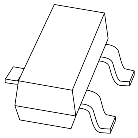

BFT25A

NPN 5 GHz wideband transistor

Rev. 04 — 6 July 2004 **Product data sheet**

1. Product profile

1.1 General 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.

1.2 Features

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

1.3 Quick reference data

Table 1: 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 °C [1]	-	-	32	mW
h_{FE}	DC current gain	I_C = 0.5 mA; V_{CE} = 1 V	50	80	200	
f_T	transition frequency	I_C = 1 mA; V_{CE} = 1 V; T_{amb} = 25 °C; f = 500 MHz	3.5	5	-	GHz
G_{UM}	maximum unilateral power gain	I_C = 0.5 mA; V_{CE} = 1 V; T_{amb} = 25 °C; f = 1 GHz	-	15	-	dB
F	noise figure	$\Gamma = \Gamma_{opt}$; I_C = 0.5 mA; V_{CE} = 1 V; T_{amb} = 25 °C; f = 1 GHz	-	1.8	-	dB
		$\Gamma = \Gamma_{opt}$; I_C = 1 mA; V_{CE} = 1 V; T_{amb} = 25 °C; f = 1 GHz	-	2	-	dB

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

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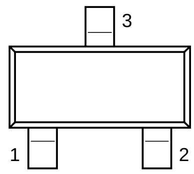
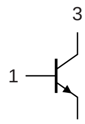
2. Pinning information

Table 2: Discrete pinning

Pin	Description	Simplified outline	Symbol
Code: V10		 SOT23	 sym021
1	base		
2	emitter		
3	collector		

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
BFT25A	-	plastic surface mounted package; 3 leads	SOT23

4. Marking

Table 4: Marking

Type number	Marking code [1]
BFT25A	34*

[1] * = p : Made in Hong Kong.
* = t : Made in Malaysia.
* = W : Made in China.

5. Limiting values

Table 5: Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter	-	8	V
V_{CEO}	collector-emitter voltage	open base	-	5	V
V_{EBO}	emitter-base voltage	open collector	-	2	V
I_C	DC collector current		-	6.5	mA
P_{tot}	total power dissipation	up to T_s = 165 °C [1]	-	32	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		-	175	°C

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

6. Thermal characteristics

Table 6: Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-s)}$	from junction to soldering point	[1]	260	K/W

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

7. Characteristics

Table 7: Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector cut-off current	I_E = 0 A; V_{CB} = 5 V	-	-	50	nA
h_{FE}	DC current gain	I_C = 0.5 mA; V_{CE} = 1 V	50	80	200	
f_T	transition frequency	I_C = 1 mA; V_{CE} = 1 V; T_{amb} = 25 °C; f = 500 MHz	3.5	5	-	GHz
C_{re}	feedback capacitance	I_C = i_c = 0 A; V_{CB} = 1 V; f = 1 MHz	-	0.3	0.45	pF
G_{UM}	maximum unilateral power gain	I_C = 0.5 mA; V_{CE} = 1 V; T_{amb} = 25 °C; f = 1 GHz [1]	-	15	-	dB
F	noise figure	$\Gamma = \Gamma_{opt}$; I_C = 0.5 mA; V_{CE} = 1 V; T_{amb} = 25 °C; f = 1 GHz	-	1.8	-	dB
		$\Gamma = \Gamma_{opt}$; I_C = 1 mA; V_{CE} = 1 V; T_{amb} = 25 °C; f = 1 GHz	-	2	-	dB

[1] G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and

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

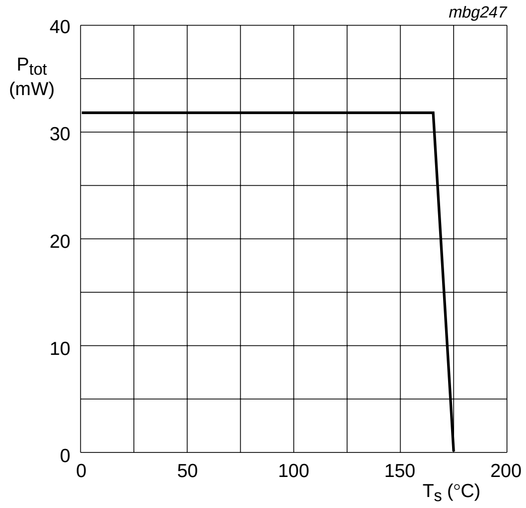
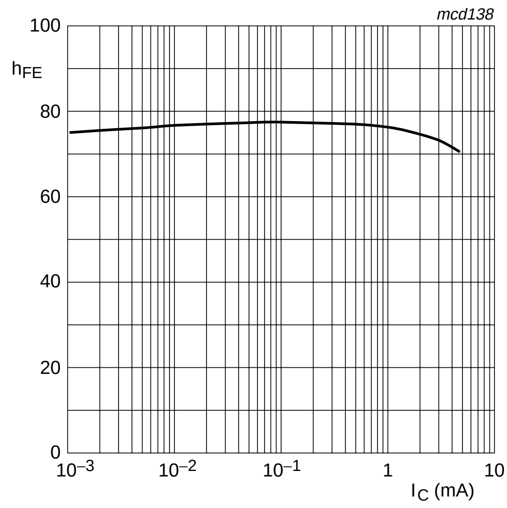
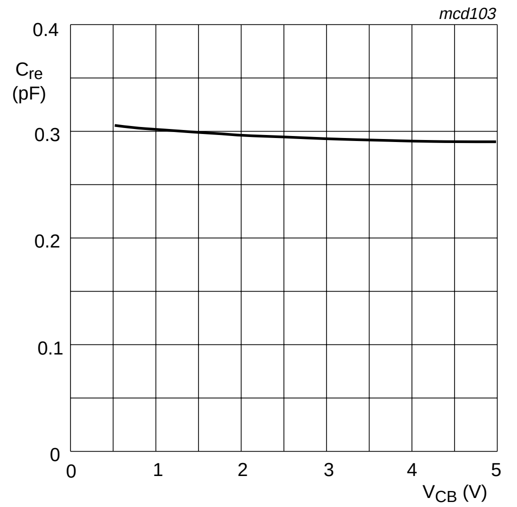


Fig 1. Power derating curve.



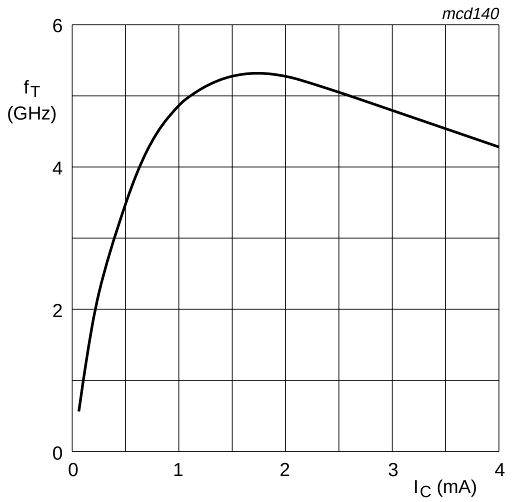
V_{CE} = 1 V.

Fig 2. DC current gain as a function of collector current.



$I_C = i_c$ = 0 A; f = 1 MHz.

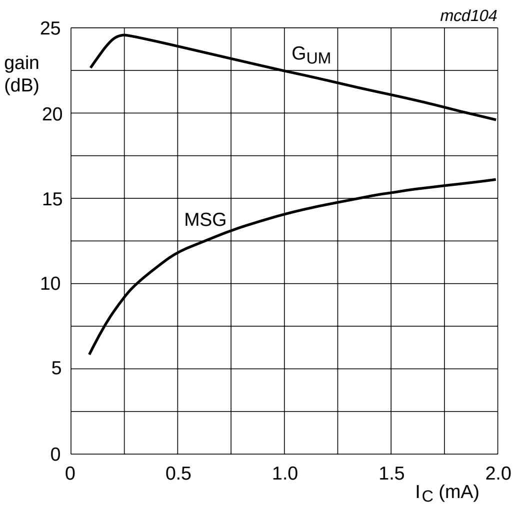
Fig 3. Feedback capacitance as a function of collector-base voltage.



V_{CE} = 1 V; T_{amb} = 25 °C; f = 500 MHz.

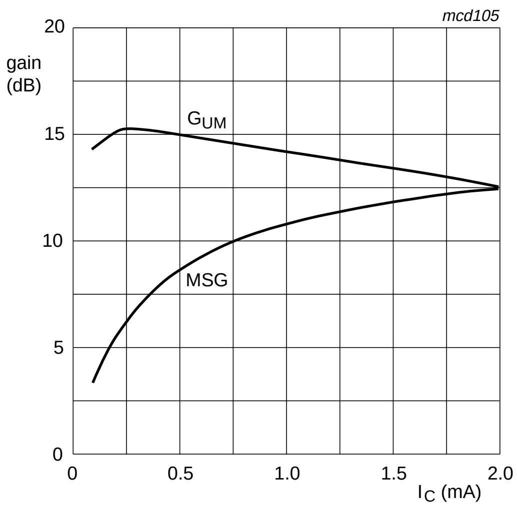
Fig 4. Transition frequency as a function of collector current.

Figure 5, 6, 7 and 8, G_{UM} = maximum unilateral power gain; MSG = maximum stable gain.



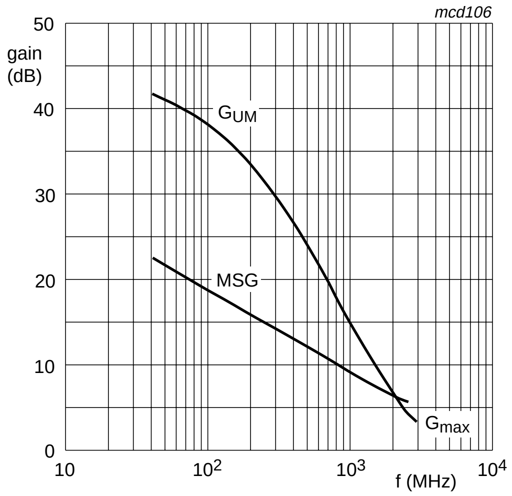
V_{CE} = 1 V; f = 500 MHz.

Fig 5. Gain as a function of collector current.



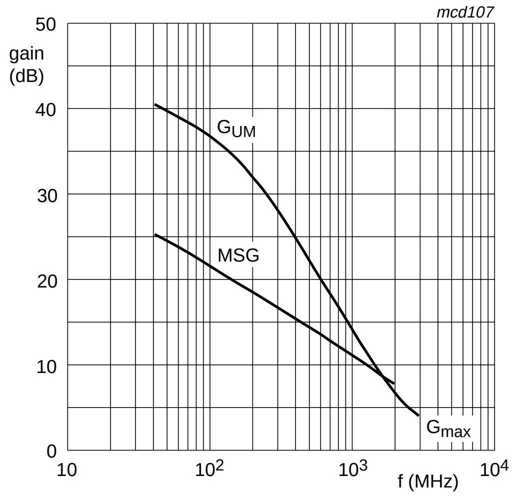
V_{CE} = 1 V; f = 1 GHz.

Fig 6. Gain as a function of collector current.



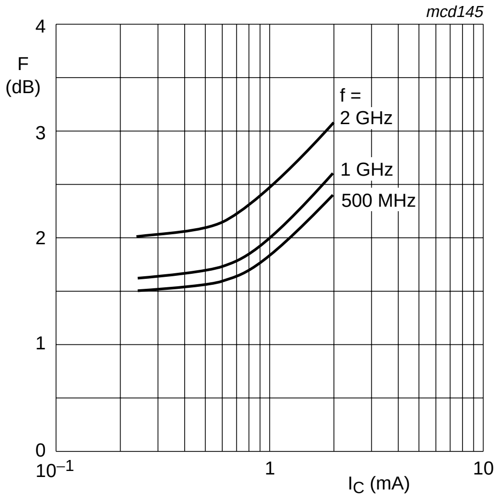
V_{CE} = 1 V; I_C = 0.5 mA.

Fig 7. Gain as a function of frequency.



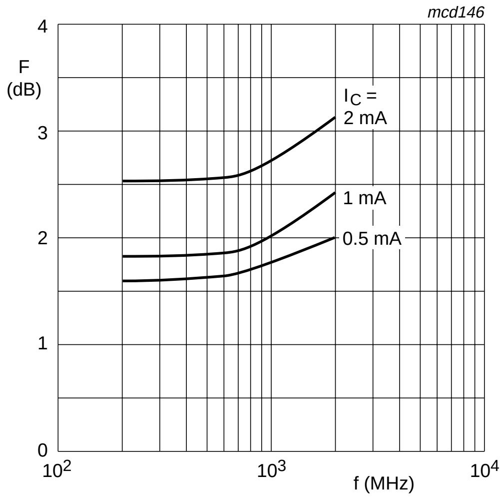
V_{CE} = 1 V; I_C = 1 mA.

Fig 8. Gain as a function of frequency.



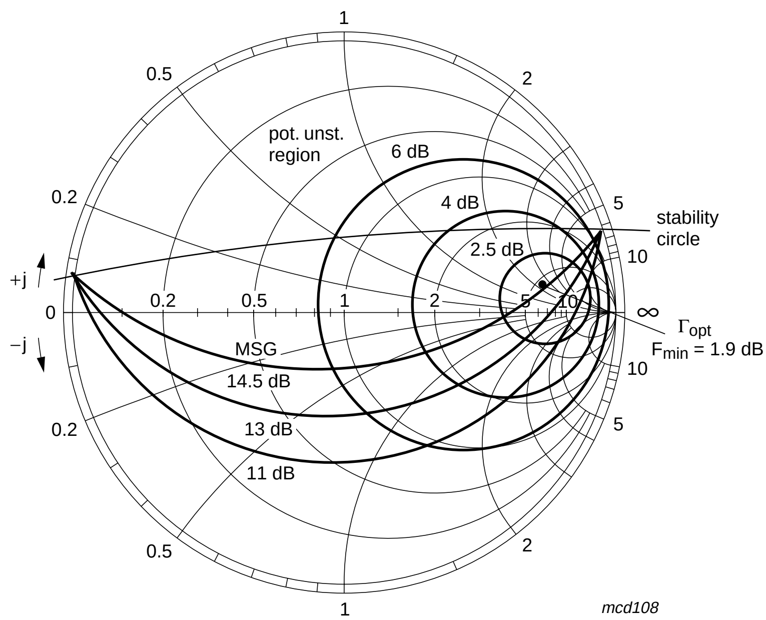
V_{CE} = 1 V.

Fig 9. Minimum noise figure as a function of collector current.



V_{CE} = 1 V.

Fig 10. Minimum noise figure as a function of frequency.



See Table 8;

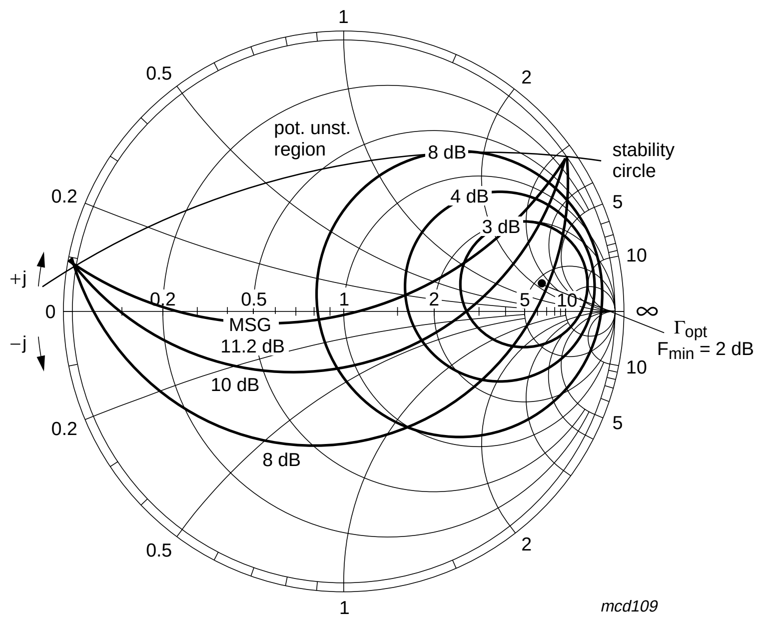
Z_o = 50 Ω.

Average gain parameter: MSG = 14.5 dB.

Fig 11. Noise circle figure.

Table 8: Noise parameters

f (MHz)	V_{CE} (V)	I_C (mA)	F_{min} (dB)	Γ_{opt}		$R_n/50$
				(mag)	(ang)	
500	1	1	1.9	0.79	4	2.5



See Table 9;

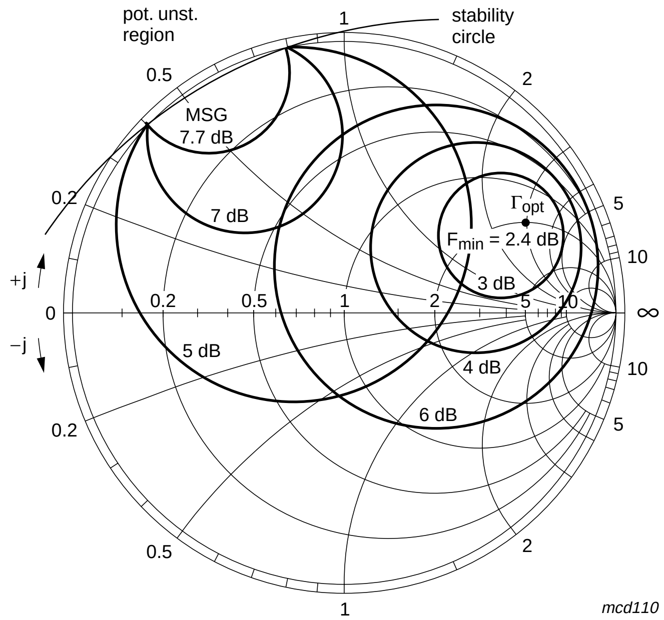
$Z_o = 50\ \Omega$.

Average gain parameter: MSG = 11.2 dB.

Fig 12. Noise circle figure.

Table 9: Noise parameters

f (MHz)	V_{CE} (V)	I_C (mA)	F_{min} (dB)	Γ_{opt}		$R_n/50$
				(mag)	(ang)	
1000	1	1	2	0.74	8	2.6



See Table 10;

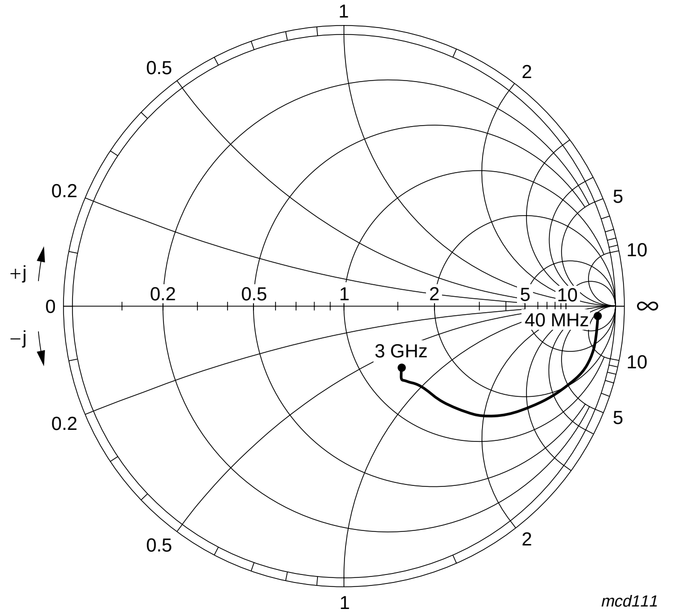
Z_o = 50 Ω.

Average gain parameter: MSG = 7.7 dB.

Fig 13. Noise circle figure.

Table 10: Noise parameters

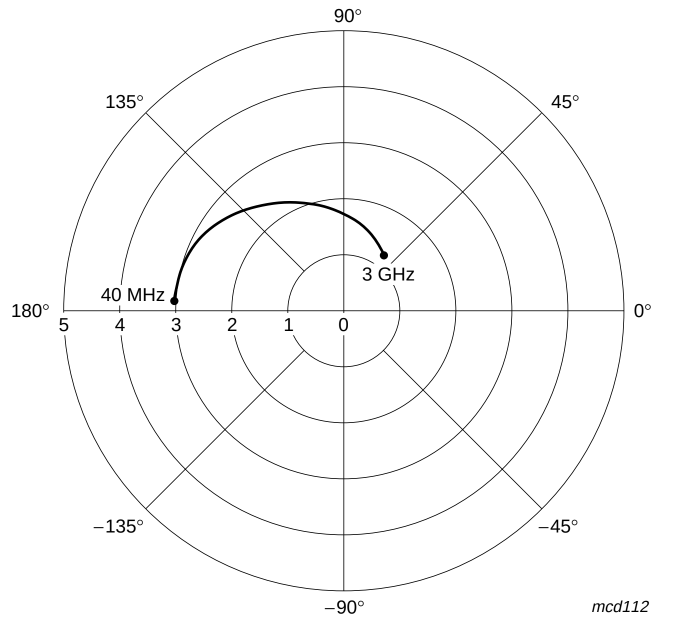
f (MHz)	V_{CE} (V)	I_C (mA)	F_{min} (dB)	Γ_{opt}		R_n/50
				(mag)	(ang)	
2000	1	1	2.4	0.72	26	1.7



V_{CE} = 1 V; I_C = 1 mA.

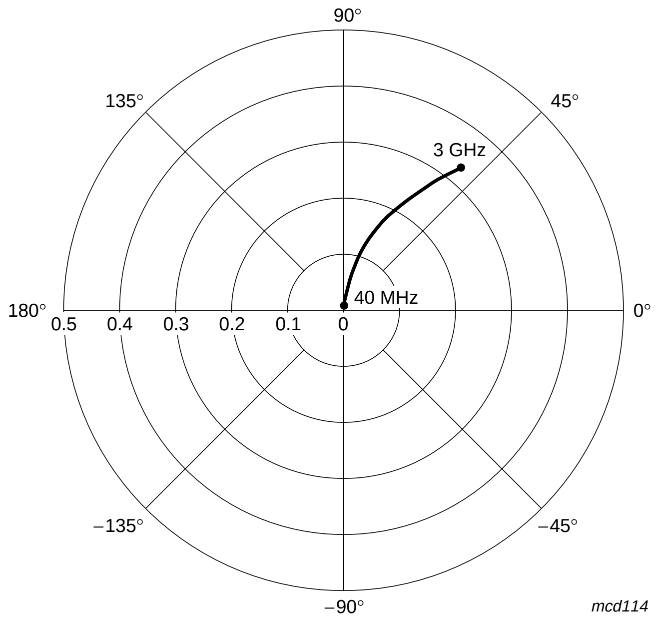
Z_o = 50 Ω.

Fig 14. Common emitter input reflection coefficient (S_{11}).



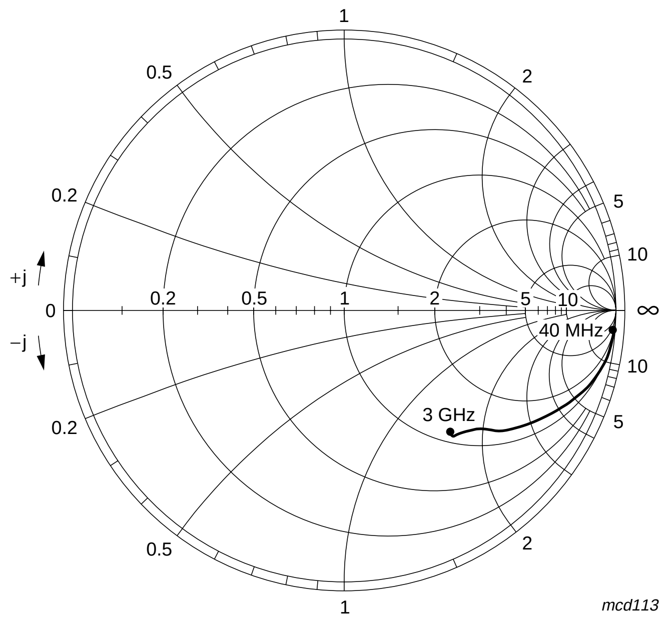
V_{CE} = 1 V; I_C = 1 mA.

Fig 15. Common emitter forward transmission coefficient (S_{21}).



V_{CE} = 1 V; I_C = 1 mA.

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



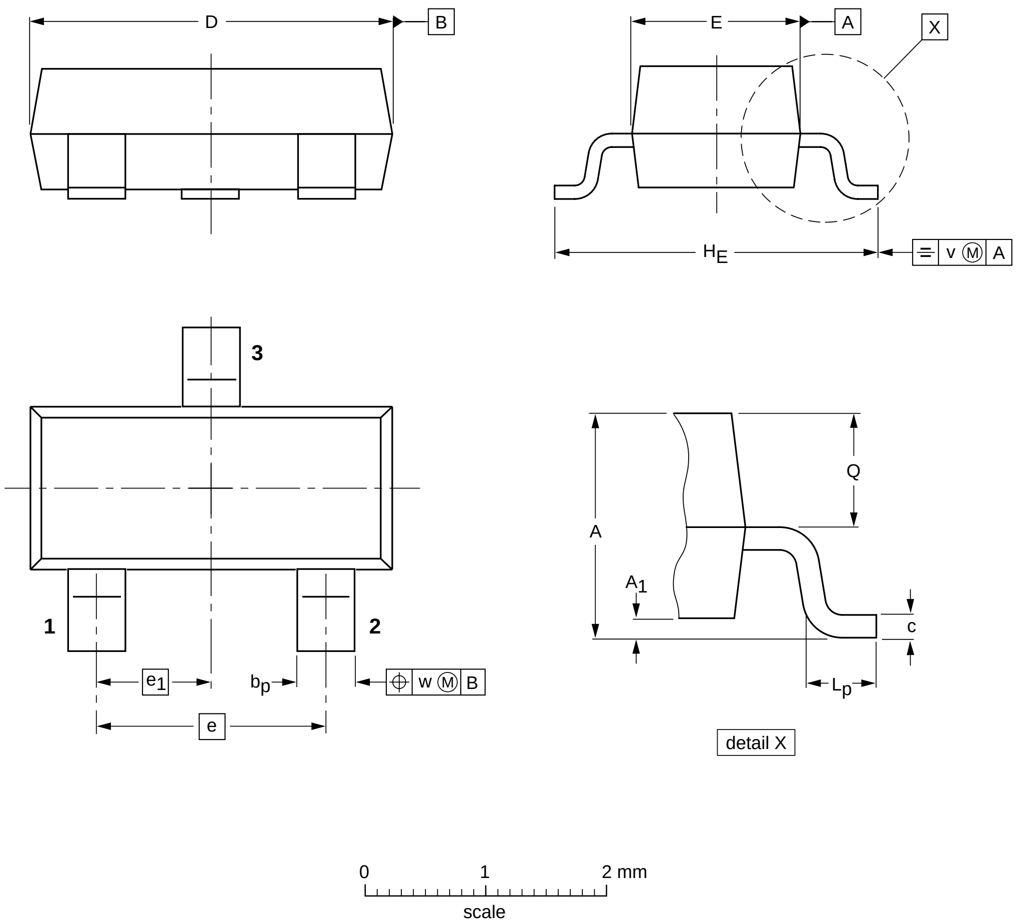
V_{CE} = 1 V; I_C = 1 mA.

Z_o = 50 Ω.

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

8. Package outline

Plastic surface mounted package; 3 leads **SOT23**



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 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23		TO-236AB				~~97-02-28~~ 99-09-13

Fig 18. Package outline.

9. Revision history

Table 11: Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
BFT25A_4	20040706	product data sheet	-	9397 750 13399	BFT25A_CNV_3
Modifications:	• Converted from Lotus Manuscript format to TDM format. • Marking code added.				
BFT25A_CNV_3	19971205	product specification	-	-	-

10. Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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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14. Contents

Date of release: 6 July 2004
Document order number: 9397 750 13399

Published in The Netherlands