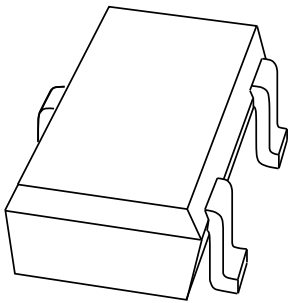


DATA SHEET



BFS540

NPN 9 GHz wideband transistor

Product specification
Supersedes data of 1997 Dec 05

2000 May 30



NPN 9 GHz wideband transistor

BFS540

FEATURES

- High power gain
- Low noise figure
- High transition frequency
- Gold metallization ensures excellent reliability
- SOT323 package.

APPLICATIONS

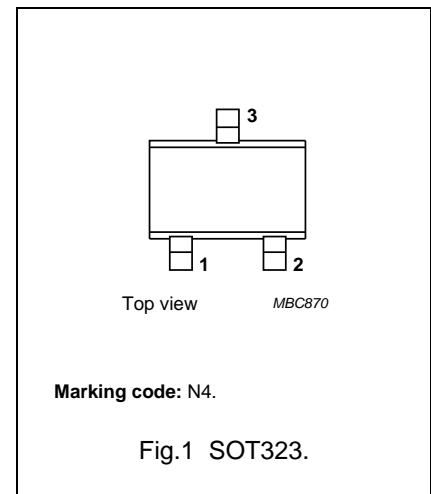
RF wideband amplifier applications such as satellite TV systems and RF portable communication equipment with signal frequencies up to 2 GHz.

DESCRIPTION

NPN transistor in a SOT323 plastic package.

PINNING

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



QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------|-------------------------------|------------------------------------------------------------------------------------------------------------|------|------|------|------|
| V_{CBO} | collector-base voltage | open emitter | – | – | 20 | V |
| V_{CEO} | collector-emitter voltage | open base | – | – | 15 | V |
| I_C | DC collector current | | – | – | 120 | mA |
| P_{tot} | total power dissipation | $T_s \leq 80\text{ }^\circ\text{C}$; note 1 | – | – | 500 | mW |
| h_{FE} | DC current gain | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$ | 100 | 120 | 250 | |
| f_T | transition frequency | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$ | – | 9 | – | GHz |
| G_{UM} | maximum unilateral power gain | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$ | – | 14 | – | dB |
| F | noise figure | $I_C = 10\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$ | – | 1.3 | 1.7 | dB |

Note

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

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 60134).

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|---------------------------|----------------------------------------------|------|------|------------------|
| V_{CBO} | collector-base voltage | open emitter | – | 20 | V |
| V_{CES} | collector-emitter voltage | $R_{BE} = 0$ | – | 15 | V |
| V_{EBO} | emitter-base voltage | open collector | – | 2.5 | V |
| I_C | DC collector current | | – | 120 | mA |
| P_{tot} | total power dissipation | $T_s \leq 80\text{ }^\circ\text{C}$; note 1 | – | 500 | mW |
| T_{stg} | storage temperature | | –65 | 150 | $^\circ\text{C}$ |
| T_j | junction temperature | | – | 175 | $^\circ\text{C}$ |

Note

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

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THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------|-----------------------------------------------------|----------------------------------|-------|------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | $T_s \leq 80\text{ °C}$; note 1 | 190 | K/W |

Note

- T_s is the temperature at the soldering point of the collector tab.

CHARACTERISTICS

$T_j = 25\text{ °C}$ unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| I_{CBO} | collector cut-off current | $I_E = 0$; $V_{CE} = 8\text{ V}$ | – | – | 50 | nA |
| h_{FE} | DC current gain | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$ | 100 | 120 | 250 | |
| C_e | emitter capacitance | $I_C = i_c = 0$; $V_{EB} = 0.5\text{ V}$; $f = 1\text{ MHz}$ | – | 2 | – | pF |
| C_c | collector capacitance | $I_E = i_e = 0$; $V_{CB} = 8\text{ V}$; $f = 1\text{ MHz}$ | – | 0.9 | – | pF |
| C_{re} | feedback capacitance | $I_C = 0$; $V_{CB} = 8\text{ V}$; $f = 1\text{ MHz}$ | – | 0.6 | – | pF |
| f_T | transition frequency | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$ | – | 9 | – | GHz |
| G_{UM} | maximum unilateral power gain (note 1) | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ °C}$ | – | 14 | – | dB |
| | | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 2\text{ GHz}$; $T_{amb} = 25\text{ °C}$ | – | 8 | – | dB |
| $ s_{21} ^2$ | insertion power gain | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ °C}$ | 12 | 13 | – | dB |
| F | noise figure | $\Gamma_s = \Gamma_{opt}$; $I_C = 10\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ °C}$ | – | 1.3 | 1.8 | dB |
| | | $\Gamma_s = \Gamma_{opt}$; $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ °C}$ | – | 1.9 | 2.4 | dB |
| | | $\Gamma_s = \Gamma_{opt}$; $I_C = 10\text{ mA}$; $V_{CE} = 8\text{ V}$; $f = 2\text{ GHz}$; $T_{amb} = 25\text{ °C}$ | – | 2.1 | – | dB |
| P_{L1} | output power at 1 dB gain compression | $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $R_L = 50\text{ }\Omega$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ °C}$ | – | 21 | – | dBm |
| ITO | third order intercept point | note 2 | – | 34 | – | dBm |

Notes

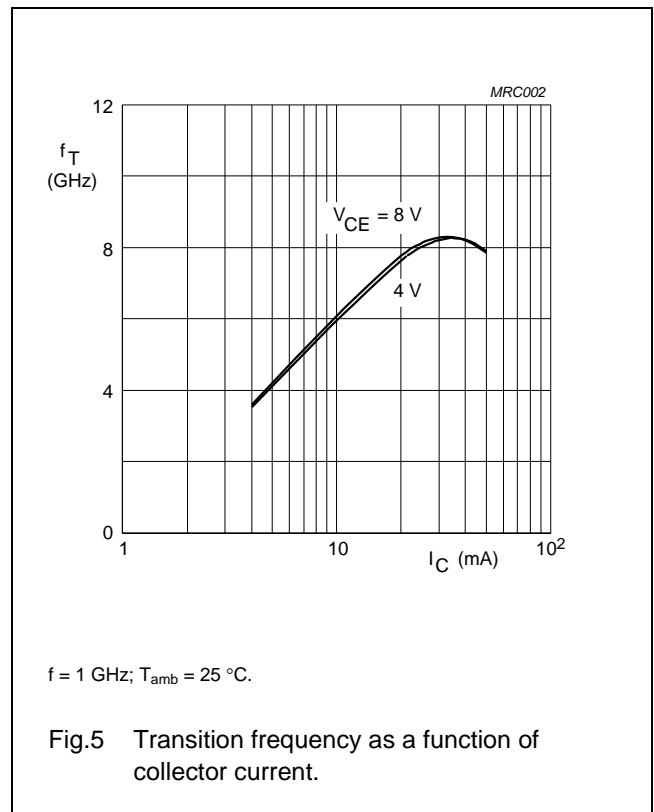
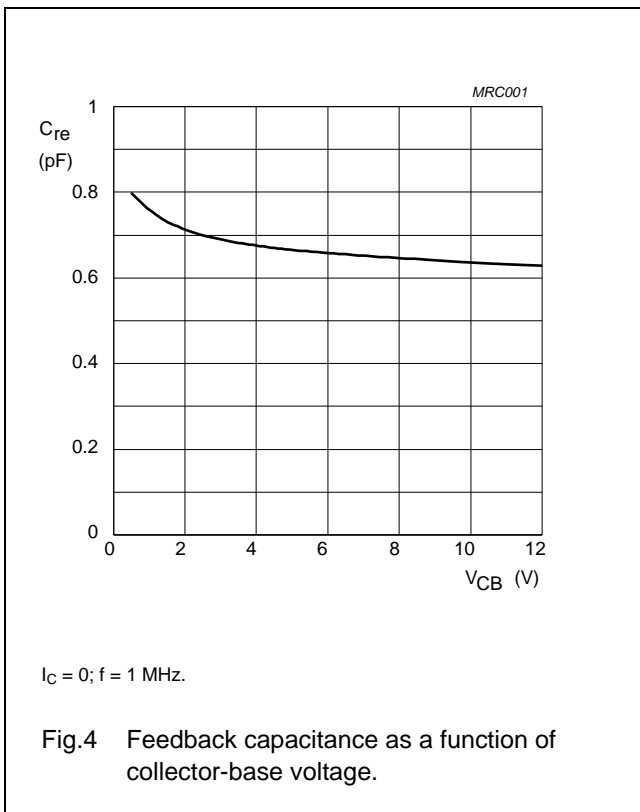
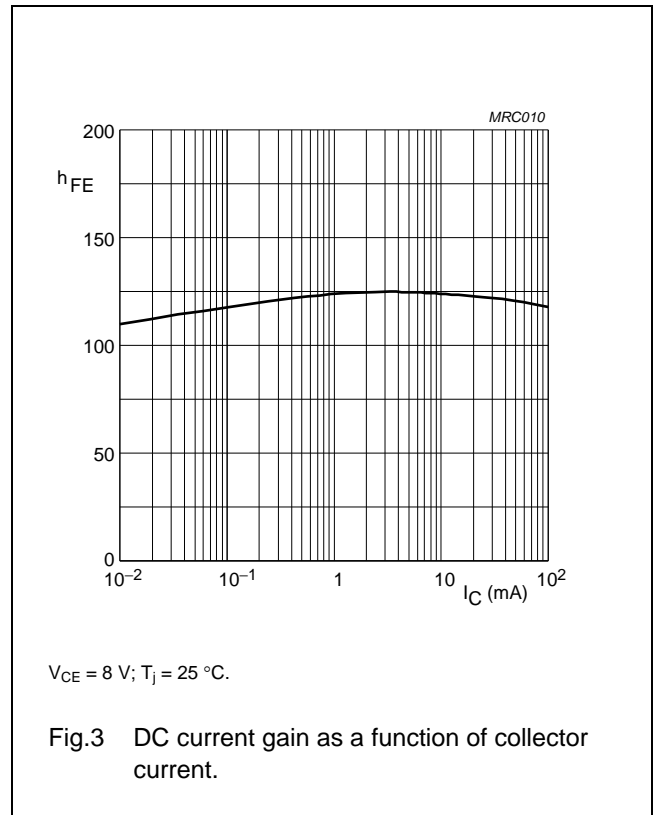
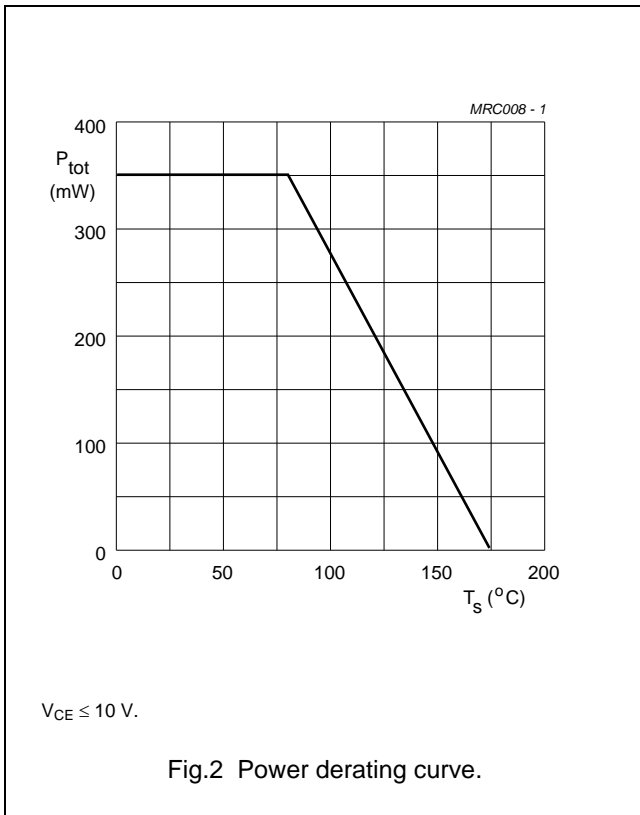
- G_{UM} is the maximum unilateral power gain, assuming s_{12} is zero and

$$G_{UM} = 10 \log \frac{|s_{21}|^2}{(1 - |s_{11}|^2)(1 - |s_{22}|^2)} \text{ dB.}$$

- $I_C = 40\text{ mA}$; $V_{CE} = 8\text{ V}$; $R_L = 50\text{ }\Omega$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ °C}$;
 $f_p = 900\text{ MHz}$; $f_q = 902\text{ MHz}$; measured at $f_{(2p-q)} = 898\text{ MHz}$ and at $f_{(2q-p)} = 904\text{ MHz}$.

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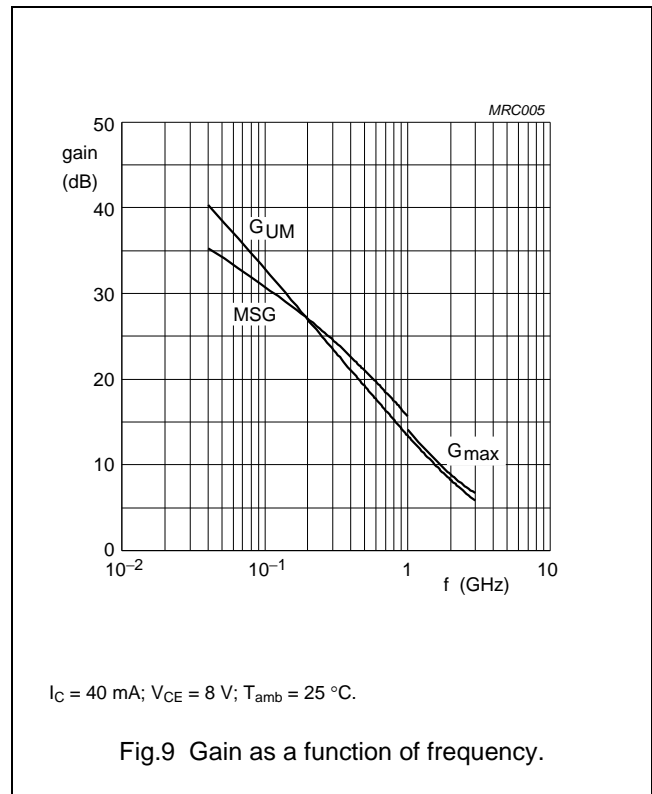
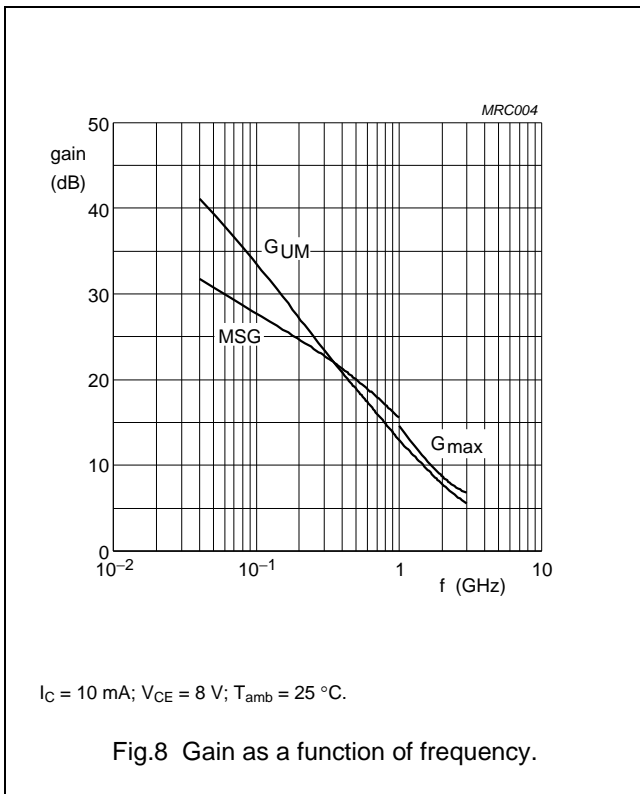
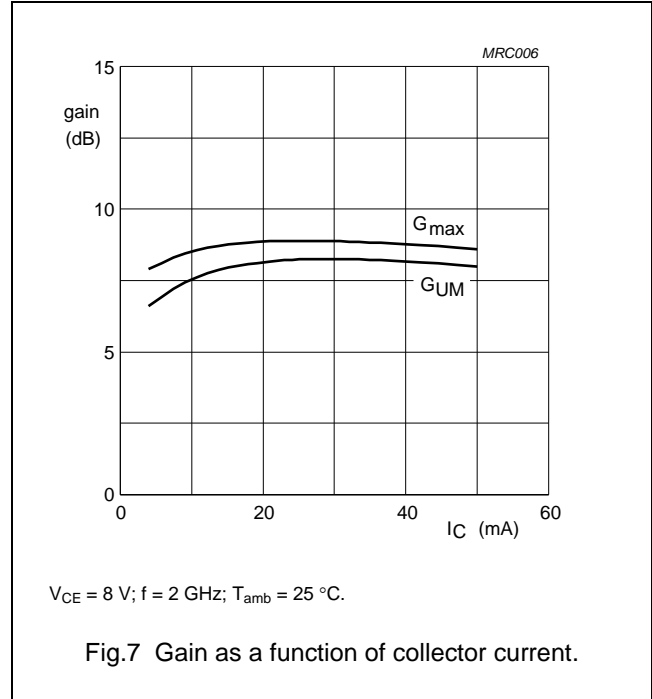
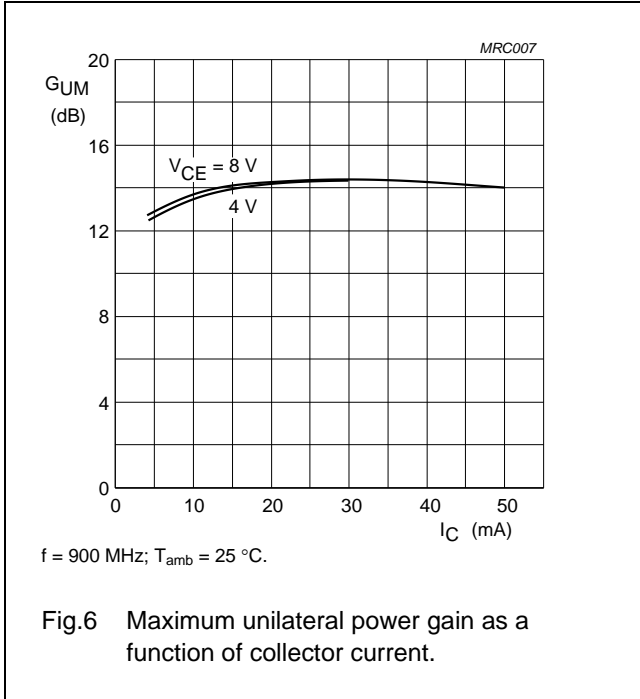
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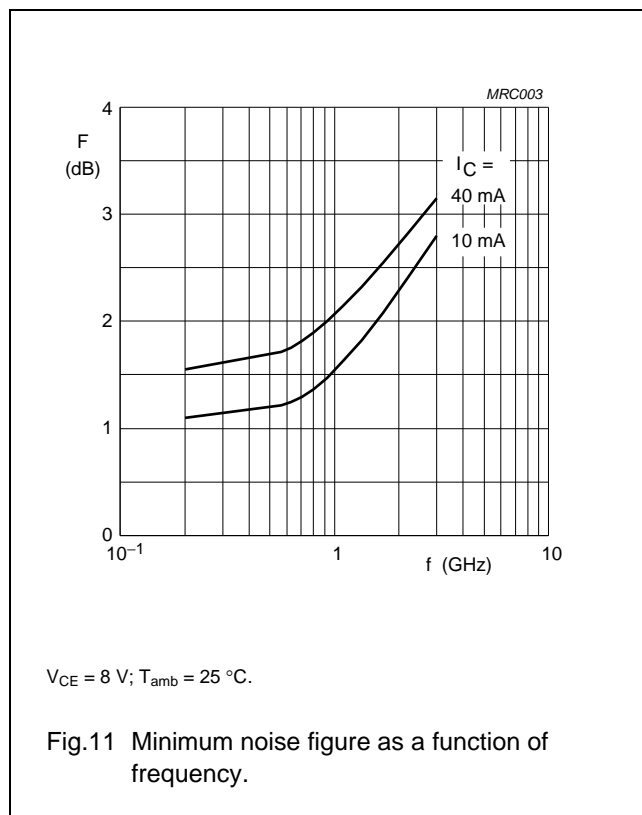
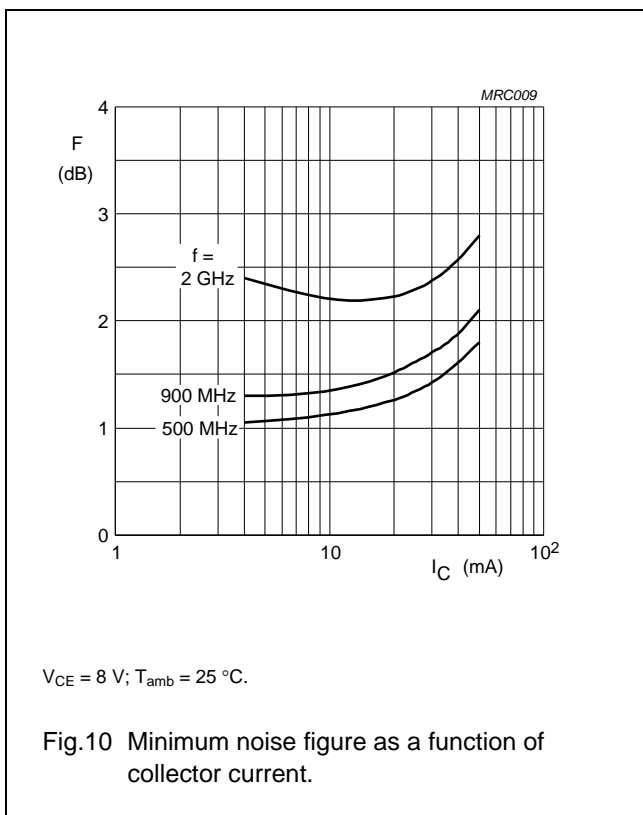
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In Figs 6 to 9, G_{UM} = maximum unilateral power gain; MSG = maximum stable gain; G_{max} = maximum available gain.



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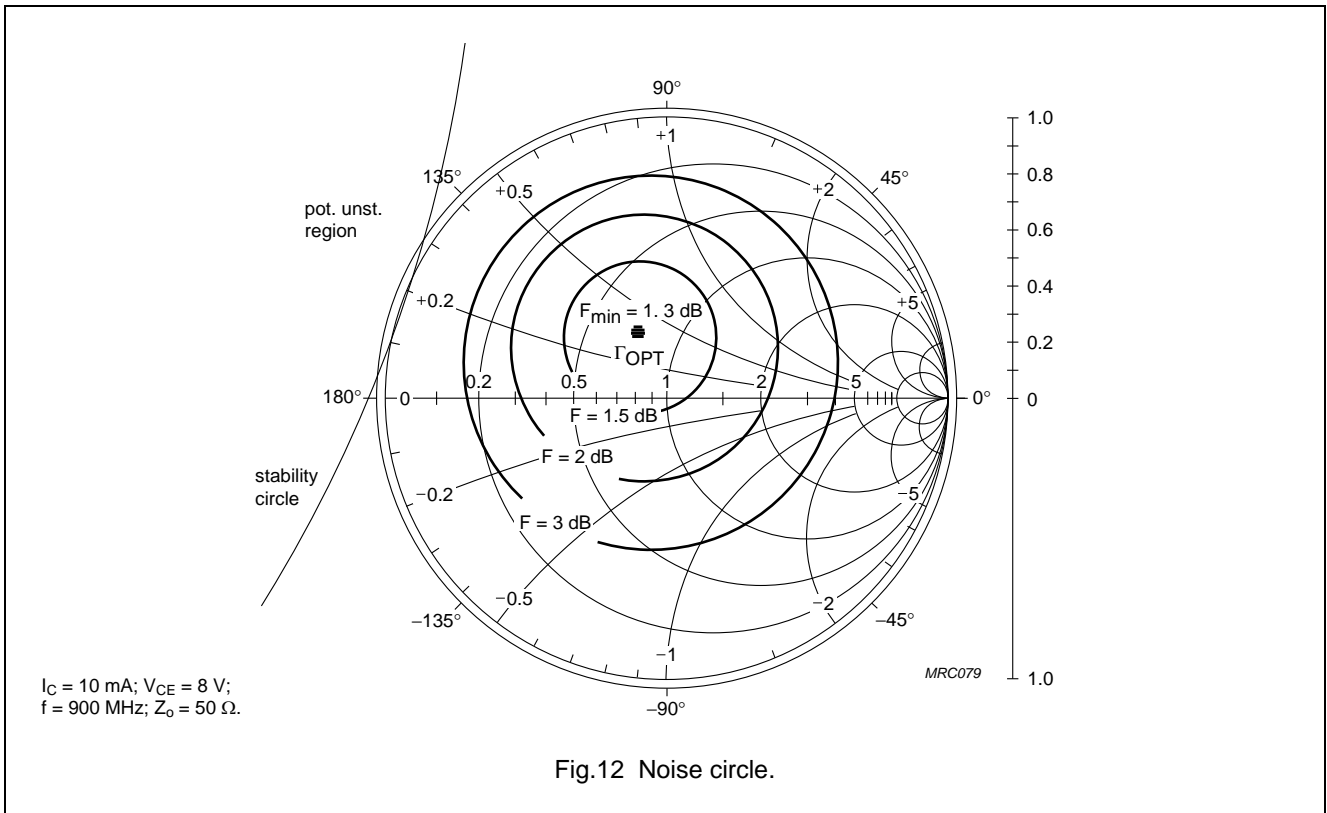


Fig.12 Noise circle.

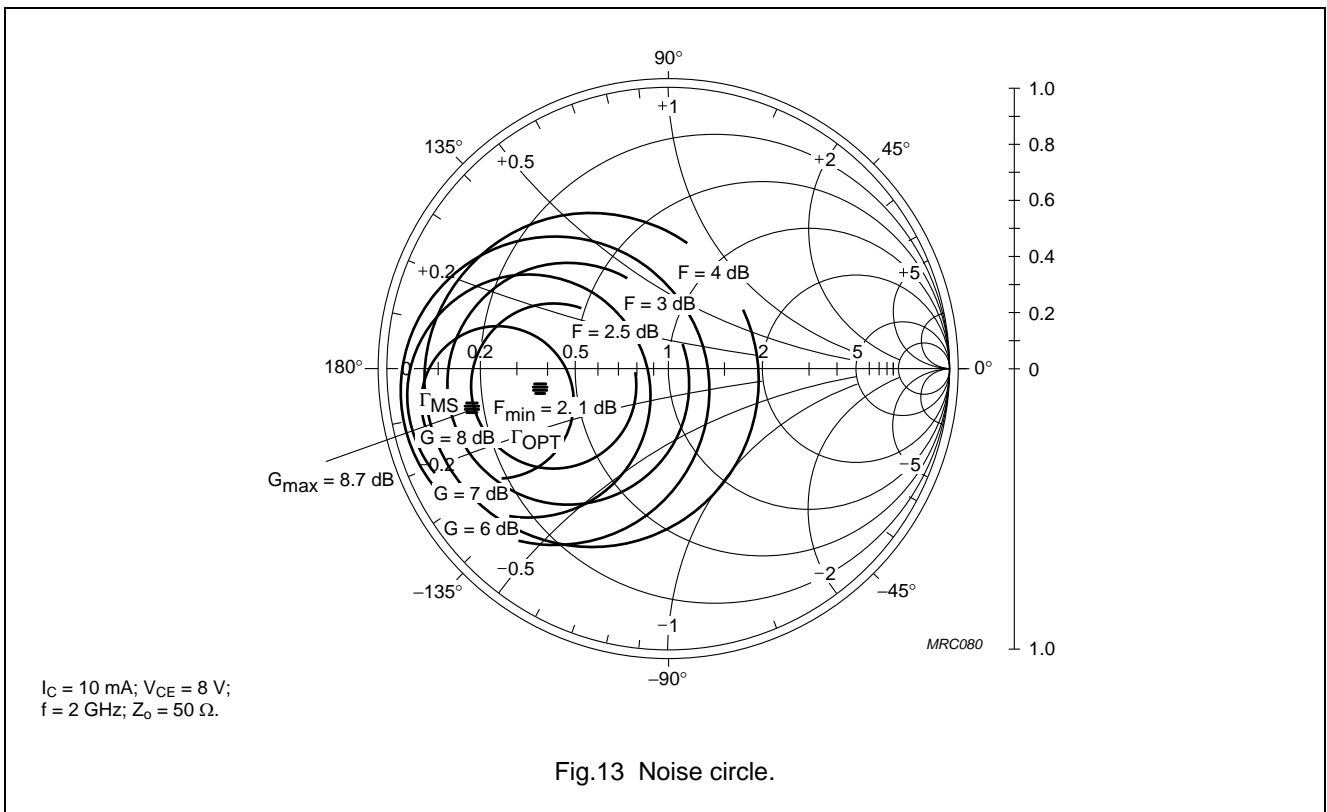
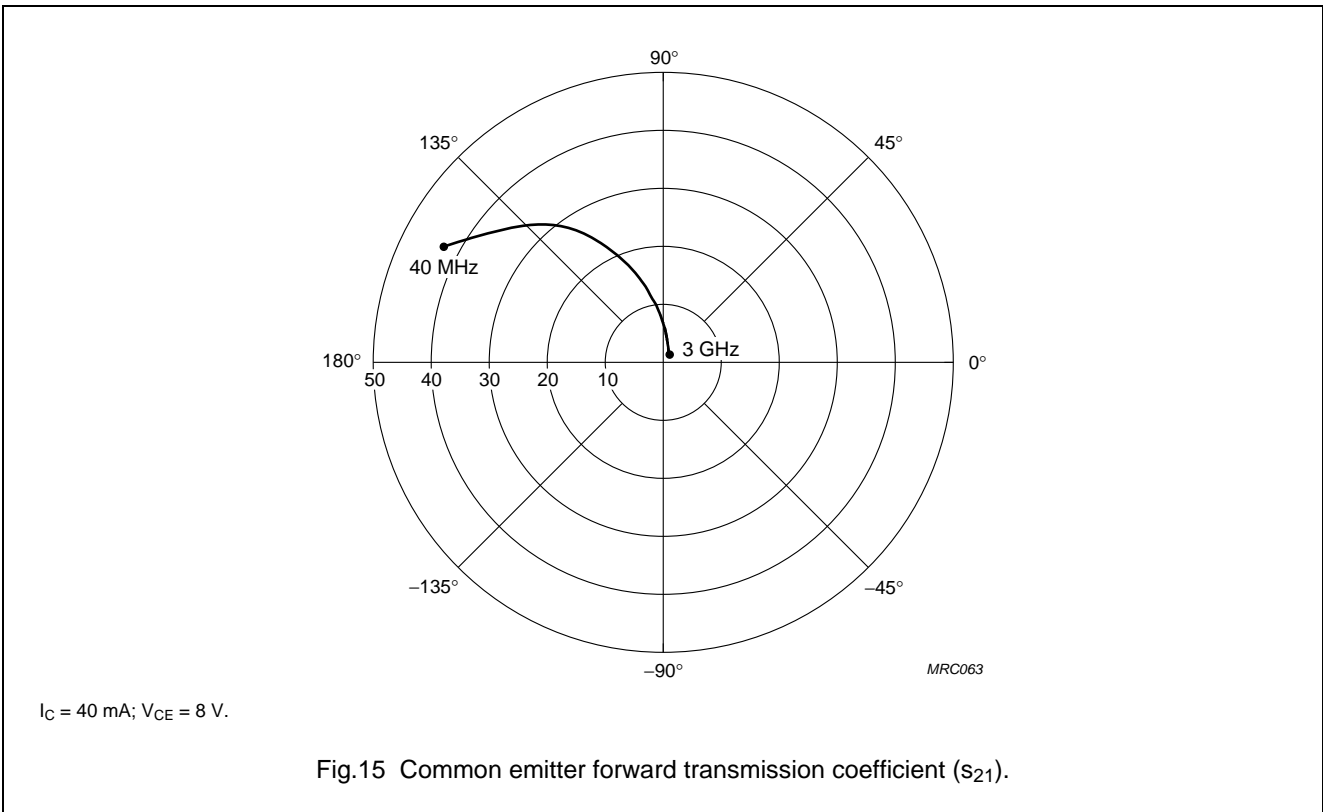
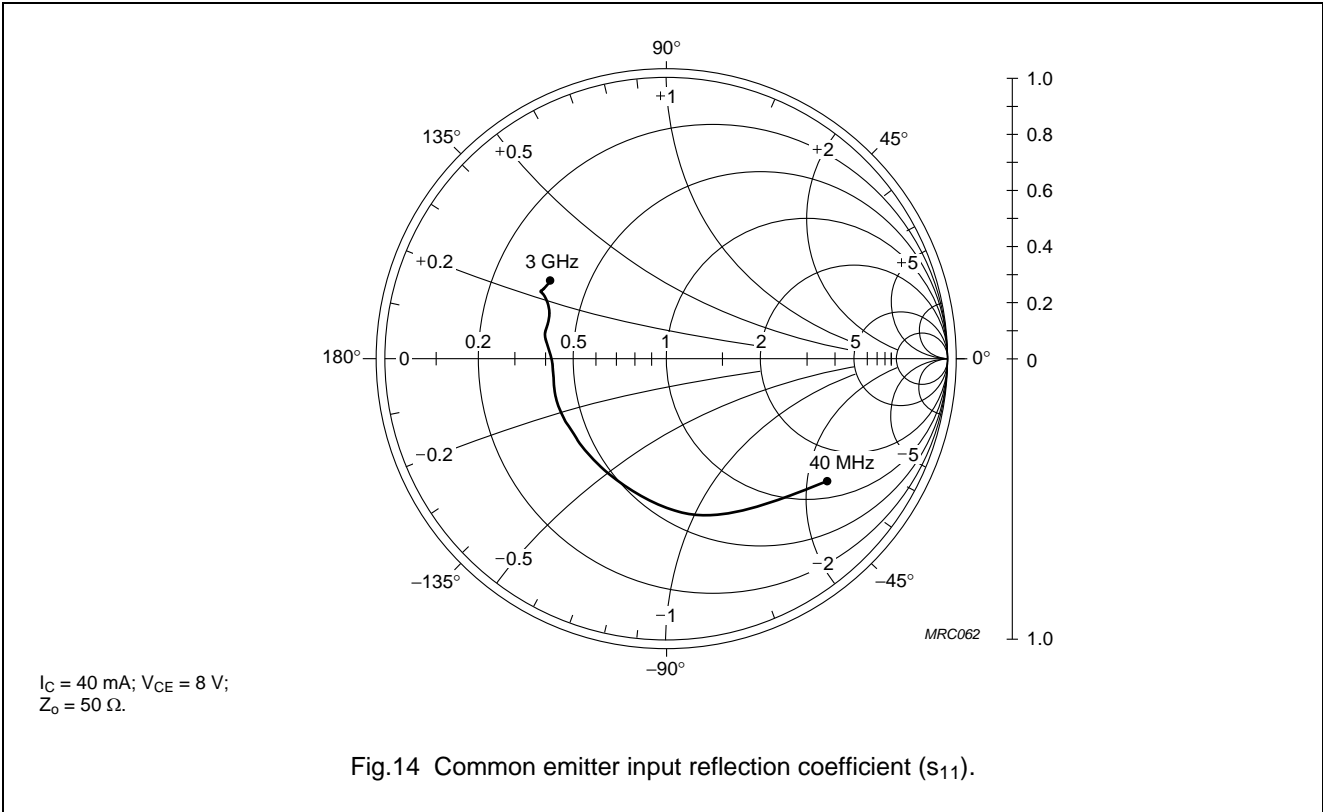


Fig.13 Noise circle.

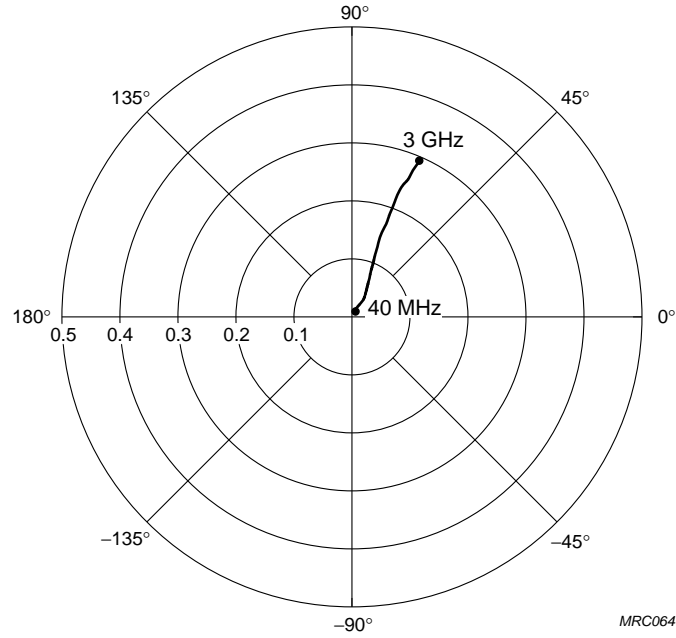
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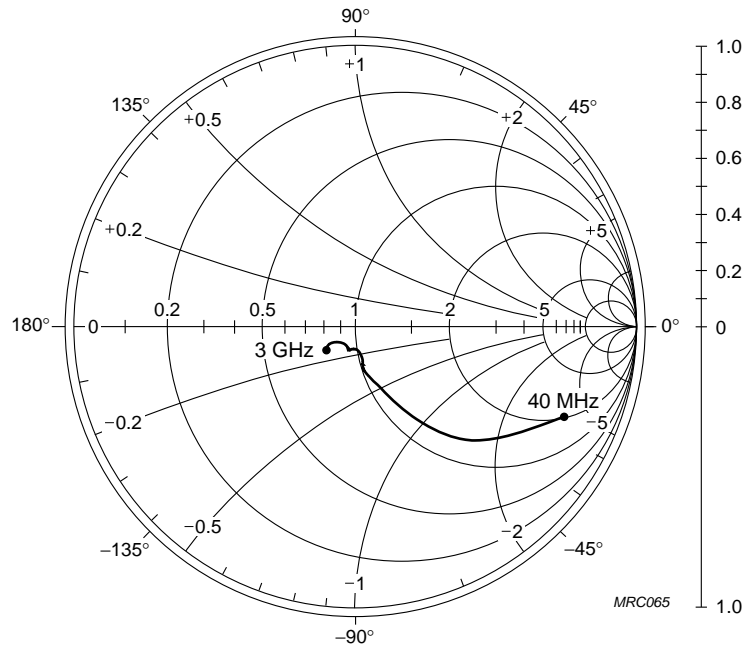
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$I_C = 40 \text{ mA}$; $V_{CE} = 8 \text{ V}$.

Fig.16 Common emitter reverse transmission coefficient (s_{12}).



$I_C = 40 \text{ mA}$; $V_{CE} = 8 \text{ V}$;
 $Z_o = 50 \Omega$.

Fig.17 Common emitter output reflection coefficient (s_{22}).

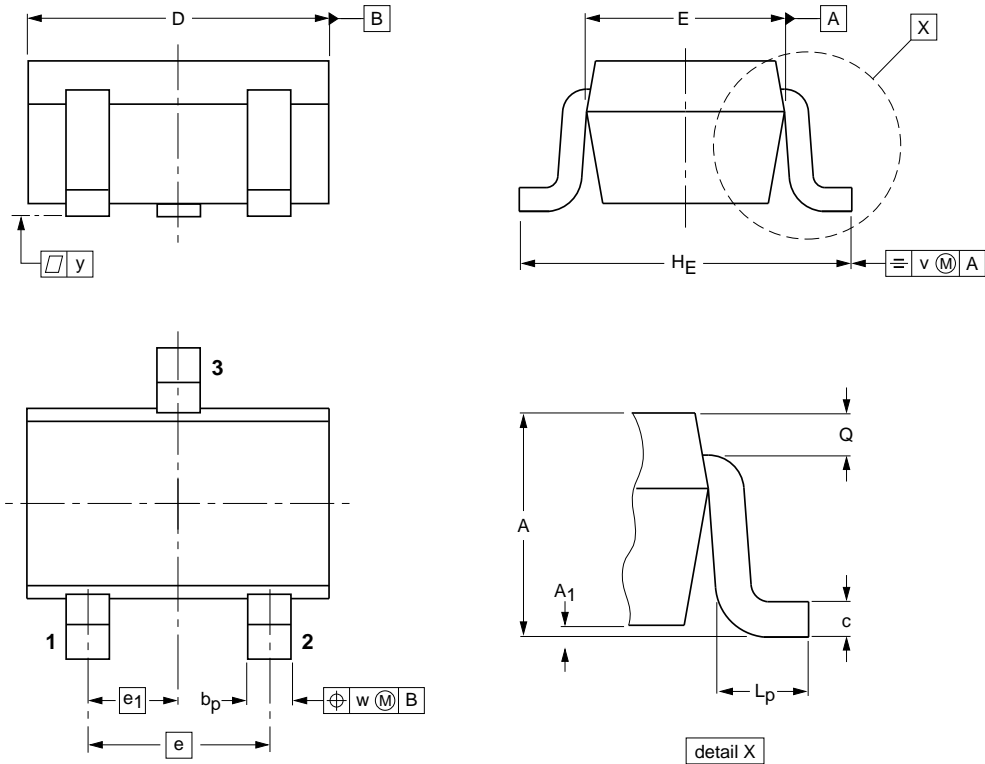
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PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads

SOT323



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₁ max | b _p | c | D | E | e | e ₁ | H _E | L _p | Q | v | w |
|------|------------|-----------------------|----------------|--------------|------------|--------------|-----|----------------|----------------|----------------|--------------|-----|-----|
| mm | 1.1 0.8 | 0.1 | 0.4 0.3 | 0.25 0.10 | 2.2 1.8 | 1.35 1.15 | 1.3 | 0.65 | 2.2 2.0 | 0.45 0.15 | 0.23 0.13 | 0.2 | 0.2 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|------------|-------|-------|--|------------------------|---------------------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT323 | | | SC-70 | | | 04-11-04 06-03-16 |

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DATA SHEET STATUS

| DOCUMENT STATUS ⁽¹⁾ | PRODUCT STATUS ⁽²⁾ | DEFINITION |
|--------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
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