

# DATA SHEET

## **BFT25A** NPN 5 GHz wideband transistor

Product specification  
File under Discrete Semiconductors, SC14

December 1997

# NPN 5 GHz wideband transistor

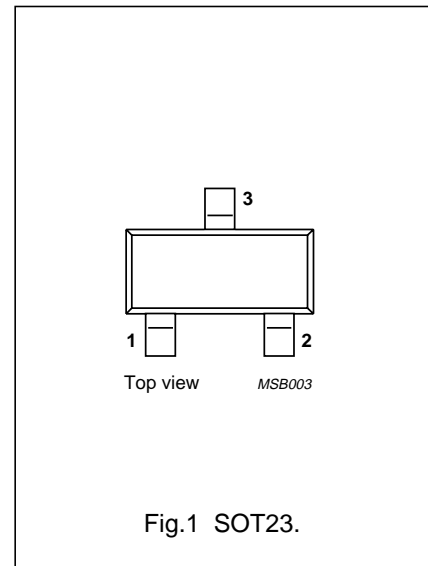
# BFT25A

### FEATURES

- Low current consumption (100  $\mu$ A – 1 mA)
- Low noise figure
- Gold metallization ensures excellent reliability.

### PINNING

PIN	DESCRIPTION
Code: V10	
1	base
2	emitter
3	collector



### DESCRIPTION

The BFT25A is a silicon npn transistor, primarily intended for use in RF low power amplifiers, such as pocket telephones and paging systems with signal frequencies up to 2 GHz.

The transistor is encapsulated in a 3-pin plastic SOT23 envelope.

### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	–	8	V
$V_{CEO}$	collector-emitter voltage	open base	–	–	5	V
$I_C$	DC collector current		–	–	6.5	mA
$P_{tot}$	total power dissipation	up to $T_s = 165\text{ }^\circ\text{C}$ ; note 1	–	–	32	mW
$h_{FE}$	DC current gain	$I_C = 0.5\text{ mA}$ ; $V_{CE} = 1\text{ V}$	50	80	200	
$f_T$	transition frequency	$I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = 25\text{ }^\circ\text{C}$ ; $f = 500\text{ MHz}$	3.5	5	–	GHz
$G_{UM}$	maximum unilateral power gain	$I_C = 0.5\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = 25\text{ }^\circ\text{C}$ ; $f = 1\text{ GHz}$	–	15	–	dB
F	noise figure	$\Gamma = \Gamma_{opt}$ ; $I_C = 0.5\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = 25\text{ }^\circ\text{C}$ ; $f = 1\text{ GHz}$	–	1.8	–	dB
		$\Gamma = \Gamma_{opt}$ ; $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = 25\text{ }^\circ\text{C}$ ; $f = 1\text{ GHz}$	–	2	–	dB

### Note

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

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**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	–	8	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	5	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	2	V
I <sub>C</sub>	DC collector current		–	6.5	mA
P <sub>tot</sub>	total power dissipation	up to T <sub>S</sub> = 165 °C; note 1	–	32	mW
T <sub>stg</sub>	storage temperature		–65	150	°C
T <sub>j</sub>	junction temperature		–	175	°C

**THERMAL RESISTANCE**

SYMBOL	PARAMETER	THERMAL RESISTANCE
R <sub>th j-s</sub>	from junction to soldering point (note 1)	260 K/W

**Note**

1. T<sub>S</sub> is the temperature at the soldering point of the collector tab.

**CHARACTERISTICS**

T<sub>j</sub> = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I <sub>CBO</sub>	collector cut-off current	I <sub>E</sub> = 0; V <sub>CB</sub> = 5 V	–	–	50	nA
h <sub>FE</sub>	DC current gain	I <sub>C</sub> = 0.5 mA; V <sub>CE</sub> = 1 V	50	80	200	
f <sub>T</sub>	transition frequency	I <sub>C</sub> = 1 mA; V <sub>CE</sub> = 1 V; T <sub>amb</sub> = 25 °C; f = 500 MHz	3.5	5	–	GHz
C <sub>re</sub>	feedback capacitance	I <sub>C</sub> = i <sub>c</sub> = 0; V <sub>CB</sub> = 1 V; f = 1 MHz	–	0.3	0.45	pF
G <sub>UM</sub>	maximum unilateral power gain (note 1)	I <sub>C</sub> = 0.5 mA; V <sub>CE</sub> = 1 V; T <sub>amb</sub> = 25 °C; f = 1 GHz	–	15	–	dB
F	noise figure	Γ = Γ <sub>opt</sub> ; I <sub>C</sub> = 0.5 mA; V <sub>CE</sub> = 1 V; T <sub>amb</sub> = 25 °C; f = 1 GHz	–	1.8	–	dB
		Γ = Γ <sub>opt</sub> ; I <sub>C</sub> = 1 mA; V <sub>CE</sub> = 1 V; T <sub>amb</sub> = 25 °C; f = 1 GHz	–	2	–	dB

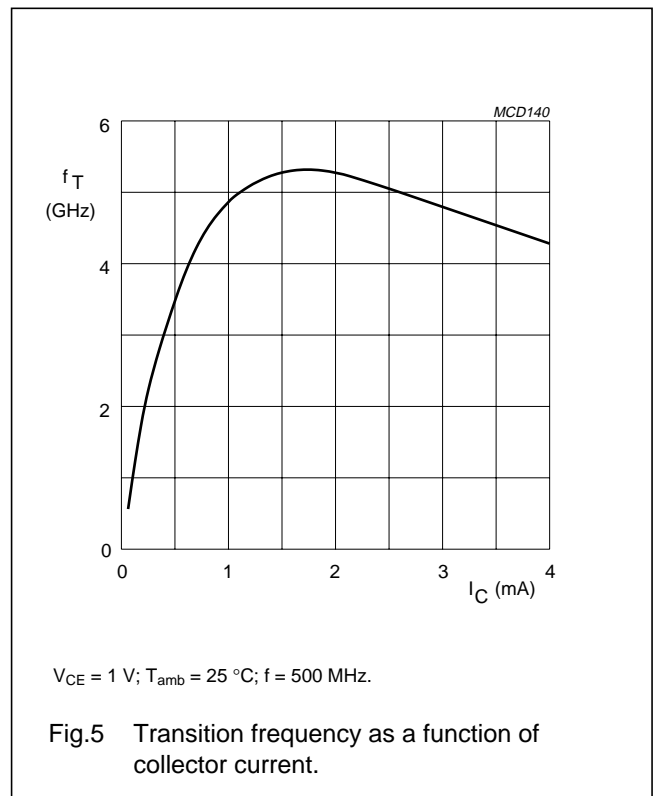
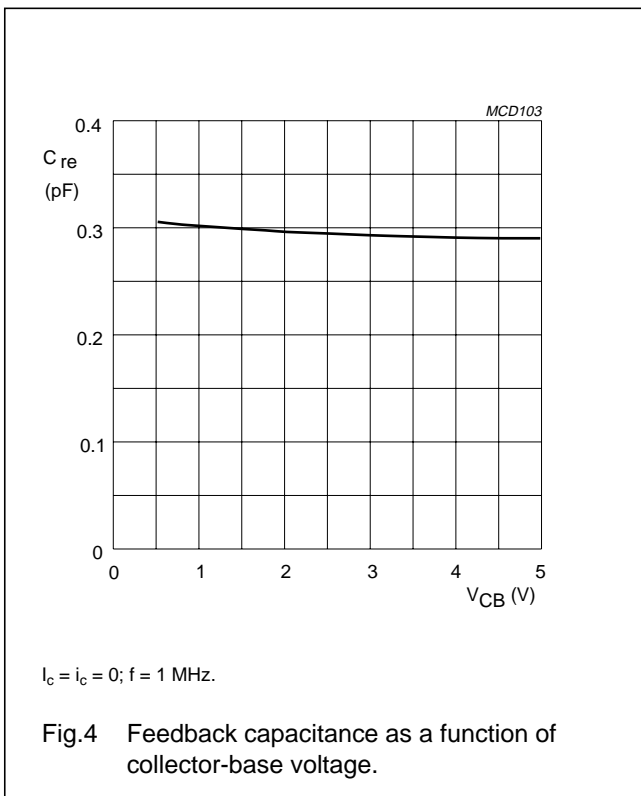
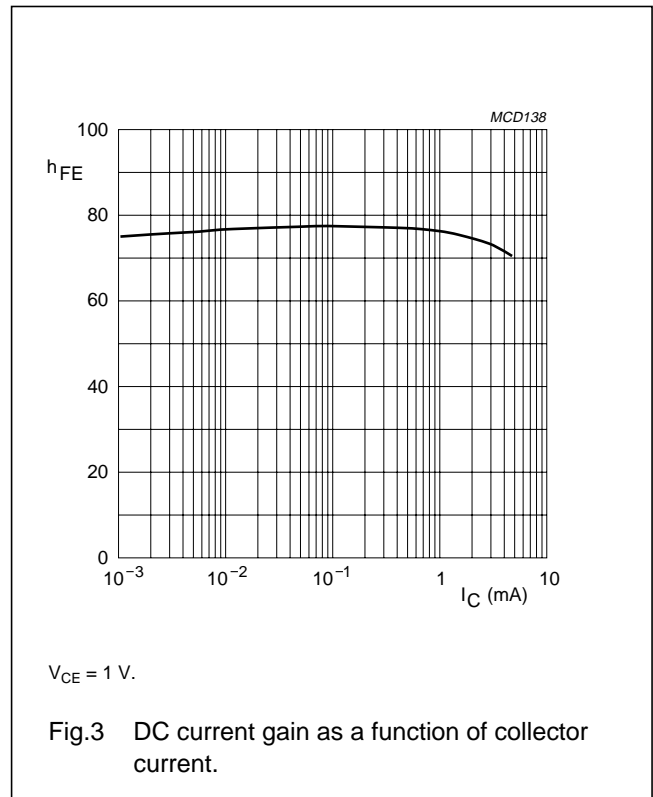
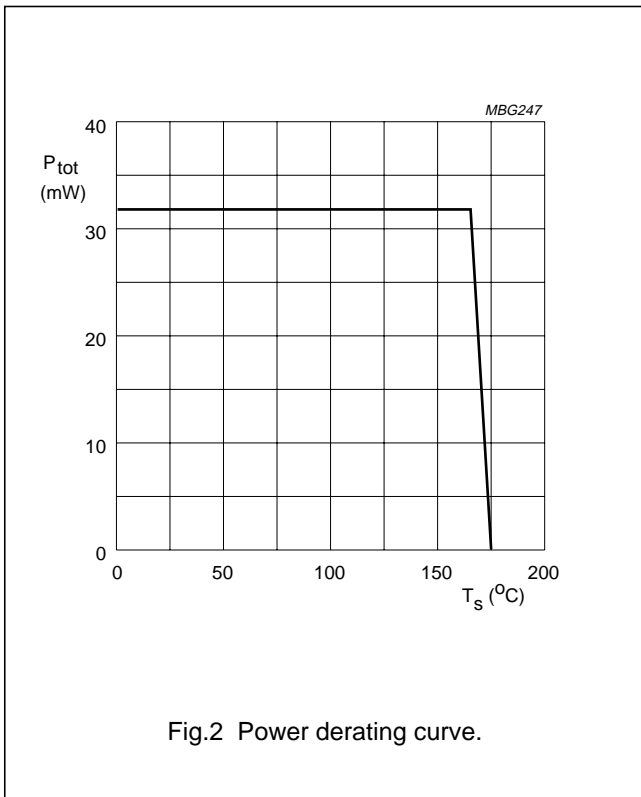
**Note**

1. G<sub>UM</sub> is the maximum unilateral power gain, assuming S<sub>12</sub> is zero and

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

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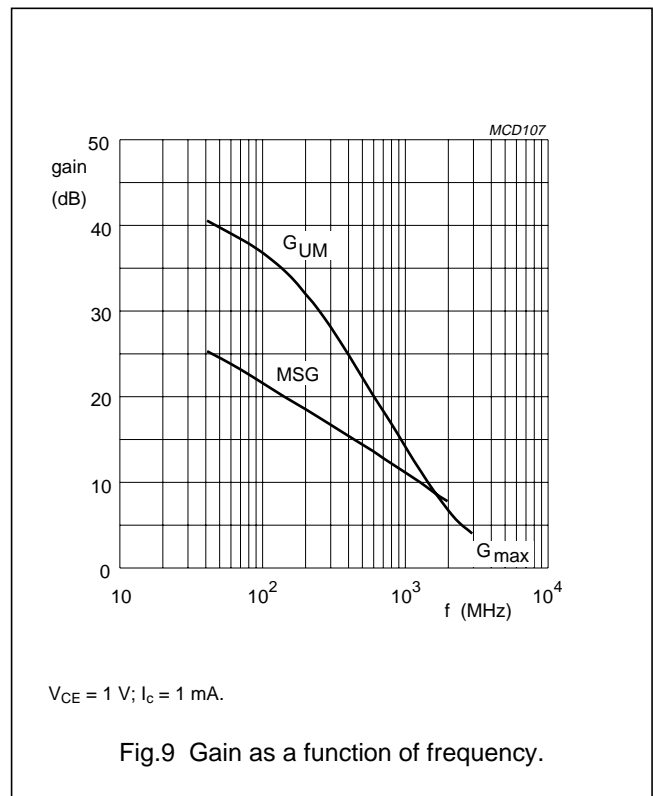
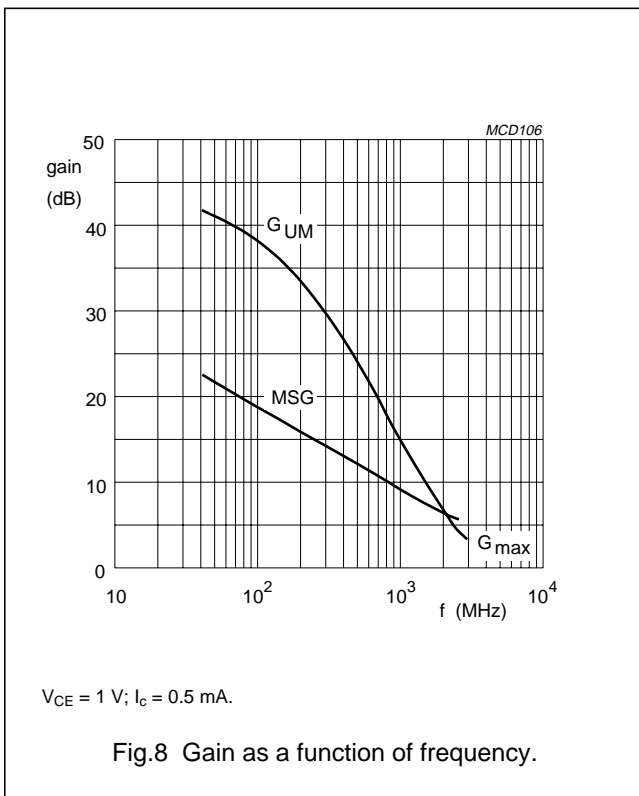
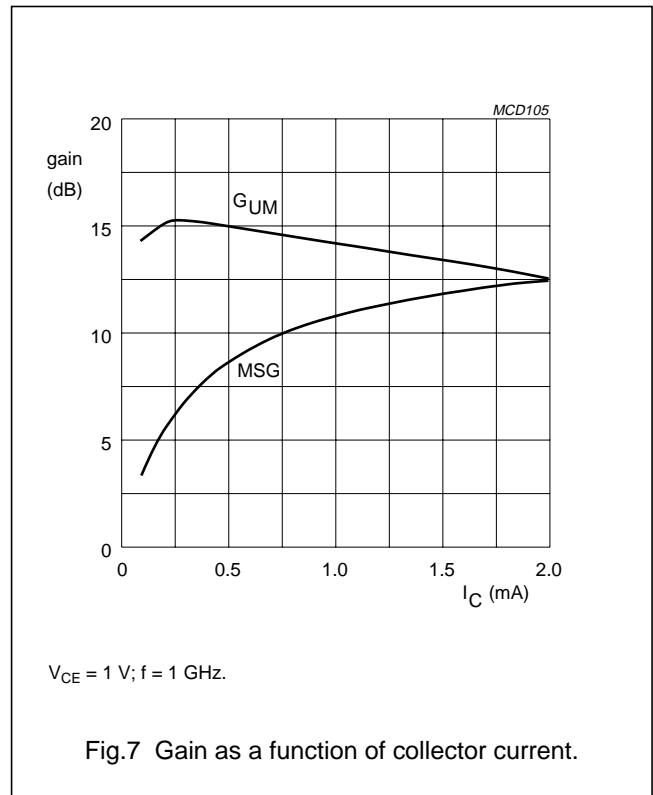
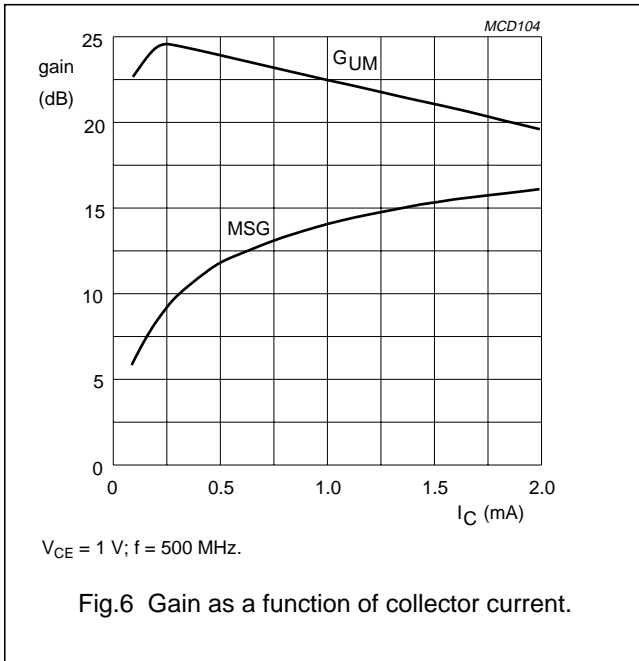
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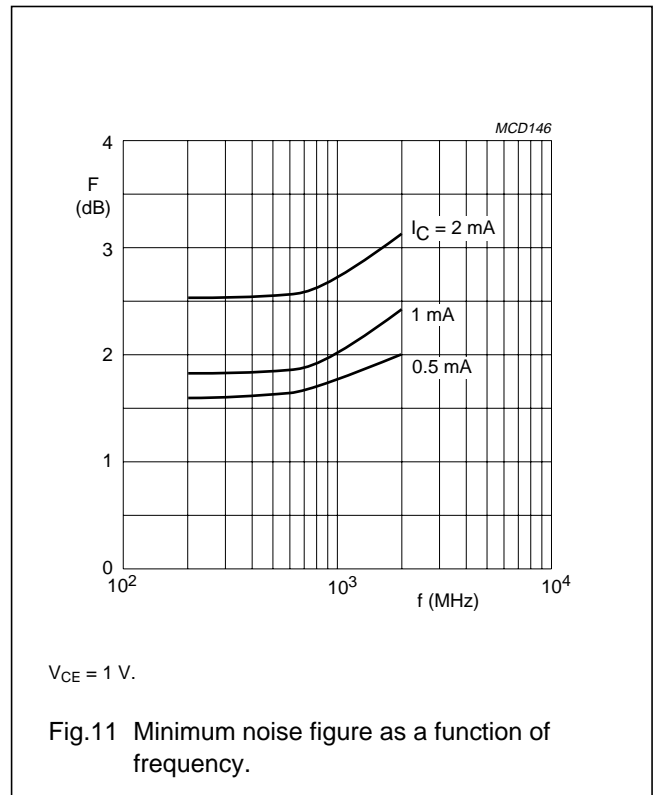
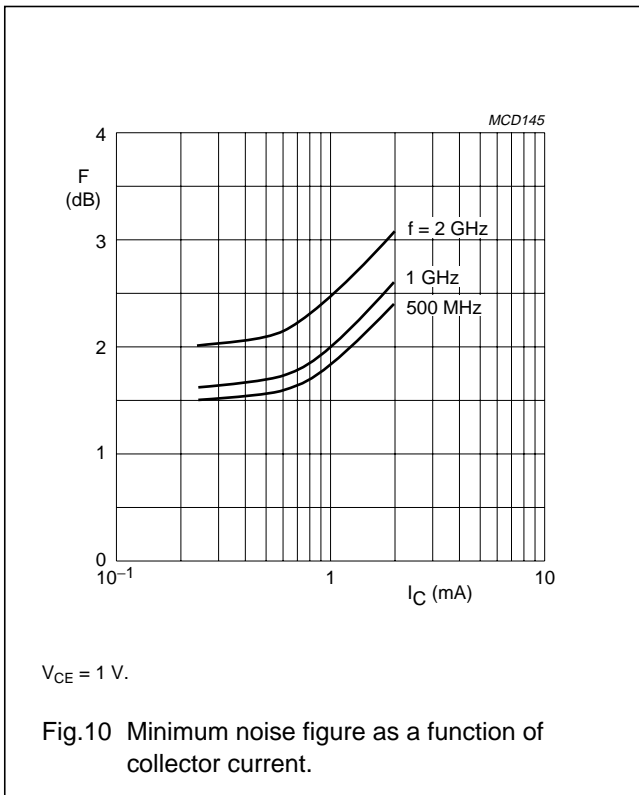
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In Figs 6 to 9,  $G_{UM}$  = maximum unilateral power gain;  $MSG$  = maximum stable gain;  $G_{max}$  = maximum available gain.



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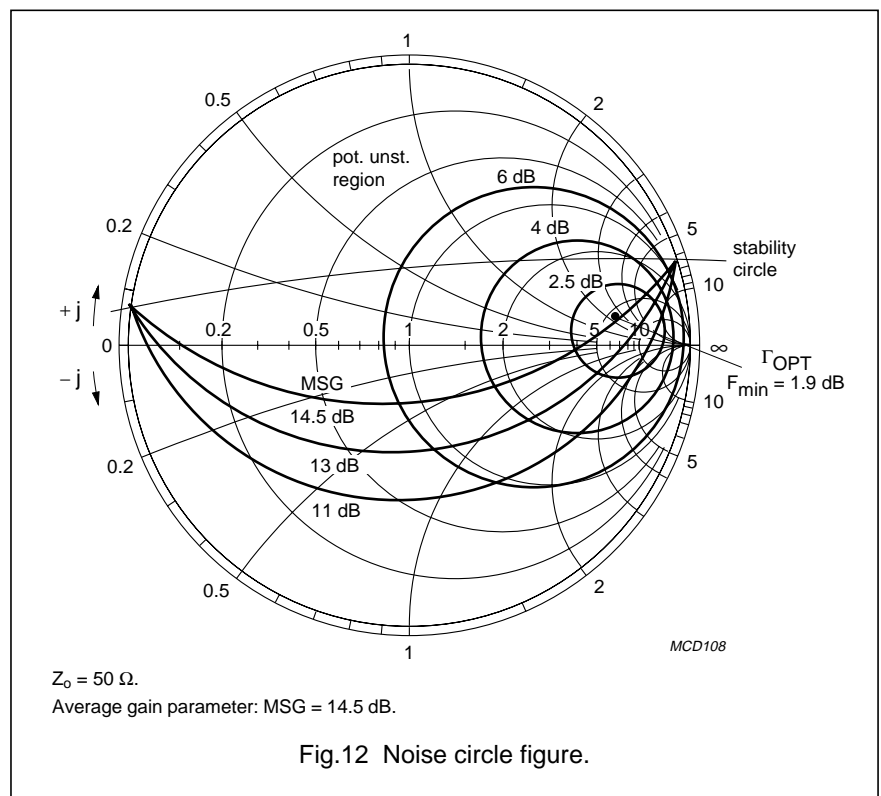
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f (MHz)	$V_{CE}$ (V)	$I_C$ (mA)
500	1	1

Noise Parameters

$F_{min}$ (dB)	Gamma (opt)		$R_n/50$
	(mag)	(ang)	
1.9	0.79	4	2.5



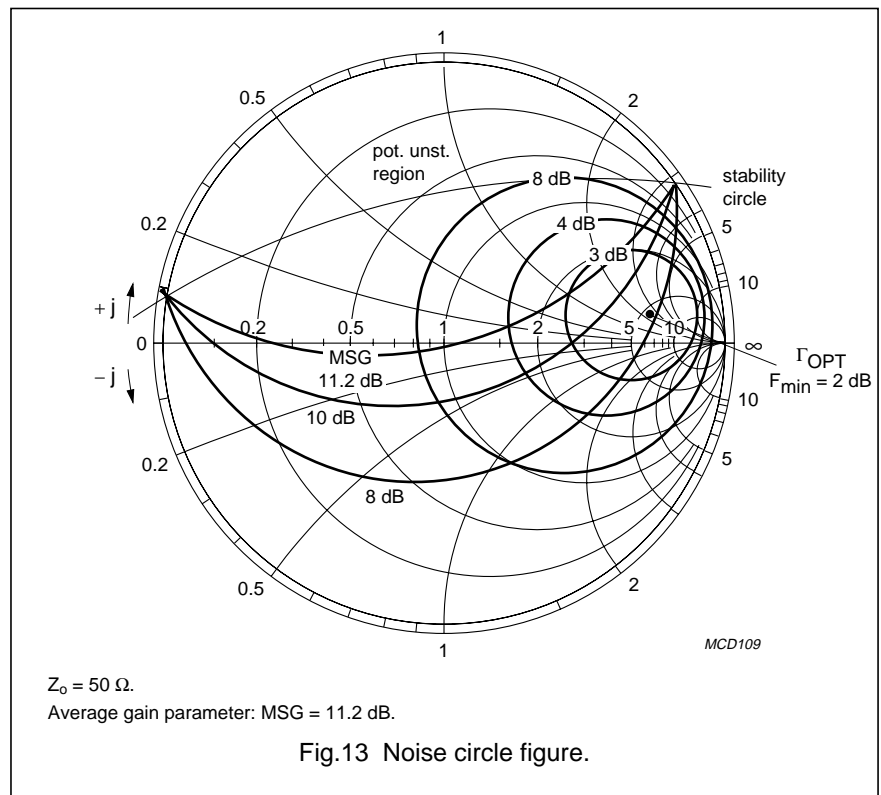
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f (MHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)
1000	1	1

Noise Parameters

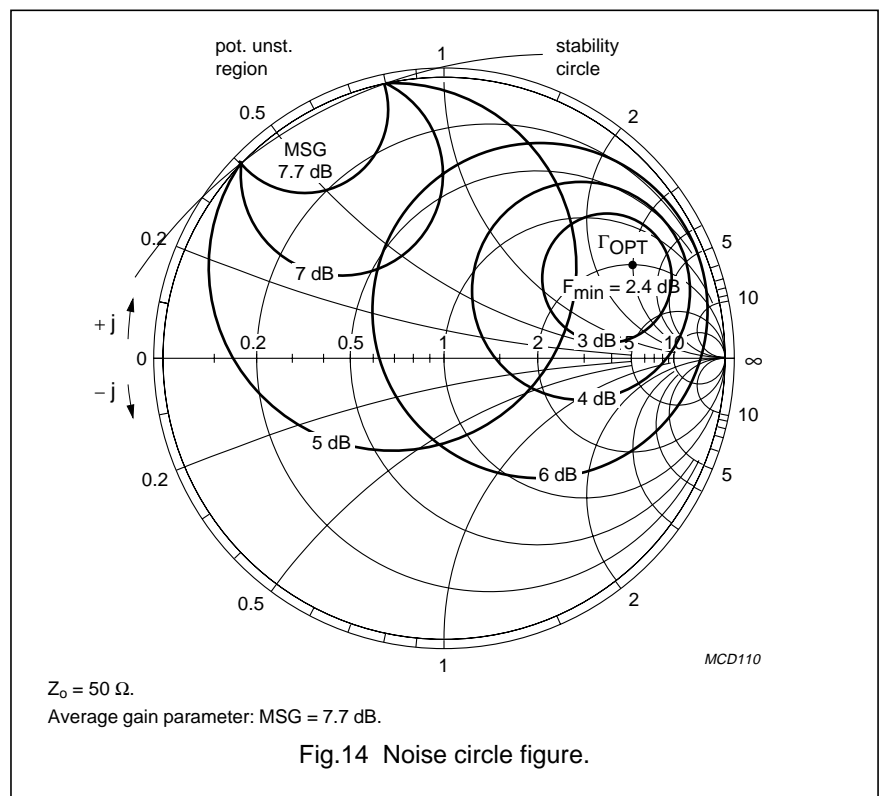
F <sub>min</sub> (dB)	Gamma (opt)		R <sub>n</sub> /50
	(mag)	(ang)	
2	0.74	8	2.6



f (MHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)
2000	1	1

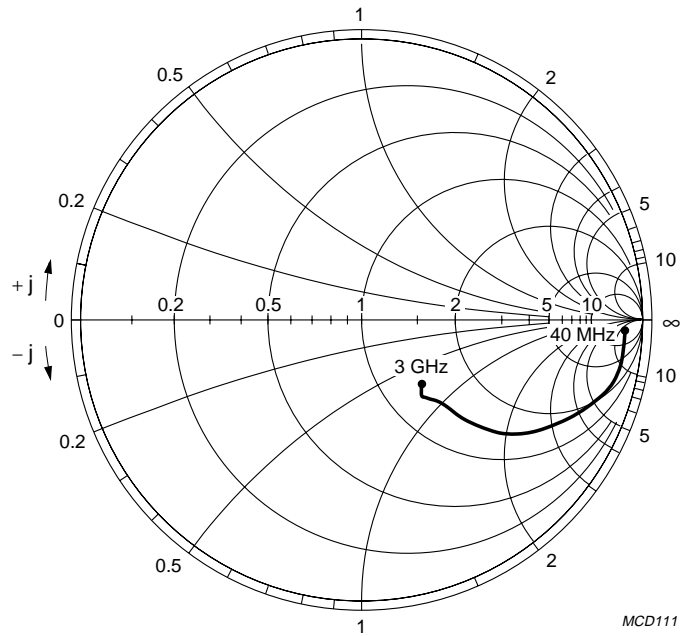
Noise Parameters

F <sub>min</sub> (dB)	Gamma (opt)		R <sub>n</sub> /50
	(mag)	(ang)	
2.4	0.72	26	1.7



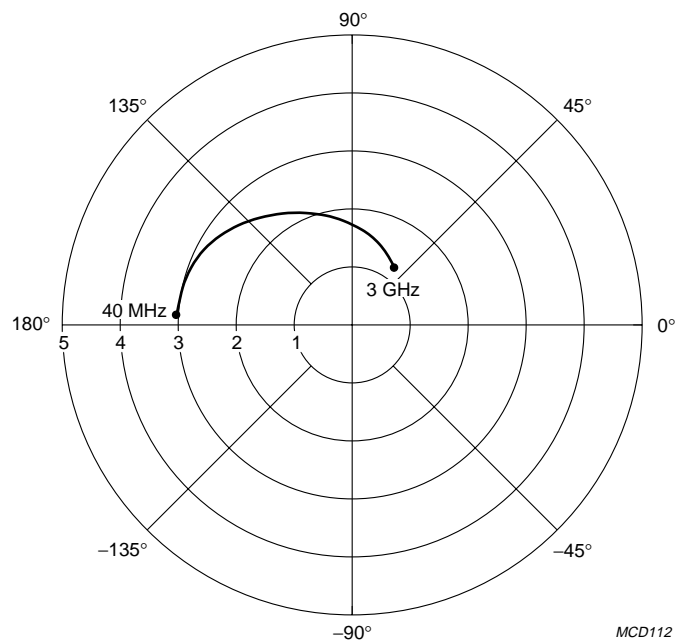
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$V_{CE} = 1\text{ V}; I_C = 1\text{ mA}.$   
 $Z_o = 50\ \Omega.$

Fig.15 Common emitter input reflection coefficient ( $S_{11}$ ).



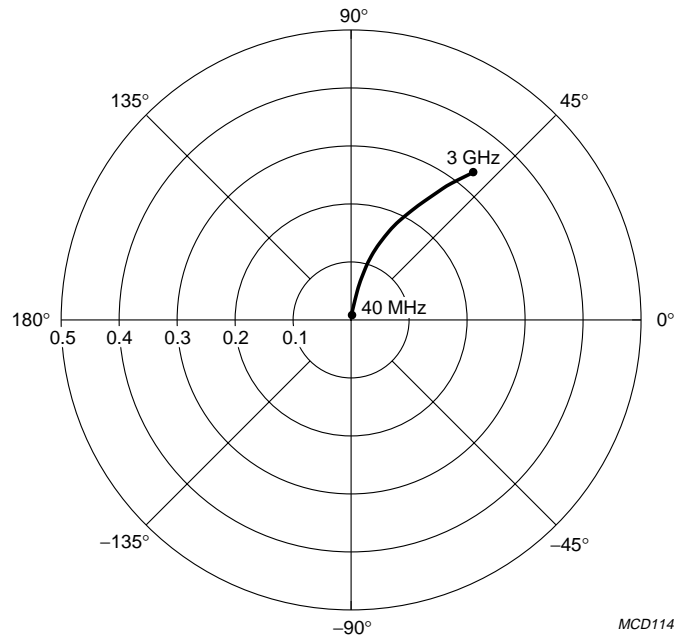
$V_{CE} = 1\text{ V}; I_C = 1\text{ mA}.$

Fig.16 Common emitter forward transmission coefficient ( $S_{21}$ ).



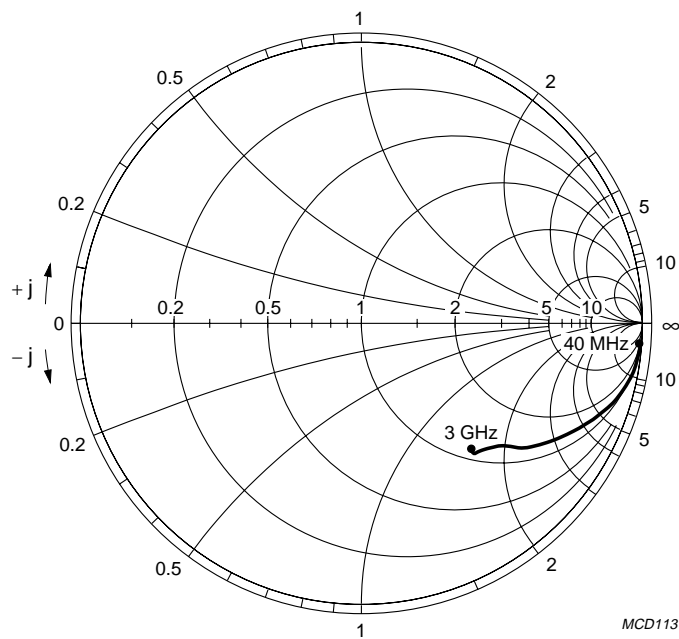
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$V_{CE} = 1\text{ V}; I_C = 1\text{ mA}.$

Fig.17 Common emitter reverse transmission coefficient ( $S_{12}$ ).



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

Fig.18 Common emitter output reflection coefficient ( $S_{22}$ ).

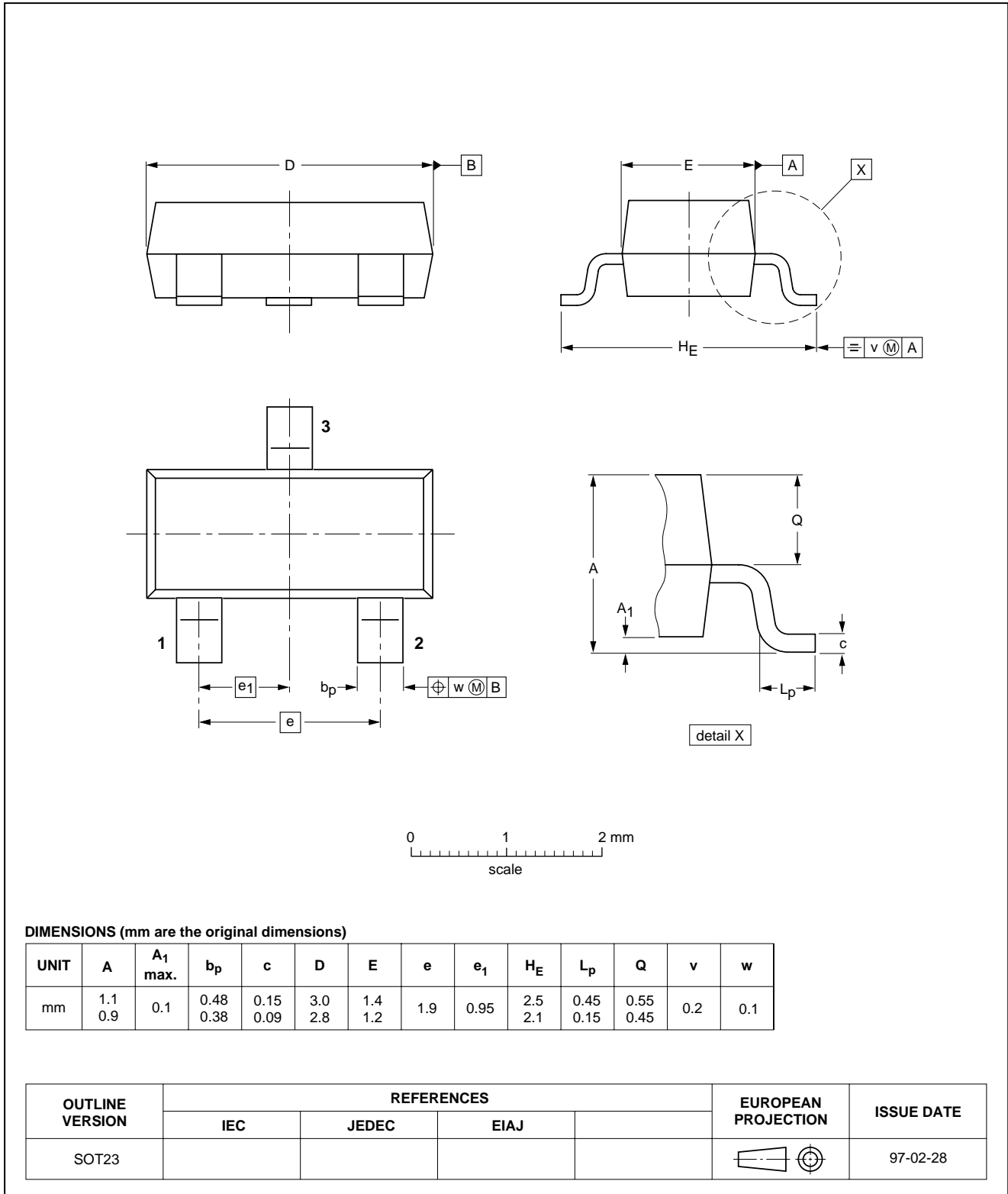
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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



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**DEFINITIONS**

<b>Data Sheet Status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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