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NPN 5 GHz wideband transistor

FEATURES
- Low current consumption (100 µA to 1 mA)
- Low noise figure
- Gold metallization ensures excellent reliability.

APPLICATIONS
- RF low power amplifiers, such as pocket telephones, paging systems, with signal frequencies up to 2 GHz.

DESCRIPTION
NPN silicon wideband transistor in a four-lead dual emitter SOT143B plastic package (cross emitter).

PINNING

<table>
<thead>
<tr>
<th>PIN</th>
<th>DESCRIPTION</th>
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<td>1</td>
<td>collector</td>
</tr>
<tr>
<td>2</td>
<td>emitter</td>
</tr>
<tr>
<td>3</td>
<td>base</td>
</tr>
<tr>
<td>4</td>
<td>emitter</td>
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QUICK REFERENCE DATA

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<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
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<tr>
<td>V_{CBO}</td>
<td>collector-base voltage</td>
<td></td>
<td>–</td>
<td>–</td>
<td>8</td>
<td>V</td>
</tr>
<tr>
<td>V_{CEO}</td>
<td>collector-emitter voltage</td>
<td></td>
<td>–</td>
<td>–</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>I_C</td>
<td>collector current (DC)</td>
<td></td>
<td>–</td>
<td>–</td>
<td>6.5</td>
<td>mA</td>
</tr>
<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td>T_s ≤ 165 °C</td>
<td>–</td>
<td>–</td>
<td>32</td>
<td>mW</td>
</tr>
<tr>
<td>h_{FE}</td>
<td>DC current gain</td>
<td>I_C = 0.5 mA; V_{CE} = 1 V</td>
<td>50</td>
<td>80</td>
<td>200</td>
<td></td>
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<tr>
<td>f_T</td>
<td>transition frequency</td>
<td>I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C</td>
<td>3.5</td>
<td>5</td>
<td>–</td>
<td>GHz</td>
</tr>
<tr>
<td>G_{UM}</td>
<td>maximum unilateral power gain</td>
<td>I_C = 0.5 mA; V_{CE} = 1 V; f = 1 GHz; T_{amb} = 25 °C</td>
<td>–</td>
<td>18</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>F</td>
<td>noise figure</td>
<td>I_C = 0.5 mA; V_{CE} = 1 V; f = 1 GHz; \Gamma = \Gamma_{opt}; T_{amb} = 25 °C</td>
<td>–</td>
<td>1.8</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_C = 1 mA; V_{CE} = 1 V; f = 1 GHz; \Gamma = \Gamma_{opt}; T_{amb} = 25 °C</td>
<td>–</td>
<td>2</td>
<td>–</td>
<td>dB</td>
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NPN 5 GHz wideband transistor

BFG25A/X

LIMITING VALUES
In accordance with the Absolute Maximum Rating System (IEC 134).

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<td>V_{CBO}</td>
<td>collector-base voltage</td>
<td>open emitter</td>
<td>–</td>
<td>8</td>
<td>V</td>
</tr>
<tr>
<td>V_{CEO}</td>
<td>collector-emitter voltage</td>
<td>open base</td>
<td>–</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>V_{EBO}</td>
<td>emitter-base voltage</td>
<td>open collector</td>
<td>–</td>
<td>2</td>
<td>V</td>
</tr>
<tr>
<td>I_{C}</td>
<td>collector current (DC)</td>
<td></td>
<td>–</td>
<td>6.5</td>
<td>mA</td>
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<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td>T_s ≤ 165 °C; note 1</td>
<td>–</td>
<td>32</td>
<td>mW</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td>–65</td>
<td>150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>T_{j}</td>
<td>junction temperature</td>
<td>–</td>
<td>175</td>
<td>°C</td>
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Note
1. T_s is the temperature at the soldering point of the collector pin.

THERMAL CHARACTERISTICS

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<th>VALUE</th>
<th>UNIT</th>
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<td>R_{th j-s}</td>
<td>thermal resistance from junction to soldering point</td>
<td>note 1</td>
<td>320</td>
<td>K/W</td>
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Note
1. T_s is the temperature at the soldering point of the collector pin.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

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<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
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<tbody>
<tr>
<td>I_{CBO}</td>
<td>collector leakage current</td>
<td>I_E = 0; V_{CB} = 5 V</td>
<td>–</td>
<td>–</td>
<td>50</td>
<td>µA</td>
</tr>
<tr>
<td>h_{FE}</td>
<td>DC current gain</td>
<td>I_C = 0.5 mA; V_{CE} = 1 V</td>
<td>50</td>
<td>80</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>C_{re}</td>
<td>feedback capacitance</td>
<td>I_C = I_E = 0; V_{CB} = 1 V; f = 1 MHz</td>
<td>–</td>
<td>0.21</td>
<td>0.3</td>
<td>pF</td>
</tr>
<tr>
<td>f_T</td>
<td>transition frequency</td>
<td>I_C = 1 mA; V_{CE} = 1 V; T_{amb} = 25 °C; f = 500 MHz</td>
<td>3.5</td>
<td>5</td>
<td>–</td>
<td>GHz</td>
</tr>
<tr>
<td>G_{UM}</td>
<td>maximum unilateral power gain (note 1)</td>
<td>I_C = 0.5 mA; V_{CE} = 1 V; f = 1 GHz; T_{amb} = 25 °C</td>
<td>–</td>
<td>18</td>
<td>–</td>
<td>dB</td>
</tr>
</tbody>
</table>
| F      | noise figure                   | I_C = 0.5 mA; V_{CE} = 1 V; f = 1 GHz; 
Γ = Γ_{opt}; T_{amb} = 25 °C | – | 1.8 | – | dB   |
|        |                                | I_C = 1 mA; V_{CE} = 1 V; f = 1 GHz; 
Γ = Γ_{opt}; T_{amb} = 25 °C | – | 2 | – | dB   |

Note
1. G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and 
\[ G_{UM} = 10 \log \left( \frac{\left| S_{21} \right|^2}{1 - \left| S_{11} \right|^2} \frac{1 - \left| S_{22} \right|^2}{1 - \left| S_{22} \right|^2} \right) dB \]
NPN 5 GHz wideband transistor

Fig. 2 Power derating curve.

Fig. 3 DC current gain as a function of collector current; typical values.

Fig. 4 Feedback capacitance as a function of collector-base voltage; typical values.

Fig. 5 Transition frequency as a function of collector current; typical values.
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**Fig. 6** Gain as a function of collector current; typical values.

\[ V_{CE} = 1 \text{ V}; f = 500 \text{ MHz}. \]

GUM = maximum unilateral power gain;
MSG = maximum stable gain.

**Fig. 7** Gain as a function of collector current; typical values.

\[ V_{CE} = 1 \text{ V}; f = 1 \text{ GHz}. \]

GUM = maximum unilateral power gain;
MSG = maximum stable gain.

**Fig. 8** Gain as a function of frequency; typical values.

\[ I_C = 0.5 \text{ mA}; V_{CE} = 1 \text{ V}. \]

GUM = maximum unilateral power gain;
MSG = maximum stable gain.

**Fig. 9** Gain as a function of frequency; typical values.

\[ I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}. \]

GUM = maximum unilateral power gain;
MSG = maximum stable gain.
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**Fig. 10** Minimum noise figure as a function of collector current; typical values.

**Fig. 11** Minimum noise figure as a function of frequency; typical values.

**Fig. 12** Common emitter noise figure circles; typical values.

\[ I_C = 1 \text{ mA}; \quad V_{CE} = 1 \text{ V}; \quad f = 500 \text{ MHz}; \quad Z_O = 50 \Omega; \quad \text{Maximum stable gain} = 15.6 \text{ dB}; \quad F_{\text{min}} = 1.9 \text{ dB}; \quad \Gamma_{\text{opt}} = 0.85; \quad 5^\circ; \quad R_i/50 = 2.4. \]
Fig. 13 Common emitter noise figure circles; typical values.

Fig. 14 Common emitter noise figure circles; typical values.
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**Fig. 15** Common emitter input reflection coefficient ($S_{11}$); typical values.

$IC = 1$ mA; $V_{CE} = 1$ V; $Z_o = 50$ Ω.

**Fig. 16** Common emitter forward transmission coefficient ($S_{21}$); typical values.

$IC = 1$ mA; $V_{CE} = 1$ V.
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**Fig. 17** Common emitter reverse transmission coefficient ($S_{12}$); typical values.

![Graph](image1)

$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}$.  

**Fig. 18** Common emitter output reflection coefficient ($S_{22}$); typical values.

![Graph](image2)

$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; Z_0 = 50 \Omega$. 

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PACKAGE OUTLINE

Plastic surface mounted package; 4 leads

SOT143B

DIMENSIONS (mm are the original dimensions)

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<th>Q</th>
<th>v</th>
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<td>0.9</td>
<td>0.48</td>
<td>0.38</td>
<td>0.88</td>
<td>0.15</td>
<td>3.0</td>
<td>2.8</td>
<td>1.4</td>
<td>1.9</td>
<td>1.7</td>
<td>2.5</td>
<td>0.45</td>
<td>0.55</td>
<td>0.2</td>
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OUTLINE VERSION

SOT143B

REFERENCES

IEC  JEDC  EIAJ

EUROPEAN PROJECTION

ISSUE DATE

97-02-28

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Legal information

Data sheet status

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<tr>
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<tr>
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