
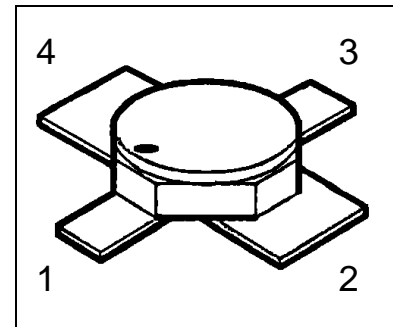


**HiRel NPN Silicon Germanium RF Transistor**

- **HiRel Discrete and Microwave Semiconductor**
- For high power amplifiers
- Ideal for low phase noise oscillators
- Maximum available gain:  $G_{ma} = 19$  dB at 1.8 GHz  
Noise figure  $F = 0.9$  dB at 1.8 GHz
- Hermetically sealed microwave package
-  **ESA Space Qualified**  
ESCC Detail Spec. No.: 5611/010



**ESD:** Electrostatic discharge sensitive device, observe handling precautions!

| Type       | Marking | Pin Configuration |   |   |   | Package |
|------------|---------|-------------------|---|---|---|---------|
|            |         | 1                 | 2 | 3 | 4 |         |
| BFY650B-11 | -       | C                 | E | B | E | Micro-X |

**Maximum Ratings**

| Parameter  | Symbol    | Values     | Unit   |
|--|-----------|------------|--------|
| Collector-emitter voltage<br>$T_a > 0$ °C<br>$T_a \leq 0$ °C | $V_{CEO}$ | 4.0<br>3.7 | V<br>V |
| Collector-base voltage                                       | $V_{CBO}$ | 13         | V      |
| Emitter-base voltage   | $V_{EBO}$ | 1.2        | V      |
| Collector current <sup>1)</sup>                              | $I_C$     | 150        | mA     |
| Base current   | $I_B$     | 10         | mA     |
| Junction temperature   | $T_j$     | 175        | °C     |
| Operating temperature range                                  | $T_{op}$  | -65...+175 | °C     |
| Storage temperature range                                    | $T_{stg}$ | -65...+175 | °C     |

**Thermal Resistance**

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

**Notes.:**

1) For  $T_S \leq 85$ °C. For  $T_S > 85$  °C derating is required.

2)  $T_S$  is measured on the emitter lead at the soldering point to the pcb.

**Electrical Characteristics**

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

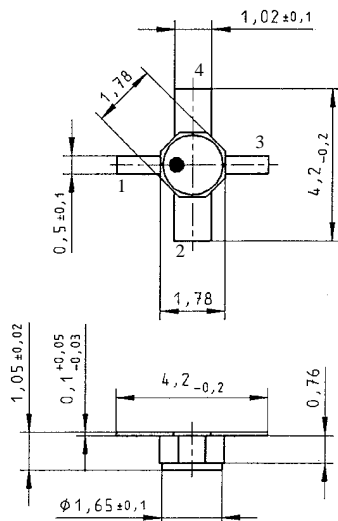
| Parameter   | Symbol        | Values |             |      | Unit          |
|---|---------------|--------|-------------|------|---------------|
|   |               | min.   | typ.        | max. |               |
| <b>DC Characteristics</b>   |               |        |             |      |               |
| Collector-base cutoff current<br>$V_{CB} = 5\text{ V}, I_E = 0$   | $I_{CBO}$     | -      | -           | 10   | $\mu\text{A}$ |
| Collector-emitter cutoff current <sup>1)</sup><br>$V_{CE} = 4.0\text{ V}, I_B = 0.1\ \mu\text{A}$   | $I_{CEX}$     | -      | -           | 200  | $\mu\text{A}$ |
| Emitter-base cutoff current<br>$V_{EB} = 1.2\text{ V}, I_C = 0$   | $I_{EBO}$     | -      | -           | 10   | $\mu\text{A}$ |
| DC current gain<br>$I_C = 80\text{ mA}, V_{CE} = 3\text{ V}$  | $h_{FE}$      | 110    | 180         | 270  | -             |
| <b>AC Characteristics</b>   |               |        |             |      |               |
| Collector-base capacitance<br>$V_{CB} = 2\text{ V}, V_{BE} = v_{be} = 0, f = 1\text{ MHz}$  | $C_{CB}$      | -      | 0.26        | -    | pF            |
| Collector-emitter capacitance<br>$V_{CE} = 2\text{ V}, V_{BE} = v_{be} = 0, f = 1\text{ MHz}$   | $C_{CE}$      | -      | 0.55        | -    | pF            |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}, V_{CB} = v_{cb} = 0, f = 1\text{ MHz}$  | $C_{EB}$      | -      | 1.4         | -    | pF            |
| Noise Figure ( $Z_S = Z_{\text{sopt}}$ )<br>$I_C = 10\text{ mA}, V_{CE} = 3\text{ V}, f = 1.8\text{ GHz}$<br>$I_C = 10\text{ mA}, V_{CE} = 3\text{ V}, f = 6.0\text{ GHz}$          | F             | -      | 0.9<br>1.4  | -    | dB            |
| Insertion power gain ( $Z_S = Z_L = 50\ \Omega$ )<br>$I_C = 80\text{ mA}, V_{CE} = 3\text{ V}, f = 1.8\text{ GHz}$<br>$I_C = 80\text{ mA}, V_{CE} = 3\text{ V}, f = 6.0\text{ GHz}$ | $ S_{21e} ^2$ | -      | 16.5<br>6.7 | -    | dB            |
| Power gain ( $Z_S = Z_{\text{Sopt}}, Z_L = Z_{\text{Lopt}}$ )<br>$I_C = 80\text{ mA}, V_{CE} = 3\text{ V}, f = 1.8\text{ GHz}$  | $G_{ma}^{2)}$ | -      | 19.2        | -    | dB            |
| Power gain ( $Z_S = Z_{\text{Sopt}}, Z_L = Z_{\text{Lopt}}$ )<br>$I_C = 80\text{ mA}, V_{CE} = 3\text{ V}, f = 6.0\text{ GHz}$  | $G_{ma}^{2)}$ | -      | 9.3         | -    | dB            |

**Notes.:**

 1) This Test assures  $V(\text{BR})_{CE0} > 4.0\text{ V}$ 

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

## Micro-X Package



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