emitter capacitance $V_{CE} = 10\text{ V}$, $f = 1\text{ MHz}$, $V_{BE} = 0$, base grounded | C_{ce} | - | 0.25 | - | |
| Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, $V_{CB} = 0$, collector grounded | C_{eb} | - | 2.25 | - | |
| Minimum noise figure $I_C = 10\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_{Sopt}$, $f = 900\text{ MHz}$ $f = 1.8\text{ GHz}$ | NF_{min} | - | 1 1.6 | - | dB |
| Power gain, maximum stable ¹⁾ $I_C = 30\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 900\text{ MHz}$ | G_{ms} | - | 12.5 | - | dB |
| Power gain, maximum available ¹⁾ $I_C = 30\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$ | G_{ma} | - | 19 | - | dB |
| Transducer gain $I_C = 30\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 900\text{ MHz}$ $f = 1.8\text{ GHz}$ | $ S_{21e} ^2$ | - | 14.5 8.5 | - | dB |
| Third order intercept point at output ²⁾ $V_{CE} = 8\text{ V}$, $I_C = 30\text{ mA}$, $f = 900\text{ MHz}$, $Z_S = Z_L = 50\Omega$ | IP_3 | - | 29 | - | dBm |
| 1dB compression point at output ³⁾ $I_C = 30\text{ mA}$, $V_{CE} = 8\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 900\text{ MHz}$ | P_{-1dB} | - | 14.5 | - | |

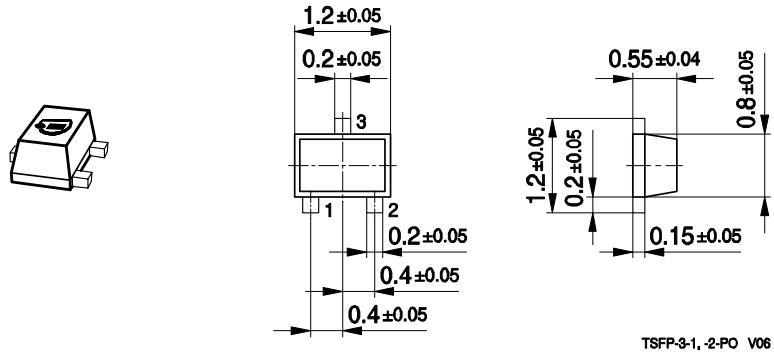
¹⁾ $G_{ma} = |S_{21} / S_{12}| (k - (k^2 - 1)^{1/2})$, $G_{ms} = |S_{21} / S_{12}|$
²⁾ IP_3 value depends on termination of all intermodulation frequency components.
Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

³⁾ DC current at no input power

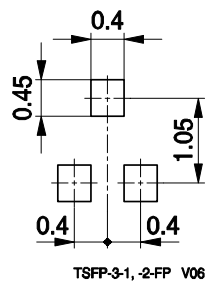
Total power dissipation $P_{\text{tot}} = f(T_S)$



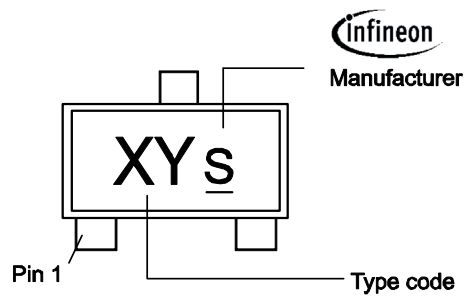
Package Outline



Foot Print



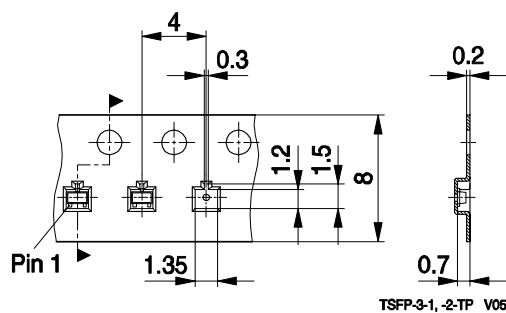
Marking Layout (Example)



Standard Packing

Reel Ø 180 mm = 3.000 Pieces/Reel

Reel Ø 330 mm = 10.000 Pieces/Reel



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