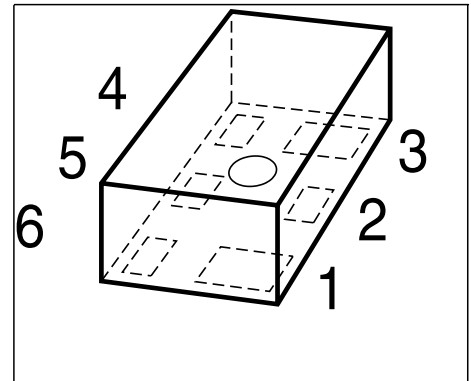
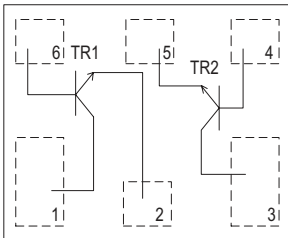


NPN Silicon RF TWIN Transistor

- High f_T of 22 GHz
- For low voltage / low current applications
- Ideal for VCO modules and low noise amplifiers
- Low noise figure: 1.1 dB at 1.8 GHz
- World's smallest SMD 6-pin leadless package
- Excellent ESD performance
- Built in 2 transistors (TR1, TR2: die as BFR460L3)



* Short-term description



ESD: Electrostatic discharge sensitive device, observe handling precaution!

| Type | Marking | Pin Configuration | | | | | | Package |
|----------|---------|-------------------|------|------|------|------|------|----------|
| BFS460L6 | AB | 1=C1 | 2=E1 | 3=C2 | 4=B2 | 5=E2 | 6=B1 | TSLP-6-1 |

Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---------------------------------------|-----------|-------------|------|
| Collector-emitter voltage | V_{CEO} | | V |
| $T_A > 0\text{ °C}$ | | 4.5 | |
| $T_A \leq 0\text{ °C}$ | | 4.2 | |
| Collector-emitter voltage | V_{CES} | 15 | |
| Collector-base voltage | V_{CBO} | 15 | |
| Emitter-base voltage | V_{EBO} | 1.5 | |
| Collector current | I_C | 50 | mA |
| Base current | I_B | 5 | |
| Total power dissipation ¹⁾ | P_{tot} | 200 | mW |
| $T_S \leq 104\text{ °C}$ | | | |
| Junction temperature | T_j | 150 | °C |
| Ambient temperature | T_A | -65 ... 150 | |
| Storage temperature | T_{stg} | -65 ... 150 | |

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

Thermal Resistance

| Parameter | Symbol | Value | Unit |
|--|------------|------------|------|
| Junction - soldering point ¹⁾ | R_{thJS} | ≤ 230 | K/W |

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

| Parameter | Symbol | Values | | | Unit |
|-----------|--------|--------|------|------|------|
| | | min. | typ. | max. | |

DC Characteristics

| | | | | | |
|---|---------------|-----|-----|-----|---------------|
| Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$ | $V_{(BR)CEO}$ | 4.5 | 5.8 | - | V |
| Collector-emitter cutoff current $V_{CE} = 15 \text{ V}, V_{BE} = 0$ | I_{CES} | - | - | 10 | μA |
| Collector-base cutoff current $V_{CB} = 5 \text{ V}, I_E = 0$ | I_{CBO} | - | - | 100 | nA |
| Emitter-base cutoff current $V_{EB} = 0.5 \text{ V}, I_C = 0$ | I_{EBO} | - | - | 1 | μA |
| DC current gain $I_C = 20 \text{ mA}, V_{CE} = 3 \text{ V}$, pulse measured | h_{FE} | 90 | 120 | 160 | - |

¹⁾For calculation of R_{thJA} please refer to Application Note Thermal Resistance

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

| Parameter | Symbol | Values | | | Unit |
|--|---------------|--------|------------|------|------|
| | | min. | typ. | max. | |
| AC Characteristics (verified by random sampling) | | | | | |
| Transition frequency $I_C = 30\text{ mA}$, $V_{CE} = 3\text{ V}$, $f = 1\text{ GHz}$ | f_T | 16 | 22 | - | GHz |
| Collector-base capacitance $V_{CB} = 3\text{ V}$, $f = 1\text{ MHz}$, emitter grounded | C_{cb} | - | 0.33 | 0.5 | pF |
| Collector emitter capacitance $V_{CE} = 3\text{ V}$, $f = 1\text{ MHz}$, base grounded | C_{ce} | - | 0.17 | - | |
| Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$, collector grounded | C_{eb} | - | 0.57 | - | |
| Noise figure $I_C = 5\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $f = 1.8\text{ GHz}$ $I_C = 5\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $f = 3\text{ GHz}$ | F | - | 1.1 1.4 | - | dB |
| Power gain, maximum stable ¹⁾ $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 1.8\text{ GHz}$ $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 3\text{ GHz}$ | G_{ms} | - | 14.5 10 | - | dB |
| Transducer gain $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{ GHz}$ $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 3\text{ GHz}$ | $ S_{21e} ^2$ | - | 12.5 9 | - | |
| Third order intercept point at output ²⁾ $V_{CE} = 3\text{ V}$, $I_C = 20\text{ mA}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{ GHz}$ | IP_3 | - | 28 | - | dBm |
| 1dB Compression point at output $I_C = 20\text{ mA}$, $V_{CE} = 3\text{ V}$, $Z_S = Z_L = 50\Omega$, $f = 1.8\text{ GHz}$ | P_{-1dB} | - | 12 | - | |

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