

# DATA SHEET

**BFG25A/X**

**NPN 5 GHz wideband transistor**

Product specification  
Supersedes data of September 1995  
File under Discrete Semiconductors, SC14

1997 Oct 29

# NPN 5 GHz wideband transistor

# BFG25A/X

### FEATURES

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

### APPLICATIONS

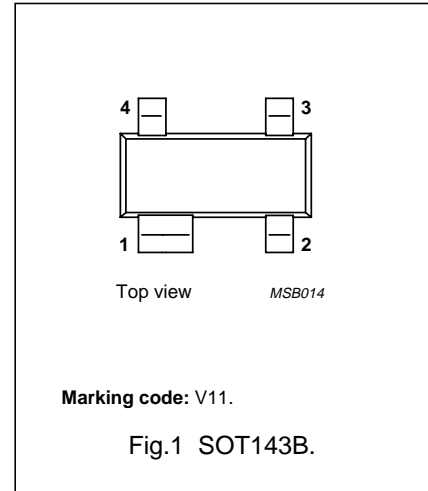
- RF low power amplifiers, such as pocket telephones, paging systems, with signal frequencies up to 2 GHz.

### DESCRIPTION

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

### PINNING

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		–	–	8	V
$V_{CEO}$	collector-emitter voltage		–	–	5	V
$I_C$	collector current (DC)		–	–	6.5	mA
$P_{tot}$	total power dissipation	$T_s \leq 165 \text{ }^\circ\text{C}$	–	–	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	$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V};$ $f = 500 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	3.5	5	–	GHz
$G_{UM}$	maximum unilateral power gain	$I_C = 0.5 \text{ mA}; V_{CE} = 1 \text{ V};$ $f = 1 \text{ GHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	–	18	–	dB
F	noise figure	$I_C = 0.5 \text{ mA}; V_{CE} = 1 \text{ V};$ $f = 1 \text{ GHz}; \Gamma = \Gamma_{opt}; T_{amb} = 25 \text{ }^\circ\text{C}$	–	1.8	–	dB
		$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; f = 1 \text{ GHz};$ $\Gamma = \Gamma_{opt}; T_{amb} = 25 \text{ }^\circ\text{C}$	–	2	–	dB

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**LIMITING VALUES**

In accordance with the Absolute Maximum Rating 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>	collector current (DC)		–	6.5	mA
P <sub>tot</sub>	total power dissipation	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

**Note**

1. T<sub>s</sub> is the temperature at the soldering point of the collector pin.

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th j-s</sub>	thermal resistance from junction to soldering point	note 1	320	K/W

**Note**

1. T<sub>s</sub> is the temperature at the soldering point of the collector pin.

**CHARACTERISTICS**

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

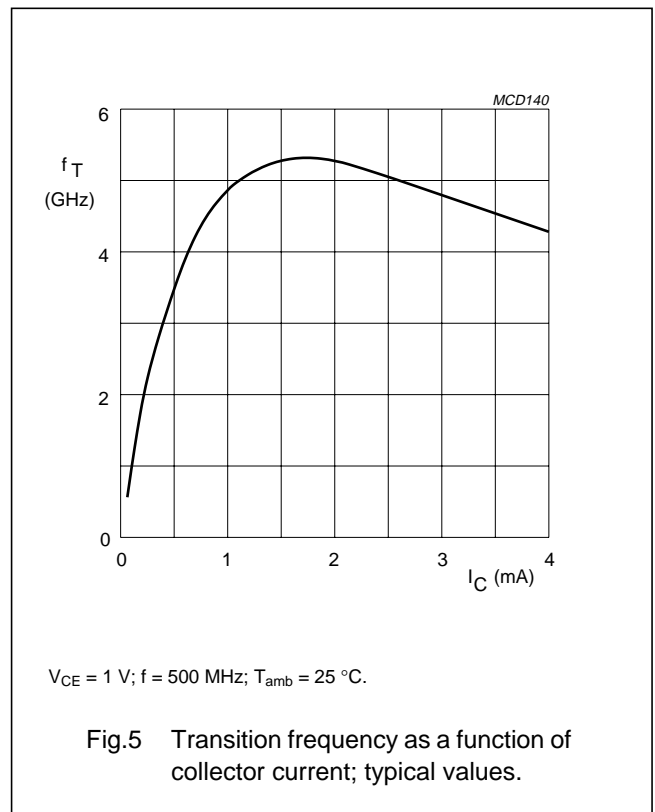
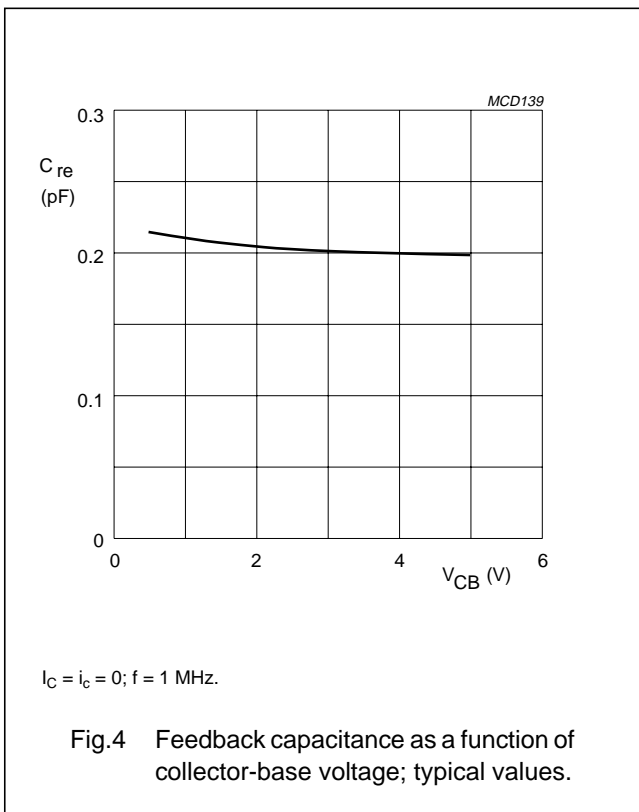
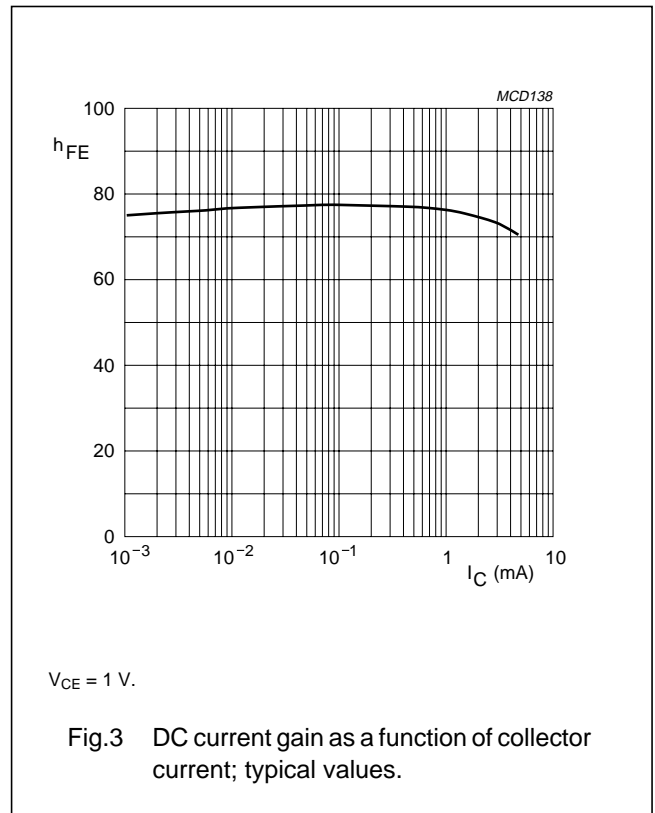
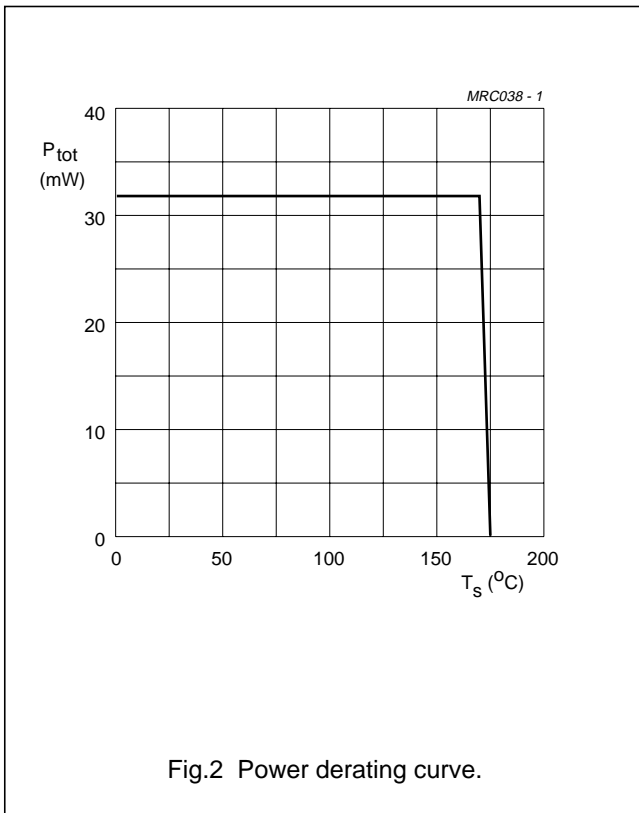
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I <sub>CBO</sub>	collector leakage current	I <sub>E</sub> = 0; V <sub>CB</sub> = 5 V	–	–	50	μA
h <sub>FE</sub>	DC current gain	I <sub>C</sub> = 0.5 mA; V <sub>CE</sub> = 1 V	50	80	200	
C <sub>re</sub>	feedback capacitance	I <sub>C</sub> = i <sub>c</sub> = 0; V <sub>CB</sub> = 1 V; f = 1 MHz	–	0.21	0.3	pF
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
G <sub>UM</sub>	maximum unilateral power gain (note 1)	I <sub>C</sub> = 0.5 mA; V <sub>CE</sub> = 1 V; f = 1 GHz; T <sub>amb</sub> = 25 °C	–	18	–	dB
F	noise figure	I <sub>C</sub> = 0.5 mA; V <sub>CE</sub> = 1 V; f = 1 GHz; Γ = Γ <sub>opt</sub> ; T <sub>amb</sub> = 25 °C	–	1.8	–	dB
		I <sub>C</sub> = 1 mA; V <sub>CE</sub> = 1 V; f = 1 GHz; Γ = Γ <sub>opt</sub> ; T <sub>amb</sub> = 25 °C	–	2	–	dB

**Note**

1. G<sub>UM</sub> is the maximum unilateral power gain, assuming S<sub>12</sub> is zero and  $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$  dB

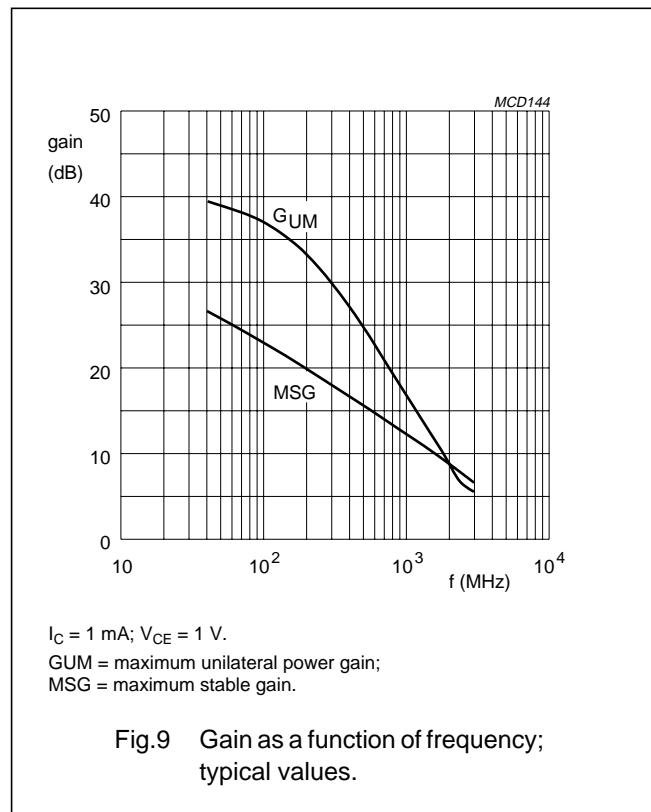
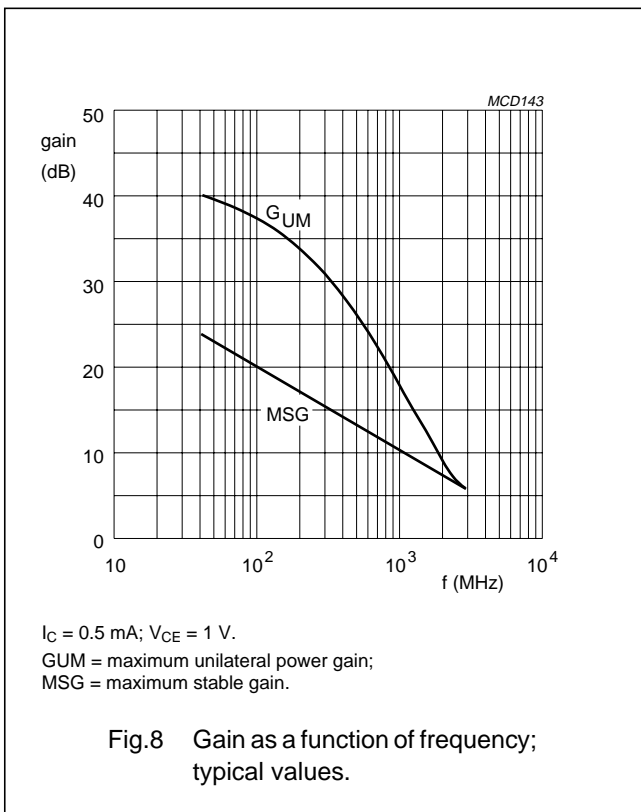
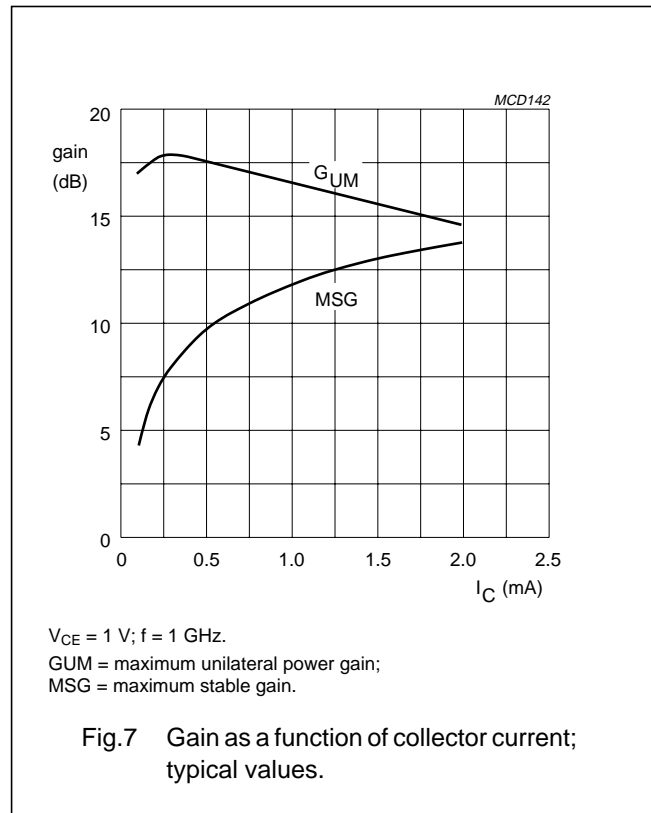
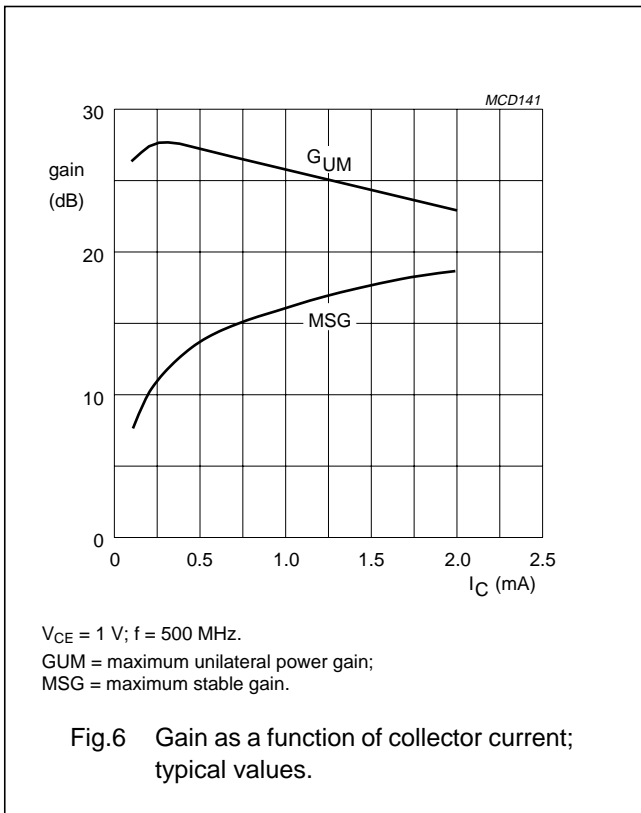
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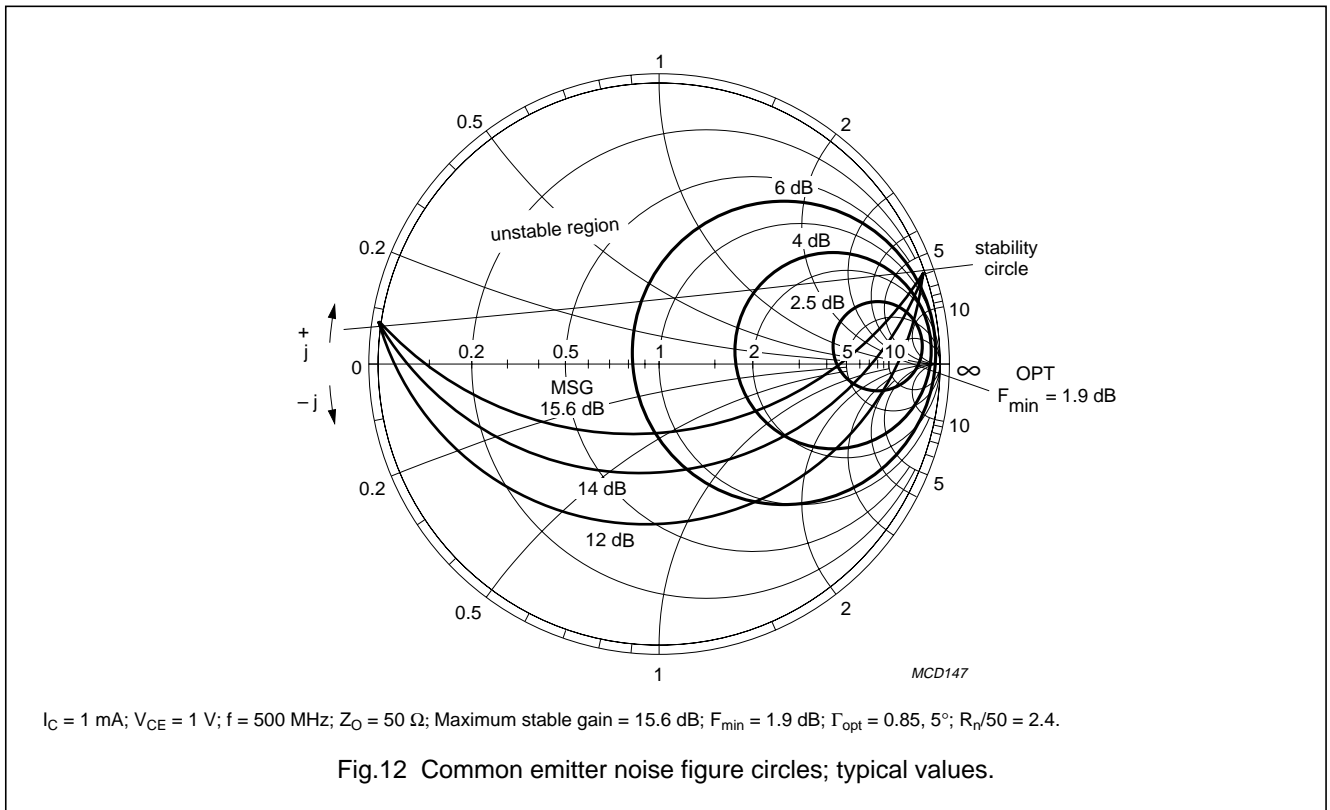
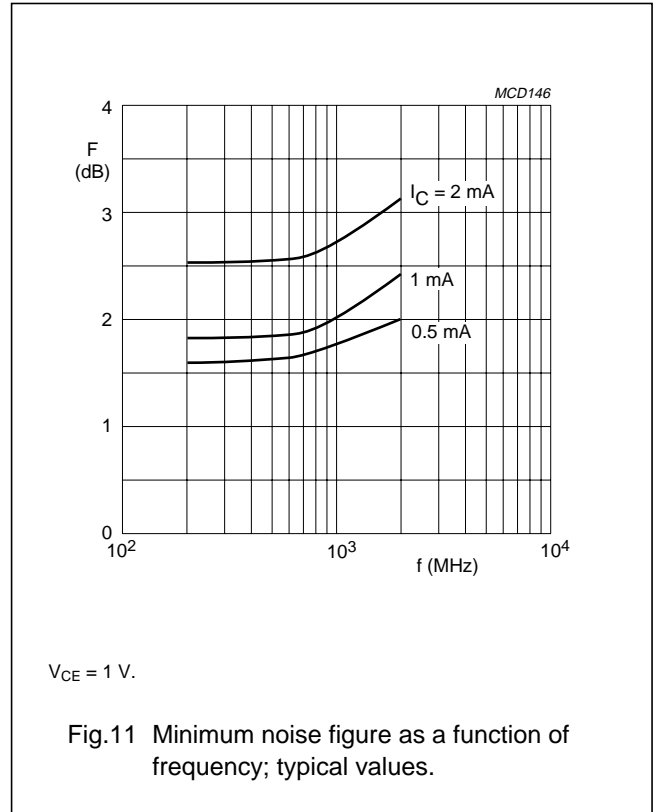
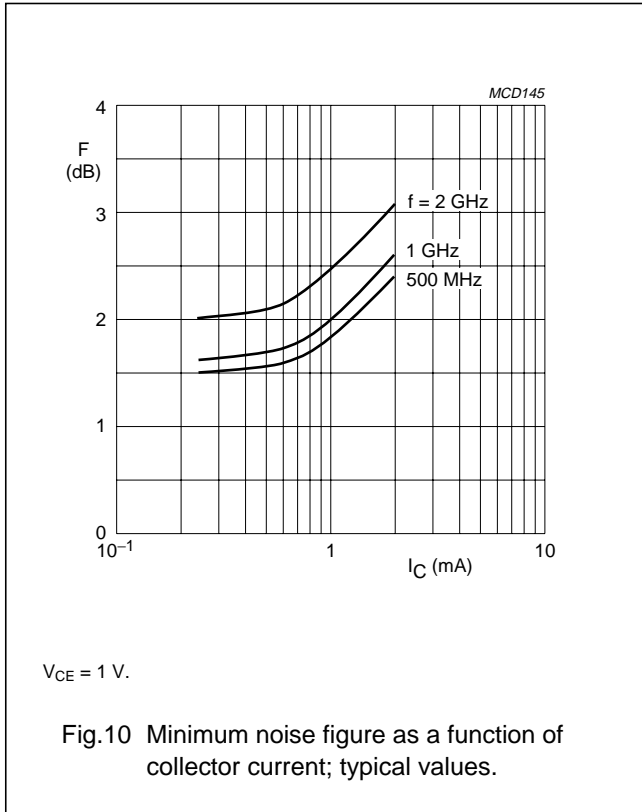
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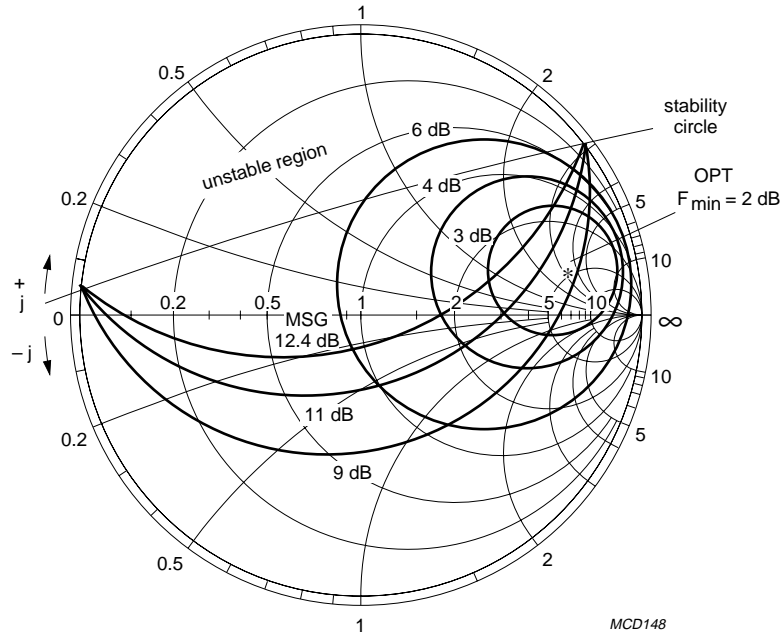
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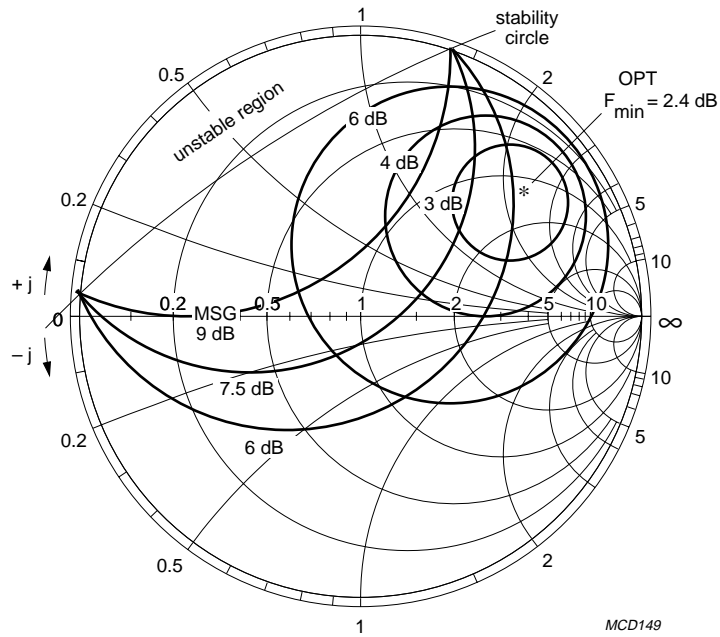
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$I_C = 1 \text{ mA}$ ;  $V_{CE} = 1 \text{ V}$ ;  $f = 1000 \text{ MHz}$ ;  $Z_O = 50 \Omega$ ; Maximum stable gain = 12.4 dB;  $F_{min} = 2 \text{ dB}$ ;  $\Gamma_{opt} = 0.78, 14^\circ$ ;  $R_n/50 = 2.6$ .

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

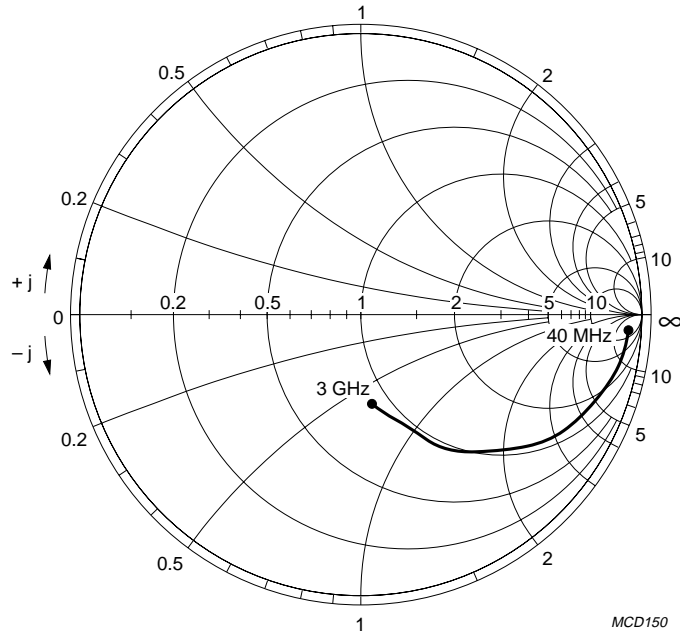


$I_C = 1 \text{ mA}$ ;  $V_{CE} = 1 \text{ V}$ ;  $f = 2000 \text{ MHz}$ ;  $Z_O = 50 \Omega$ ; Maximum stable gain = 8.9 dB;  $F_{min} = 2.4 \text{ dB}$ ;  $\Gamma_{opt} = 0.72, 38^\circ$ ;  $R_n/50 = 1.9$ .

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

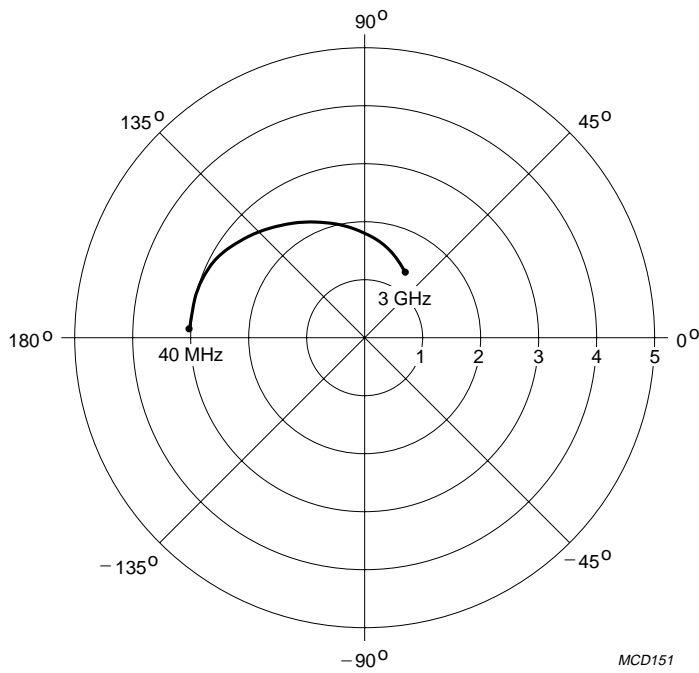
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$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}; Z_0 = 50 \Omega.$

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



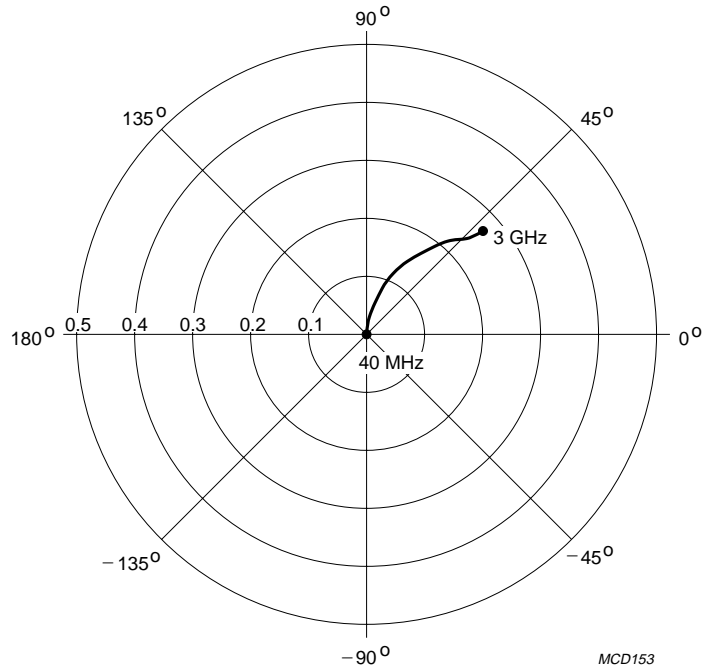
$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}.$

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



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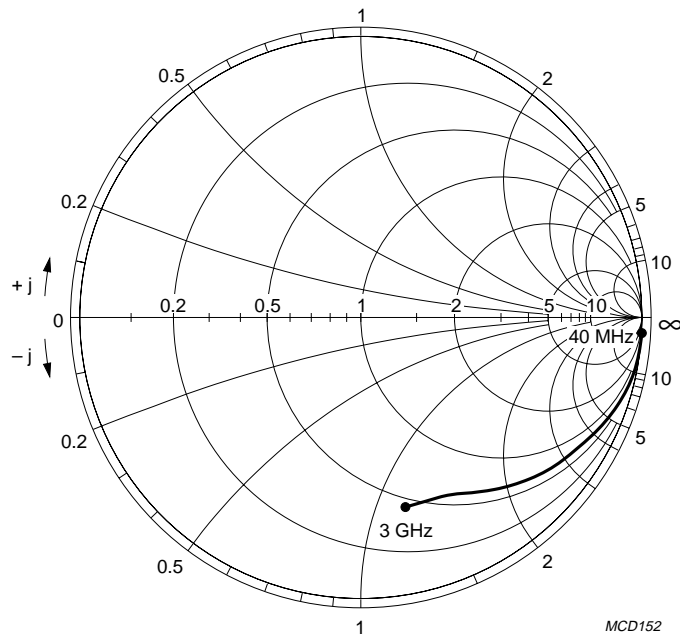
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$I_C = 1 \text{ mA}; V_{CE} = 1 \text{ V}.$

MCD153

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



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

MCD152

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

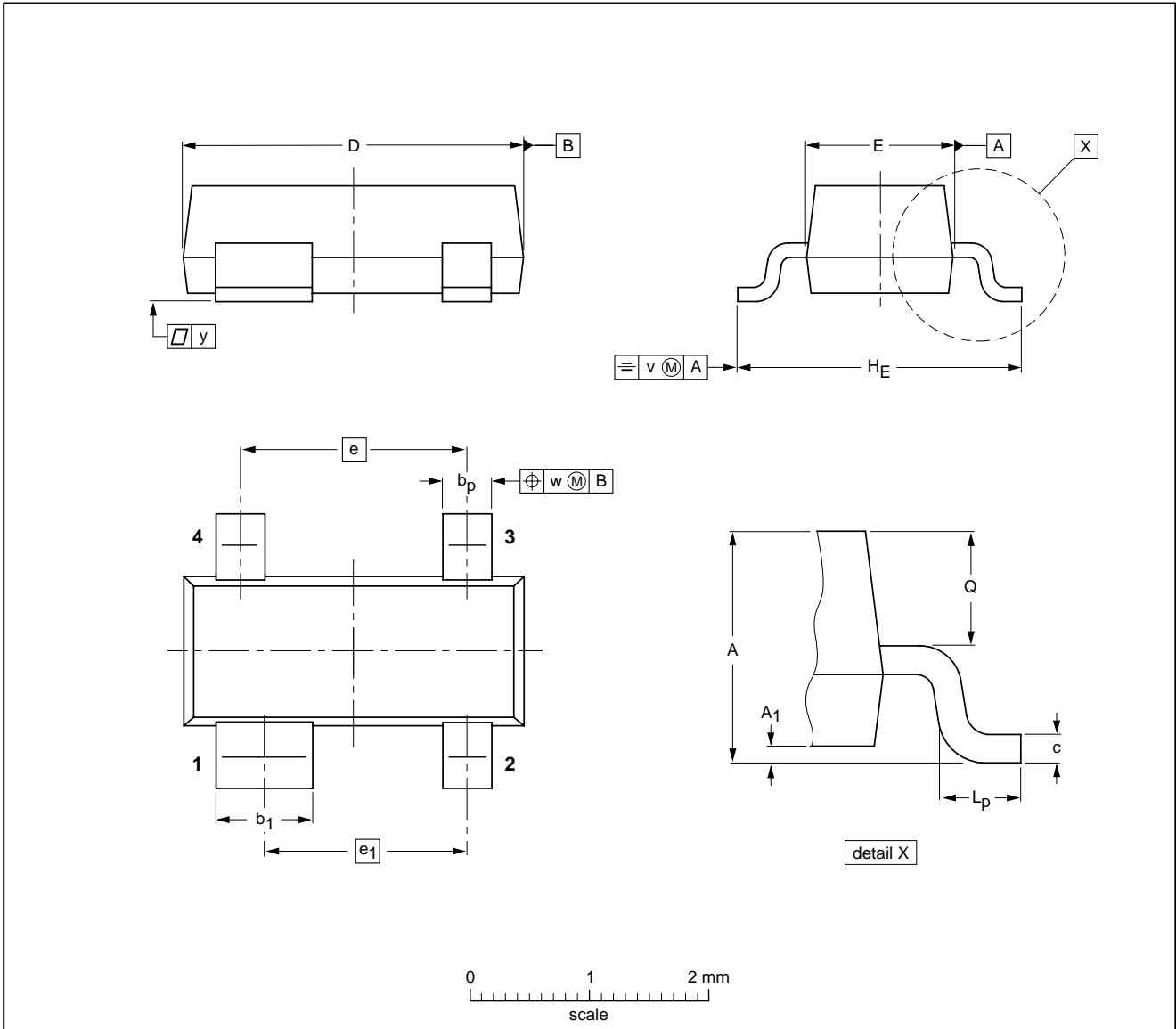
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PACKAGE OUTLINE

Plastic surface mounted package; 4 leads

SOT143B



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	b <sub>1</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	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**

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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.	
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