

DATA SHEET

BFR53

NPN 2 GHz wideband transistor

Product specification
Supersedes data of September 1995
File under Discrete Semiconductors, SC14

1997 Oct 28

NPN 2 GHz wideband transistor

BFR53

FEATURES

- Very low intermodulation distortion
- Very high power gain.

APPLICATIONS

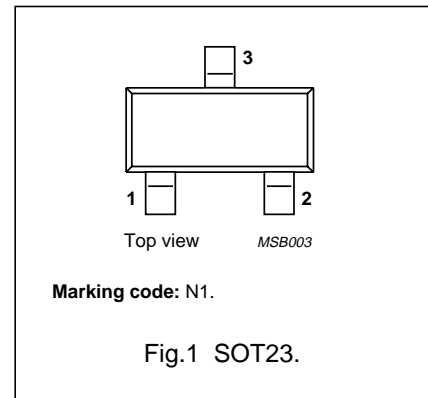
- Thick and thin-film circuits.

DESCRIPTION

NPN wideband transistor in a plastic SOT23 package.

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 | – | 18 | V |
| V_{CEO} | collector-emitter voltage | open base | – | 10 | V |
| I_{CM} | peak collector current | $f > 1$ MHz | – | 100 | mA |
| P_{tot} | total power dissipation | $T_s \leq 85$ °C | – | 250 | mW |
| C_{re} | feedback capacitance | $I_C = 2$ mA; $V_{CE} = 5$ V; $f = 1$ MHz; $T_{amb} = 25$ °C | 0.9 | – | pF |
| f_T | transition frequency | $I_C = 25$ mA; $V_{CE} = 5$ V; $f = 500$ MHz; $T_j = 25$ °C | 2 | – | GHz |
| G_{UM} | maximum unilateral power gain | $I_C = 30$ mA; $V_{CE} = 5$ V; $f = 800$ MHz; $T_{amb} = 25$ °C | 10.5 | – | dB |

LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|-----------|---------------------------|---------------------------|------|------|------|
| V_{CBO} | collector-base voltage | open emitter | – | 18 | V |
| V_{CEO} | collector-emitter voltage | open base | – | 10 | V |
| V_{EBO} | emitter-base voltage | open collector | – | 2.5 | V |
| I_C | collector current (DC) | | – | 50 | mA |
| I_{CM} | peak collector current | $f > 1$ MHz | – | 100 | mA |
| P_{tot} | total power dissipation | $T_s \leq 85$ °C (note 1) | – | 250 | mW |
| T_{stg} | storage temperature | | –65 | +150 | °C |
| T_j | junction temperature | | – | 150 | °C |

Note

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

NPN 2 GHz wideband transistor

BFR53

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------|---|----------------------------------|-------|------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | $T_s \leq 85\text{ °C}$; 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.

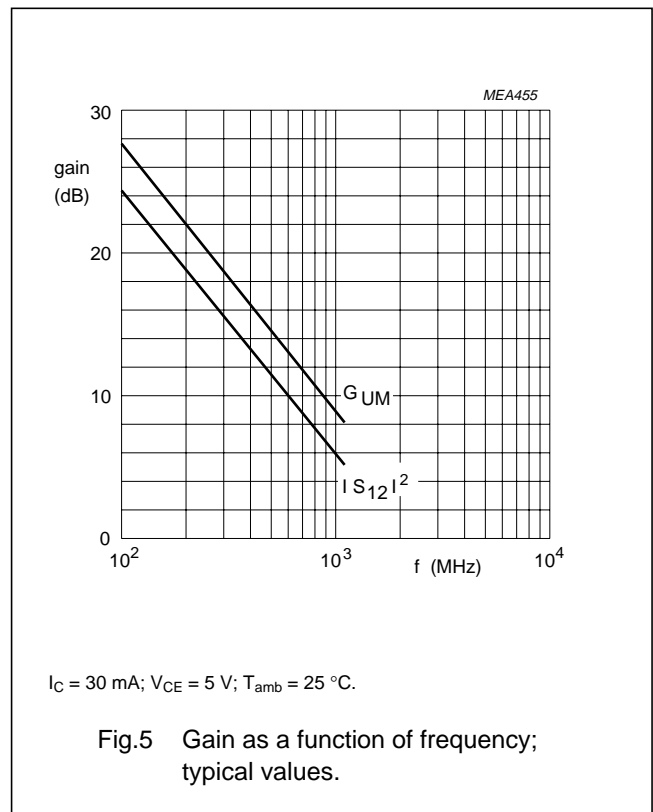
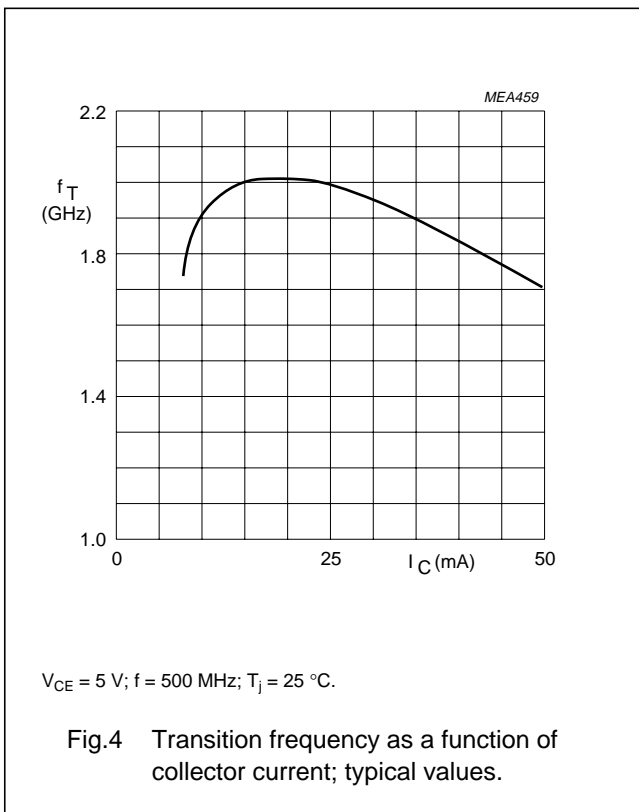
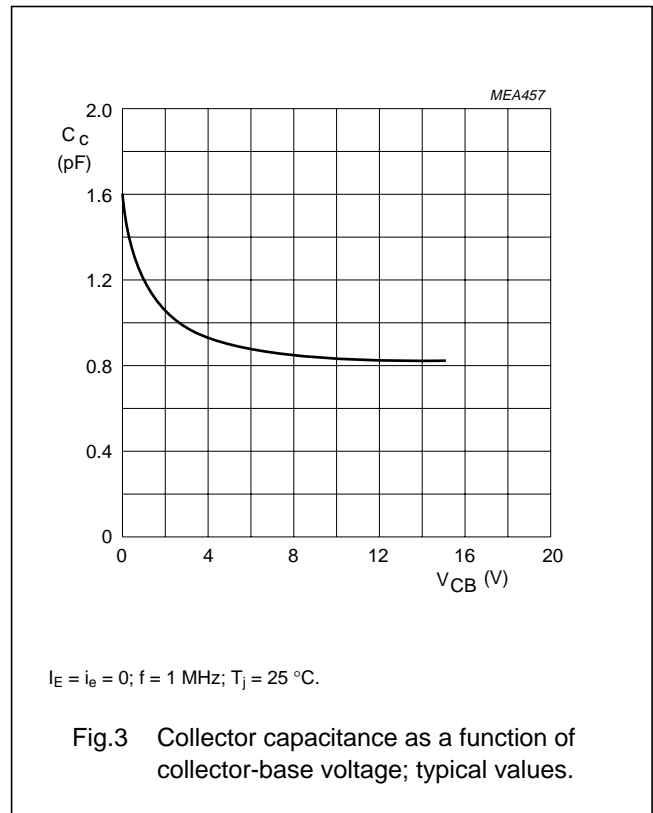
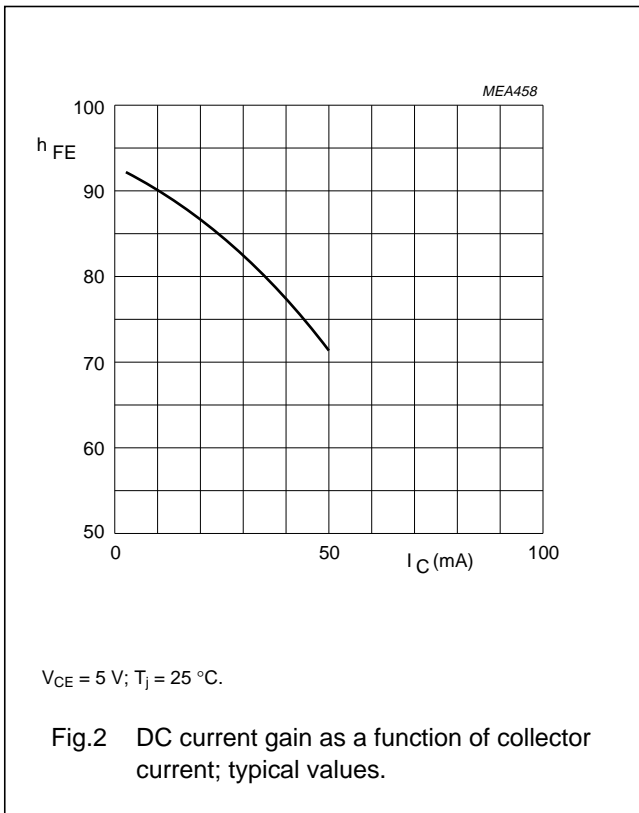
| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------|--|--|------|------|------|------|
| I_{CBO} | collector cut-off current | $I_E = 0$; $V_{CB} = 10\text{ V}$ | – | – | 50 | nA |
| h_{FE} | DC current gain | $I_C = 25\text{ mA}$; $V_{CE} = 5\text{ V}$; see Fig.2 | 25 | – | – | |
| | | $I_C = 50\text{ mA}$; $V_{CE} = 5\text{ V}$; see Fig.2 | 25 | – | – | |
| C_c | collector capacitance | $I_E = i_e = 0$; $V_{CB} = 5\text{ V}$; $f = 1\text{ MHz}$; see Fig.3 | – | 0.9 | – | pF |
| C_e | emitter capacitance | $I_C = i_c = 0$; $V_{EB} = 0.5\text{ V}$; $f = 1\text{ MHz}$ | – | 1.5 | – | pF |
| C_{re} | feedback capacitance | $I_C = 2\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 1\text{ MHz}$; $T_{amb} = 25\text{ °C}$ | – | 0.9 | – | pF |
| f_T | transition frequency | $I_C = 25\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; see Fig.4 | – | 2 | – | GHz |
| G_{UM} | maximum unilateral power gain (note 1) | $I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 800\text{ MHz}$; $T_{amb} = 25\text{ °C}$; see Fig.5 | – | 10.5 | – | dB |
| F | noise figure | $I_C = 2\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $T_{amb} = 25\text{ °C}$; see Fig.6 | – | – | 5 | dB |

Note

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

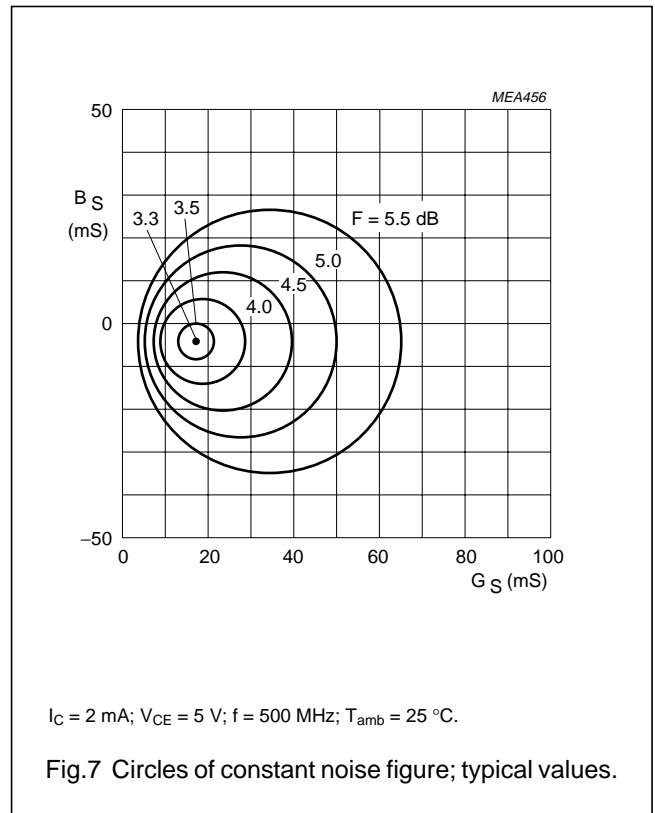
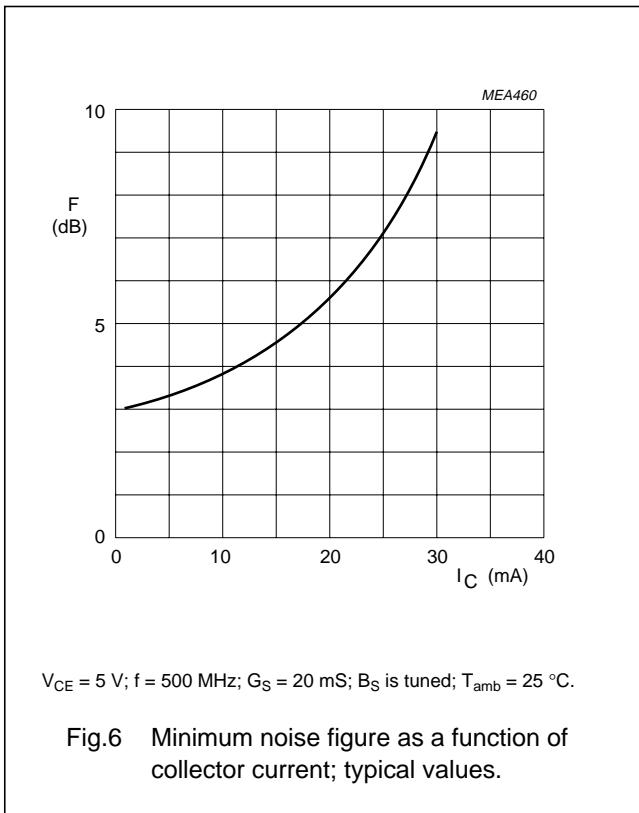
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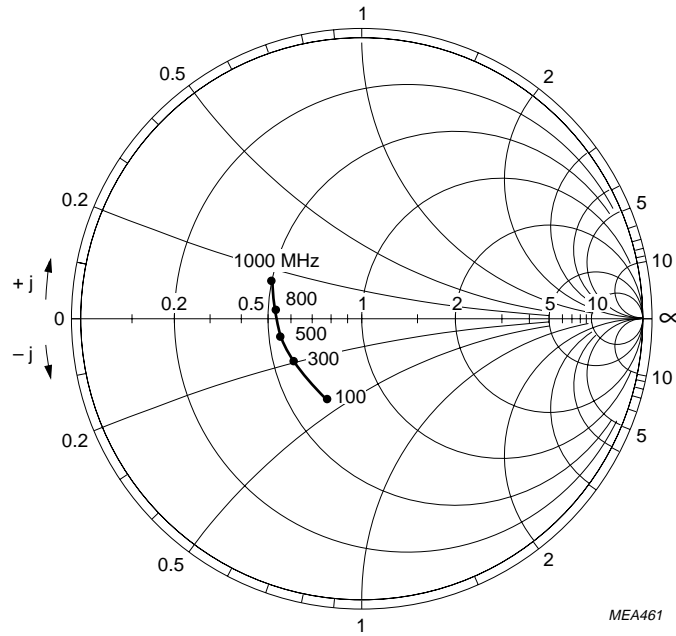
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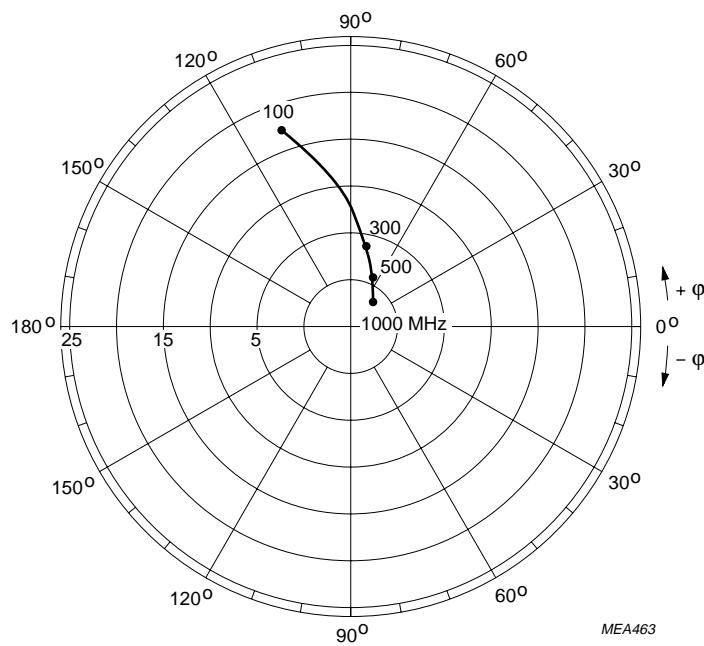
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MEA461

$I_C = 30 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $Z_0 = 50 \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

Fig.8 Common emitter input reflection coefficient (S_{11}).



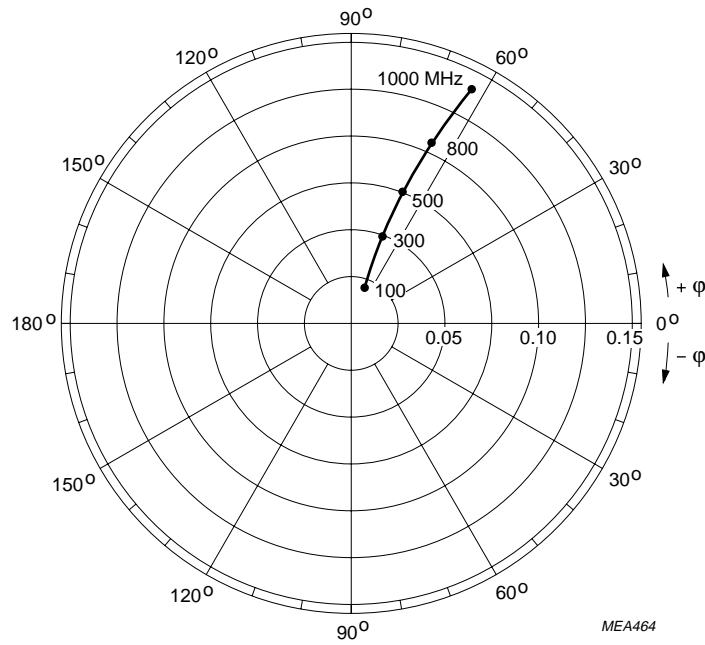
MEA463

$I_C = 30 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

Fig.9 Common emitter forward transmission coefficient (S_{21}).

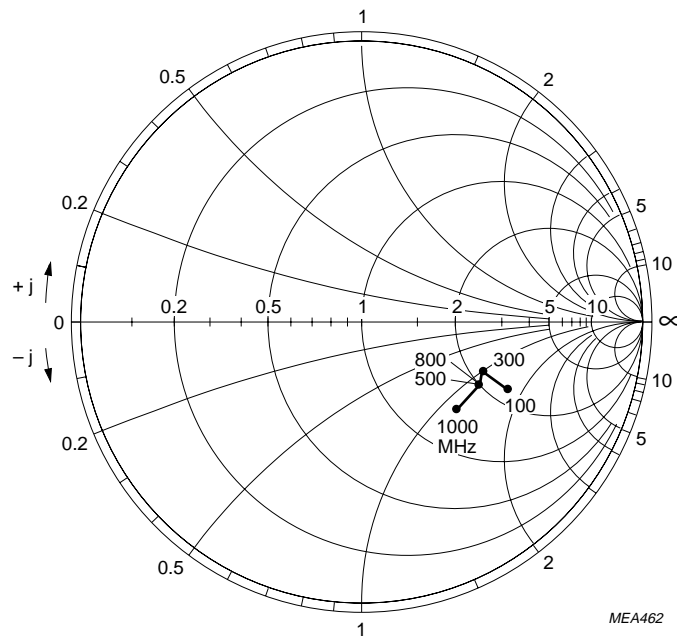
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$I_C = 30 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

Fig.10 Common emitter reverse transmission coefficient (S_{12}).



$I_C = 30 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $Z_o = 50 \text{ } \Omega$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

Fig.11 Common emitter output reflection coefficient (S_{22}).

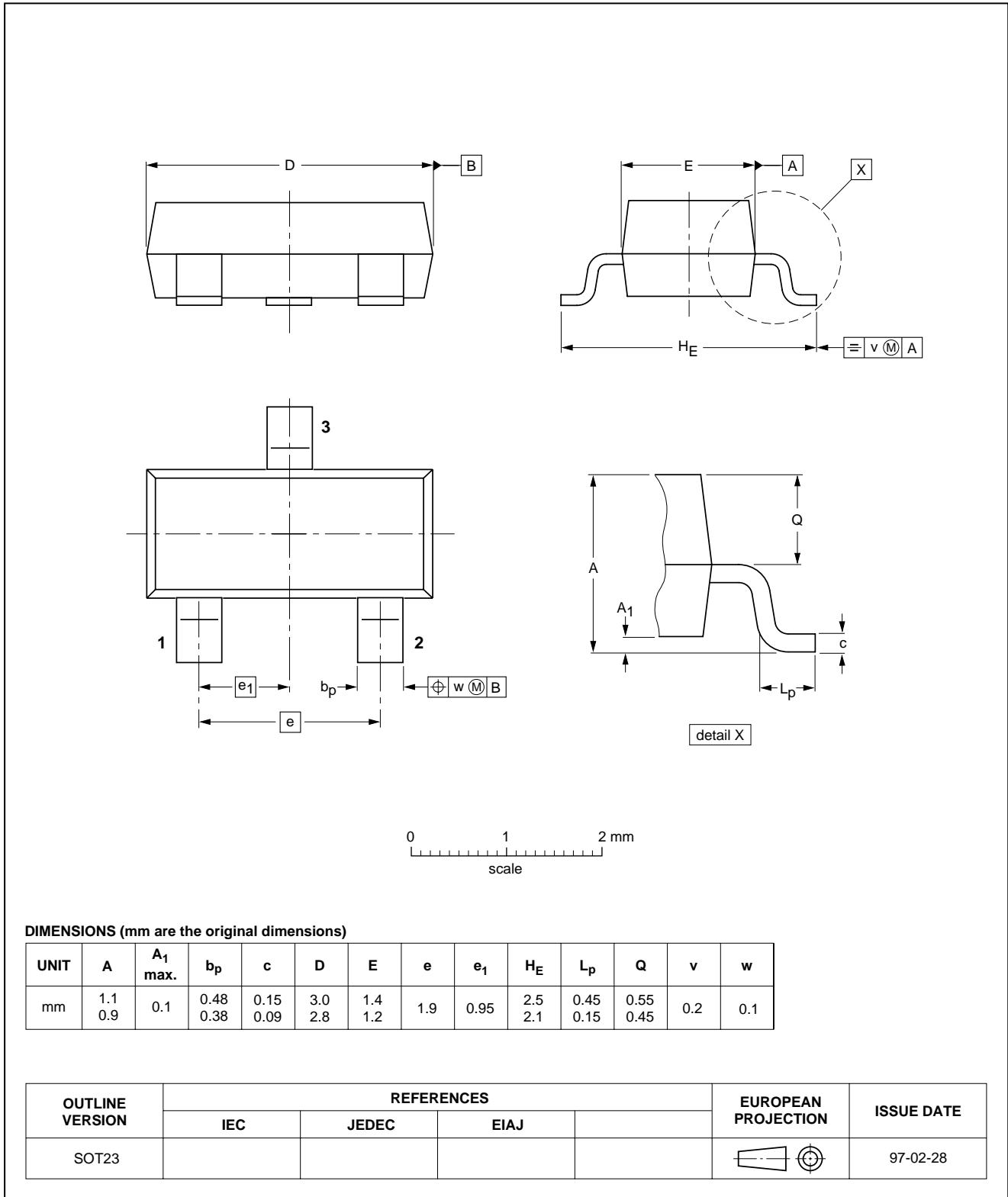
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PACKAGE OUTLINES

Plastic surface mounted package; 3 leads

SOT23



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BFR53

DEFINITIONS

| Data sheet status | |
|---|--|
| 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. |
| Short-form specification | The data in this specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook. |
| Limiting values | |
| 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. | |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |

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NOTES

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