

HiRel NPN Silicon RF Transistor

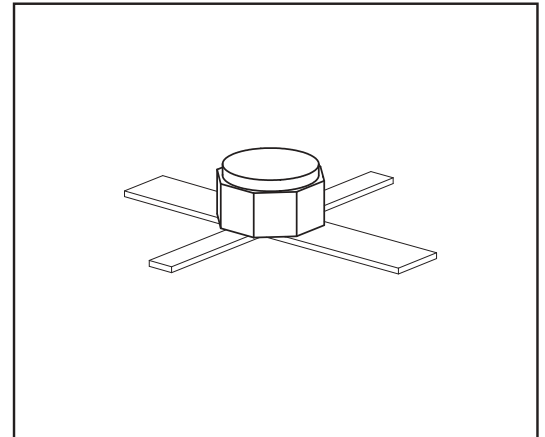
- **HiRel Discrete and Microwave Semiconductor**

- For low noise, high-gain amplifiers up to 2 GHz
- For linear broadband amplifiers
- Hermetically sealed microwave package
- $f_T = 8$ GHz
- $F = 2.3$ dB at 2 GHz

- **ESA Space Qualified**

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

Type Variant No. 06



ESD: Electrostatic discharge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration						Package
BFY193 (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	80	mA
Base current	I_B	10 ¹⁾	
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	T_{stg}	-65 ... 200	$^\circ\text{C}$

¹The maximum permissible base current for V_{FBE} measurements is 30mA (spotmeasurement duration < 1s)

²At $T_S = 104^\circ\text{C}$. 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

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ¹⁾	R_{thJS}	< 165	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 $I_E = 30 \text{ mA}, I_C = 0$	V_{FBE}	-	-	1	V
Collector-emitter cutoff current $V_{CE} = 12 \text{ V}, I_B = 0,5 \mu\text{A}^2)$	I_{CEX}	-	-	600	μA
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	μA
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 $I_C = 30 \text{ mA}, V_{CE} = 8 \text{ V}$	h_{FE}	50	100	175	-

¹⁾ T_S is measured on the collector lead at the soldering point to the pcb

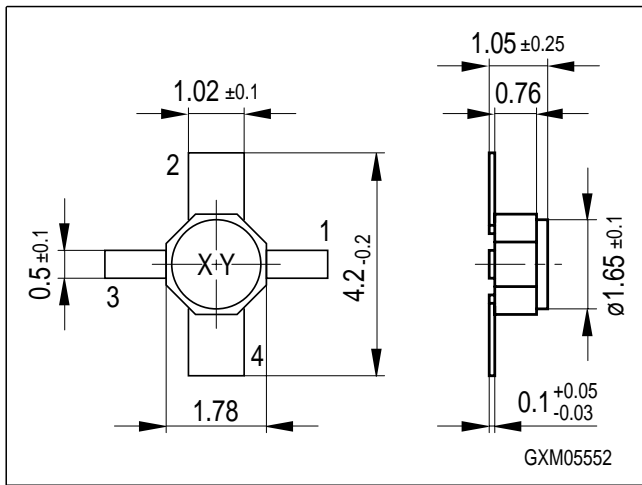
²⁾ This test assures $V_{(BR)CE0} > 12\text{V}$

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
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	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $V_{CB} = v_{cb} = 0$, $f = 1\text{ MHz}$	C_{eb}	-	1.9	2.4	
Noise figure $I_C = 15\text{ mA}$, $V_{CE} = 5\text{ V}$, $Z_S = Z_{Sopt}$, $f = 2\text{ GHz}$	F	-	2.3	2.9	dB
Power gain ¹⁾ $I_C = 40\text{ mA}$, $V_{CE} = 5\text{ V}$, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, $f = 2\text{ GHz}$	G_{ma}	12.5	13.5	-	
Transducer gain $I_C = 40\text{ mA}$, $V_{CE} = 5\text{ V}$, $Z_S = Z_L = 50\ \Omega$, $f = 2\text{ GHz}$	$ S_{21e} ^2$	8	9	-	dB
Output power $I_C = 50\text{ mA}$, $V_{CE} = 5\text{ V}$, $P_{IN} = 10\text{ dBm}$, $Z_S = Z_L = 50\ \Omega$, $f = 2\text{ GHz}$	P_{OUT}	16.5	17.5	-	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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