BFT25A

NPN 5 GHz wideband transistor

Rev. 5 — 12 September 2011 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 and benefits

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

1.3 Quick reference data

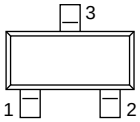
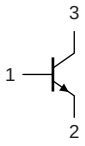
Table 1. Quick reference data

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.

2. Pinning information

Table 2. Discrete pinning

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

sym021

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

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

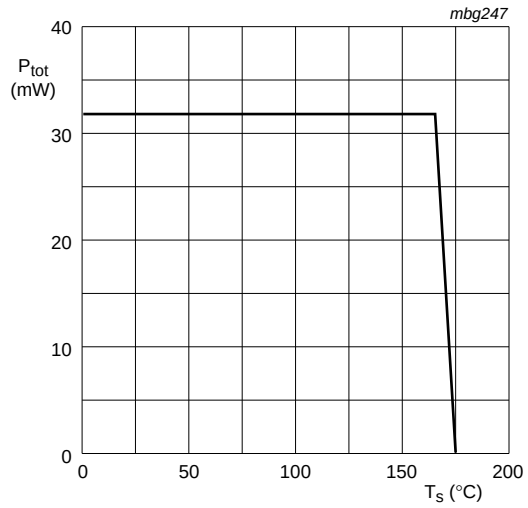
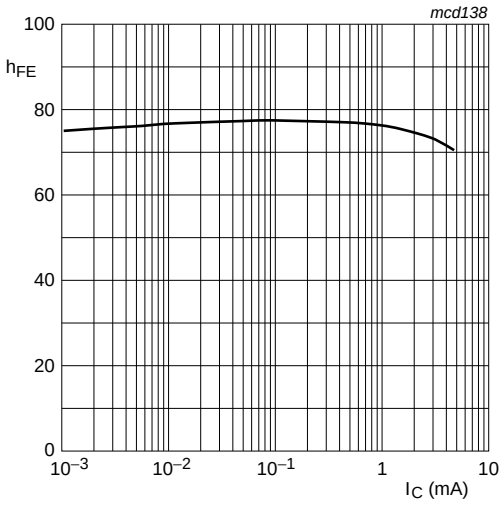
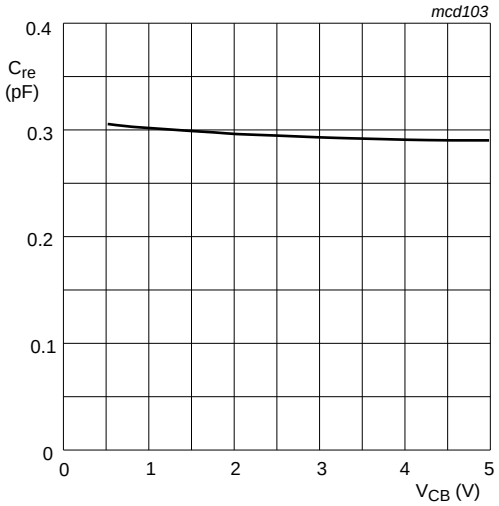


Fig 1. Power derating curve.



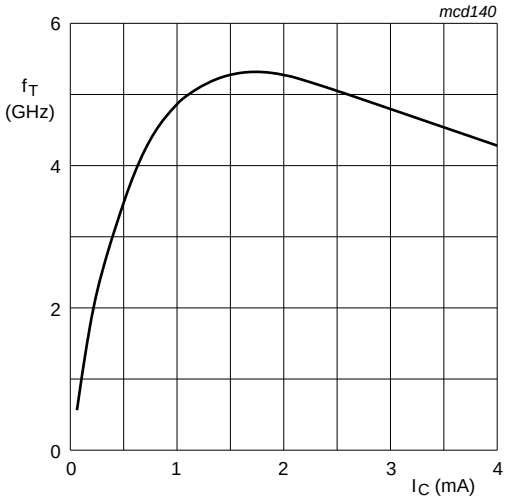
V_{CE} = 1 V.

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



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

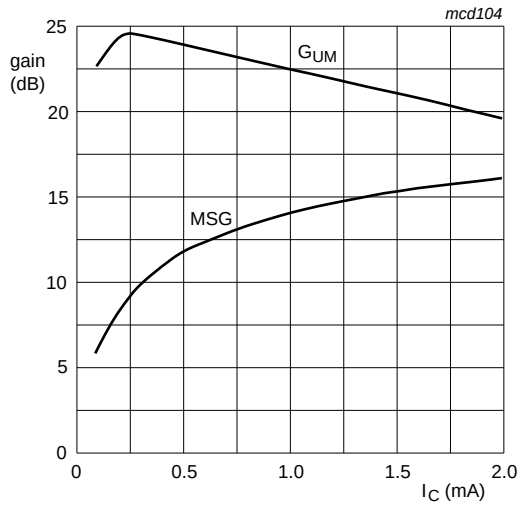
Fig 3. Feedback capacitance as a function of collector-base voltage.



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

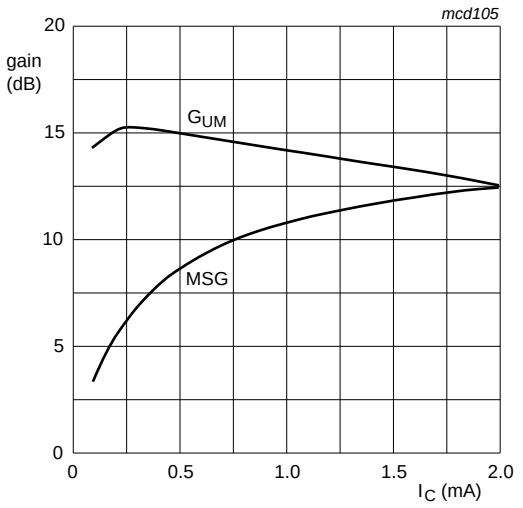
Fig 4. Transition frequency as a function of collector current.

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



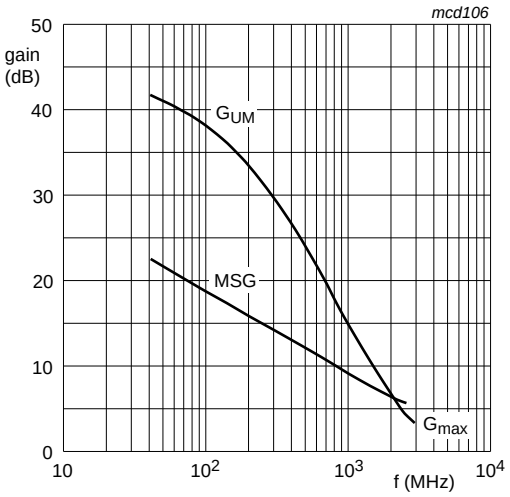
V_{CE} = 1 V; f = 500 MHz.

Fig 5. Gain as a function of collector current.



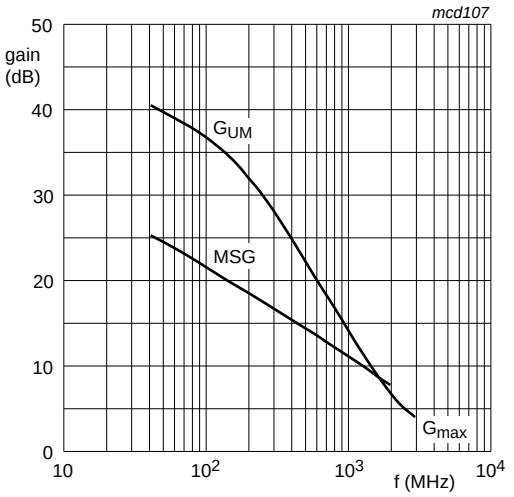
V_{CE} = 1 V; f = 1 GHz.

Fig 6. Gain as a function of collector current.



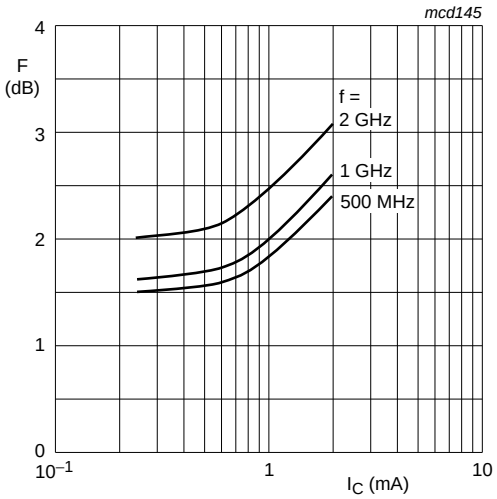
V_{CE} = 1 V; I_C = 0.5 mA.

Fig 7. Gain as a function of frequency.



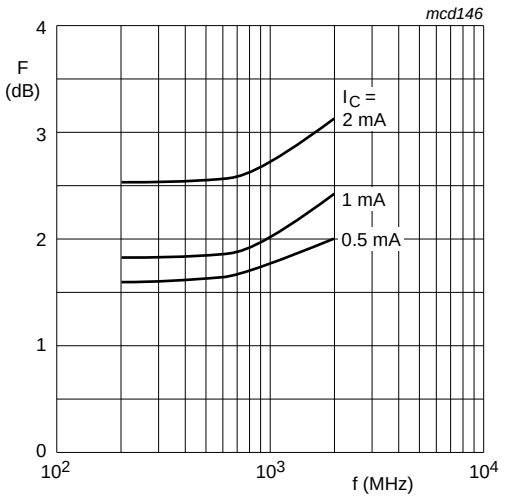
V_{CE} = 1 V; I_C = 1 mA.

Fig 8. Gain as a function of frequency.



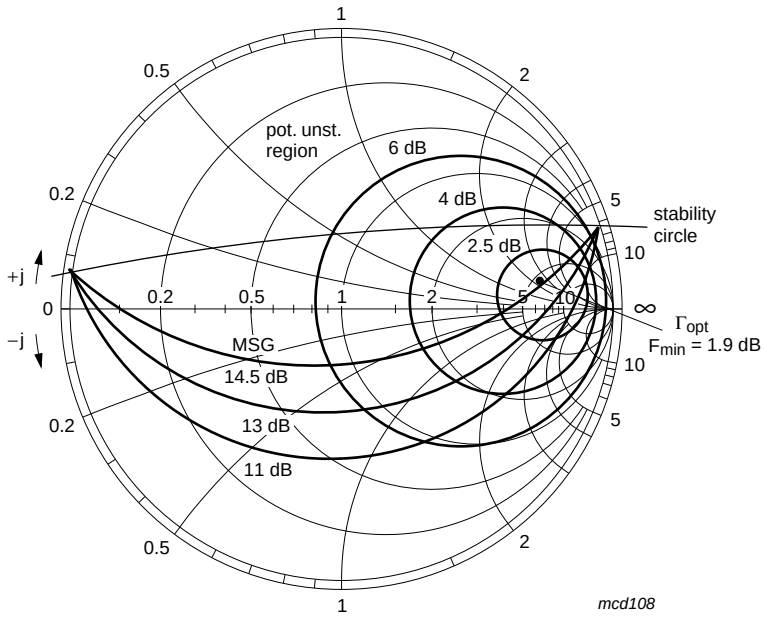
V_{CE} = 1 V.

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;

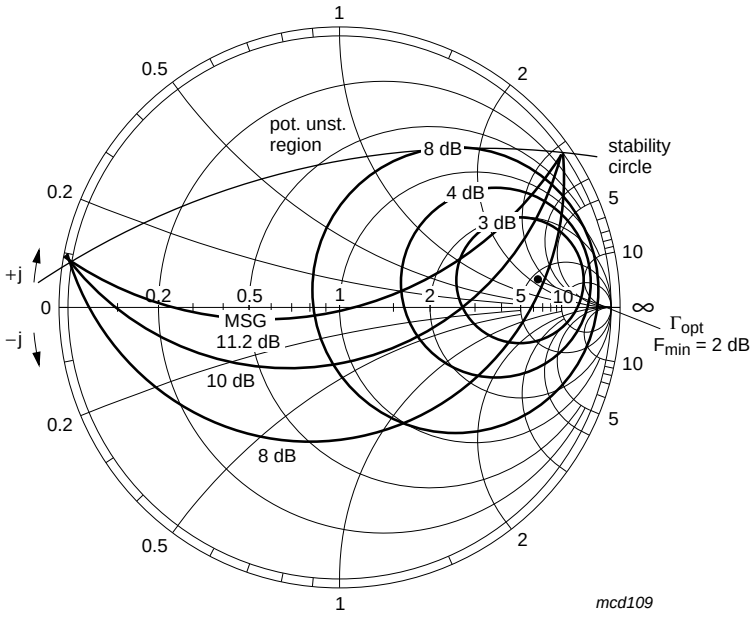
Z_o = 50 Ω.

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;

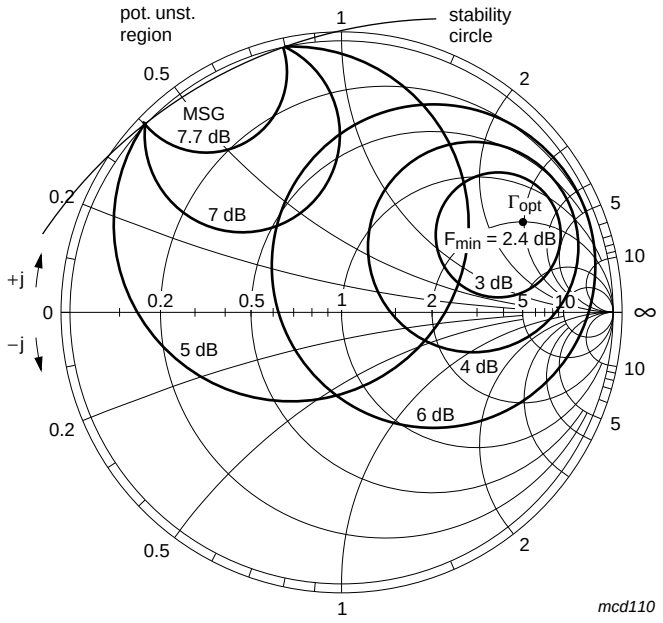
Z_o = 50 Ω.

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;

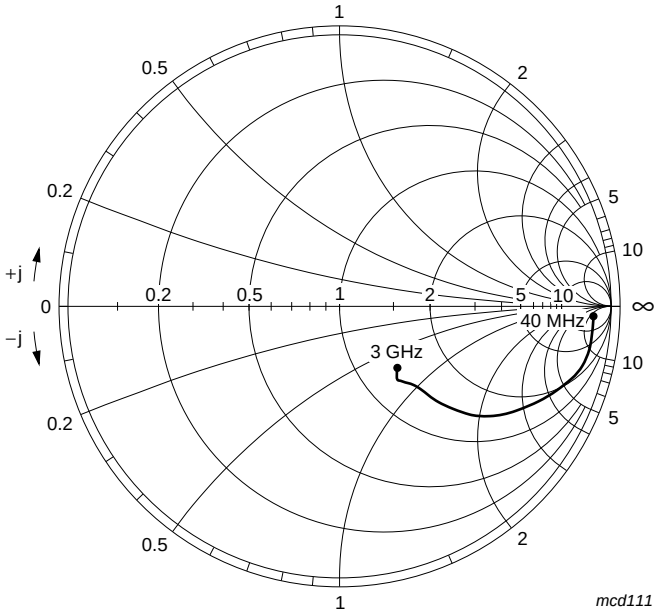
Z_o = 50 Ω.

Average gain parameter: MSG = 7.7 dB.

Fig 13. Noise circle figure.

Table 10. Noise parameters

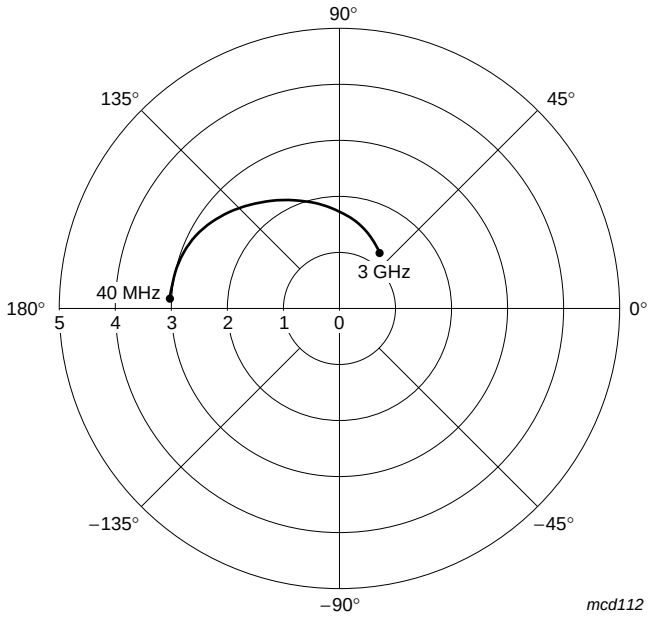
f (MHz)	V_{CE} (V)	I_C (mA)	F_{min} (dB)	Γ_{opt}		$R_n/50$
				(mag)	(ang)	
2000	1	1	2.4	0.72	26	1.7



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

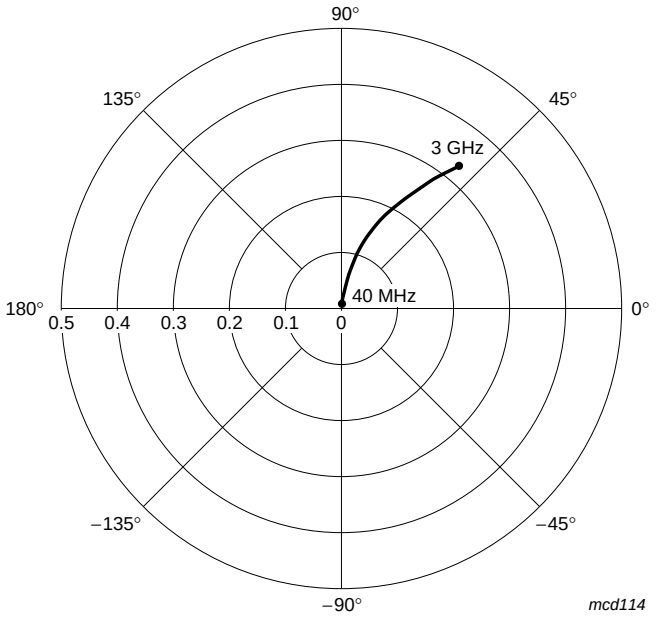
Z_o = 50 Ω.

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



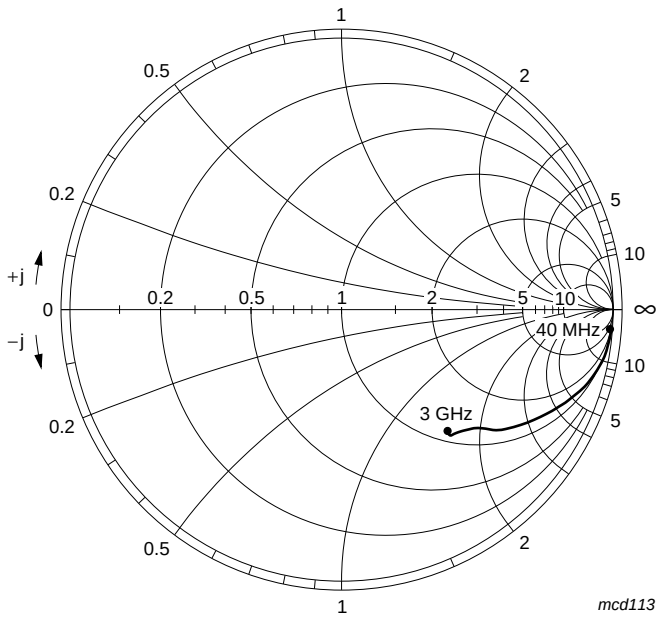
V_{CE} = 1 V; I_C = 1 mA.

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}).



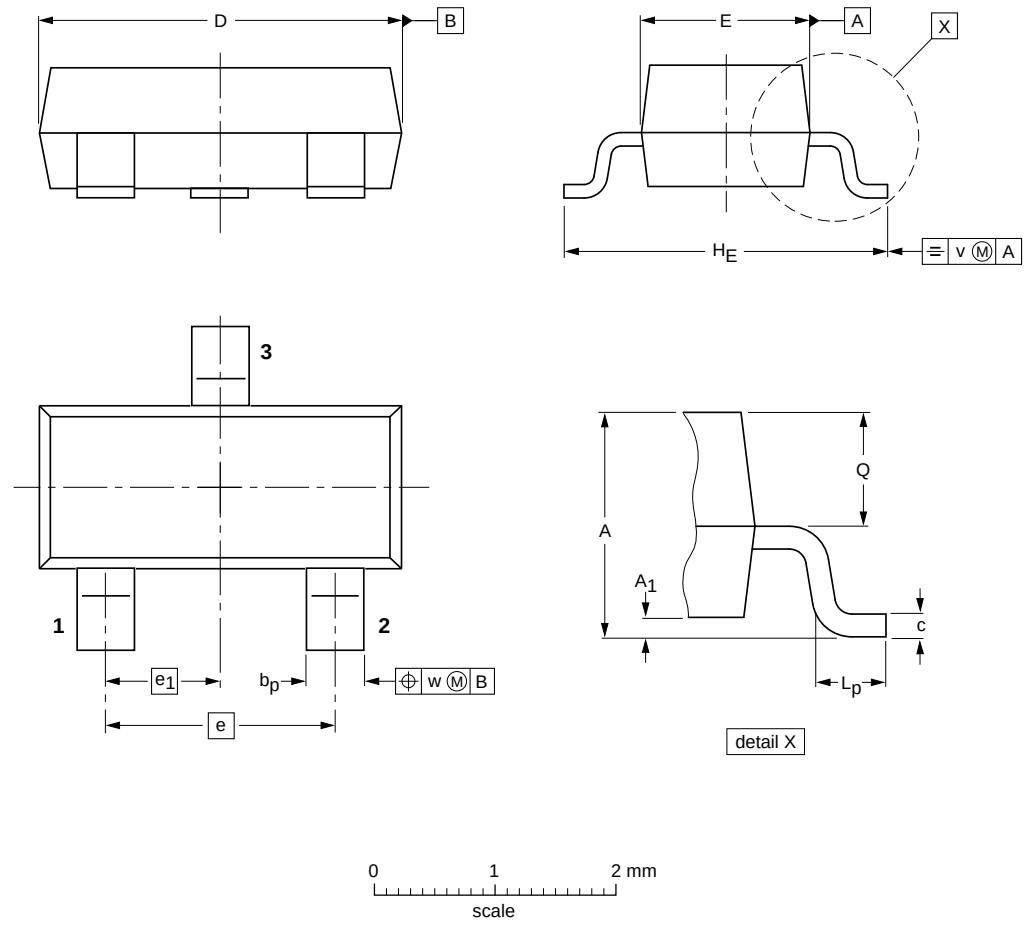
V_{CE} = 1 V; I_C = 1 mA.

Z_0 = 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	JEITA			
SOT23		TO-236AB				~~04-11-04~~ 06-03-16

Fig 18. Package outline.

9. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BFT25A v.5	20110912	Product data sheet	-	BFT25A v.4
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Package outline drawings have been updated to the latest version.			
BFT25A v.4 (9397 750 13399)	20040706	Product data sheet	-	BFT25A_CNV v.3
BFT25A_CNV v.3	19971205	Product specification	-	-

10. Legal information

10.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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For sales office addresses, please send an email to: **salesaddresses@nxp.com**

12. Contents

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Date of release: 12 September 2011

Document identifier: BFT25A