

# BFT92

## PNP 5 GHz wideband transistor

Rev. 3 — 22 January 2016

Product data sheet

## 1. Product profile

### 1.1 General description

PNP transistor in a plastic SOT23 envelope. It is primarily intended for use in RF wideband amplifiers, such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analyzers, etc. The transistor features low intermodulation distortion and high power gain; due to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies. NPN complements are BFR92 and BFR92A.

### 1.2 Features and benefits

- High power gain
- Low intermodulation distortion

### 1.3 Applications

- Oscilloscopes and spectrum analyzers
- Radar systems
- RF wideband amplifiers

### 1.4 Quick reference data

Table 1. Quick reference data

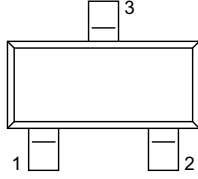
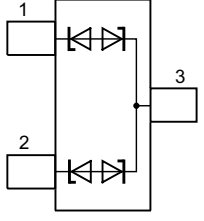
| Symbol    | Parameter                     | Conditions                                                                                                                                                              | Min | Typ | Max | Unit |
|-----------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $V_{CBO}$ | collector-base voltage        | open emitter                                                                                                                                                            | -   | -   | -20 | V    |
| $V_{CEO}$ | collector-emitter voltage     | open base                                                                                                                                                               | -   | -   | -15 | V    |
| $I_C$     | DC collector current          |                                                                                                                                                                         | -   | -   | -25 | mA   |
| $P_{tot}$ | total power dissipation       | up to $T_s = 95\text{ °C}$ <a href="#">[1]</a>                                                                                                                          | -   | -   | 300 | mW   |
| $f_T$     | transition frequency          | $I_C = -14\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ; $f = 500\text{ MHz}$                                                                                                  | -   | 5   | -   | GHz  |
| $C_{re}$  | feedback capacitance          | $I_C = -2\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ; $f = 1\text{ MHz}$                                                                                                     | -   | 0.7 | -   | pF   |
| $G_{UM}$  | maximum unilateral power gain | $I_C = -14\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ; $f = 500\text{ MHz}$<br>$T_{amb} = 25\text{ °C}$                                                                      | -   | 18  | -   | dB   |
| NF        | noise figure                  | $I_C = -5\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ; $f = 500\text{ MHz}$ ;<br>$T_{amb} = 25\text{ °C}$                                                                     | -   | 2.5 | -   | dB   |
| $d_{im}$  | intermodulation distortion    | $I_C = -14\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ; $R_L = 75\text{ }\Omega$ ;<br>$V_o = 150\text{ mV}$ ; $T_{amb} = 25\text{ °C}$ ;<br>$f_{(p+q-r)} = 493.25\text{ MHz}$ | -   | -60 | -   | dB   |

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



## 2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline                                                                 | Graphic symbol                                                                                   |
|-----|-------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1   | base        |  | <br>001aaa629 |
| 2   | emitter     |                                                                                    |                                                                                                  |
| 3   | collector   |                                                                                    |                                                                                                  |

## 3. Ordering information

Table 3. Ordering information

| Type number | Package  |                                          |         |
|-------------|----------|------------------------------------------|---------|
|             | Name     | Description                              | Version |
| BFT92       | TO-236AB | Plastic surface mounted package; 3 leads | SOT23   |

## 4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| BFT92       | W1%          |

## 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                       | -   | -20 | V    |
| $V_{CEO}$ | collector-emitter voltage | open base                          | -   | -15 | V    |
| $V_{EBO}$ | emitter-base voltage      | open collector                     | -   | -2  | V    |
| $I_C$     | DC collector current      |                                    | -   | -25 | mA   |
| $I_{CM}$  | peak collector current    | $f > 1$ MHz                        | -   | -35 | mA   |
| $P_{tot}$ | total power dissipation   | up to $T_s = 95$ °C <sup>[1]</sup> | -   | 300 | 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 |
|---------------|-----------------------------------------------------|------------------------------------------------|-----|------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | up to $T_s = 95\text{ °C}$ <a href="#">[1]</a> | 260 | K/W  |

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

## 7. Characteristics

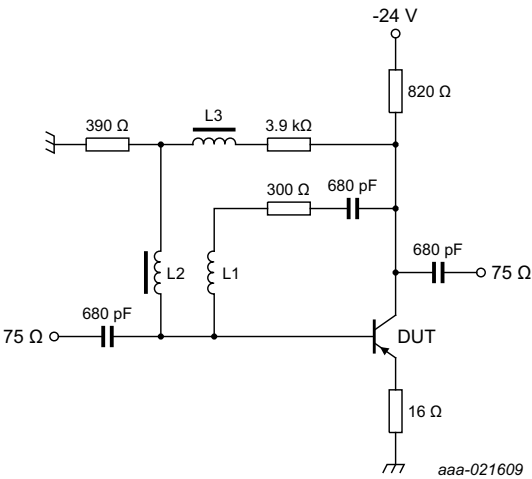
**Table 7. Characteristics**

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

| Symbol    | Parameter                     | Conditions                                                                                                                                                                                                                                                                                                                                                               | Min | Typ  | Max | Unit |
|-----------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|------|
| $I_{CBO}$ | collector cut-off current     | $I_E = 0$ ; $V_{CB} = -10\text{ V}$                                                                                                                                                                                                                                                                                                                                      | -   | -    | -50 | nA   |
| $h_{FE}$  | DC current gain               | $I_C = -14\text{ mA}$ ; $V_{CE} = -10\text{ V}$                                                                                                                                                                                                                                                                                                                          | 20  | 50   | -   |      |
| $f_T$     | transition frequency          | $I_C = -14\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ;<br>$f = 500\text{ MHz}$                                                                                                                                                                                                                                                                                                | -   | 5    | -   | GHz  |
| $C_c$     | collector capacitance         | $I_E = i_e = 0$ ; $V_{CB} = -10\text{ V}$ ; $f = 1\text{ MHz}$                                                                                                                                                                                                                                                                                                           | -   | 0.75 | -   | pF   |
| $C_e$     | emitter capacitance           | $I_C = i_c = 0$ ; $V_{EB} = -0.5\text{ V}$ ; $f = 1\text{ MHz}$                                                                                                                                                                                                                                                                                                          | -   | 0.8  | -   | pF   |
| $C_{re}$  | feedback capacitance          | $I_C = -2\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ; $f = 1\text{ MHz}$                                                                                                                                                                                                                                                                                                      | -   | 0.7  | -   | pF   |
| $G_{UM}$  | maximum unilateral power gain | $I_C = -14\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ;<br>$f = 500\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$ <a href="#">[1]</a>                                                                                                                                                                                                                                                 | -   | 18   | -   | dB   |
| NF        | noise figure                  | $I_C = -5\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ;<br>$f = 500\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$                                                                                                                                                                                                                                                                      | -   | 2.5  | -   | dB   |
| $V_o$     | output voltage                | $d_{im} = -60\text{ dB}$ (DIN 45004B); $I_C = -14\text{ mA}$ ;<br>$V_{CE} = -10\text{ V}$ ; $R_L = 75\text{ }\Omega$ ;<br>$V_p = V_o$ at $d_{im} = -60\text{ dB}$ ; $f_p = 495.25\text{ MHz}$ ;<br>$V_q = V_o - 6\text{ dB}$ ; $f_q = 503.25\text{ MHz}$ ;<br>$V_r = V_o - 6\text{ dB}$ ; $f_r = 505.25\text{ MHz}$ ;<br>measured at $f_{(p+q-r)} = 493.25\text{ MHz}$ . | -   | 150  | -   | mV   |

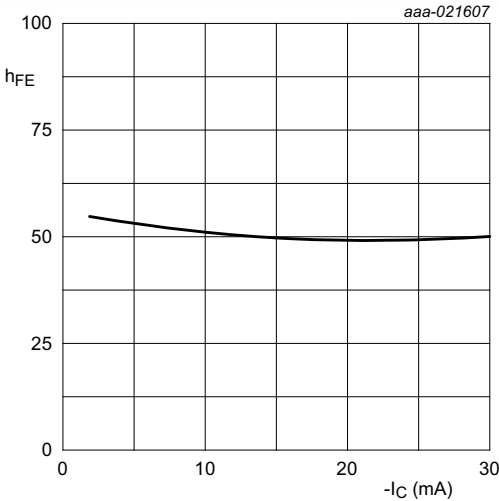
[1]  $G_{UM}$  is the maximum unilateral power gain, assuming  $S_{12}$  is zero and  $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)} \text{ dB}$

8. Graphs



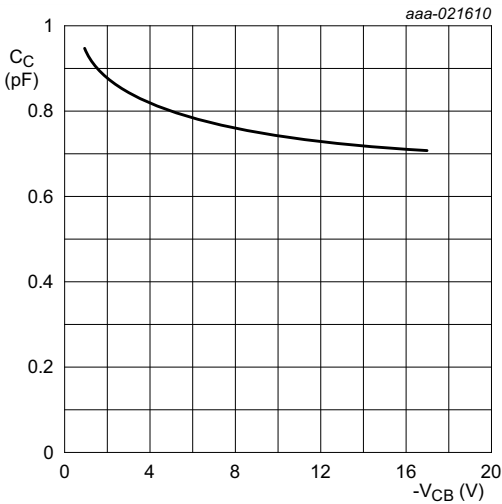
L2 = L3 = 5 uH Ferroxcube choke, catalogue number 3122 108 20150  
L1 = 4 turns 0.35 mm copper wire; winding pitch 1 mm; internal diameter 4 mm

Fig 1. Intermodulation distortion test circuit



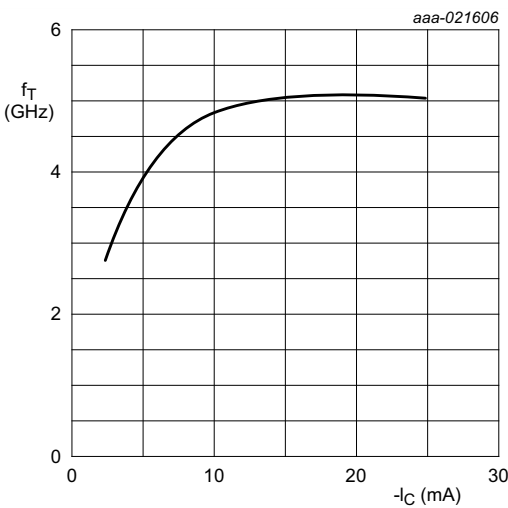
$V_{CE} = -10$  V;  $T_j = 25$  °C

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



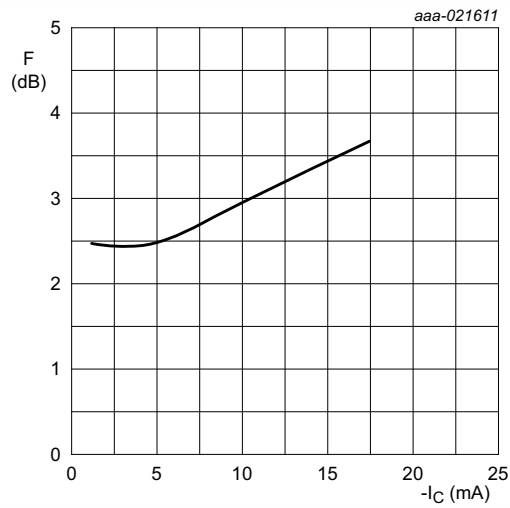
$I_E = i_e = 0$ ;  $f = 1$  MHz;  $T_j = 25$  °C

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



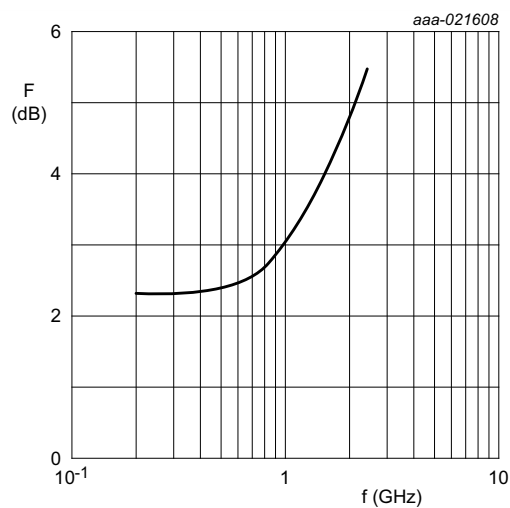
$V_{CE} = -10$  V;  $f = 500$  MHz;  $T_j = 25$  °C

Fig 4. Transistion frequency as a function of collector current



$V_{CE} = -10$  V;  $Z_s = \text{opt}$ ;  $f = 500$  MHz;  $T_{\text{amb}} = 25$  °C

**Fig 5. Minimum noise figure as a function of collector current.**



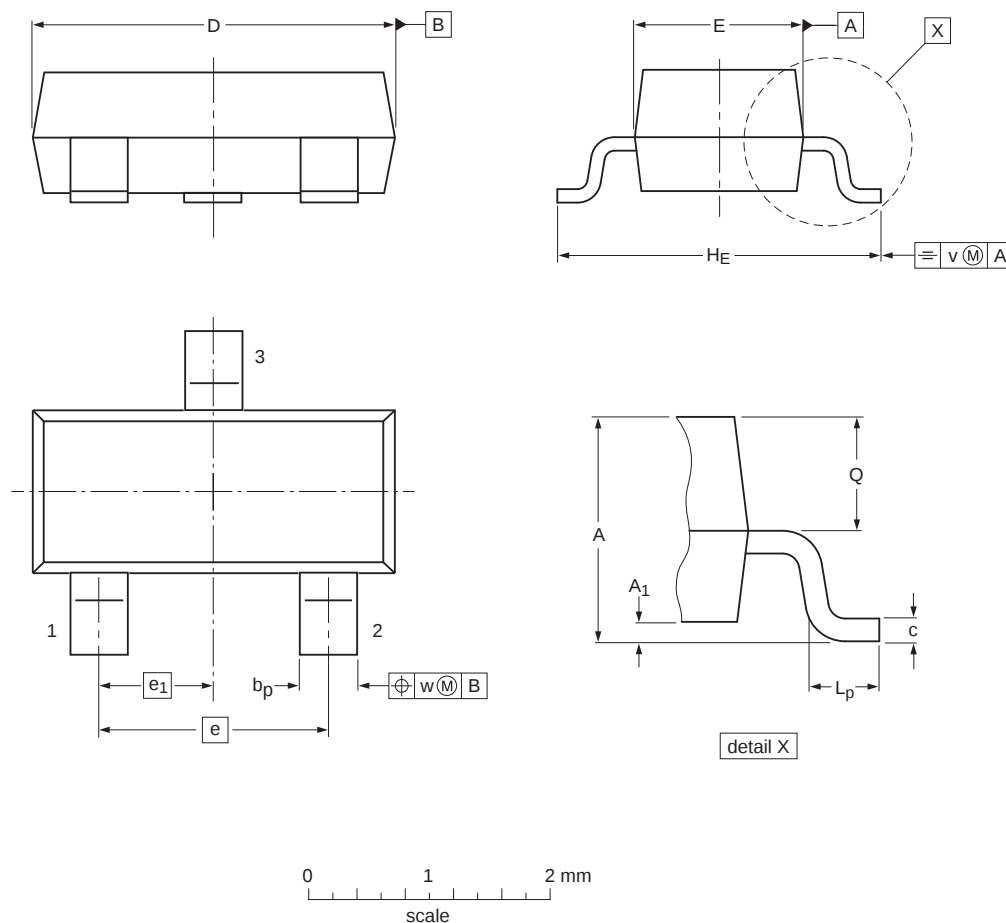
$I_C = -2$  mA;  $V_{CE} = -10$  V;  $Z_s = \text{opt}$ ;  $T_{\text{amb}} = 25$  °C

**Fig 6. Minimum noise figure as a function of frequency.**

## 9. Package outline

Plastic surface-mounted package; 3 leads

**SOT23**



Dimensions (mm are the original dimensions)

| Unit |     | A   | A <sub>1</sub> | b <sub>p</sub> | c    | D   | E   | e   | e <sub>1</sub> | H <sub>E</sub> | L <sub>p</sub> | Q    | v   | w   |
|------|-----|-----|----------------|----------------|------|-----|-----|-----|----------------|----------------|----------------|------|-----|-----|
| mm   | max | 1.1 | 0.1            | 0.48           | 0.15 | 3.0 | 1.4 | 1.9 | 0.95           | 2.5            | 0.45           | 0.55 | 0.2 | 0.1 |
|      | nom |     |                |                |      |     |     |     |                |                |                |      |     |     |
|      | min | 0.9 |                | 0.38           | 0.09 | 2.8 | 1.2 |     |                | 2.1            | 0.15           | 0.45 |     |     |

sot023\_po

| Outline version | References |          |       |  | European projection                                                                   | Issue date                      |
|-----------------|------------|----------|-------|--|---------------------------------------------------------------------------------------|---------------------------------|
|                 | IEC        | JEDEC    | JEITA |  |                                                                                       |                                 |
| SOT23           |            | TO-236AB |       |  |  | <del>14-06-19</del><br>14-09-22 |

**Fig 7. Package outline SOT23 (TO-236AB)**

## 10. Revision history

Table 8. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                         | Data sheet status     | Change notice | Supersedes |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|------------|
| BFT92 v.3      | 20160122                                                                                                                                                                                                                                             | Product data sheet    | -             | BFT92 v.2  |
| 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></ul> |                       |               |            |
| BFT92 v.2      | 19921101                                                                                                                                                                                                                                             | Product specification | -             | -          |

## 11. Legal information

### 11.1 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.                                     |

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

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13. Contents

1    **Product profile** ..... 1

1.1    General description ..... 1

1.2    Features and benefits ..... 1

1.3    Applications ..... 1

1.4    Quick reference data ..... 1

2    **Pinning information** ..... 2

3    **Ordering information** ..... 2

4    **Marking** ..... 2

5    **Limiting values** ..... 2

6    **Thermal characteristics** ..... 3

7    **Characteristics** ..... 3

8    **Graphs** ..... 4

9    **Package outline** ..... 6

10    **Revision history** ..... 7

11    **Legal information** ..... 8

11.1    Data sheet status ..... 8

11.2    Definitions ..... 8

11.3    Disclaimers ..... 8

11.4    Trademarks ..... 9

12    **Contact information** ..... 9

13    **Contents** ..... 10

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