

# DATA SHEET

**BFT25**

NPN 2 GHz wideband transistor

Product specification

November 1992



## NPN 2 GHz wideband transistor

## BFT25

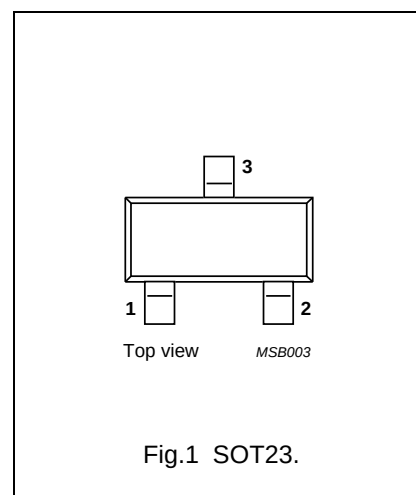
## DESCRIPTION

NPN transistor in a plastic SOT23 envelope.

It is primarily intended for use in RF low power amplifiers, such as in pocket phones, paging systems, etc. The transistor features low current consumption (100  $\mu$ A to 1 mA); due to its high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

## PINNING

| PIN       | DESCRIPTION |
|-----------|-------------|
| Code: V1p |             |
| 1         | base        |
| 2         | emitter     |
| 3         | collector   |



## QUICK REFERENCE DATA

| SYMBOL    | PARAMETER                     | CONDITIONS                                                                                                  | 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 $T_s = 167\text{ }^{\circ}\text{C}$ ; note 1                                                          | —    | 30   | mW   |
| $f_T$     | transition frequency          | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 500\text{ MHz}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$ | 2.3  | —    | GHz  |
| $C_{re}$  | feedback capacitance          | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$   | —    | 0.45 | pF   |
| $G_{UM}$  | maximum unilateral power gain | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 500\text{ MHz}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$ | 18   | —    | dB   |
| $F$       | noise figure                  | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 500\text{ MHz}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$ | 3.8  | —    | dB   |

## LIMITING VALUES

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

| 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                 |
| $I_{CM}$  | peak collector current    | $f > 1\text{ MHz}$                                 | —    | 10   | mA                 |
| $P_{tot}$ | total power dissipation   | up to $T_s = 167\text{ }^{\circ}\text{C}$ ; note 1 | —    | 30   | mW                 |
| $T_{stg}$ | storage temperature       |                                                    | −65  | 150  | $^{\circ}\text{C}$ |
| $T_j$     | junction temperature      |                                                    | —    | 175  | $^{\circ}\text{C}$ |

## Note

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

## NPN 2 GHz wideband transistor

BFT25

## THERMAL RESISTANCE

| SYMBOL        | PARAMETER                                           | CONDITIONS                               | THERMAL RESISTANCE |
|---------------|-----------------------------------------------------|------------------------------------------|--------------------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | up to $T_s = 167^\circ\text{C}$ ; note 1 | 260 K/W            |

## Note

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

## CHARACTERISTICS

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

| SYMBOL    | PARAMETER                              | CONDITIONS                                                                                          | MIN. | TYP. | MAX. | UNIT |
|-----------|----------------------------------------|-----------------------------------------------------------------------------------------------------|------|------|------|------|
| $I_{CBO}$ | collector cut-off current              | $I_E = 0$ ; $V_{CB} = 5\text{ V}$                                                                   | –    | –    | 50   | nA   |
| $h_{FE}$  | DC current gain                        | $I_C = 10\ \mu\text{A}$ ; $V_{CE} = 1\text{ V}$                                                     | 20   | 30   | –    |      |
|           |                                        | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$                                                         | 20   | 40   | –    |      |
| $f_T$     | transition frequency                   | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 500\text{ MHz}$                                  | 1.2  | 2.3  | –    | GHz  |
| $C_c$     | collector capacitance                  | $I_E = I_C = 0$ ; $V_{CB} = 0.5\text{ V}$ ; $f = 1\text{ MHz}$                                      | –    | –    | 0.6  | pF   |
| $C_e$     | emitter capacitance                    | $I_C = I_E = 0$ ; $V_{EB} = 0$ ; $f = 1\text{ MHz}$                                                 | –    | –    | 0.5  | pF   |
| $C_{re}$  | feedback capacitance                   | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_{amb} = 25^\circ\text{C}$     | –    | –    | 0.45 | pF   |
| $G_{UM}$  | maximum unilateral power gain (note 1) | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 500\text{ MHz}$ ; $T_{amb} = 25^\circ\text{C}$   | –    | 18   | –    | dB   |
|           |                                        | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 800\text{ MHz}$ ; $T_{amb} = 25^\circ\text{C}$   | –    | 12   | –    | dB   |
| F         | noise figure                           | $I_C = 0.1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 500\text{ MHz}$ ; $T_{amb} = 25^\circ\text{C}$ | –    | 5.5  | –    | dB   |
|           |                                        | $I_C = 1\text{ mA}$ ; $V_{CE} = 1\text{ V}$ ; $f = 500\text{ MHz}$ ; $T_{amb} = 25^\circ\text{C}$   | –    | 3.8  | –    | dB   |

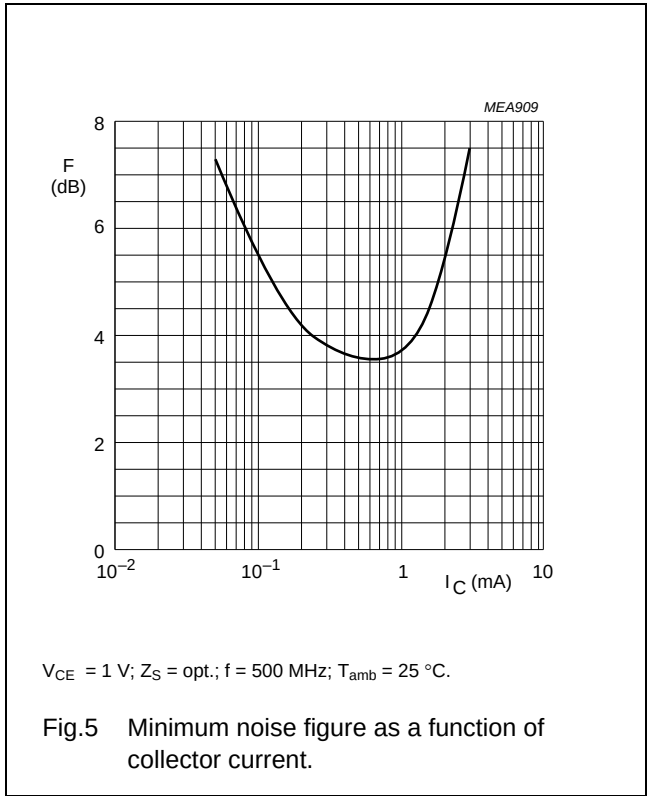
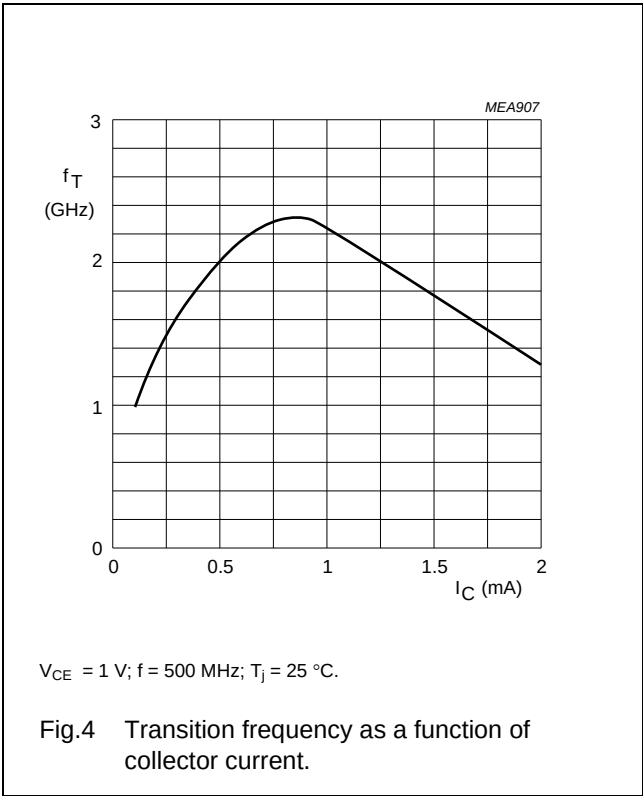
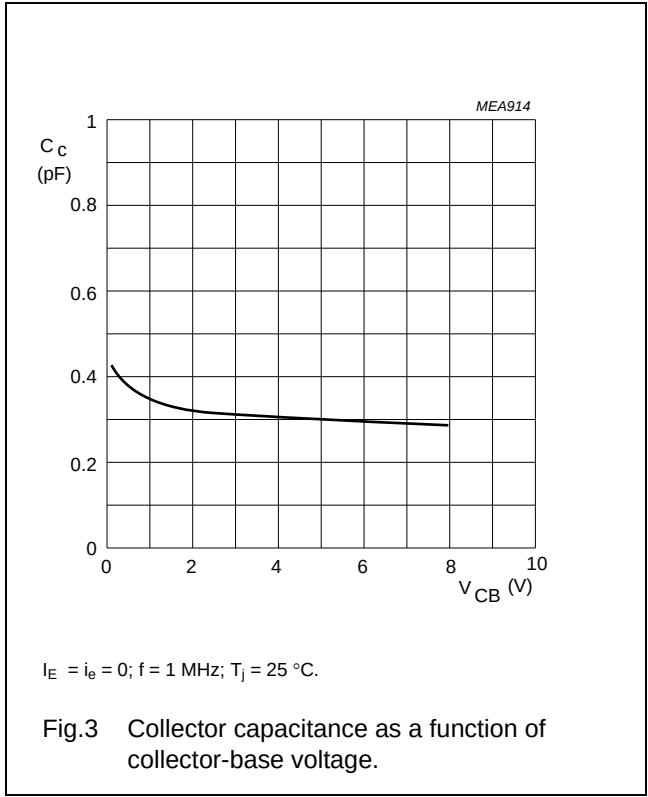
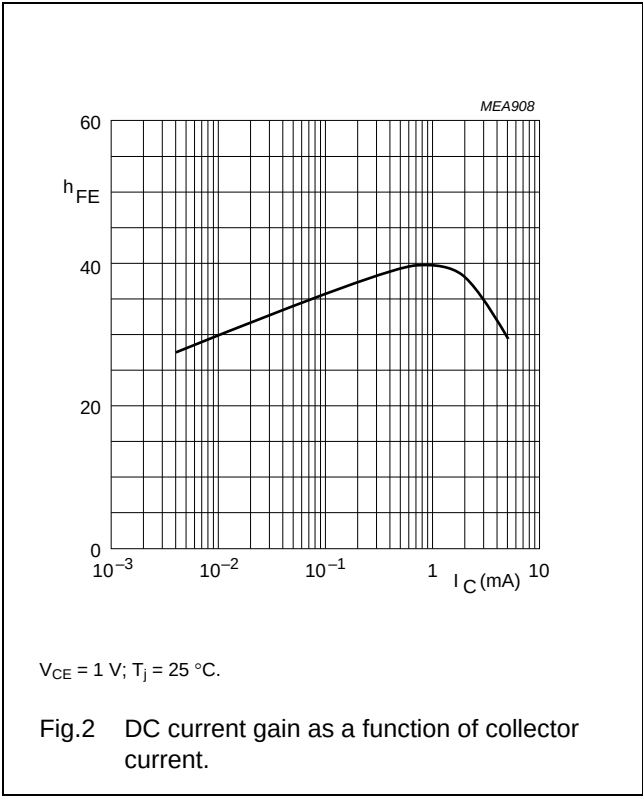
## Note

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

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

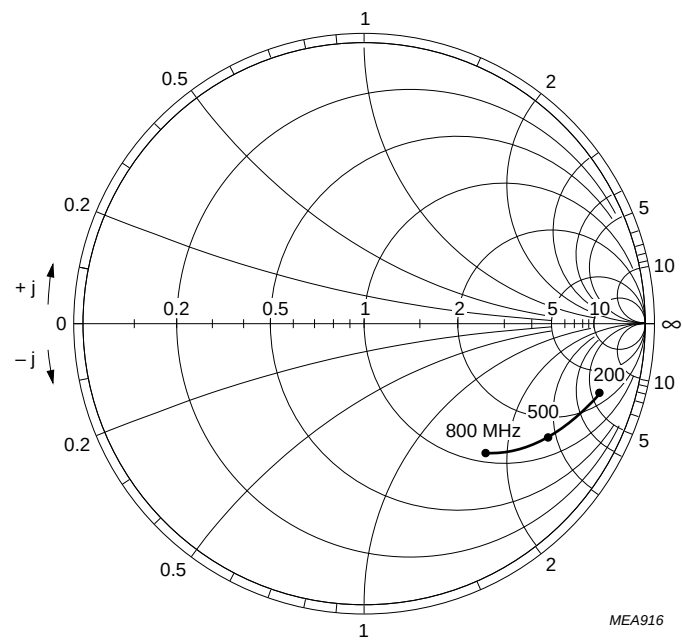
NPN 2 GHz wideband transistor

BFT25



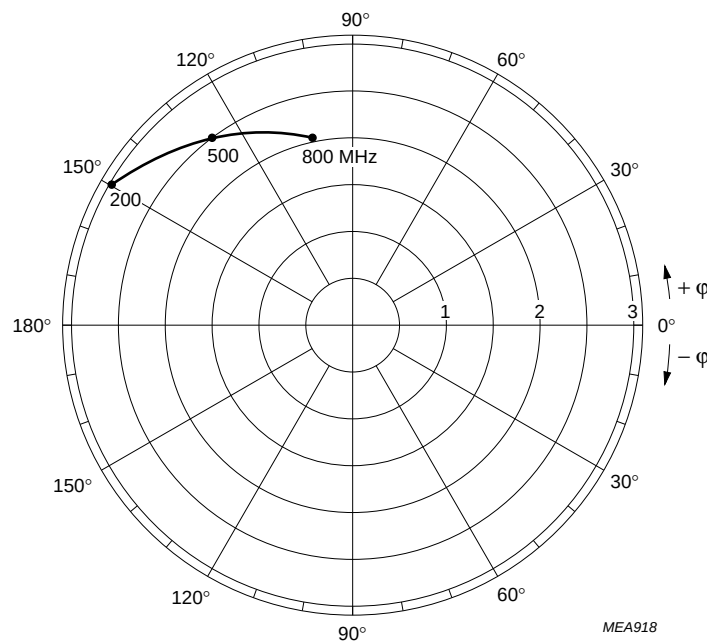
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$I_C = 1 \text{ mA}$ ;  $V_{CE} = 1 \text{ V}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ .  
 $Z_0 = 50 \text{ }\Omega$ .

Fig.6 Common emitter input reflection coefficient ( $S_{11}$ ).

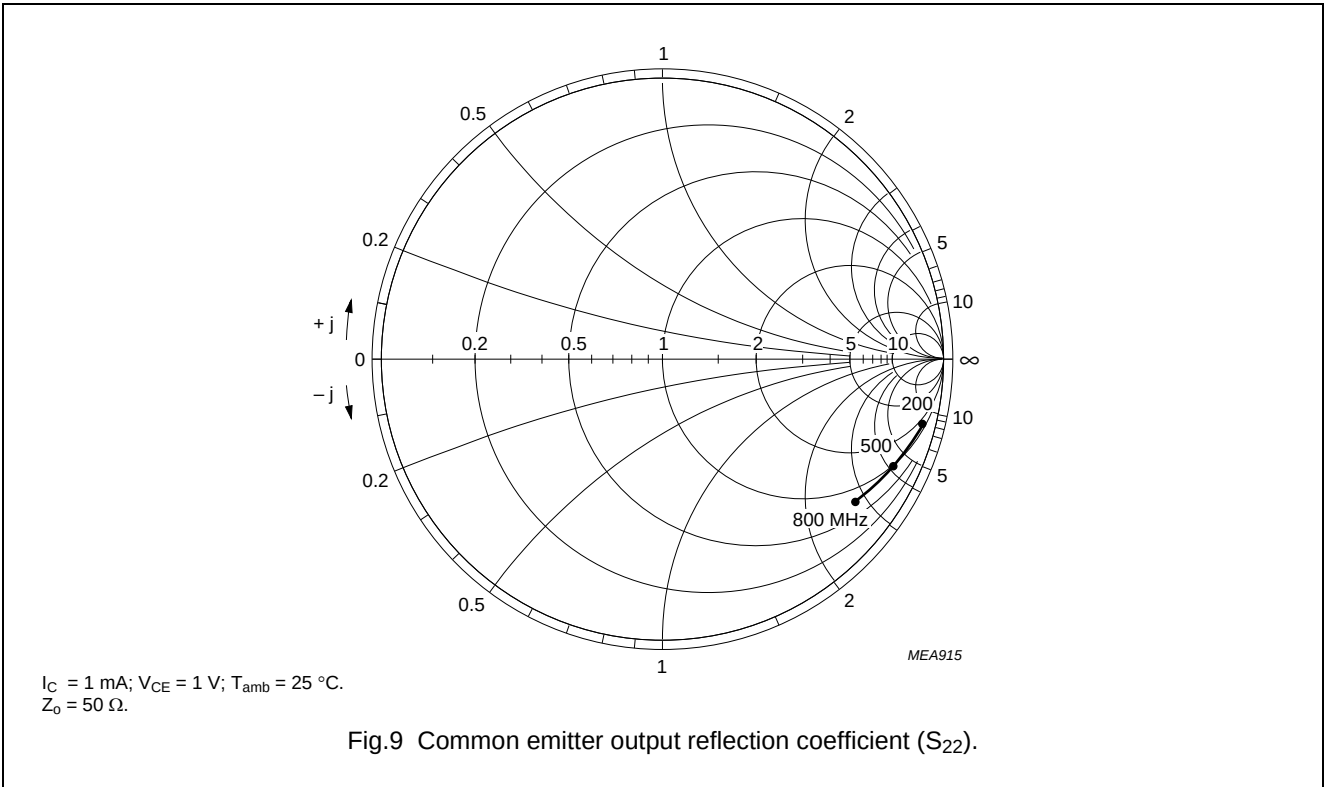
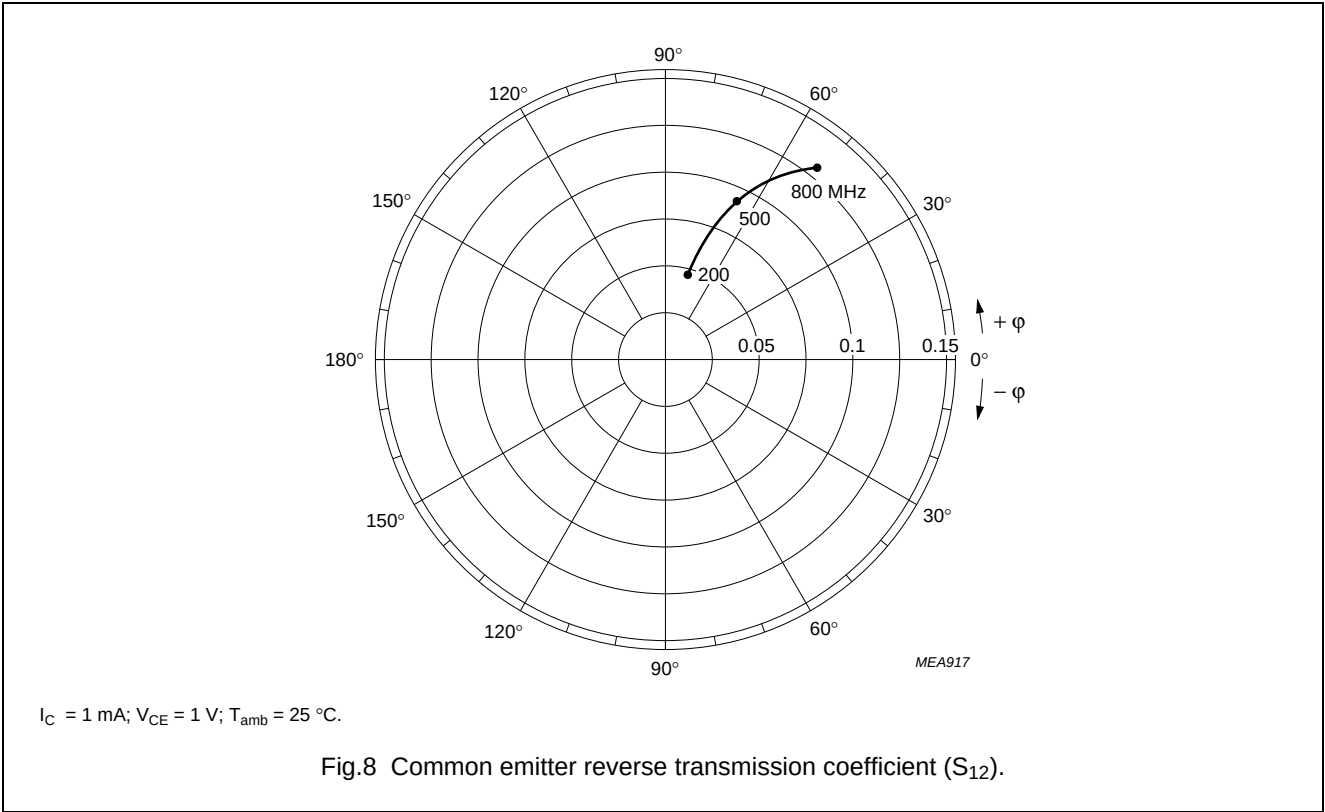


$I_C = 1 \text{ mA}$ ;  $V_{CE} = 1 \text{ V}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ .

Fig.7 Common emitter forward transmission coefficient ( $S_{21}$ ).

NPN 2 GHz wideband transistor

BFT25



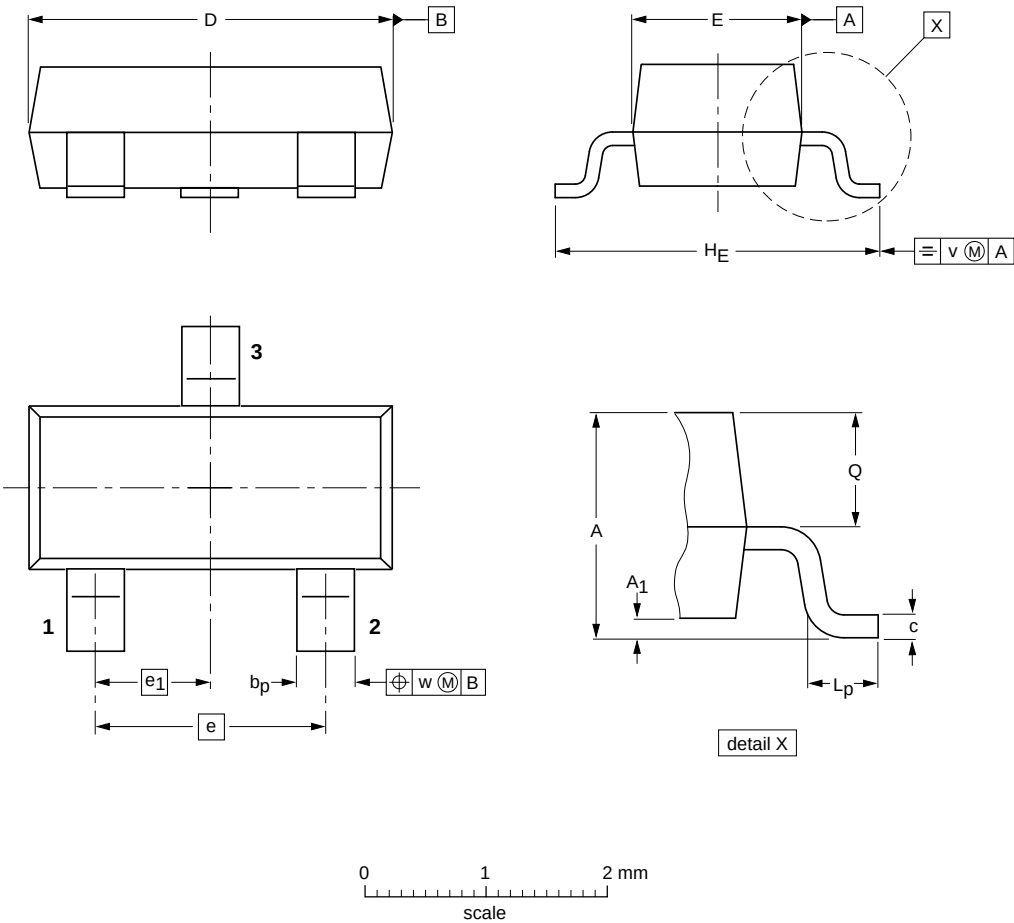
NPN 2 GHz wideband transistor

BFT25

PACKAGE OUTLINE

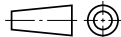
Plastic surface-mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

| UNIT | A          | A <sub>1</sub><br>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<br>0.9 | 0.1                    | 0.48<br>0.38   | 0.15<br>0.09 | 3.0<br>2.8 | 1.4<br>1.2 | 1.9 | 0.95           | 2.5<br>2.1     | 0.45<br>0.15   | 0.55<br>0.45 | 0.2 | 0.1 |

| OUTLINE<br>VERSION | REFERENCES |          |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE                      |
|--------------------|------------|----------|-------|--|---------------------------------------------------------------------------------------|---------------------------------|
|                    | IEC        | JEDEC    | JEITA |  |                                                                                       |                                 |
| SOT23              |            | TO-236AB |       |  |  | <del>04-11-04</del><br>06-03-16 |

## NPN 2 GHz wideband transistor

BFT25

## 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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