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# 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  $\mu$ A to 1 mA)
- Low noise figure
- Gold metallization ensures excellent reliability.

### 1.3 Quick reference data

Table 1. Quick reference data

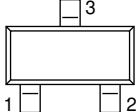
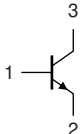
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	-	8	V
$V_{CEO}$	collector-emitter voltage	open base	-	-	5	V
$I_C$	DC collector current		-	-	6.5	mA
$P_{tot}$	total power dissipation	up to $T_s = 165\text{ }^\circ\text{C}$	[1]	-	32	mW
$h_{FE}$	DC current gain	$I_C = 0.5\text{ mA}; V_{CE} = 1\text{ V}$	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

[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		Version
	Name	Description	
BFT25A	-	plastic surface mounted package; 3 leads	SOT23

## 4. Marking

Table 4. Marking

Type number	Marking code <sup>[1]</sup>
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 $T_s = 165\text{ °C}$ <sup>[1]</sup>	-	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

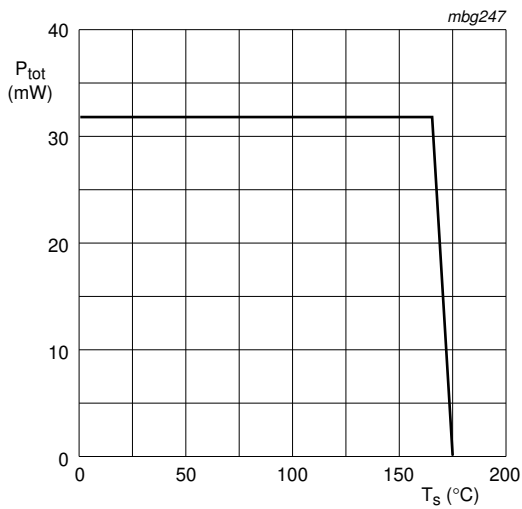
**Table 7. Characteristics**

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

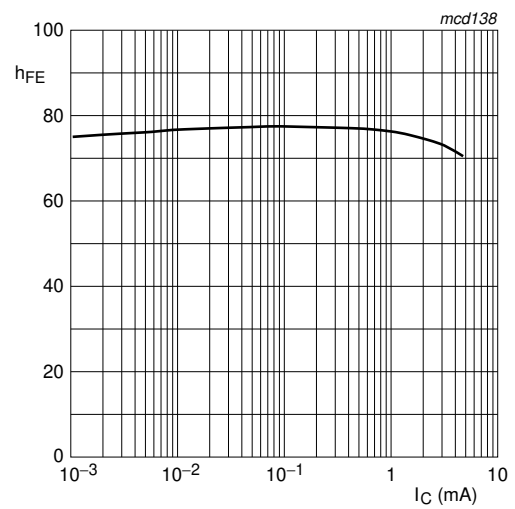
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector cut-off current	$I_E = 0\text{ A}; V_{CB} = 5\text{ V}$	-	-	50	nA
$h_{FE}$	DC current gain	$I_C = 0.5\text{ mA}; V_{CE} = 1\text{ V}$	50	80	200	
$f_T$	transition frequency	$I_C = 1\text{ mA}; V_{CE} = 1\text{ V};$ $T_{amb} = 25\text{ °C};$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

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

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

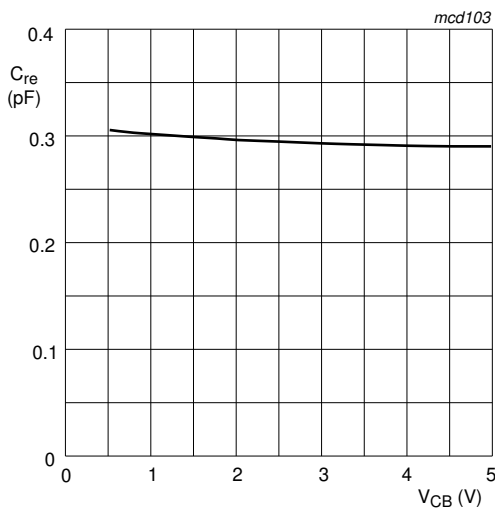


**Fig 1. Power derating curve.**



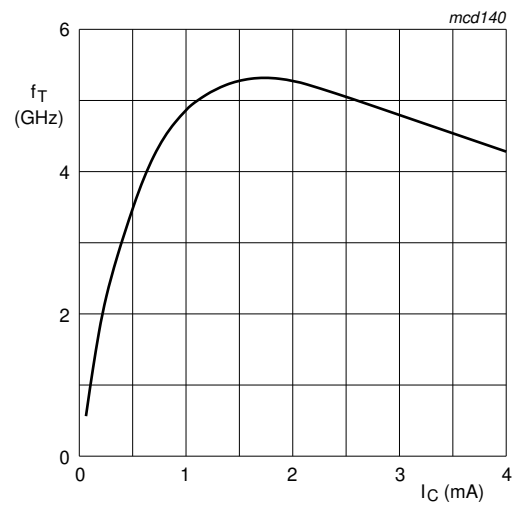
$V_{CE} = 1$  V.

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



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

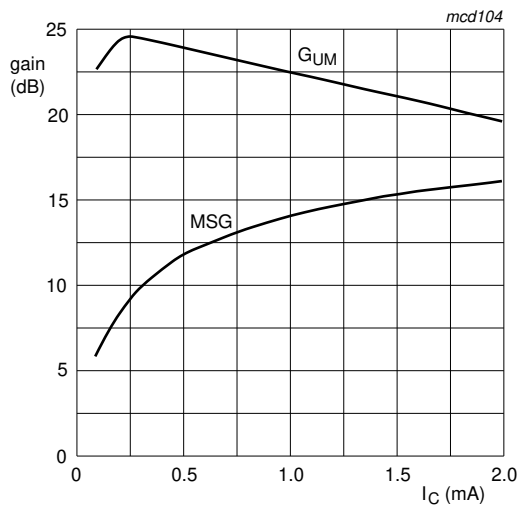
**Fig 3. Feedback capacitance as a function of collector-base voltage.**



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

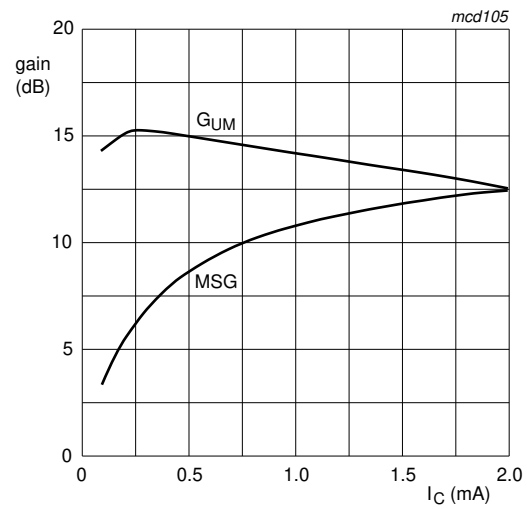
**Fig 4. Transition frequency as a function of collector current.**

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



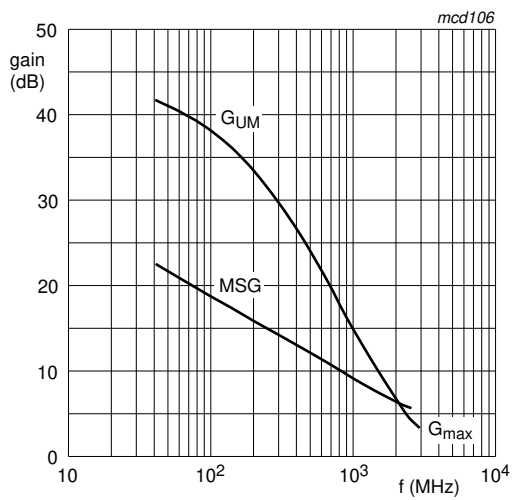
$V_{CE} = 1\text{ V}; f = 500\text{ MHz}$ .

**Fig. 5. Gain as a function of collector current.**



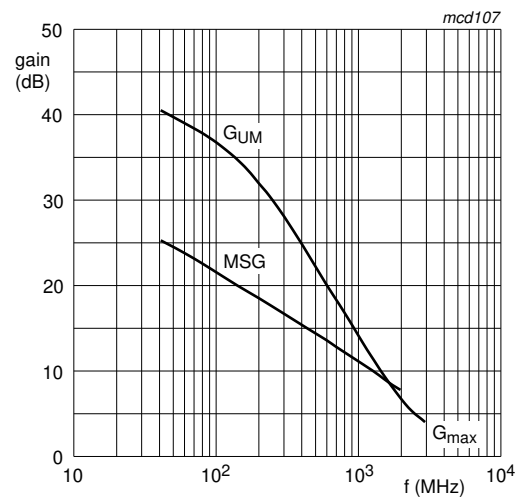
$V_{CE} = 1\text{ V}; f = 1\text{ GHz}$ .

**Fig. 6. Gain as a function of collector current.**



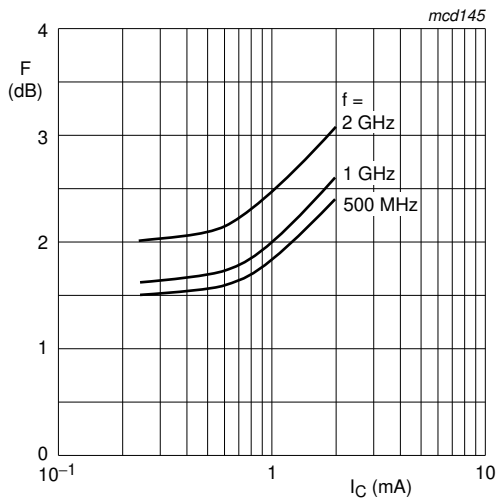
$V_{CE} = 1\text{ V}; I_C = 0.5\text{ mA}$ .

**Fig. 7. Gain as a function of frequency.**



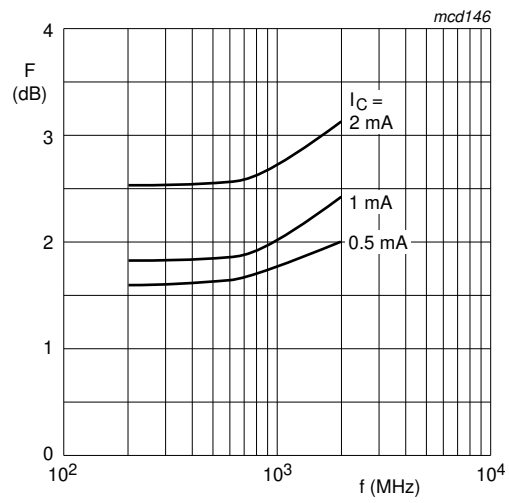
$V_{CE} = 1\text{ V}; I_C = 1\text{ mA}$ .

**Fig. 8. Gain as a function of frequency.**



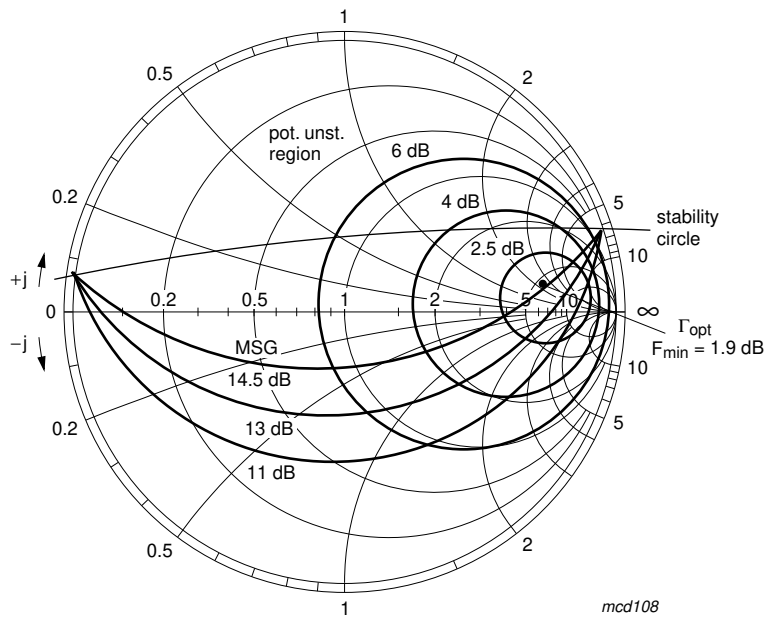
$V_{CE} = 1 \text{ V.}$

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



$V_{CE} = 1 \text{ V.}$

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

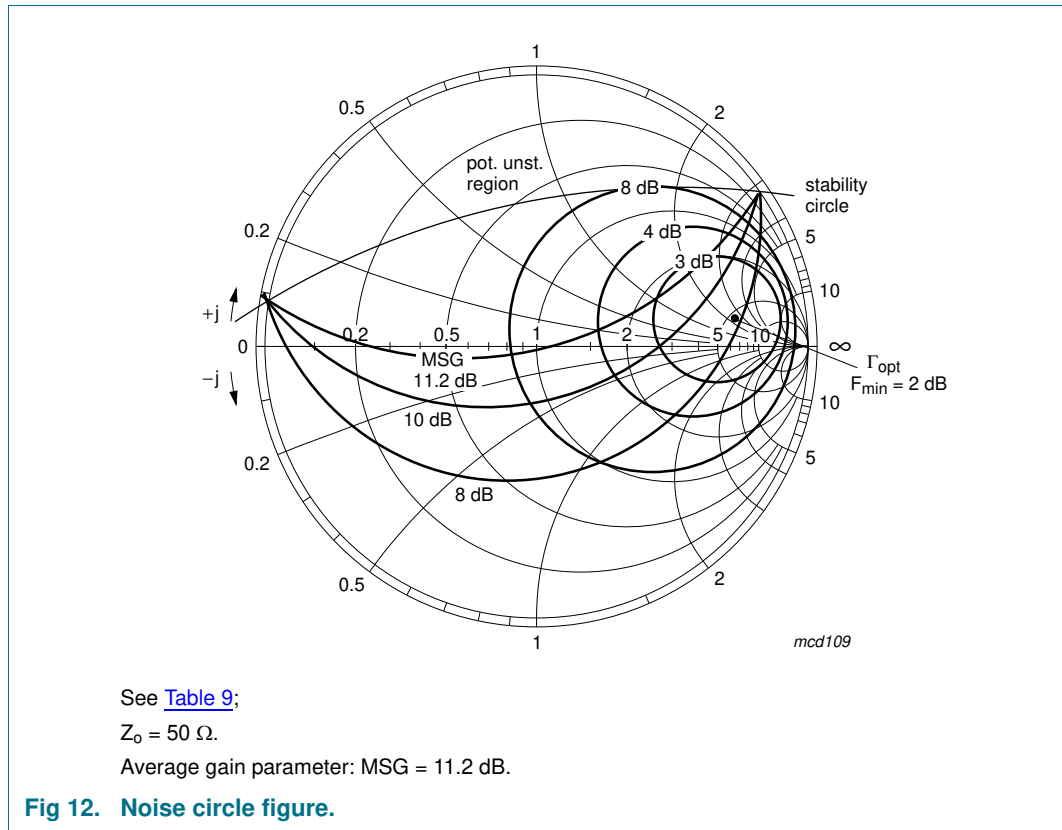


See [Table 8](#);  
 $Z_o = 50 \Omega.$   
 Average gain parameter:  $MSG = 14.5 \text{ dB.}$

**Fig 11. Noise circle figure.**

**Table 8. Noise parameters**

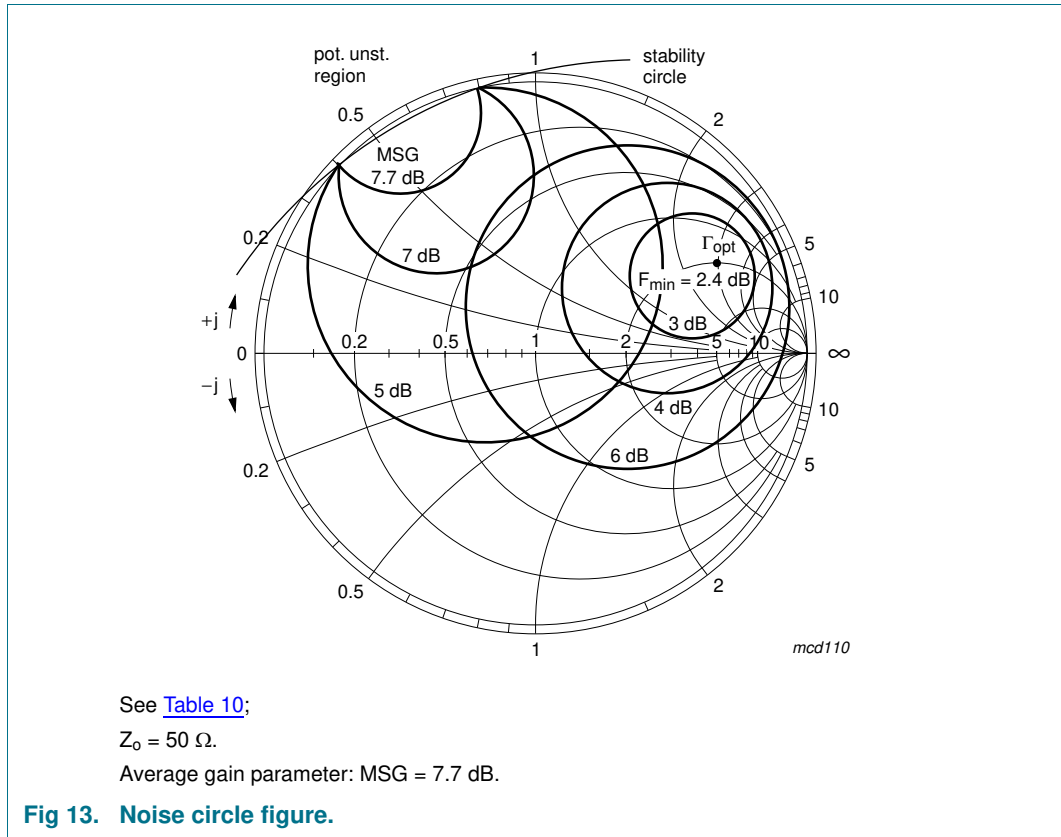
f (MHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)	F <sub>min</sub> (dB)	Γ <sub>opt</sub>		R <sub>n</sub> /50
				(mag)	(ang)	
500	1	1	1.9	0.79	4	2.5



**Table 9. Noise parameters**

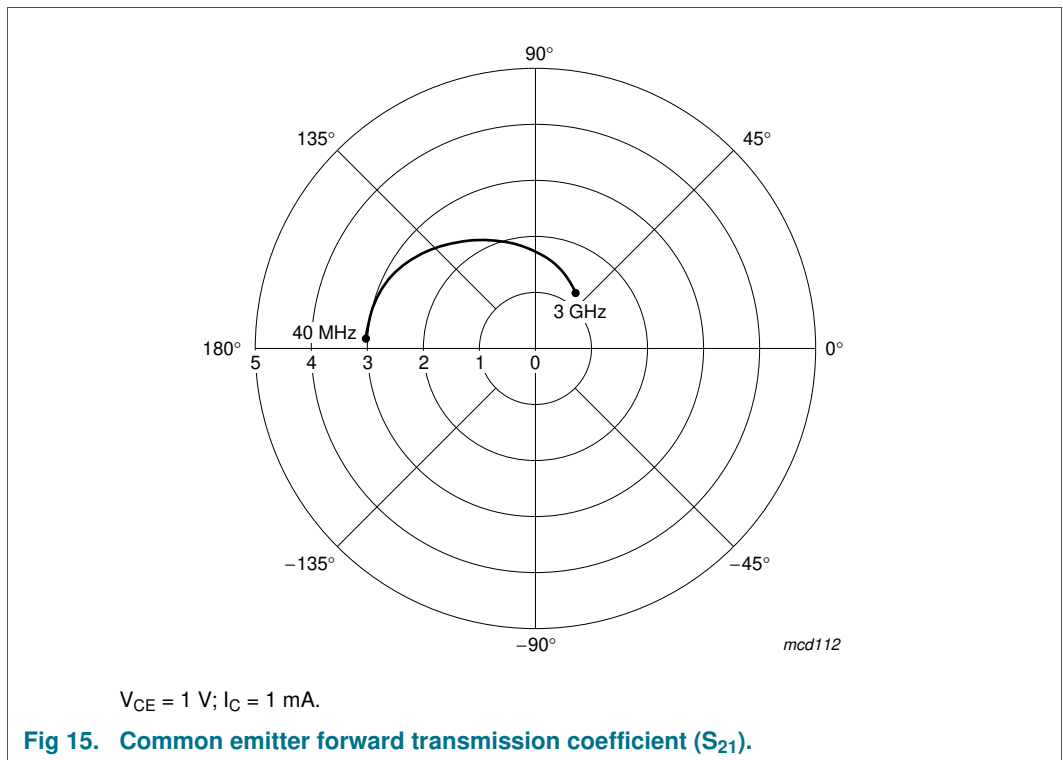
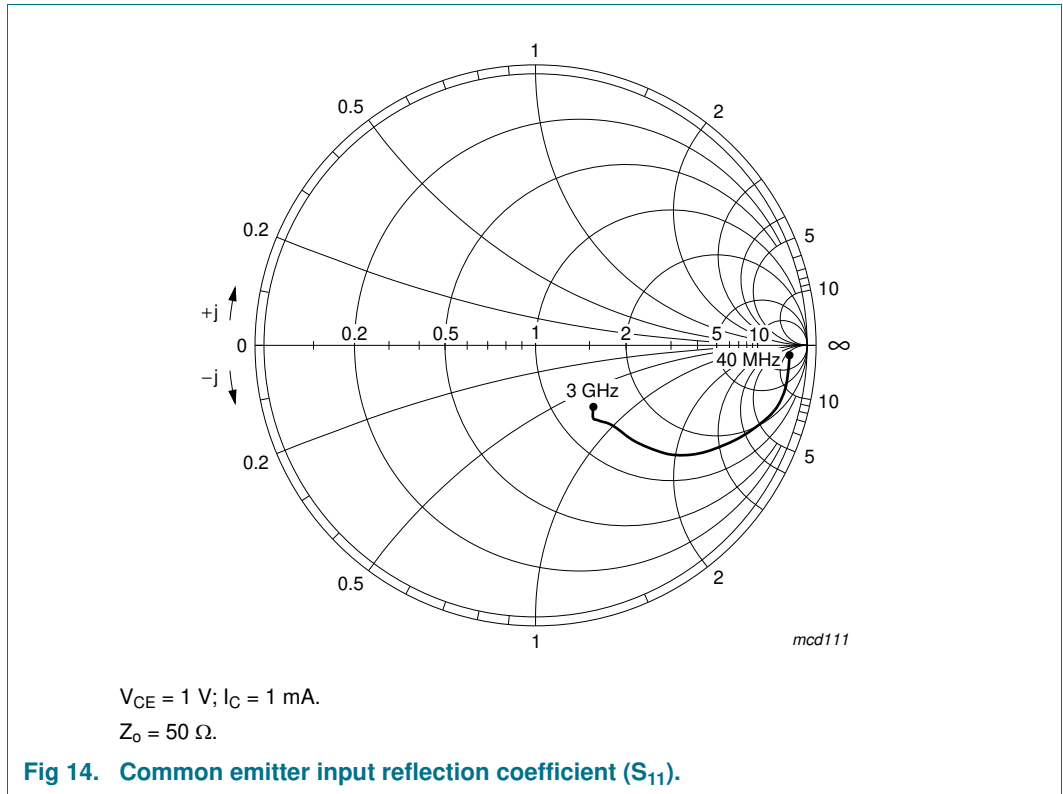
f (MHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)	F <sub>min</sub> (dB)	Γ <sub>opt</sub>		R <sub>n</sub> /50
				(mag)	(ang)	
1000	1	1	2	0.74	8	2.6

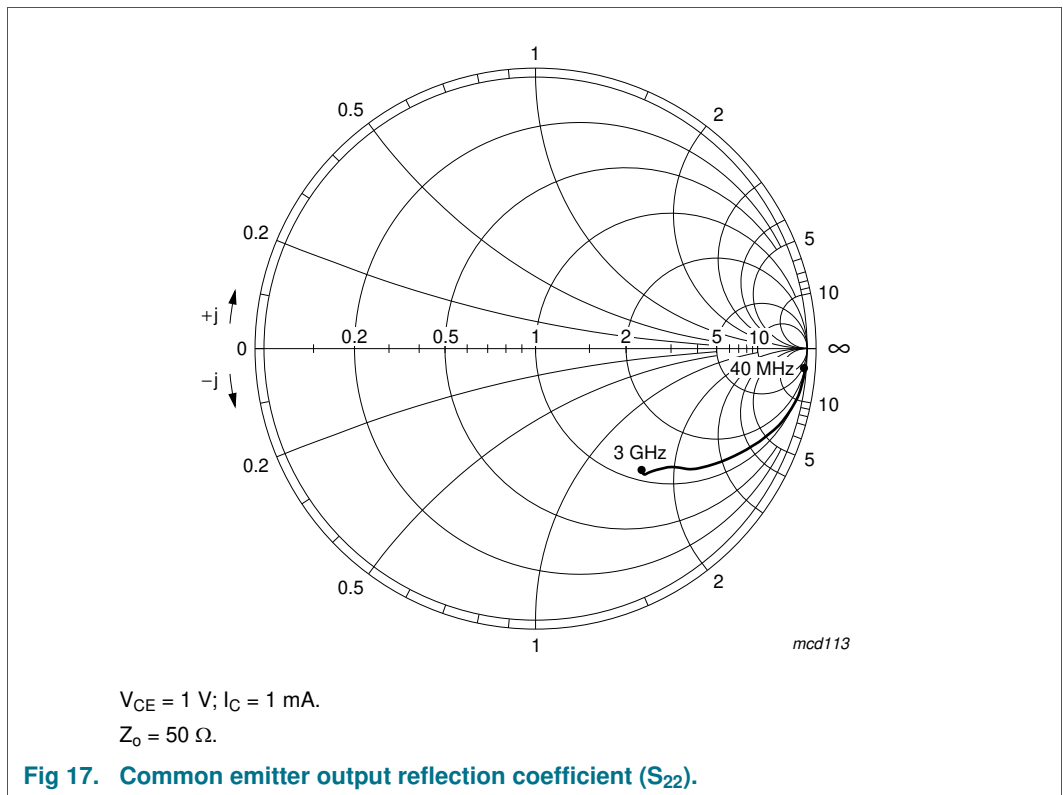
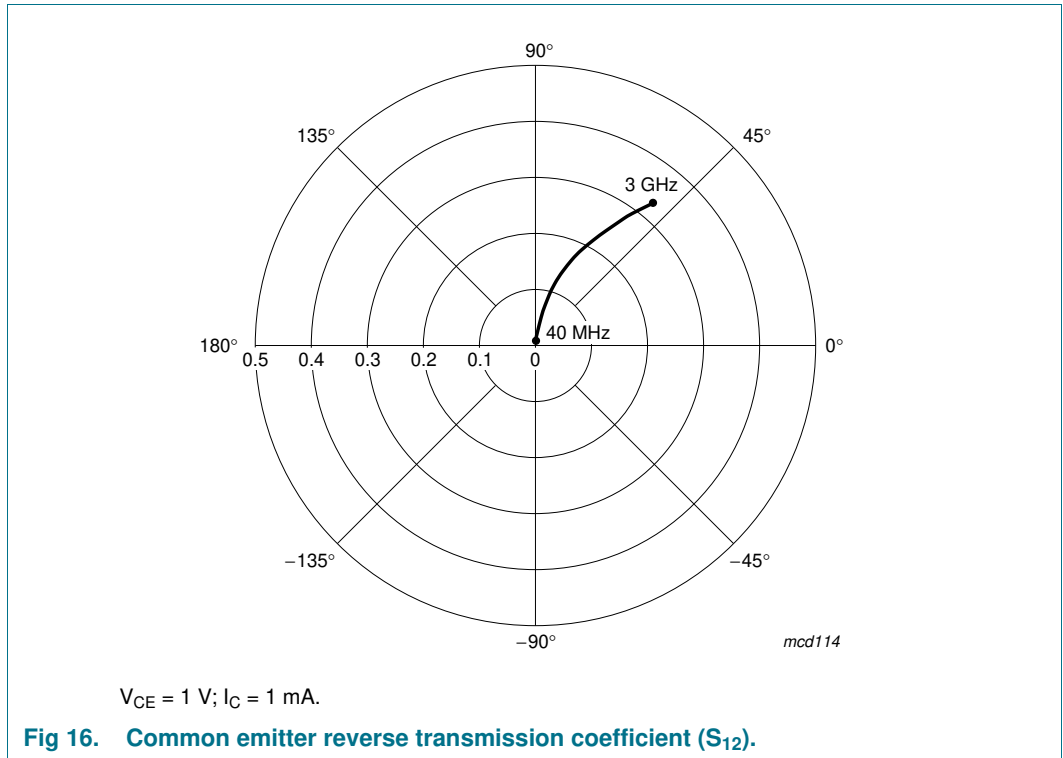




**Table 10. Noise parameters**

f (MHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)	F <sub>min</sub> (dB)	Γ <sub>opt</sub>		R <sub>n</sub> /50
				(mag)	(ang)	
2000	1	1	2.4	0.72	26	1.7

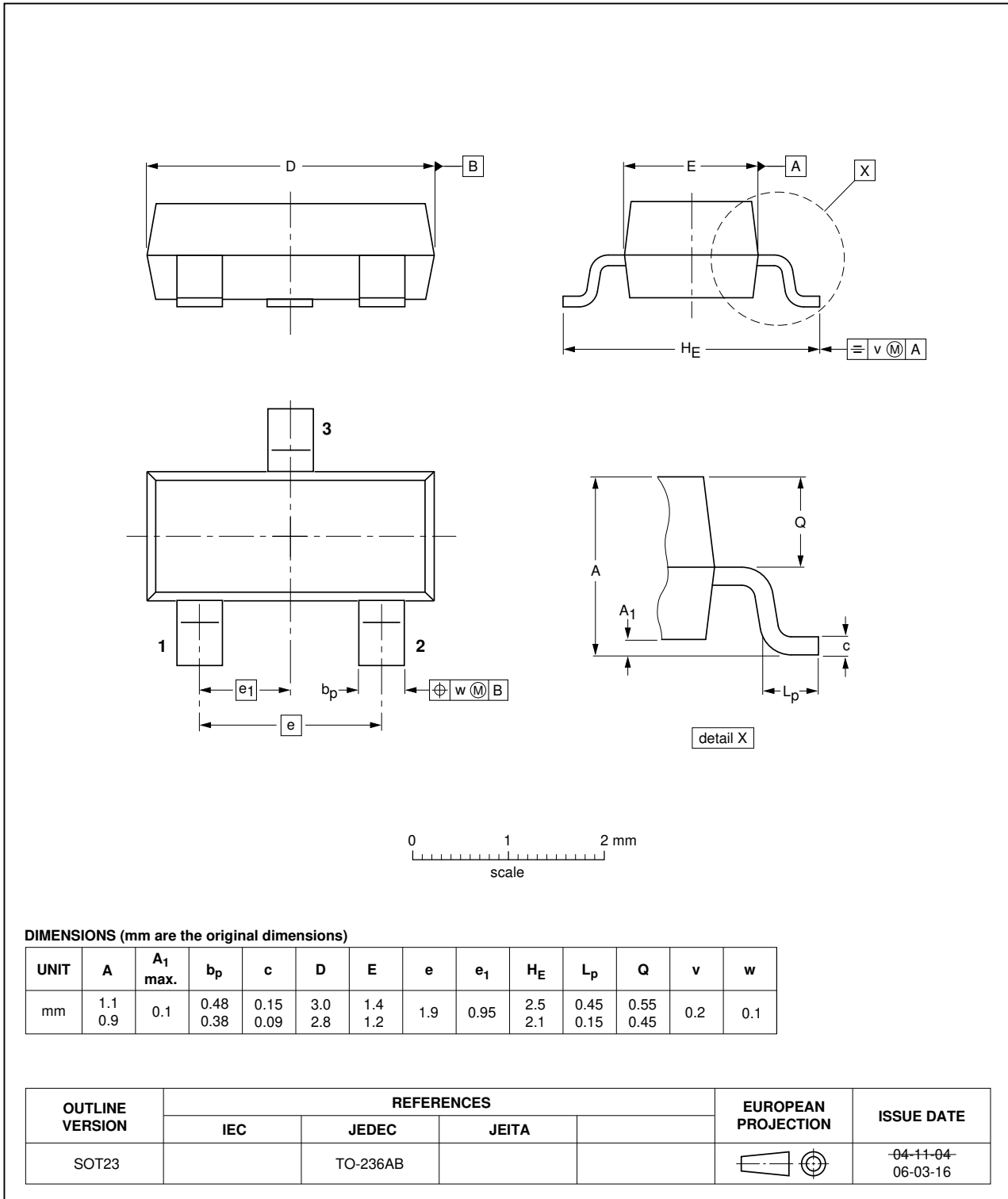




**8. Package outline**

Plastic surface-mounted package; 3 leads

SOT23



**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:		<ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Package outline drawings have been updated to the latest version.</li></ul>		
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 <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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