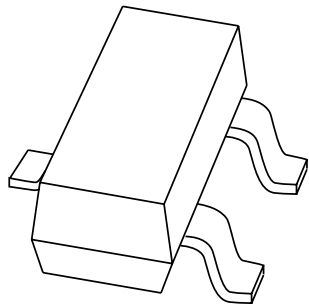


# DATA SHEET



## **PBR941B** UHF wideband transistor

Preliminary specification

2001 Jan 18

## UHF wideband transistor

## PBR941B

## FEATURES

- Small size
- Low noise
- Low distortion
- High gain
- Gold metallization ensures excellent reliability.

## APPLICATIONS

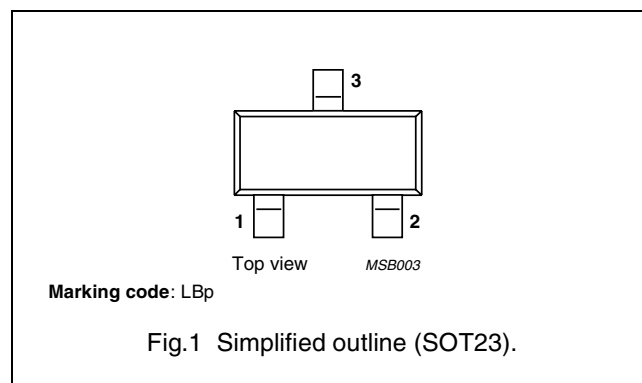
- Communication and instrumentation systems.

## DESCRIPTION

Silicon NPN transistor in a surface mount 3-pin SOT23 package. The transistor is primarily intended for wideband applications in the GHz range in the RF front end of analog and digital cellular telephones, cordless phones, radar detectors, pagers and satellite TV-tuners.

## PINNING SOT23

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | base        |
| 2   | emitter     |
| 3   | collector   |



## QUICK REFERENCE DATA

| SYMBOL        | PARAMETER                                           | CONDITIONS                                                               | MIN. | TYP. | MAX. | UNIT |
|---------------|-----------------------------------------------------|--------------------------------------------------------------------------|------|------|------|------|
| $C_{re}$      | feedback capacitance                                | $I_C = 0$ ; $V_{CB} = 6$ V; $f = 1$ MHz                                  | –    | 0.3  | –    | pF   |
| $f_T$         | transition frequency                                | $I_C = 15$ mA; $V_{CE} = 6$ V; $f_m = 1$ GHz                             | 7    | 9    | –    | GHz  |
| $G_{UM}$      | maximum unilateral power gain                       | $I_C = 15$ mA; $V_{CE} = 6$ V;<br>$T_{amb} = 25$ °C; $f = 1$ GHz         | –    | 16   | –    | dB   |
| NF            | noise figure                                        | $\Gamma_S = \Gamma_{opt}$ ; $I_C = 5$ mA; $V_{CE} = 6$ V;<br>$f = 1$ GHz | –    | 1.5  | 2.5  | dB   |
| $P_{tot}$     | total power dissipation                             | $T_s = 60$ °C; note 1                                                    | –    | –    | 360  | mW   |
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point |                                                                          | –    | –    | 320  | K/W  |

## Note

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

## UHF wideband transistor

## PBR941B

**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                     | –    | 10   | V    |
| $V_{EBO}$   | emitter-base voltage      | open collector                | –    | 1.5  | V    |
| $I_C$       | collector current (DC)    |                               | –    | 50   | mA   |
| $I_{C(AV)}$ | average collector current |                               | –    | 50   | mA   |
| $P_{tot}$   | total power dissipation   | $T_s = 60\text{ °C}$ ; note 1 | –    | 360  | 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.

**THERMAL CHARACTERISTICS**

| SYMBOL        | PARAMETER                                           | VALUE | UNIT |
|---------------|-----------------------------------------------------|-------|------|
| $R_{th\ j-s}$ | thermal resistance from junction to soldering point | 320   | K/W  |

## UHF wideband transistor

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## CHARACTERISTICS

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

| SYMBOL                         | PARAMETER                             | CONDITIONS                                                                                  | MIN. | TYP. | MAX. | UNIT |
|--------------------------------|---------------------------------------|---------------------------------------------------------------------------------------------|------|------|------|------|
| DC characteristics             |                                       |                                                                                             |      |      |      |      |
| V <sub>(BR)CBO</sub>           | collector-base breakdown voltage      | I <sub>C</sub> = 100 μA; I <sub>E</sub> = 0                                                 | 20   | —    | —    | V    |
| V <sub>(BR)CEO</sub>           | collector-emitter breakdown voltage   | I <sub>C</sub> = 100 μA; I <sub>B</sub> = 0                                                 | 10   | —    | —    | V    |
| V <sub>(BR)EBO</sub>           | emitter-base breakdown voltage        | I <sub>E</sub> = 10 μA; I <sub>C</sub> = 0                                                  | 1.5  | —    | —    | V    |
| V <sub>BEF</sub>               | forward base-emitter voltage          | I <sub>E</sub> = 25 mA                                                                      | —    | —    | 1.05 | V    |
| I <sub>CBO</sub>               | collector-base leakage current        | V <sub>CB</sub> = 10 V; I <sub>E</sub> = 0                                                  | —    | —    | 100  | nA   |
| I <sub>EBO</sub>               | emitter-base leakage current          | V <sub>EB</sub> = 1 V; I <sub>C</sub> = 0                                                   | —    | —    | 100  | nA   |
| h <sub>FE</sub>                | DC current gain                       | I <sub>C</sub> = 5 mA; V <sub>CE</sub> = 6 V                                                | 100  | 150  | 200  |      |
|                                |                                       | I <sub>C</sub> = 15 mA; V <sub>CE</sub> = 6 V                                               | —    | 150  | —    |      |
| AC characteristics             |                                       |                                                                                             |      |      |      |      |
| C <sub>re</sub>                | feedback capacitance                  | I <sub>C</sub> = 0; V <sub>CB</sub> = 6 V; f = 1 MHz                                        | —    | 0.3  | —    | pF   |
| f <sub>T</sub>                 | transition frequency                  | I <sub>C</sub> = 15 mA; V <sub>CE</sub> = 6 V; f <sub>m</sub> = 1 GHz                       | 7    | 9    | —    | GHz  |
| s <sub>21</sub>   <sup>2</sup> | insertion gain                        | I <sub>C</sub> = 15 mA; V <sub>CE</sub> = 6 V; f = 1 GHz                                    | 13   | 15   | —    | dB   |
| G <sub>UM</sub>                | maximum unilateral power gain; note 1 | I <sub>C</sub> = 15 mA; V <sub>CE</sub> = 6 V; T <sub>amb</sub> = 25 °C; f = 1 GHz          | —    | 16   | —    | dB   |
|                                |                                       | I <sub>C</sub> = 15 mA; V <sub>CE</sub> = 6 V; T <sub>amb</sub> = 25 °C; f = 2 GHz          | —    | 10   | —    | dB   |
| NF                             | noise figure                          | Γ <sub>S</sub> = Γ <sub>opt</sub> ; I <sub>C</sub> = 5 mA; V <sub>CE</sub> = 6 V; f = 1 GHz | —    | 1.5  | 2.5  | dB   |
|                                |                                       | Γ <sub>S</sub> = Γ <sub>opt</sub> ; I <sub>C</sub> = 5 mA; V <sub>CE</sub> = 6 V; f = 2 GHz | —    | 2.1  | —    | dB   |

## Note

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

UHF wideband transistor

PBR941B

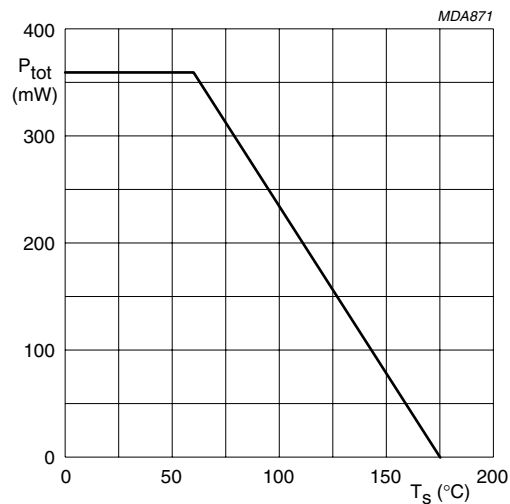
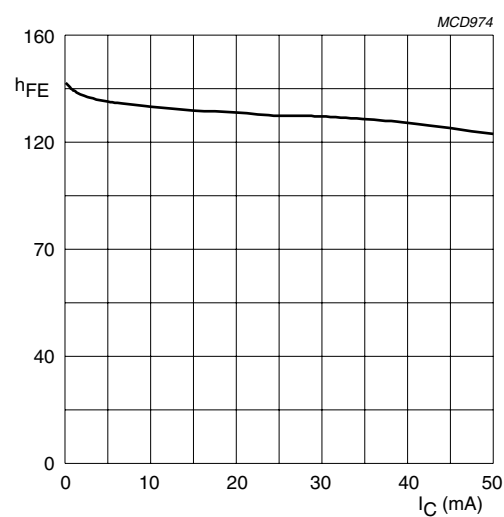
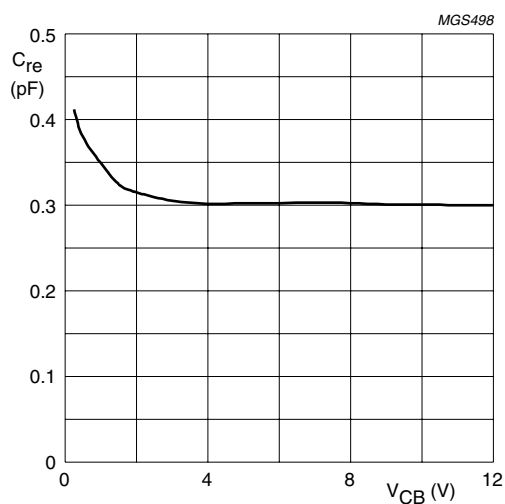


Fig.2 Power derating as a function of soldering point temperature.



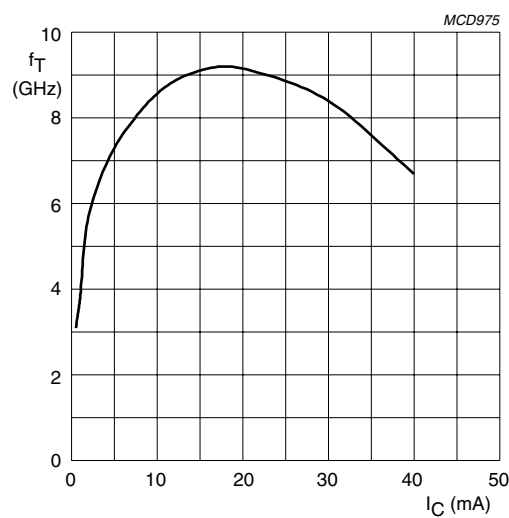
$V_{CE} = 6\text{ V}$ .

Fig.3 DC current gain as a function of collector current; typical values.



$I_C = I_c = 0$ ;  $f = 1\text{ MHz}$ .

Fig.4 Feedback capacitance as a function of collector-base voltage; typical values.

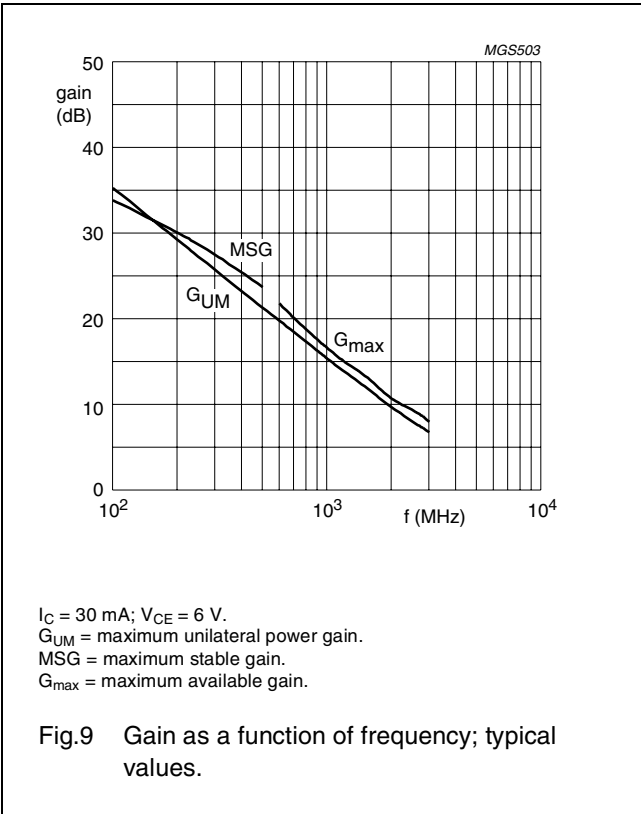
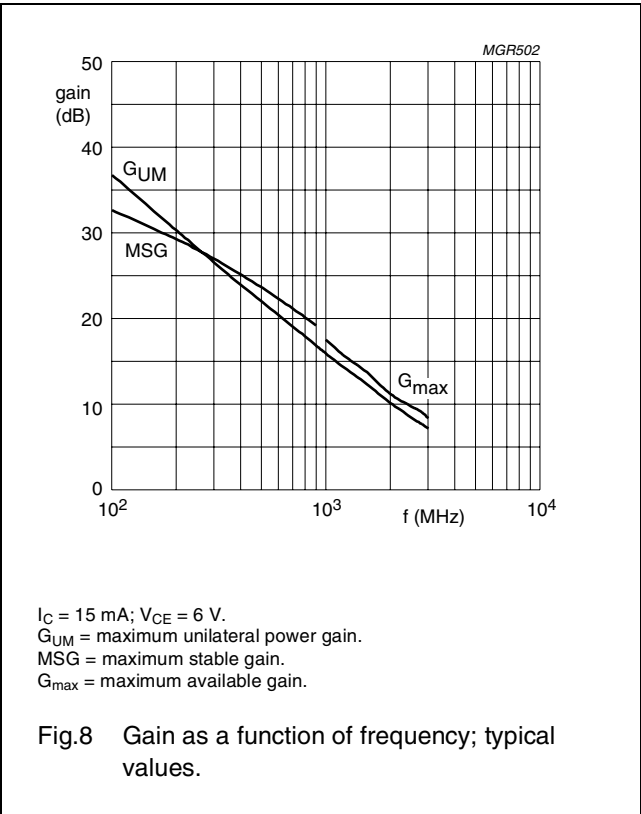
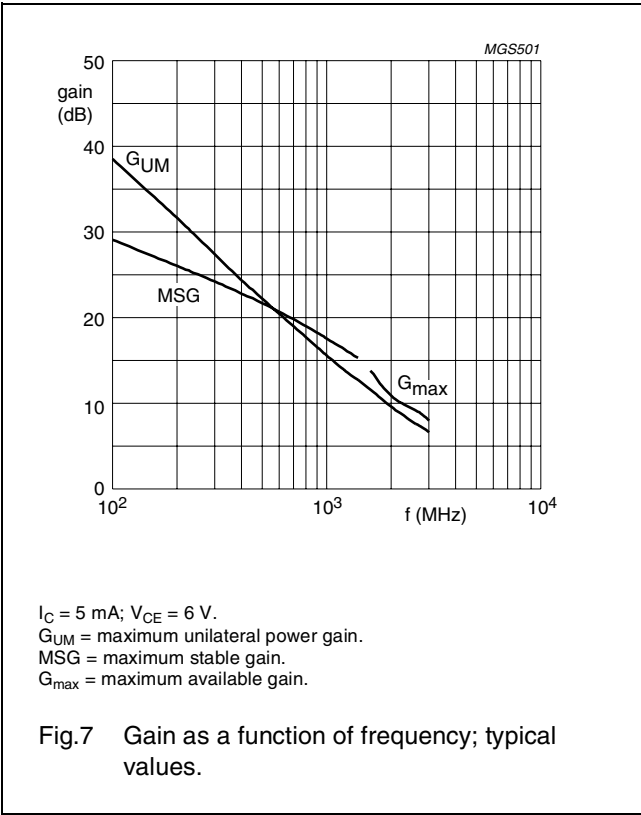
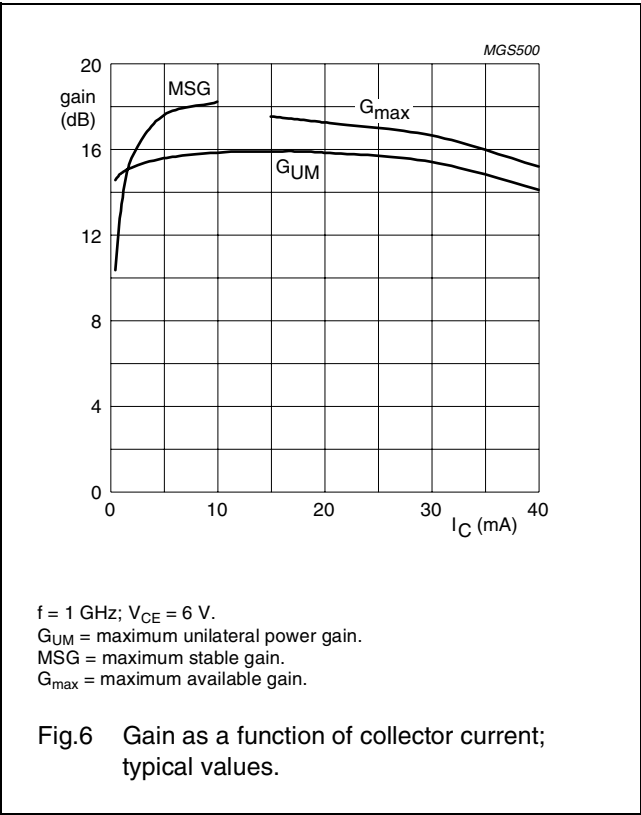


$V_{CE} = 6\text{ V}$ ;  $f_m = 1\text{ GHz}$ ;  $T_{amb} = 25\text{ °C}$ .

Fig.5 Transition frequency as a function of collector current; typical values.

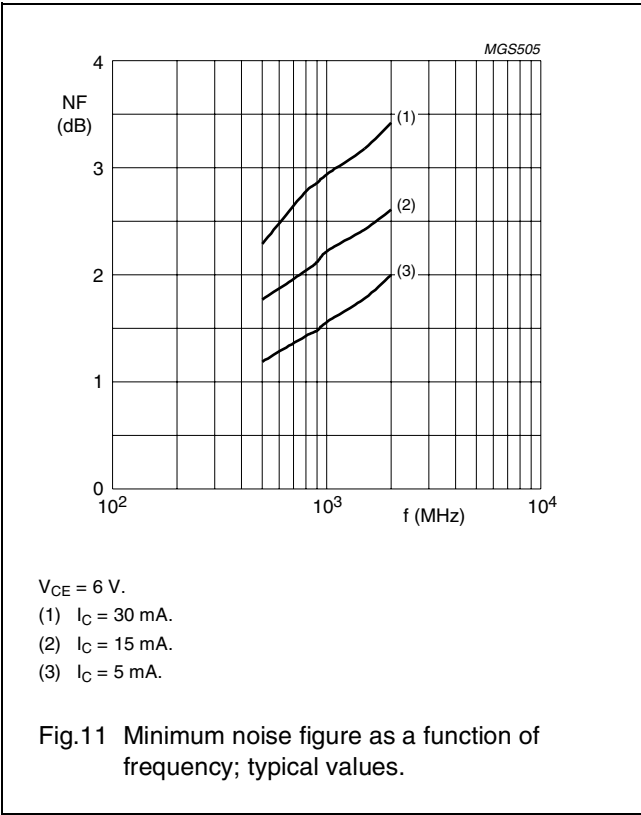
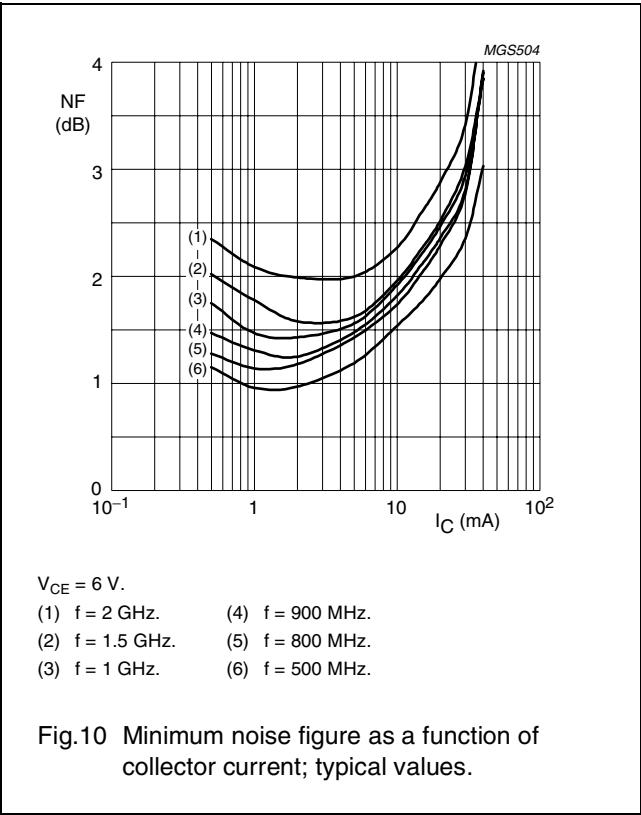
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UHF wideband transistor

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## UHF wideband transistor

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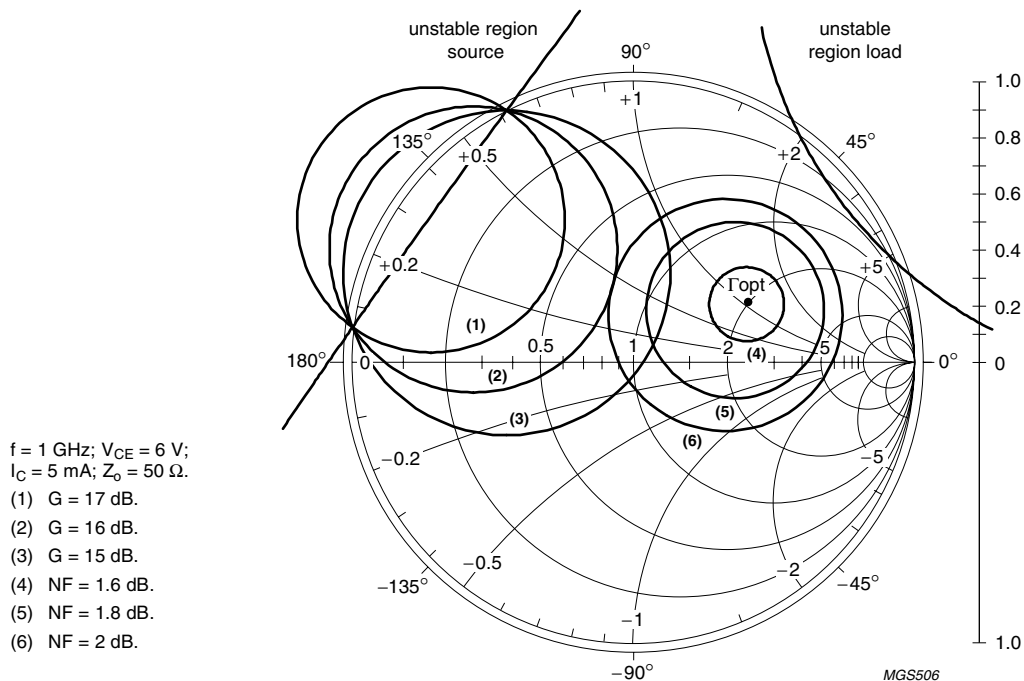


Fig.12 Common emitter available gain, noise and stability circles; typical values.

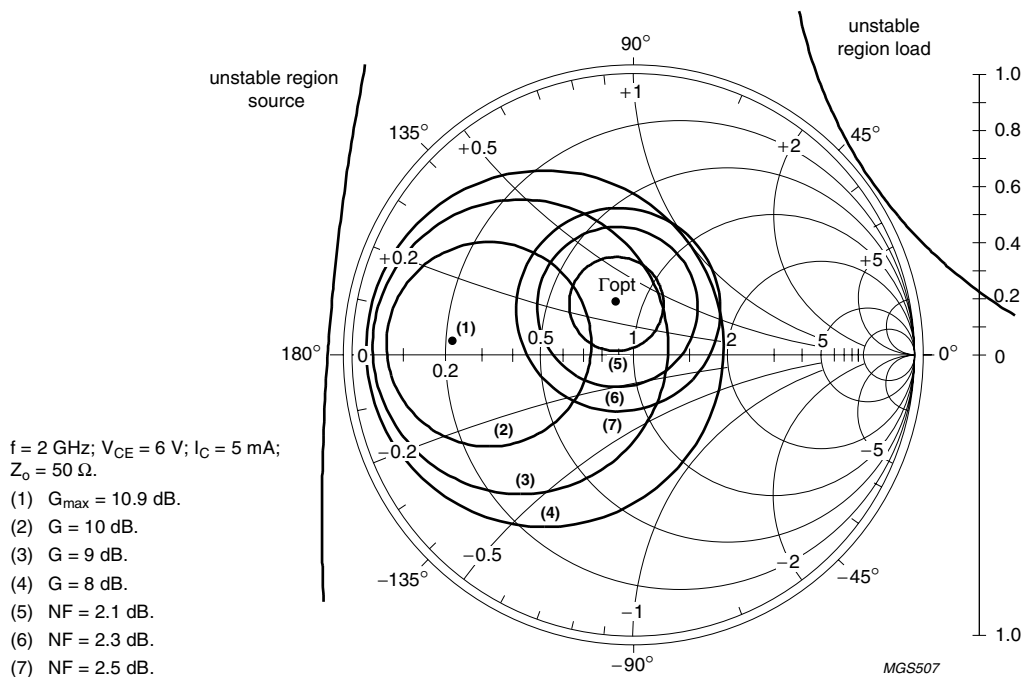
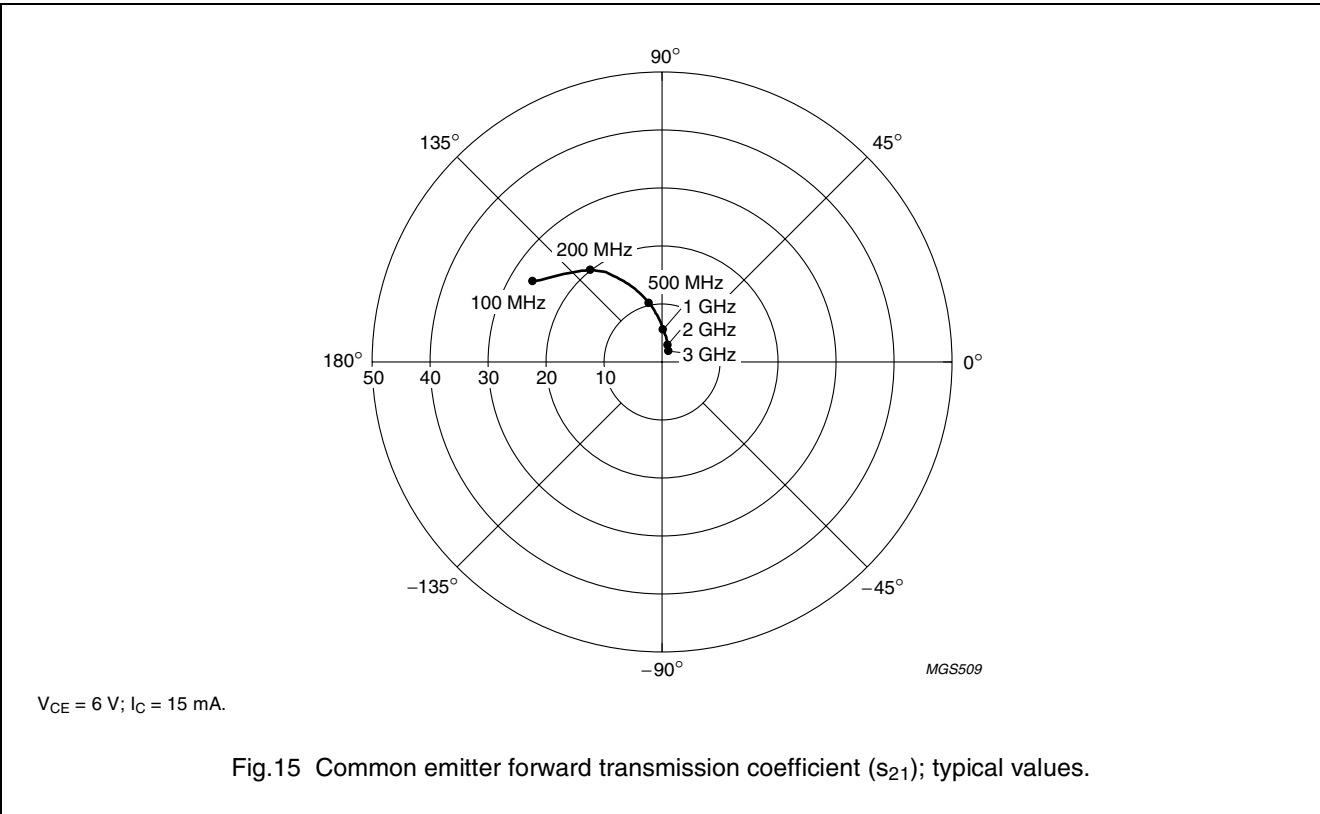
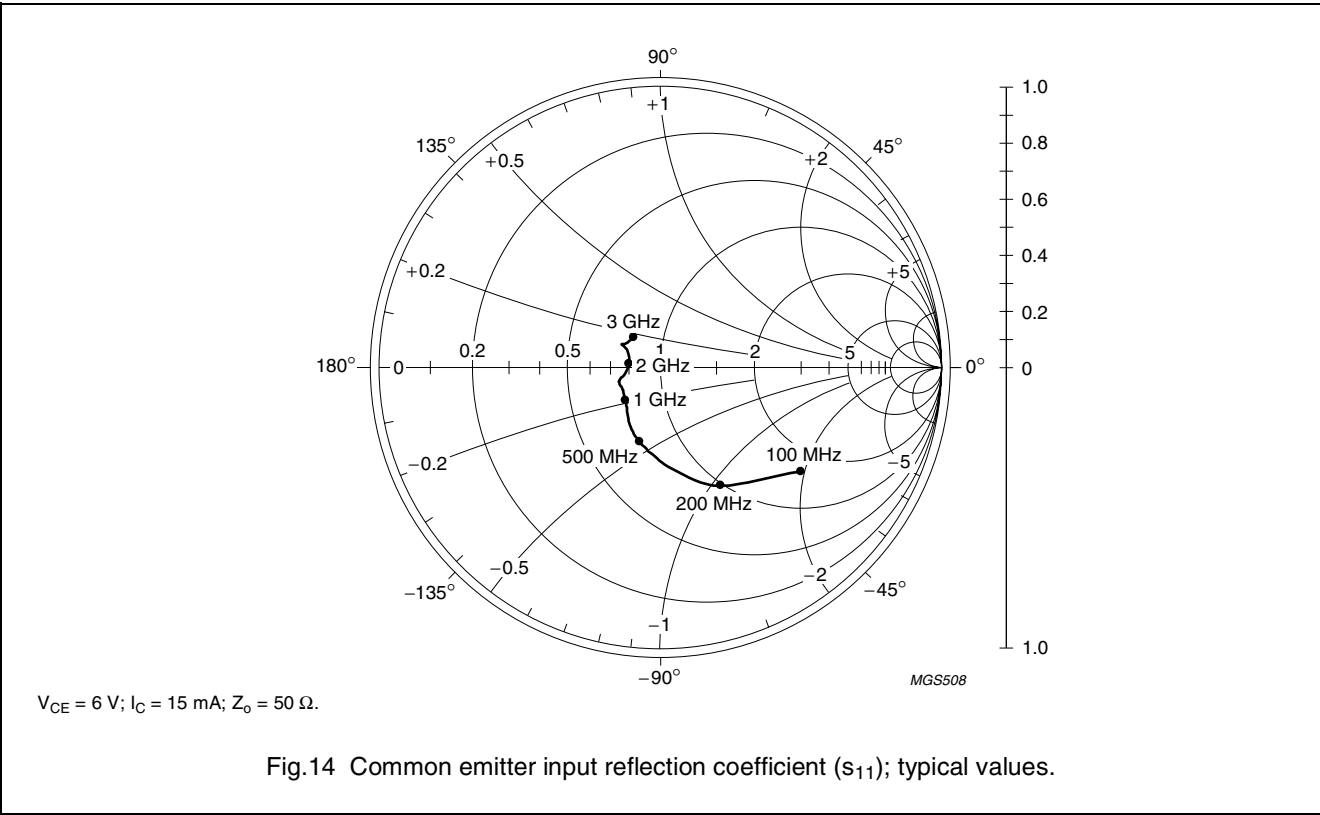


Fig.13 Common emitter available gain, noise and stability circles; typical values.

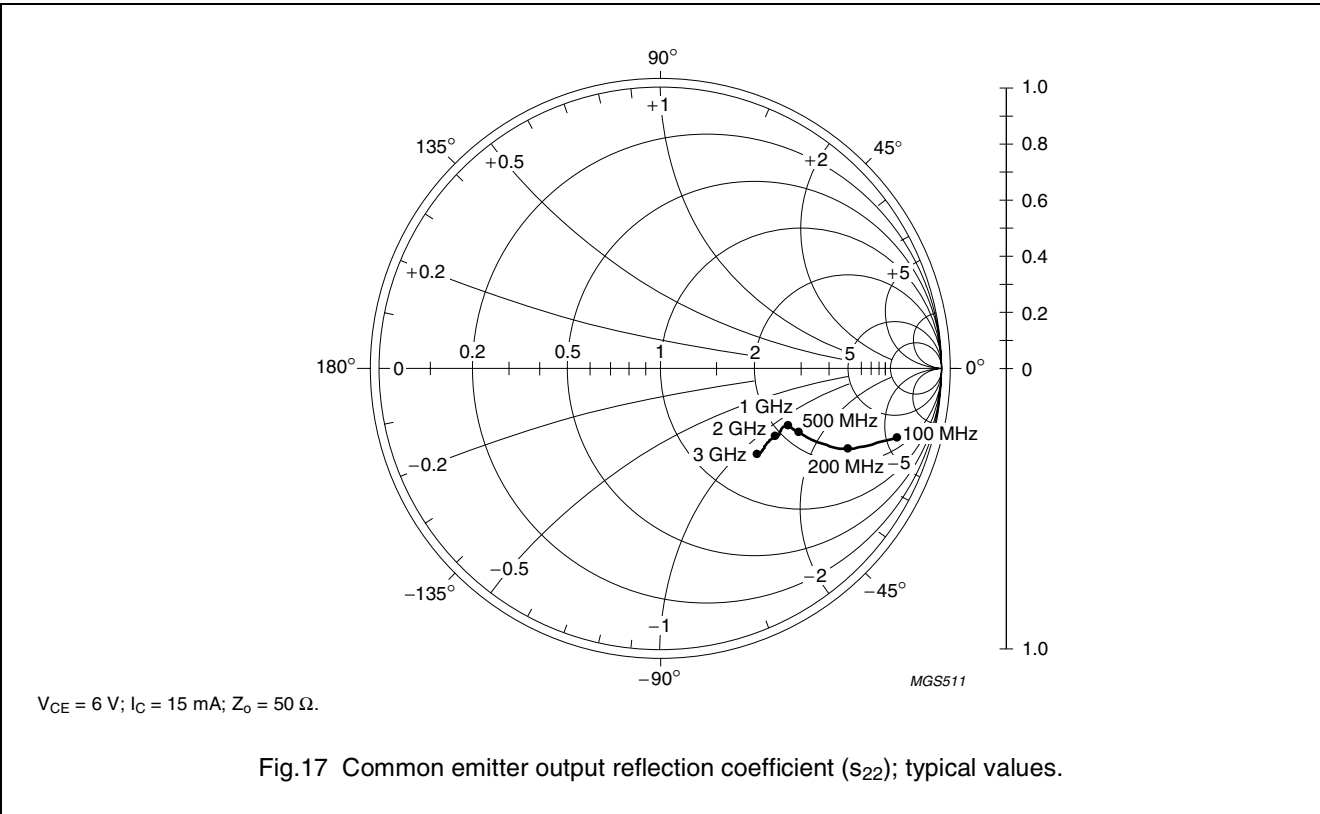
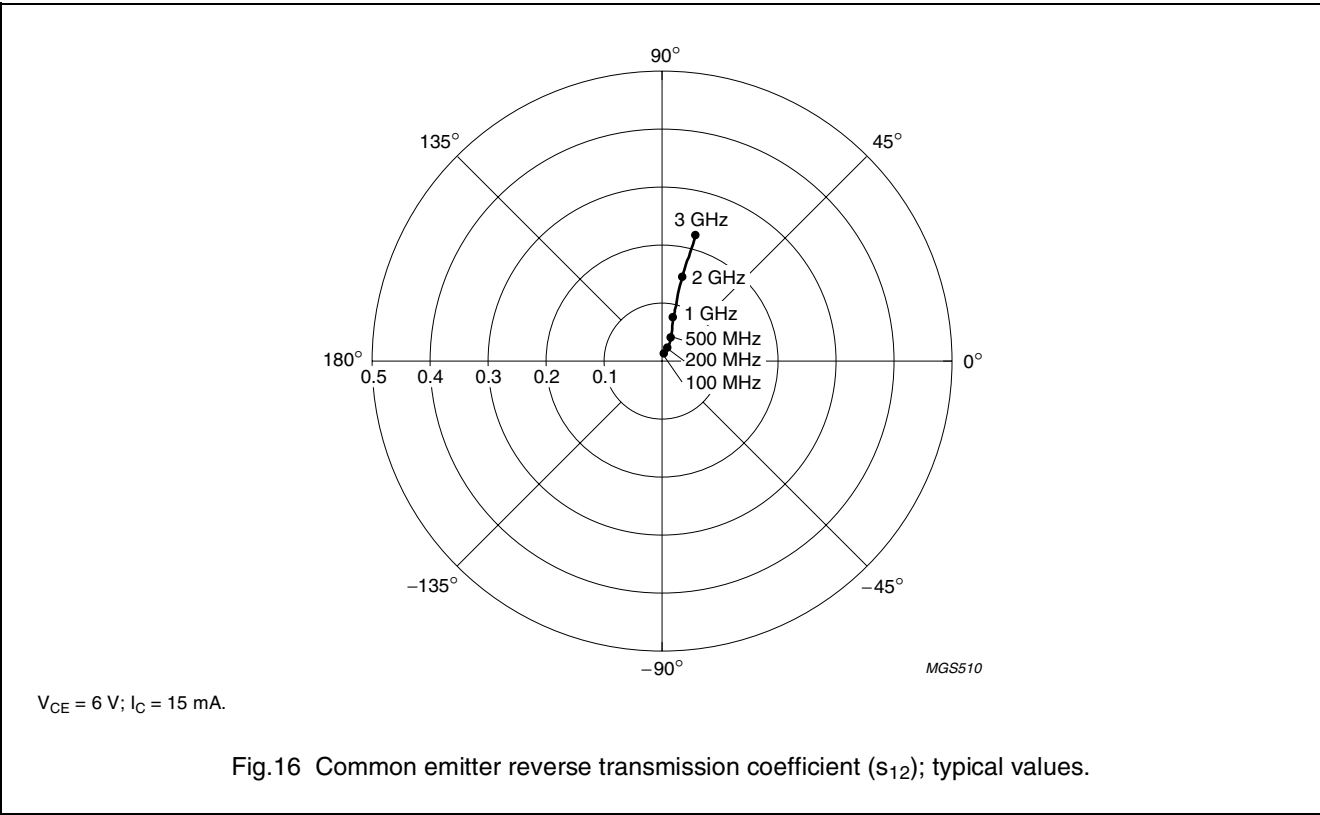
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UHF wideband transistor

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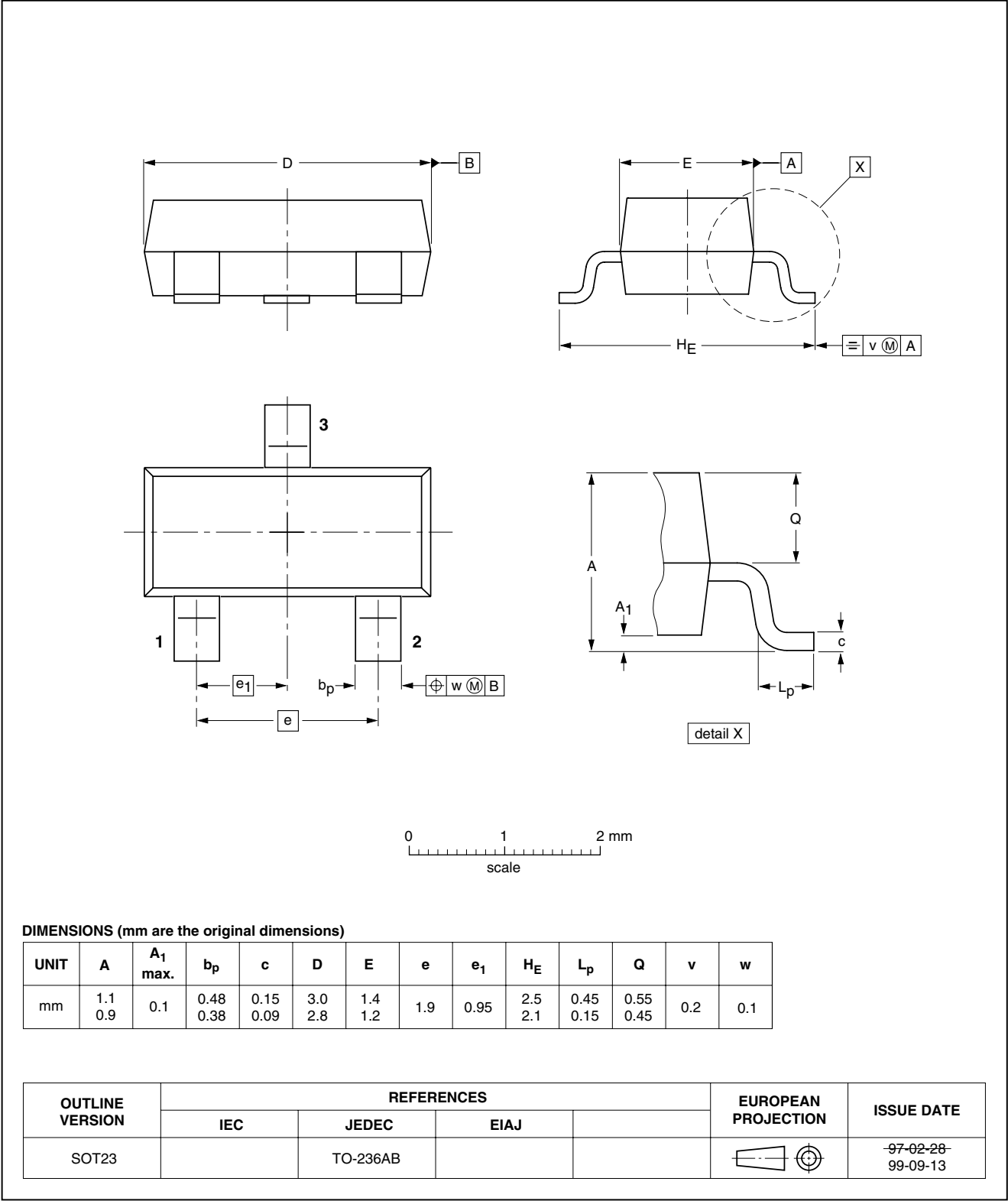
UHF wideband transistor

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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



## UHF wideband transistor

PBR941B

## DATA SHEET STATUS

| DATA SHEET STATUS         | PRODUCT STATUS | DEFINITIONS <sup>(1)</sup>                                                                                                                                                                                                                                 |
|---------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Objective specification   | Development    | This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.                                                                                                          |
| Preliminary specification | Qualification  | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
| Product specification     | Production     | This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.                                                       |

## Note

1. Please consult the most recently issued data sheet before initiating or completing a design.

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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