## HiReI 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
- $\mathrm{f}_{\mathrm{T}}=6,5 \mathrm{GHz}$
$\mathrm{F}=3 \mathrm{~dB}$ at 2 GHz
- ReSa Space Qualified

ESA/SCC Detail Spec. No.: 5611/006
Type Variant No. 07

ESD: Electrostatic discharge sensitive device, observe handling precautions!

| Type | Marking | Ordering Code | Pin Configuration |  |  | Package |  |
| :--- | :---: | :--- | :--- | :--- | :--- | :--- | :--- |
| BFY196 (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)

BFY196

| Maximum Ratings |  |  |  |
| :---: | :---: | :---: | :---: |
| Parameter | Symbol | Values | Unit |
| Collector-emitter voltage | $\mathrm{V}_{\text {CEO }}$ | 12 | V |
| Collector-emitter voltage, $\mathrm{V}_{\mathrm{BE}}=0$ | $V_{\text {CES }}$ | 20 | V |
| Collector-base voltage | $V_{\text {CBO }}$ | 20 | V |
| Emitter-base voltage | $V_{\text {EBO }}$ | 2 | V |
| Collector current | $\mathrm{I}_{\mathrm{C}}$ | 100 | mA |
| Base current | $\mathrm{I}_{\mathrm{B}}$ | $12{ }^{1)}$ | mA |
| Total power dissipation, $\mathrm{T}_{\mathrm{S}} \leq 105^{\circ} \mathrm{C}^{2), 3)^{\prime}}$ | $\mathrm{P}_{\text {tot }}$ | 700 | mW |
| Junction temperature | $\mathrm{T}_{\mathrm{j}}$ | 200 | ${ }^{\circ} \mathrm{C}$ |
| Operating temperature range | $\mathrm{T}_{\text {op }}$ | -65...+200 | ${ }^{\circ} \mathrm{C}$ |
| Storage temperature range | $\mathrm{T}_{\text {stg }}$ | -65...+200 | ${ }^{\circ} \mathrm{C}$ |
| Thermal Resistance |  |  |  |
| Junction-soldering point ${ }^{\text {3.) }}$ | $\mathrm{R}_{\text {th J }}$ | < 135 | K/W |

## Notes.:

1) The maximum permissible base current for $\mathrm{V}_{\text {FBE }}$ measurements is 50 mA (spotmeasurement duration $<1$ s)
2) At $\mathrm{T}_{\mathrm{S}}=+105^{\circ} \mathrm{C}$. For $\mathrm{T}_{\mathrm{S}}>+105^{\circ} \mathrm{C}$ derating is required.
3) $\mathrm{T}_{\mathrm{s}}$ is measured on the collector lead at the soldering point to the pcb .

## Electrical Characteristics

at $T_{A}=25^{\circ} \mathrm{C}$; unless otherwise specified

| Parameter | Symbol | Values |  |  | Unit |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  | min. | typ. | max. |  |

## DC Characteristics

| Collector-base cutoff current $V_{C B}=20 \mathrm{~V}, \mathrm{I}_{\mathrm{E}}=0$ | $\mathrm{I}_{\text {CBO }}$ | - | - | 100 | $\mu \mathrm{A}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Collector-emitter cutoff current $\mathrm{V}_{\mathrm{CE}}=12 \mathrm{~V}, \mathrm{I}_{\mathrm{B}}=1 \mu \mathrm{~A} \quad \text { 1.) }$ | $\mathrm{I}_{\text {cex }}$ | - | - | 1000 | $\mu \mathrm{A}$ |
| Collector-base cutoff current $V_{C B}=10 \mathrm{~V}, I_{E}=0$ | $\mathrm{I}_{\text {CBO }}$ | - | - | 50 | nA |
| Emitter base cuttoff current $\mathrm{V}_{\mathrm{EB}}=2 \mathrm{~V}, \mathrm{I}_{\mathrm{C}}=0$ | $\mathrm{I}_{\text {Ebo }}$ | - | - | 25 | $\mu \mathrm{A}$ |
| Emitter base cuttoff current $\mathrm{V}_{\mathrm{EB}}=1 \mathrm{~V}, \mathrm{I}_{\mathrm{C}}=0$ | $\mathrm{I}_{\text {EbO }}$ | - | - | 0.5 | $\mu \mathrm{A}$ |

## Notes:

1.) This Test assures $V(B R) C E 0>12 V$

## BFY196

## Electrical Characteristics (continued)

| Parameter | Symbol | Values |  |  | Unit |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  | min. | typ. | max. |  |
| DC Characteristics | $V_{\text {FBE }}$ | - | - | 1 | V |
| Base-Emitter forward voltage <br> $\mathrm{I}_{\mathrm{E}}=50 \mathrm{~mA}, \mathrm{I}_{\mathrm{C}}=0$ |  |  |  |  |  |
| DC current gain <br> $\mathrm{I}_{\mathrm{C}}=50 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=8 \mathrm{~V}$ | $\mathrm{~h}_{\mathrm{FE}}$ | 50 | 100 | 175 | - |

AC Characteristics

| Transition frequency $\mathrm{I}_{\mathrm{C}}=70 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=5 \mathrm{~V}, \mathrm{f}=500 \mathrm{MHz}$ | $\mathrm{f}_{T}$ | 6 | 6.5 | - | GHz |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Collector-base capacitance $\mathrm{V}_{\mathrm{CB}}=10 \mathrm{~V}, \mathrm{~V}_{\mathrm{BE}}=\mathrm{vbe}=0, \mathrm{f}=1 \mathrm{MHz}$ | $\mathrm{C}_{C B}$ | - | 1 | 1.3 | pF |
| Collector-emitter capacitance $\mathrm{V}_{\mathrm{CE}}=10 \mathrm{~V}, \mathrm{~V}_{\mathrm{BE}}=\mathrm{vbe}=0, \mathrm{f}=1 \mathrm{MHz}$ | $\mathrm{C}_{\text {CE }}$ | - | 0.44 | - | pF |
| Emitter-base capacitance $\mathrm{V}_{\mathrm{EB}}=0.5 \mathrm{~V}, \mathrm{~V}_{\mathrm{CB}}=\mathrm{vcb}=0, \mathrm{f}=1 \mathrm{MHz}$ | $\mathrm{C}_{\text {EB }}$ | - | 3,6 | 4,3 | pF |
| Noise Figure $\begin{aligned} & \mathrm{I}_{\mathrm{C}}=20 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=5 \mathrm{~V}, \mathrm{f}=2 \mathrm{GHz}, \\ & \mathrm{Z}_{\mathrm{S}}=\mathrm{Z}_{\text {Sopt }} \end{aligned}$ | F | - | 3 | 3.5 | dB |
| Power gain $\begin{aligned} & \mathrm{I}_{\mathrm{C}}=70 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=5 \mathrm{~V}, \mathrm{f}=2 \mathrm{GHz} \\ & \mathrm{Z}_{\mathrm{S}}=\mathrm{Z}_{\mathrm{Sopt}}, \mathrm{Z}_{\mathrm{L}}=\mathrm{Z}_{\text {Lopt }} \end{aligned}$ | Gma ${ }^{\text {1.) }}$ | 10 | 11 | - | dB |
| Transducer gain $\begin{aligned} & \mathrm{I}_{\mathrm{C}}=70 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=5 \mathrm{~V}, \mathrm{f}=2 \mathrm{GHz} \\ & \mathrm{Z}_{\mathrm{S}}=\mathrm{Z}_{\mathrm{L}}=50 \Omega \end{aligned}$ | $\left\|S_{21 e}\right\|^{2}$ | 4 | 5 | - | dB |
| Output Power $\begin{aligned} & \mathrm{I}_{\mathrm{C}}=80 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=5 \mathrm{~V}, \mathrm{f}=2 \mathrm{GHz}, \\ & \mathrm{P}_{\mathrm{IN}}=15 \mathrm{dBm}, \mathrm{Z}_{\mathrm{S}}=\mathrm{Z}_{\mathrm{L}}=50 \Omega \end{aligned}$ | Pout | 18.5 | 19.5 | - | dBm |

## Notes.:

1) $\quad G_{m a}=\left|\frac{S 21}{S 12}\right|\left(k-\sqrt{k^{2}-1}\right), \quad G_{m s}=\left|\frac{S 21}{S 12}\right|$

## Micro-X1 Package



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