
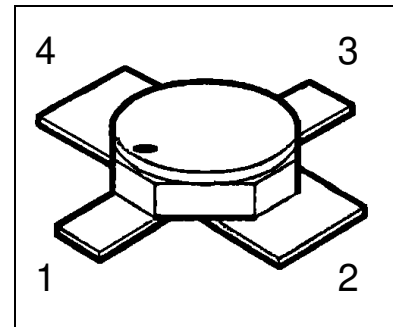


**HiRel NPN Silicon RF Transistor**

- **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 <sup>1)</sup>	mA
Total power dissipation, $T_S \leq 104^\circ\text{C}$ <sup>2), 3)</sup>	$P_{tot}$	580	mW
Junction temperature	$T_j$	200	°C
Operating temperature range	$T_{op}$	-65...+200	°C
Storage temperature range	$T_{stg}$	-65...+200	°C

**Thermal Resistance**

Junction-soldering point <sup>3)</sup>	$R_{th,JS}$	< 165	K/W
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**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	$\mu\text{A}$
Collector-emitter cutoff current $V_{CE} = 12\text{ V}, I_B = 0,5\mu\text{A}$ <sup>1.)</sup>	$I_{CEX}$	-	-	600	$\mu\text{A}$
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	$\mu\text{A}$
Emitter base cutoff current $V_{EB} = 1\text{ V}, I_C = 0$	$I_{EBO}$	-	-	0.5	$\mu\text{A}$

**Notes:**

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

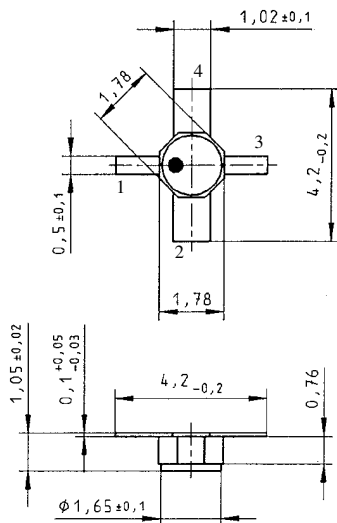
**Electrical Characteristics (continued)**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>DC Characteristics</b>					
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	-
<b>AC Characteristics</b>					
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 $I_C = 40 \text{ mA}, V_{CE} = 5 \text{ V}, f = 2 \text{ GHz}$ $Z_S = Z_L = 50 \Omega$	$ S_{21e} ^2$	8	9	-	dB
Output Power $I_C = 50 \text{ mA}, V_{CE} = 5 \text{ V}, f = 2 \text{ GHz},$ $P_{IN} = 10 \text{ dBm}, Z_S = Z_L = 50 \Omega$	$P_{OUT}$	16.5	17.5	-	dBm

**Notes.:**

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

## Micro-X1 Package



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