

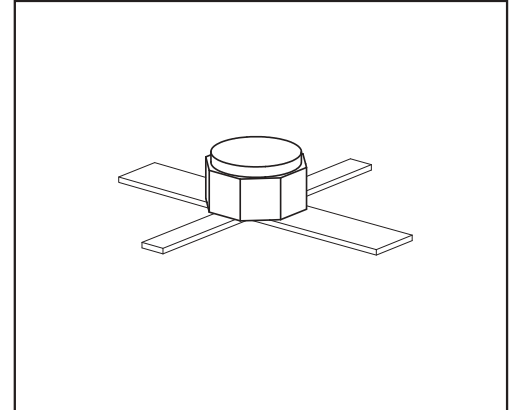
**HiRel NPN Silicon RF Transistor**
**• HiRel Discrete and Microwave Semiconductor**

- For low noise, high-gain amplifiers up to 2 GHz
- For linear broadband amplifiers
- Hermetically sealed microwave package
- $f_T = 6,5$  GHz  
 $F = 3$  dB at 2 GHz

**• eSa Space Qualification Expected 1998**

ESA/SCC Detail Spec. No.: 5611/006

Type Variant No. 07 (tbc.)


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

Type	Marking	Pin Configuration						Package
BFY196 (ql)	-	1=C	2=E	3=B	4=E	-	-	MICRO-X1

(ql) Testing level: P: Professional testing  
 H: High Rel quality  
 S: Space quality  
 ES: ESA qualified

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CEO}$	12	V
Collector-emitter voltage, $V_{BE} = 0$	$V_{CES}$	20	
Collector-base voltage	$V_{CBO}$	20	
Emitter-base voltage	$V_{EBO}$	2	
Collector current	$I_C$	100	mA
Base current	$I_B$	12 <sup>1)</sup>	
Total power dissipation <sup>2)</sup> $T_S \leq 105^\circ\text{C}$ <sup>2)3)</sup>	$P_{tot}$	700	mW
Junction temperature	$T_j$	200	$^\circ\text{C}$
Operating temperature range	$T_{op}$	-65 ... 200	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-65 ... 200	$^\circ\text{C}$

<sup>1</sup>The maximum permissible base current for  $V_{FBE}$  measurements is 50mA (spotmeasurement duration < 1s)

<sup>2</sup>At  $T_S = 105^\circ\text{C}$ . For  $T_S > 105^\circ\text{C}$  derating is required

<sup>3</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	< 135	K/W

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**DC Characteristics**

Base-emitter forward voltage $I_E = 50 \text{ mA}, I_C = 0$	$V_{FBE}$	-	-	1	V
Collector-emitter cutoff current $V_{CE} = 12 \text{ V}, I_B = 1 \mu\text{A}$ <sup>2)</sup>	$I_{CEX}$	-	-	1000	$\mu\text{A}$
Collector -base cutoff current $V_{CB} = 20 \text{ V}, I_E = 0$ $V_{CB} = 10 \text{ V}, I_E = 0$	$I_{CBO}$	-	-	100 0.05	$\mu\text{A}$
Emitter-base cutoff current $V_{EB} = 2 \text{ V}, I_C = 0$ $V_{EB} = 1 \text{ V}, I_C = 0$	$I_{EBO}$	-	-	25 0.5	
DC current gain $I_C = 50 \text{ mA}, V_{CE} = 8 \text{ V}$	$h_{FE}$	50	100	175	-

<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

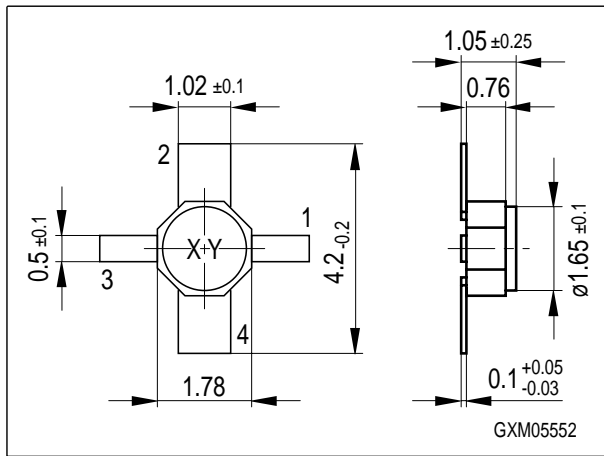
<sup>2)</sup>This test assures  $V_{(BR)CE0} > 12\text{V}$

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b> (verified by random sampling)					
Transition frequency $I_C = 70\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 500\text{ MHz}$	$f_T$	6	6.5	-	GHz
Collector-base capacitance $V_{CB} = 10\text{ V}$ , $V_{BE} = v_{be} = 0$ , $f = 1\text{ MHz}$	$C_{cb}$	-	1	1.3	pF
Collector emitter capacitance $V_{CE} = 10\text{ V}$ , $V_{BE} = v_{be} = 0$ , $f = 1\text{ MHz}$	$C_{ce}$	-	0.44	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$ , $V_{CB} = v_{cb} = 0$ , $f = 1\text{ MHz}$	$C_{eb}$	-	3.6	4.3	
Noise figure $I_C = 20\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $Z_S = Z_{Sopt}$ , $f = 2\text{ GHz}$	$F$	-	3	3.5	dB
Power gain, maximum available $I_C = 70\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $Z_S = Z_{Sopt}$ , $Z_L = Z_{Lopt}$ , $f = 2\text{ GHz}$	$G_{ma}^{1)}$	10	11	-	
Transducer gain $I_C = 70\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $Z_S = Z_L = 50\ \Omega$ , $f = 2\text{ GHz}$	$ S_{21e} ^2$	4	5	-	dB
Output power $I_C = 80\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $P_{IN} = 15\text{ dBm}$ , $Z_S = Z_L = 50\ \Omega$ , $f = 2\text{ GHz}$	$P_{OUT}$	18.5	19.5	-	dBm

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

### Micro-X1 Package



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