

# DATA SHEET

**BFS17A**

**NPN 3 GHz wideband transistor**

Product specification  
File under Discrete Semiconductors, SC14

September 1995

# NPN 3 GHz wideband transistor

# BFS17A

## DESCRIPTION

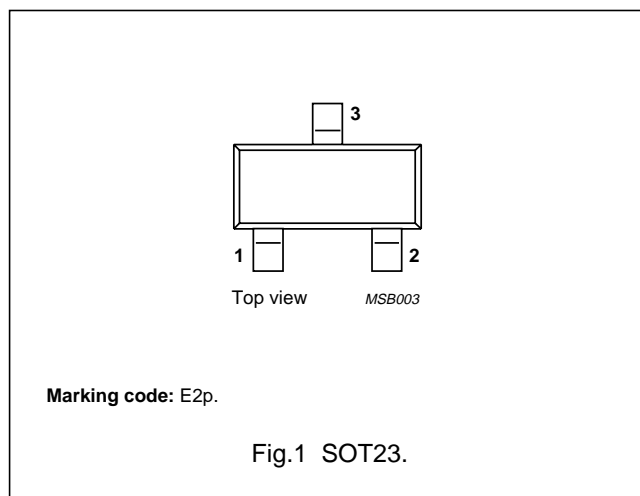
NPN transistor in a plastic SOT23 package.

## APPLICATIONS

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

## PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



## 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.

## NPN 3 GHz wideband transistor

BFS17A

## 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

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

## CHARACTERISTICS

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

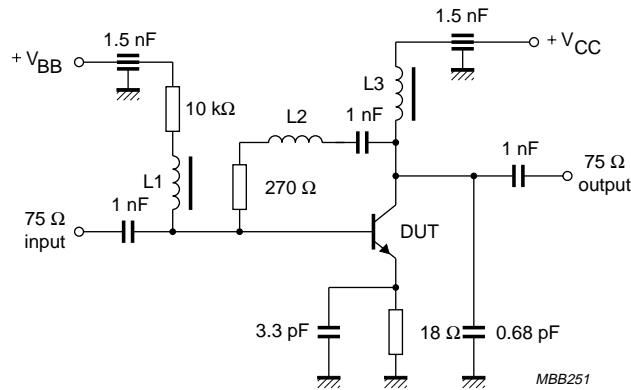
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$I_E = 0$ ; $V_{CB} = 10\text{ V}$	–	–	50	nA
$h_{FE}$	DC current gain	$I_C = 2\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = 25\text{ °C}$	25	90	–	
		$I_C = 25\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $T_{amb} = 25\text{ °C}$	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  $f_{(p+q-r)} = 793.25\text{ MHz}$ .

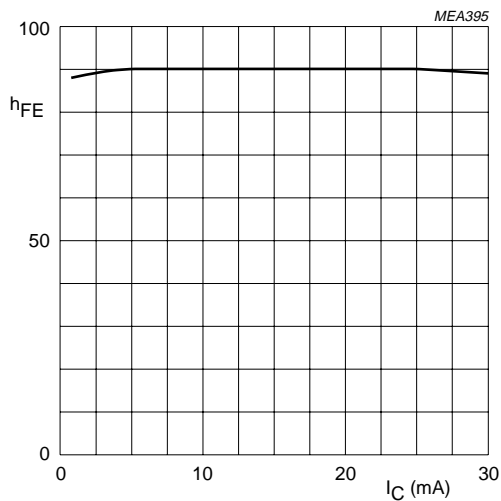
NPN 3 GHz wideband transistor

BFS17A



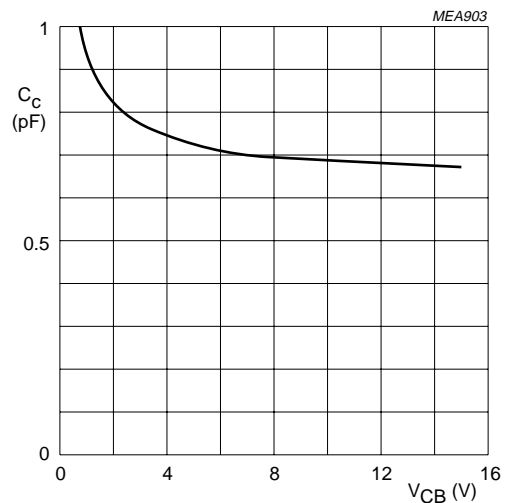
L1 = L3 = 5 μH Ferroxcube choke.  
 L2 = 3 turns 0.4 mm copper wire; winding pitch 1 mm; internal diameter 3 mm.

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



V<sub>CE</sub> = 1 V; T<sub>amb</sub> = 25 °C.

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

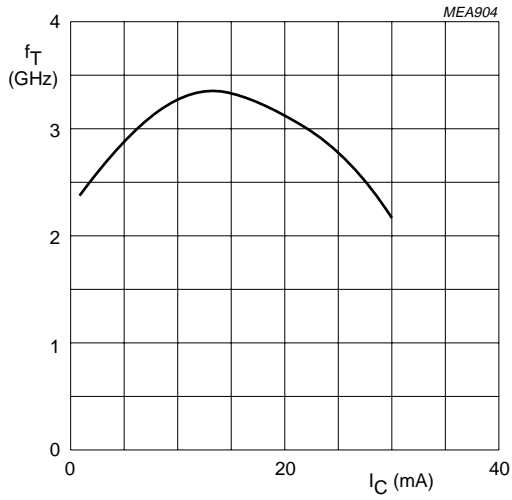


I<sub>E</sub> = 0; f = 1 MHz; T<sub>amb</sub> = 25 °C.

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

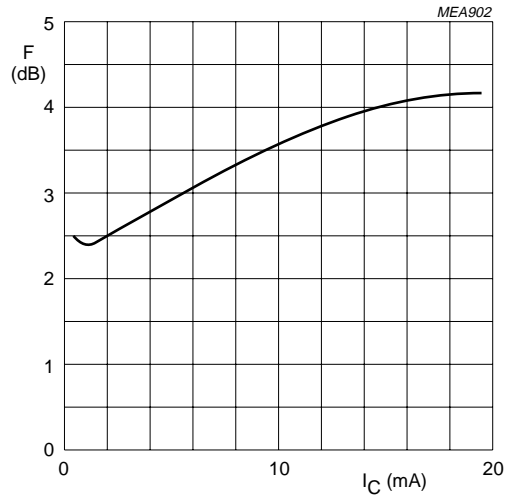
NPN 3 GHz wideband transistor

BFS17A



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

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



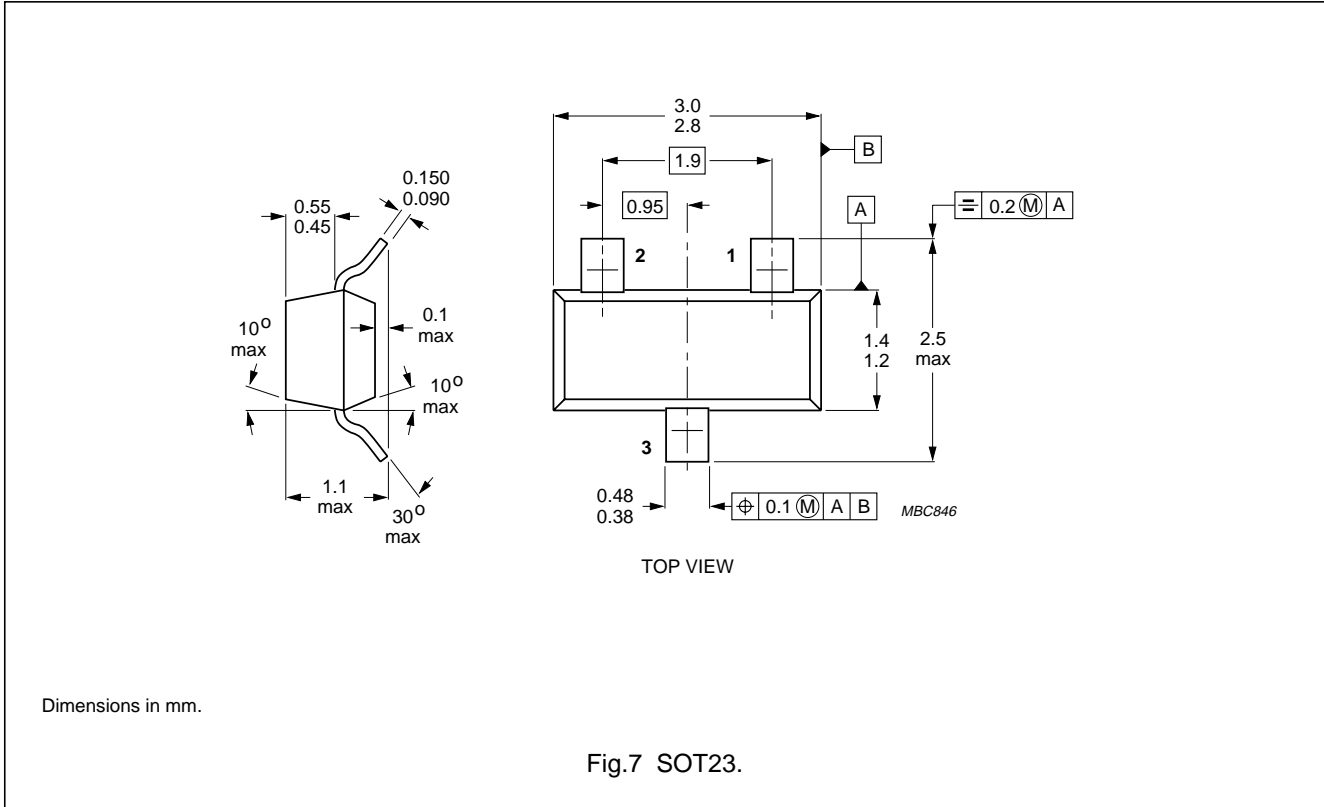
$V_{CE} = 5\text{ V}; Z_s = 60\ \Omega; f = 800\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}.$

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

NPN 3 GHz wideband transistor

BFS17A

PACKAGE OUTLINE



DEFINITIONS

<b>Data sheet status</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.