
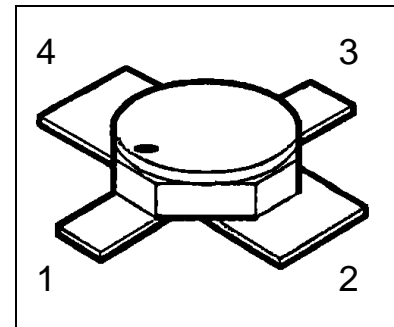


## HiRel NPN Silicon Germanium RF Transistor

- **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 $T_a > 0^\circ\text{C}$ $T_a \leq 0^\circ\text{C}$	$V_{CEO}$	4.0 3.7	V 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	$^\circ\text{C}$
Operating temperature range	$T_{op}$	-65...+175	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-65...+175	$^\circ\text{C}$

### Thermal Resistance

Junction-soldering point <sup>2)</sup>	$R_{th JS}$	150	K/W
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### Notes.:

1) For  $T_S \leq 85^\circ\text{C}$ . For  $T_S > 85^\circ\text{C}$  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.	

### DC Characteristics

Collector-base cutoff current $V_{CB} = 5\text{ V}, I_E = 0$	$I_{CBO}$	-	-	10	$\mu\text{A}$
Collector-emitter cutoff current <sup>1)</sup> $V_{CE} = 4.0\text{ V}, I_B = 0.1\text{ }\mu\text{A}$	$I_{CEX}$	-	-	200	$\mu\text{A}$
Emitter-base cutoff current $V_{EB} = 1.2\text{ V}, I_C = 0$	$I_{EBO}$	-	-	10	$\mu\text{A}$
DC current gain $I_C = 80\text{ mA}, V_{CE} = 3\text{ V}$	$h_{FE}$	110	180	270	-

### AC Characteristics

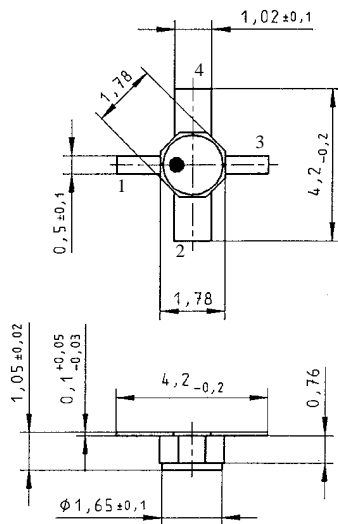
Collector-base capacitance $V_{CB} = 2\text{ V}, V_{BE} = v_{be} = 0, f = 1\text{ MHz}$	$C_{CB}$	-	0.26	-	pF
Collector-emitter capacitance $V_{CE} = 2\text{ V}, V_{BE} = v_{be} = 0, f = 1\text{ MHz}$	$C_{CE}$	-	0.55	-	pF
Emitter-base capacitance $V_{EB} = 0.5\text{ V}, V_{CB} = v_{cb} = 0, f = 1\text{ MHz}$	$C_{EB}$	-	1.4	-	pF
Noise Figure ( $Z_S = Z_{\text{sopt}}$ ) $I_C = 10\text{ mA}, V_{CE} = 3\text{ V}, f = 1.8\text{ GHz}$ $I_C = 10\text{ mA}, V_{CE} = 3\text{ V}, f = 6.0\text{ GHz}$	$F$	- -	0.9 1.4	- -	dB
Insertion power gain ( $Z_S = Z_L = 50\text{ }\Omega$ ) $I_C = 80\text{ mA}, V_{CE} = 3\text{ V}, f = 1.8\text{ GHz}$ $I_C = 80\text{ mA}, V_{CE} = 3\text{ V}, f = 6.0\text{ GHz}$	$ S_{21e} ^2$	- -	16.5 6.7	- -	dB
Power gain ( $Z_S = Z_{\text{Sopt}}, Z_L = Z_{\text{Lopt}}$ ) $I_C = 80\text{ mA}, V_{CE} = 3\text{ V}, f = 1.8\text{ GHz}$	$G_{ma}^{2)}$	-	19.2	-	dB
Power gain ( $Z_S = Z_{\text{Sopt}}, Z_L = Z_{\text{Lopt}}$ ) $I_C = 80\text{ mA}, V_{CE} = 3\text{ V}, f = 6.0\text{ GHz}$	$G_{ma}^{2)}$	-	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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