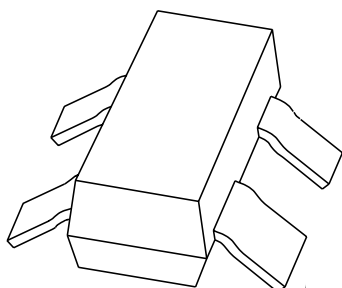


DATA SHEET



BFG92A/X NPN 5 GHz wideband transistor

Product specification
Supersedes data of 1995 Sep 12

1998 Sep 23

NPN 5 GHz wideband transistor

BFG92A/X

FEATURES

- High power gain
- Low noise figure
- Gold metallization ensures excellent reliability.

APPLICATIONS

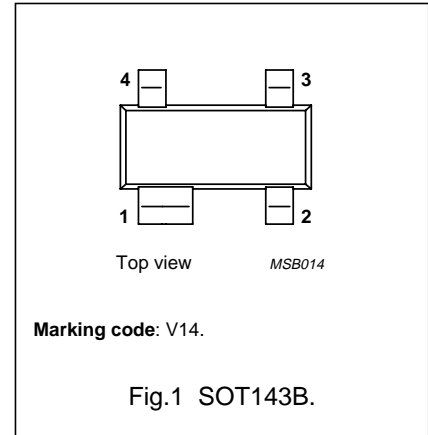
Wideband applications in the UHF and microwave range.

DESCRIPTION

Silicon NPN transistor in a 4-pin, dual-emitter SOT143B plastic package.

PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | collector |
| 2 | emitter |
| 3 | base |
| 4 | emitter |



QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------|-------------------------------|--|------|------|------|------|
| V_{CBO} | collector-base voltage | | – | – | 20 | V |
| V_{CEO} | collector-emitter voltage | | – | – | 15 | V |
| I_C | collector current (DC) | | – | – | 25 | mA |
| P_{tot} | total power dissipation | $T_s \leq 60\text{ }^\circ\text{C}$ | – | – | 400 | mW |
| C_{re} | feedback capacitance | $I_C = i_c = 0$; $V_{CB} = 10\text{ V}$; $f = 1\text{ MHz}$ | – | 0.35 | – | pF |
| f_T | transition frequency | $I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 500\text{ MHz}$ | 3.5 | 5 | – | GHz |
| G_{UM} | maximum unilateral power gain | $I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^\circ\text{C}$; $f = 1\text{ GHz}$ | – | 16 | – | dB |
| | | $I_C = 15\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^\circ\text{C}$; $f = 2\text{ GHz}$ | – | 11 | – | dB |
| F | noise figure | $\Gamma_s = \Gamma_{opt}$; $I_C = 5\text{ mA}$; $V_{CE} = 10\text{ V}$; $T_{amb} = 25\text{ }^\circ\text{C}$; $f = 1\text{ GHz}$ | – | 2 | – | dB |

NPN 5 GHz wideband transistor

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LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|------------------|---------------------------|--------------------------------|------|------|------|
| V _{CBO} | collector-base voltage | open emitter | – | 20 | V |
| V _{CEO} | collector-emitter voltage | open base | – | 15 | V |
| V _{EBO} | emitter-base voltage | open collector | – | 2 | V |
| I _C | collector current (DC) | | – | 25 | mA |
| P _{tot} | total power dissipation | T _s ≤ 60 °C; note 1 | – | 400 | mW |
| T _{stg} | storage temperature range | | –65 | 150 | °C |
| T _j | junction temperature | | – | 175 | °C |

Note

1. T_s is the temperature at the soldering point of the collector pin.

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------------|---|------------|-------|------|
| R _{th j-s} | thermal resistance from junction to soldering point | note 1 | 290 | K/W |

Note

1. T_s is the temperature at the soldering point of the collector pin.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

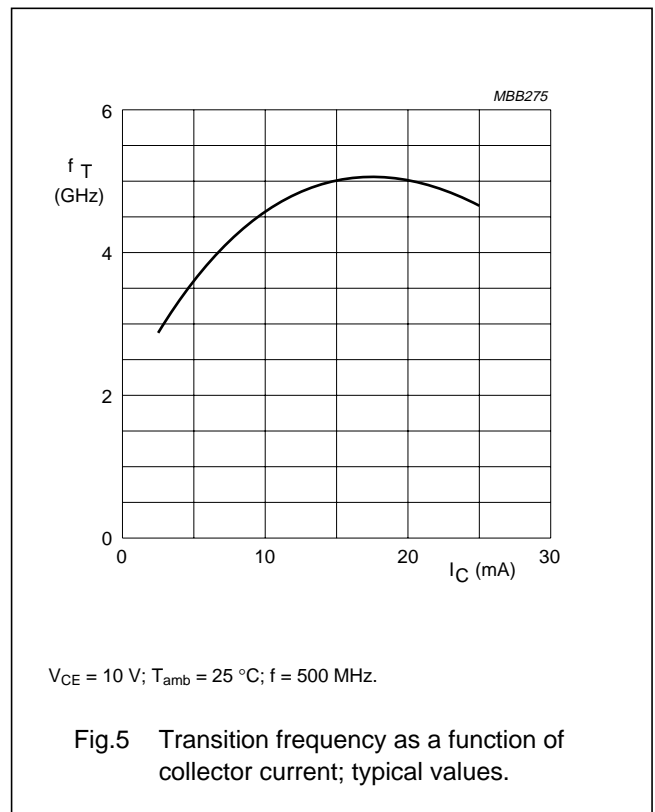
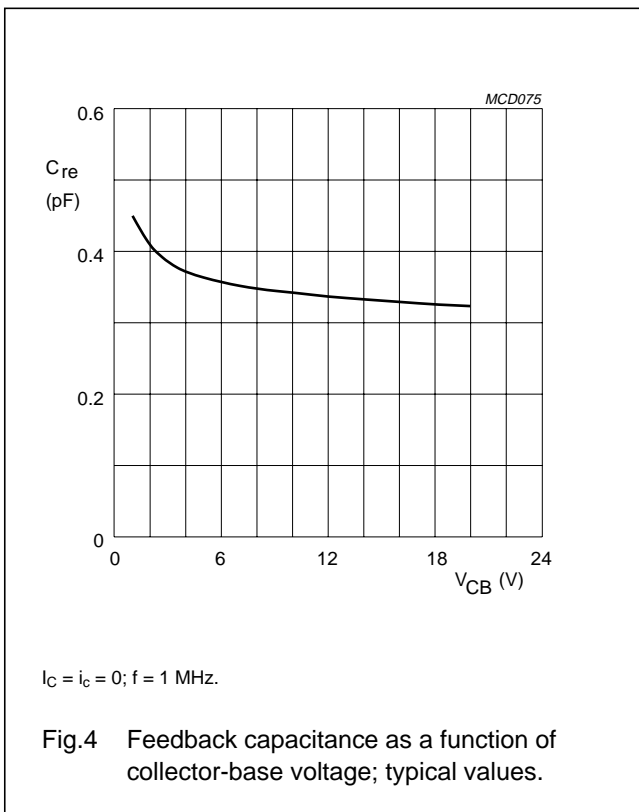
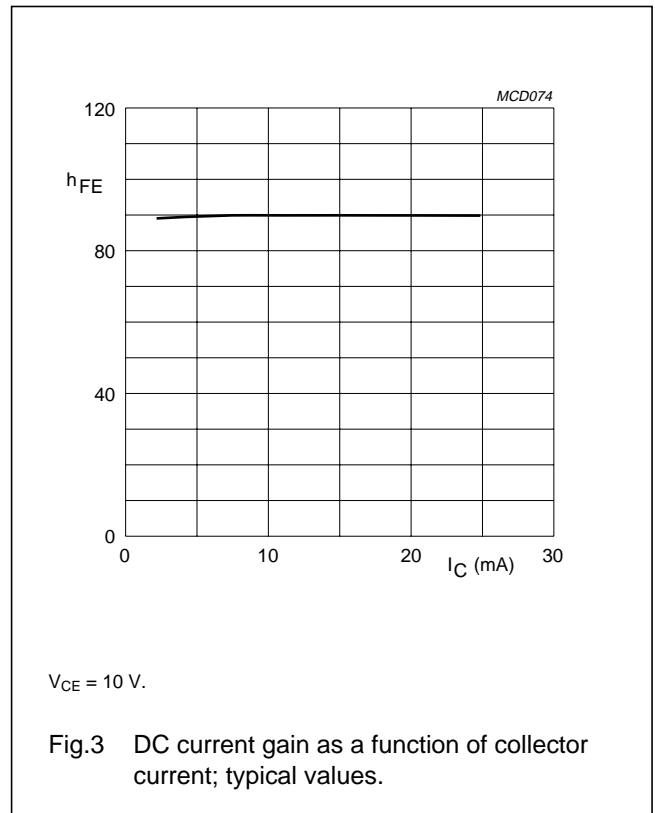
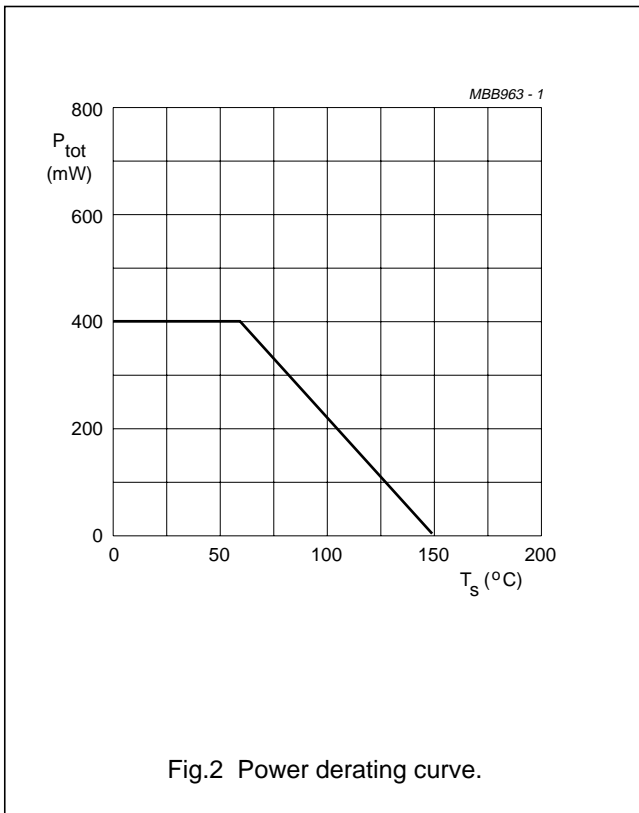
| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|------------------|---------------------------------------|---|------|------|------|------|
| I _{CBO} | collector leakage current | I _E = 0; V _{CB} = 10 V | – | – | 50 | nA |
| h _{FE} | DC current gain | I _C = 15 mA; V _{CE} = 10 V | 40 | 90 | – | |
| C _c | collector capacitance | I _E = i _e = 0; V _{CB} = 10 V; f = 1 MHz | – | 0.6 | – | pF |
| C _e | emitter capacitance | I _C = i _c = 0; V _{EB} = 10 V; f = 1 MHz | – | 0.9 | – | pF |
| C _{re} | feedback capacitance | I _C = i _c = 0; V _{CB} = 10 V; f = 1 MHz | – | 0.35 | – | pF |
| f _T | transition frequency | I _C = 15 mA; V _{CE} = 10 V; f = 500 MHz | 3.5 | 5 | – | GHz |
| G _{UM} | maximum unilateral power gain; note 1 | I _C = 15 mA; V _{CE} = 10 V; T _{amb} = 25 °C; f = 1 GHz | – | 16 | – | dB |
| | | I _C = 15 mA; V _{CE} = 10 V; T _{amb} = 25 °C; f = 2 GHz | – | 11 | – | dB |
| F | noise figure | Γ _s = Γ _{opt} ; I _C = 5 mA; V _{CE} = 10 V; T _{amb} = 25 °C; f = 1 GHz | – | 2 | – | dB |
| | | Γ _s = Γ _{opt} ; I _C = 5 mA; V _{CE} = 10 V; T _{amb} = 25 °C; f = 2 GHz | – | 3 | – | dB |

Note

1. G_{UM} is the maximum unilateral power gain, assuming S₁₂ is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$ dB.

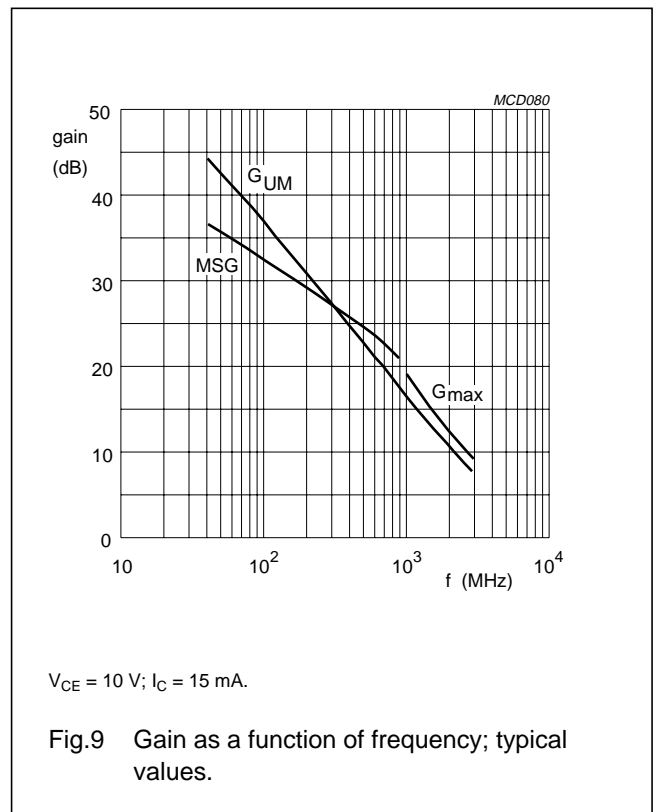
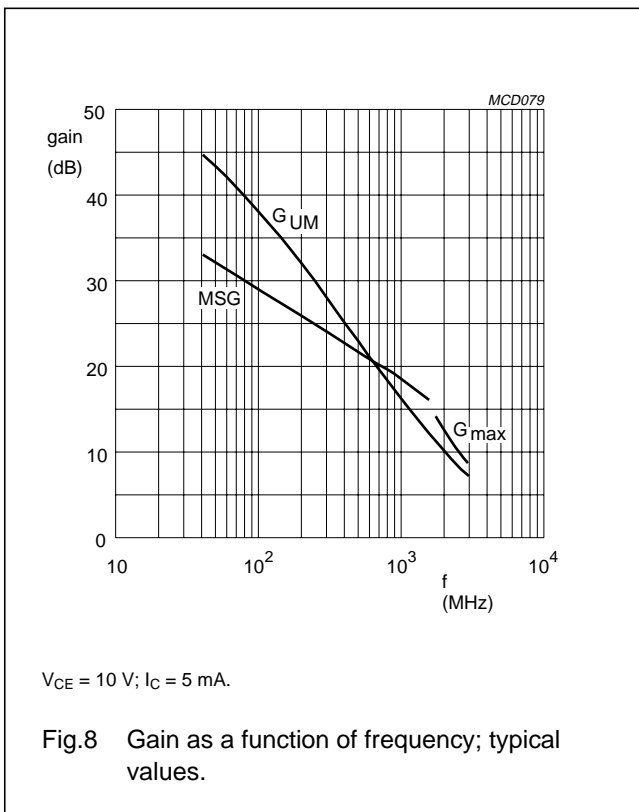
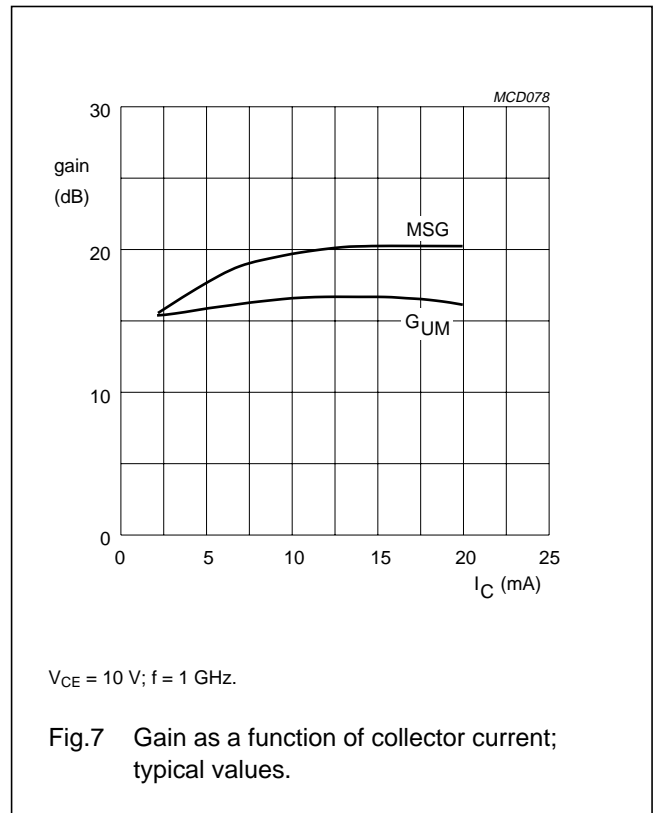
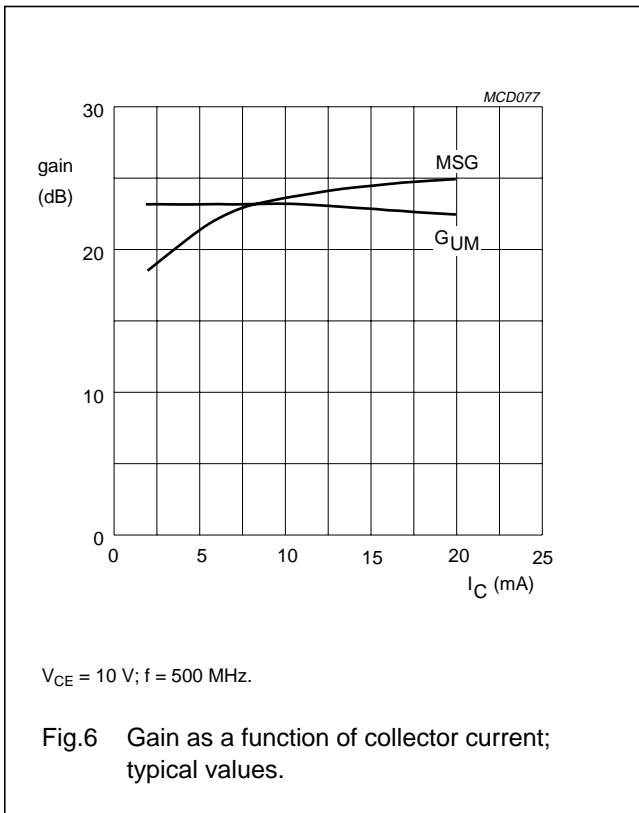
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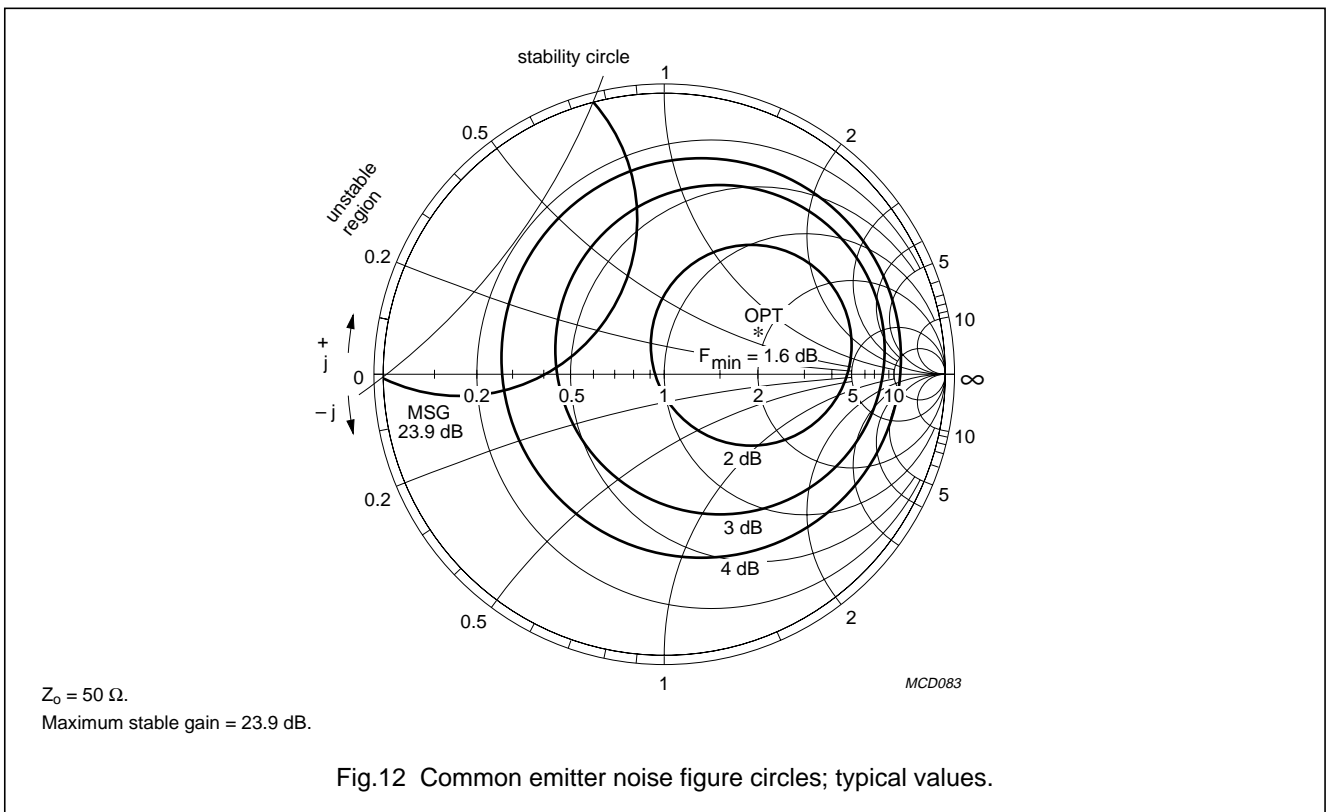
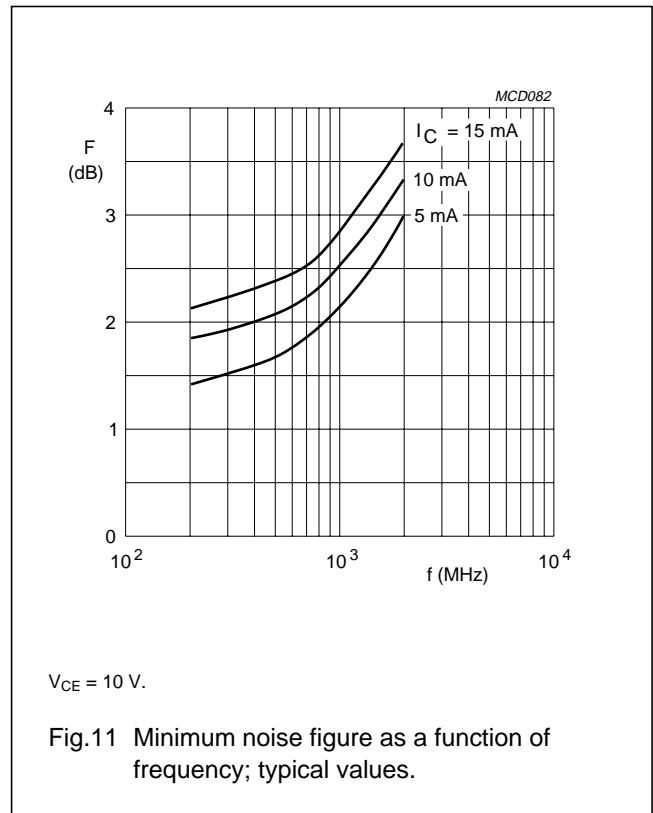
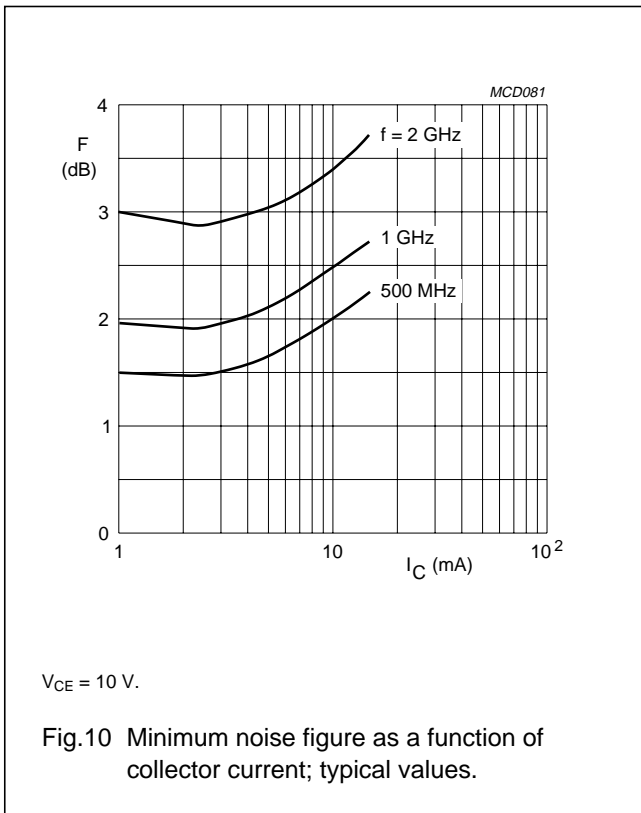
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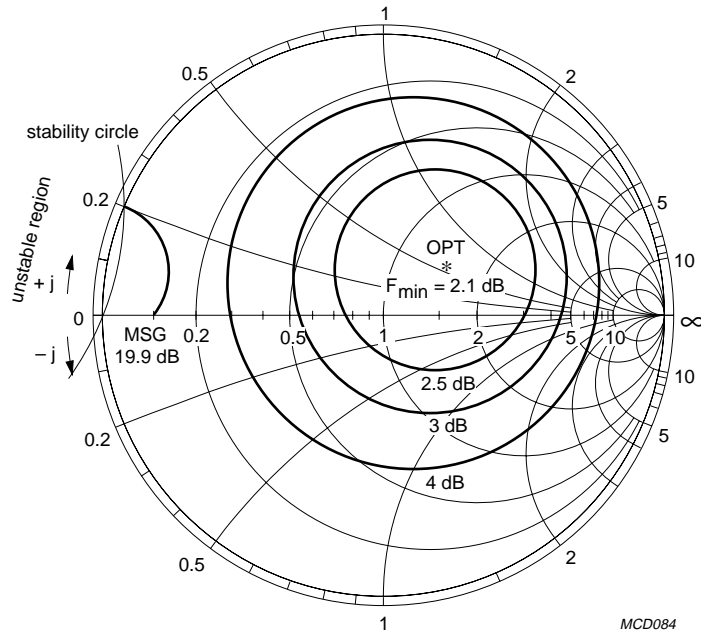
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NPN 5 GHz wideband transistor

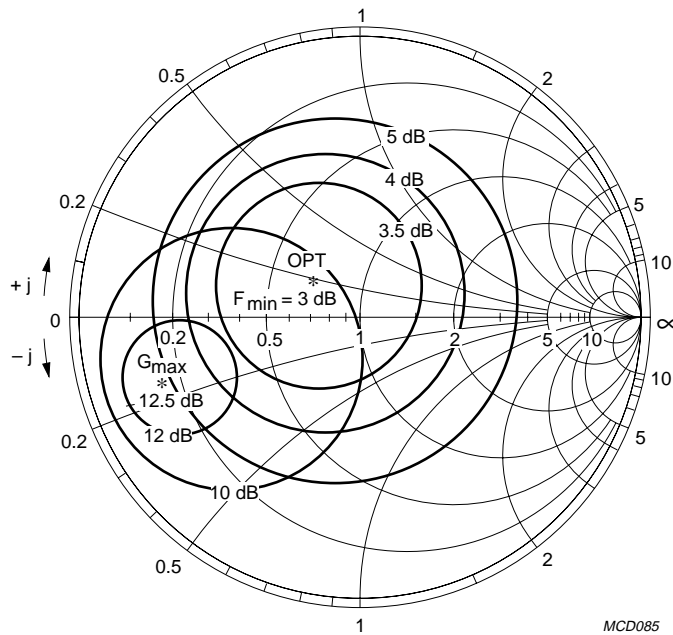
BFG92A/X



MCD084

$Z_0 = 50 \Omega$.
Maximum stable gain = 19.9 dB.

Fig.13 Common emitter noise figure circles; typical values.



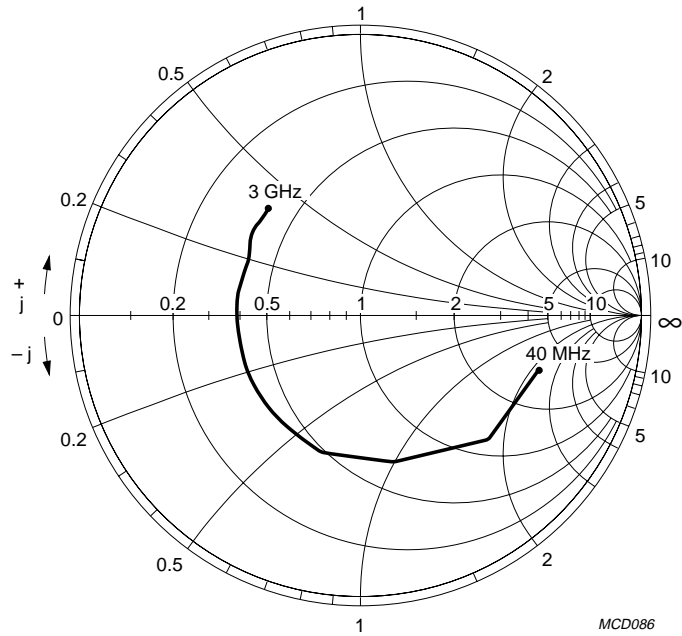
MCD085

$Z_0 = 50 \Omega$.

Fig.14 Common emitter noise figure circles; typical values.

NPN 5 GHz wideband transistor

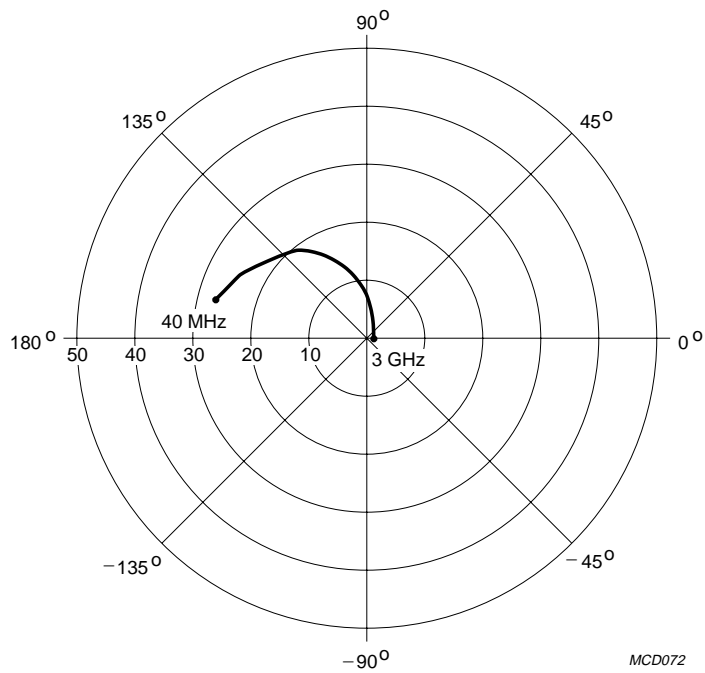
BFG92A/X



$V_{CE} = 10\text{ V}; I_C = 15\text{ mA}$.

MCD086

Fig.15 Common emitter input reflection coefficient (S_{11}); typical values.



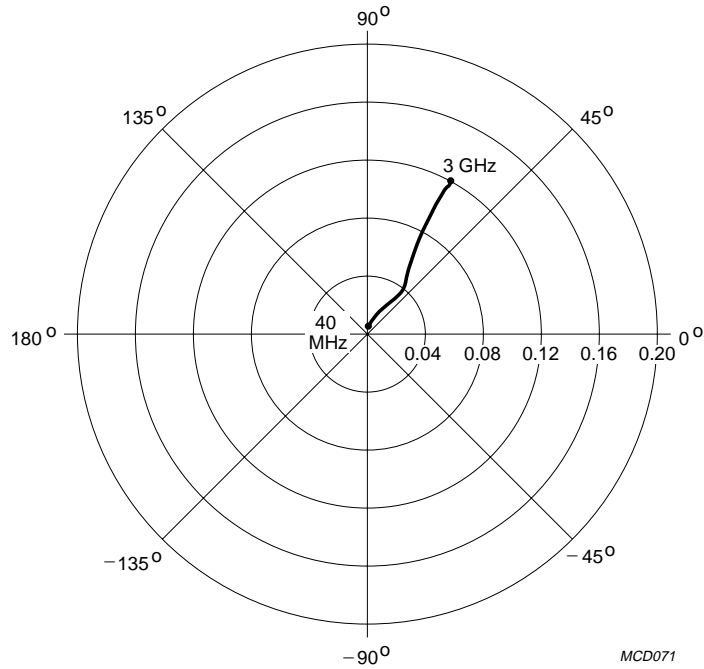
$V_{CE} = 10\text{ V}; I_C = 15\text{ mA}$.

MCD072

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

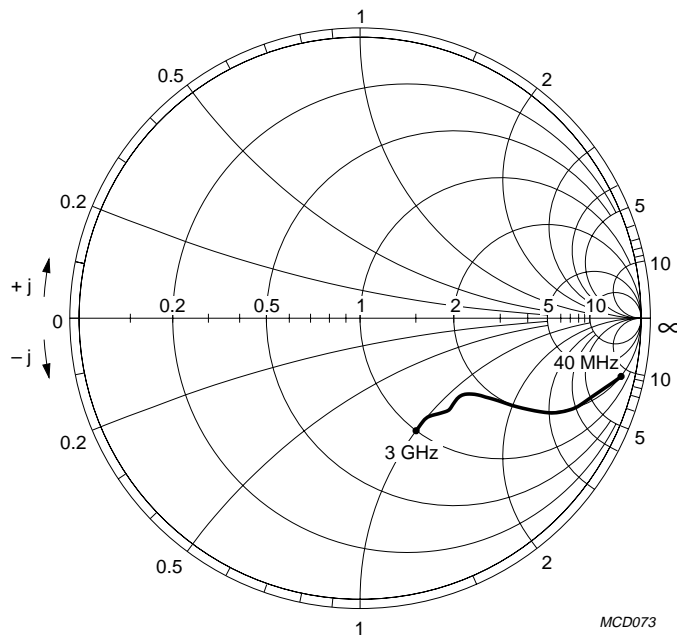
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$V_{CE} = 10\text{ V}; I_C = 15\text{ mA}$.

Fig.17 Common emitter reverse transmission coefficient (S_{12}); typical values.



$V_{CE} = 10\text{ V}; I_C = 15\text{ mA}$.

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

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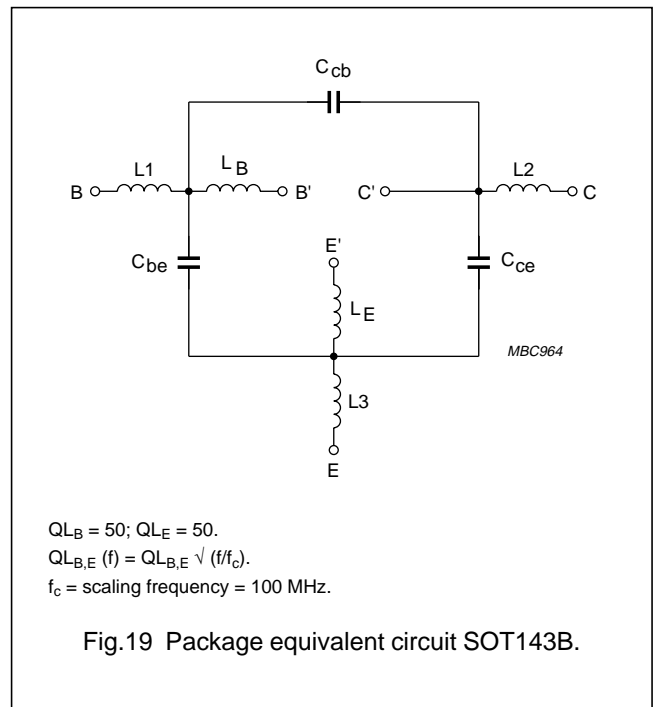
SPICE parameters for BFR90A/X die

| SEQUENCE No. | PARAMETER | VALUE | UNIT |
|--------------|-----------|-------|------|
| 1 | IS | 411.8 | aA |
| 2 | BF | 102.6 | – |
| 3 | NF | 997.2 | m |
| 4 | VAF | 62.67 | V |
| 5 | IKF | 3.200 | A |
| 6 | ISE | 4.010 | fA |
| 7 | NE | 1.577 | – |
| 8 | BR | 18.10 | – |
| 9 | NR | 996.2 | m |
| 10 | VAR | 3.369 | V |
| 11 | IKR | 1.281 | A |
| 12 | ISC | 279.9 | aA |
| 13 | NC | 1.075 | – |
| 14 | RB | 10.00 | Ω |
| 15 | IRB | 1.000 | μA |
| 16 | RBM | 10.00 | Ω |
| 17 | RE | 1.164 | Ω |
| 18 | RC | 2.320 | Ω |
| 19 (note 1) | XTB | 0.000 | – |
| 20 (note 1) | EG | 1.110 | eV |
| 21 (note 1) | XTI | 3.000 | – |
| 22 | CJE | 890.5 | fF |
| 23 | VJE | 600.0 | mV |
| 24 | MJE | 258.5 | m |
| 25 | TF | 15.49 | ps |
| 26 | XTF | 39.14 | – |
| 27 | VTF | 2.152 | V |
| 28 | ITF | 213.7 | mA |
| 29 | PTF | 0.000 | deg |
| 30 | CJC | 546.5 | fF |
| 31 | VJC | 380.8 | mV |
| 32 | MJC | 202.9 | m |
| 33 | XCJC | 150.0 | m |
| 34 | TR | 5.618 | ns |
| 35 (note 1) | CJS | 0.000 | F |

| SEQUENCE No. | PARAMETER | VALUE | UNIT |
|--------------|-----------|-------|------|
| 36 (note 1) | VJS | 750.0 | mV |
| 37 (note 1) | MJS | 0.000 | – |
| 38 | FC | 850.0 | m |

Note

1. These parameters have not been extracted, the default values are shown.



List of components (see Fig.19)

| DESIGNATION | VALUE | UNIT |
|-----------------|-------|------|
| C _{be} | 84 | fF |
| C _{cb} | 17 | fF |
| C _{ce} | 191 | fF |
| L1 | 0.12 | nH |
| L2 | 0.21 | nH |
| L3 | 0.06 | nH |
| L _B | 0.95 | nH |
| L _E | 0.40 | nH |

NPN 5 GHz wideband transistor

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PACKAGE OUTLINES

Plastic surface mounted package; 4 leads

SOT143B



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₁ max | b _p | b ₁ | c | D | E | e | e ₁ | H _E | L _p | Q | v | w | y |
|------|------------|-----------------------|----------------|----------------|--------------|------------|------------|-----|----------------|----------------|----------------|--------------|-----|-----|-----|
| mm | 1.1 0.9 | 0.1 | 0.48 0.38 | 0.88 0.78 | 0.15 0.09 | 3.0 2.8 | 1.4 1.2 | 1.9 | 1.7 | 2.5 2.1 | 0.45 0.15 | 0.55 0.45 | 0.2 | 0.1 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|------------|-------|------|--|------------------------|------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT143B | | | | | | 97-02-28 |

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DEFINITIONS

| | |
|---|---|
| Data sheet status | |
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| Limiting values | |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |

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NOTES

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