
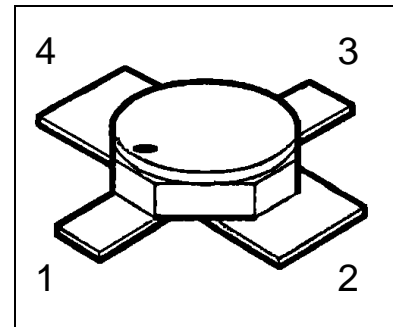


HiRel NPN Silicon RF Transistor

- **HiRel Discrete and Microwave Semiconductor**
- For low noise, high-gain amplifiers up to 2GHz.
- For linear broadband amplifiers
- Hermetically sealed microwave package
- $f_T = 8 \text{ GHz}$
 $F = 2.3 \text{ dB at } 2 \text{ GHz}$
-  **ESA Space Qualified**
ESA/SCC Detail Spec. No.: 5611/006
Type Variant No. 06



ESD: Electrostatic discharge sensitive device,
observe handling precautions!

| Type | Marking | Ordering Code | Pin Configuration | | | | Package |
|-------------|---------|---------------|-------------------|---|---|---|----------|
| | | | 1 | 2 | 3 | 4 | |
| BFY193 (ql) | - | see below | C | E | B | E | Micro-X1 |

(ql) Quality Level: P: Professional Quality
 H: High Rel Quality
 S: Space Quality
 ES: ESA Space Quality

(see order instructions for ordering example)

Maximum Ratings

| Parameter | Symbol | Values | Unit |
|--|-----------|------------------|------------------|
| Collector-emitter voltage | V_{CEO} | 12 | V |
| Collector-emitter voltage, $V_{BE}=0$ | V_{CES} | 20 | V |
| Collector-base voltage | V_{CBO} | 20 | V |
| Emitter-base voltage | V_{EBO} | 2 | V |
| Collector current | I_C | 80 | mA |
| Base current | I_B | 10 ¹⁾ | mA |
| Total power dissipation, $T_S \leq 104^\circ\text{C}$ ^{2), 3)} | P_{tot} | 580 | mW |
| Junction temperature | T_j | 200 | $^\circ\text{C}$ |
| Operating temperature range | T_{op} | -65...+200 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -65...+200 | $^\circ\text{C}$ |

Thermal Resistance

| | | | |
|--|-------------|-------|-----|
| Junction-soldering point ³⁾ | $R_{th JS}$ | < 165 | K/W |
|--|-------------|-------|-----|

Notes.:

- 1) The maximum permissible base current for V_{FBE} measurements is 30mA (spot-measurement duration < 1s)
- 2) At $T_S = +104^\circ\text{C}$. For $T_S > +104^\circ\text{C}$ derating is required.
- 3) T_S is measured on the collector lead at the soldering point to the pcb.

Electrical Characteristics

at $T_A=25^\circ\text{C}$; unless otherwise specified

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

DC Characteristics

| | | | | | |
|---|-----------|---|---|-----|---------------|
| Collector-base cutoff current $V_{CB} = 20\text{ V}, I_E = 0$ | I_{CBO} | - | - | 100 | μA |
| Collector-emitter cutoff current $V_{CE} = 12\text{ V}, I_B = 0,5\mu\text{A}$ ^{1.)} | I_{CEX} | - | - | 600 | μA |
| Collector-base cutoff current $V_{CB} = 10\text{ V}, I_E = 0$ | I_{CBO} | - | - | 50 | nA |
| Emitter base cutoff current $V_{EB} = 2\text{ V}, I_C = 0$ | I_{EBO} | - | - | 25 | μA |
| Emitter base cutoff current $V_{EB} = 1\text{ V}, I_C = 0$ | I_{EBO} | - | - | 0.5 | μA |

Notes:

- 1.) This Test assures $V(BR)_{CE0} > 12\text{V}$

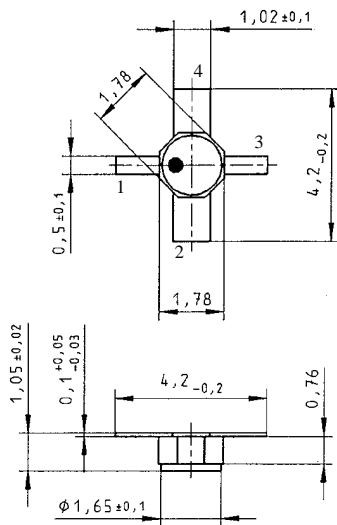
Electrical Characteristics (continued)

| Parameter | Symbol | Values | | | Unit |
|---|----------------|----------|----------|--------|------|
| | | min. | typ. | max. | |
| DC Characteristics | | | | | |
| Base-Emitter forward voltage $I_E = 30\text{ mA}, I_C = 0$ | V_{FBE} | - | - | 1 | V |
| DC current gain $I_C = 30\text{ mA}, V_{CE} = 8\text{ V}$ | h_{FE} | 50 | 100 | 175 | - |
| AC Characteristics | | | | | |
| Transition frequency $I_C = 40\text{mA}, V_{CE} = 5\text{ V}, f = 500\text{ MHz}$ $I_C = 50\text{ mA}, V_{CE} = 8\text{ V}, f = 500\text{ MHz}$ | f_T | 6,5 - | 7.5 8 | - - | GHz |
| Collector-base capacitance $V_{CB} = 10\text{ V}, V_{BE} = v_{be} = 0, f = 1\text{ MHz}$ | C_{CB} | - | 0.56 | 0.75 | pF |
| Collector-emitter capacitance $V_{CE} = 10\text{ V}, V_{BE} = v_{be} = 0, f = 1\text{ MHz}$ | C_{CE} | - | 0.34 | - | pF |
| Emitter-base capacitance $V_{EB} = 0.5\text{V}, V_{CB} = v_{cb} = 0, f = 1\text{ MHz}$ | C_{EB} | - | 1.9 | 2.4 | pF |
| Noise Figure $I_C = 15\text{ mA}, V_{CE} = 5\text{ V}, f = 2\text{ GHz},$ $Z_S = Z_{Sopt}$ | F | - | 2.3 | 2.9 | dB |
| Power gain $I_C = 40\text{ mA}, V_{CE} = 5\text{V}, f = 2\text{ GHz}$ $Z_S = Z_{Sopt}, Z_L = Z_{Lopt}$ | $G_{ma}^{1.)}$ | 12.5 | 13.5 | - | dB |
| Transducer gain $I_C = 40\text{ mA}, V_{CE} = 5\text{ V}, f = 2\text{ GHz}$ $Z_S = Z_L = 50\text{ }\Omega$ | $ S_{21e} ^2$ | 8 | 9 | - | dB |
| Output Power $I_C = 50\text{ mA}, V_{CE} = 5\text{ V}, f = 2\text{GHz},$ $P_{IN}=10\text{dBm}, Z_S = Z_L = 50\text{ }\Omega$ | P_{OUT} | 16.5 | 17.5 | - | dBm |

Notes.:

$$1.) \quad G_{ma} = \left| \frac{S_{21}}{S_{12}} \right| (k - \sqrt{k^2 - 1}), \quad G_{ms} = \left| \frac{S_{21}}{S_{12}} \right|$$

Micro-X1 Package



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