

# DATA SHEET

**BFS17A**

**NPN 3 GHz wideband transistor**

Product specification

September 1995



## NPN 3 GHz wideband transistor

## BFS17A

## DESCRIPTION

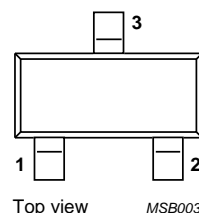
NPN transistor in a plastic SOT23 package.

## APPLICATIONS

- It is intended for RF applications such as oscillators in TV tuners.

## PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



Marking code: E2p.

Fig.1 SOT23.

## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	—	25	V
$V_{CEO}$	collector-emitter voltage	open base	—	15	V
$I_C$	DC collector current		—	25	mA
$P_{tot}$	total power dissipation	up to $T_s = 70\text{ °C}$ ; note 1	—	300	mW
$f_T$	transition frequency	$I_C = 25\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $f = 500\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	2.8	—	GHz
$G_{UM}$	maximum unilateral power gain	$I_C = 14\text{ mA}$ ; $V_{CE} = 10\text{ V}$ ; $f = 800\text{ MHz}$	13.5	—	dB
F	noise figure	$I_C = 2\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $f = 800\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	2.5	—	dB
$V_O$	output voltage	$d_{im} = -60\text{ dB}$ ; $I_C = 14\text{ mA}$ ; $V_{CE} = 10\text{ V}$ ; $R_L = 75\text{ }\Omega$ ; $T_{amb} = 25\text{ °C}$ ; $f_{(p+q-r)} = 793.25\text{ MHz}$	150	—	mV

## LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	—	25	V
$V_{CEO}$	collector-emitter voltage	open base	—	15	V
$V_{EBO}$	emitter-base voltage	open collector	—	2.5	V
$I_C$	DC collector current		—	25	mA
$I_{CM}$	peak collector current		—	50	mA
$P_{tot}$	total power dissipation	up to $T_s = 70\text{ °C}$ ; note 1	—	300	mW
$T_{stg}$	storage temperature		−65	+150	°C
$T_j$	junction temperature		—	150	°C

## Note to the Quick reference data and the Limiting values

- $T_s$  is the temperature at the soldering point of the collector pin.

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## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	up to $T_s = 70\text{ °C}$ ; note 1	260	K/W

## Note

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

## CHARACTERISTICS

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

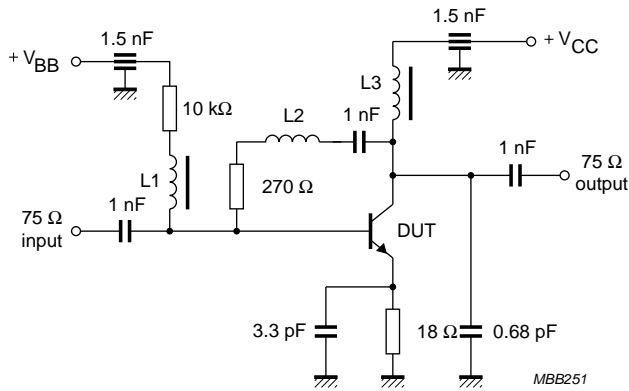
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$I_E = 0$ ; $V_{CB} = 10\text{ V}$	–	–	50	nA
$h_{FE}$	DC current gain	$I_C = 2\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = 25\text{ °C}$	25	90	–	
		$I_C = 25\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = 25\text{ °C}$	25	90	–	
$f_T$	transition frequency	$I_C = 25\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $f = 500\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	2.8	–	GHz
$C_c$	collector capacitance	$I_E = 0$ ; $V_{CB} = 10\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	0.7	–	pF
$C_e$	emitter capacitance	$I_C = 0$ ; $V_{EB} = 0.5\text{ V}$ ; $f = 1\text{ MHz}$	–	1.25	–	pF
$C_{re}$	feedback capacitance	$I_C = 0$ ; $V_{CE} = 5\text{ V}$ ; $f = 1\text{ MHz}$	–	0.6	–	pF
$G_{UM}$	maximum unilateral power gain note 1	$I_C = 14\text{ mA}$ ; $V_{CE} = 10\text{ V}$ ; $f = 800\text{ MHz}$	–	13.5	–	dB
$F$	noise figure	$I_C = 2\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $Z_S = 60\text{ }\Omega$ ; $f = 800\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	2.5	–	dB
$V_O$	output voltage	note 2	–	150	–	mV

## Notes

- $G_{UM}$  is the maximum unilateral power gain, assuming  $S_{12}$  is zero and  $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$  dB.
- $d_{im} = -60\text{ dB}$  (DIN 45004B);  $I_C = 14\text{ mA}$ ;  $V_{CE} = 10\text{ V}$ ;  $R_L = 75\text{ }\Omega$ ;  $T_{amb} = 25\text{ °C}$ ;  
 $V_p = V_O$ ;  $f_p = 795.25\text{ MHz}$ ;  
 $V_q = V_O - 6\text{ dB}$ ;  $f_q = 803.25\text{ MHz}$ ;  
 $V_r = V_O - 6\text{ dB}$ ;  $f_r = 805.25\text{ MHz}$ ;  
measured at  $f_{(p+q-r)} = 793.25\text{ MHz}$ .

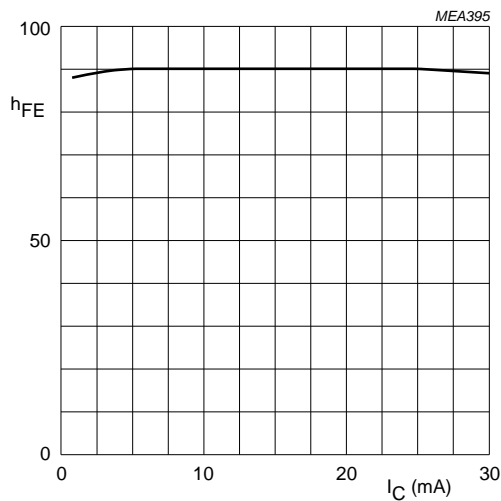
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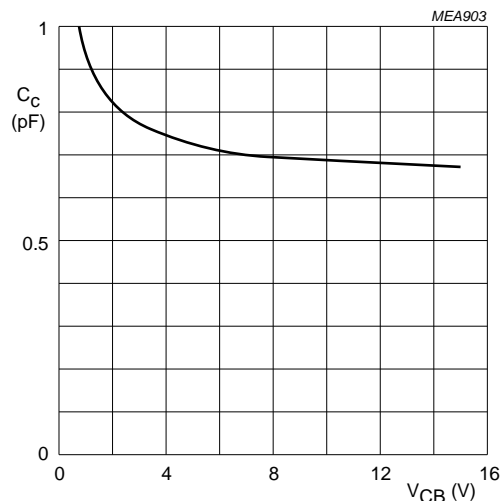
L1 = L3 = 5 μH Ferroxcube choke.  
L2 = 3 turns 0.4 mm copper wire; winding pitch 1 mm; internal diameter 3 mm.

Fig.2 Intermodulation distortion and second order intermodulation distortion test circuit.



$V_{CE} = 1\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ .

Fig.3 DC current gain as a function of collector current.

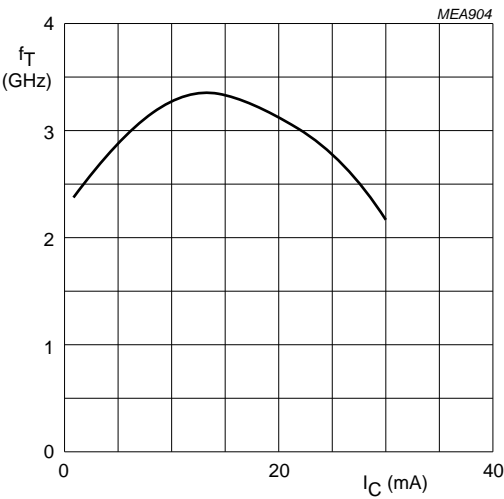


$I_E = 0$ ;  $f = 1\text{ MHz}$ ;  $T_{amb} = 25\text{ °C}$ .

Fig.4 Collector capacitance as a function of collector-base voltage.

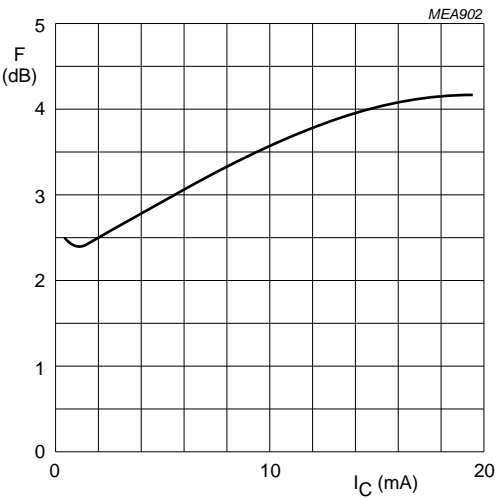
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$V_{CE} = 5\text{ V}$ ;  $f = 500\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

Fig.5 Transition frequency as a function of collector current.



$V_{CE} = 5\text{ V}$ ;  $Z_s = 60\text{ }\Omega$ ;  $f = 800\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

Fig.6 Minimum noise figure as a function of collector current.

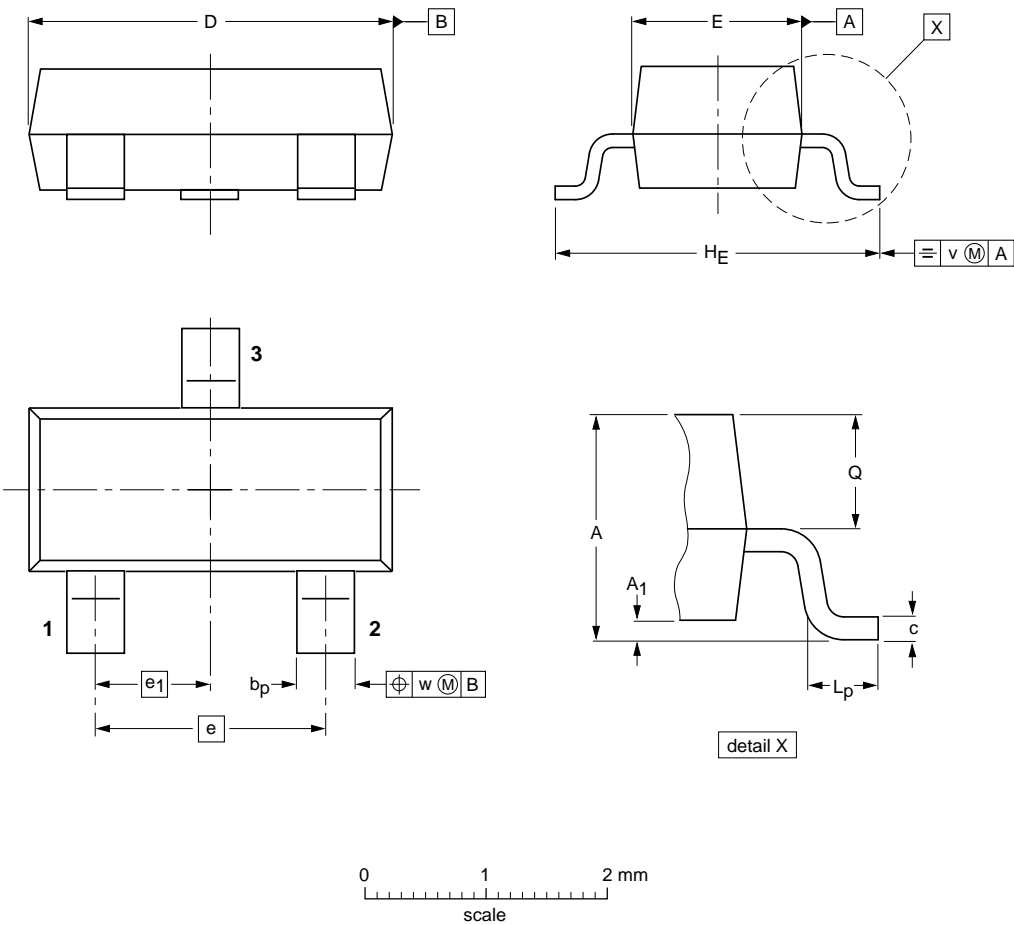
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PACKAGE OUTLINE

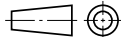
Plastic surface-mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max.	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	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				<del>04-11-04</del> 06-03-16

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## DATA SHEET STATUS

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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Printed in The Netherlands

R77/02/pp9

Date of release: September 1995