

# 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

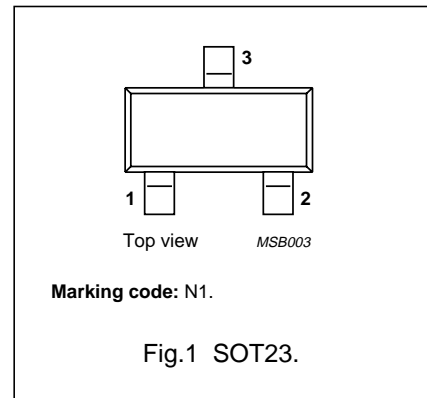
- Thick and thin-film circuits.

## 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.

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## 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.

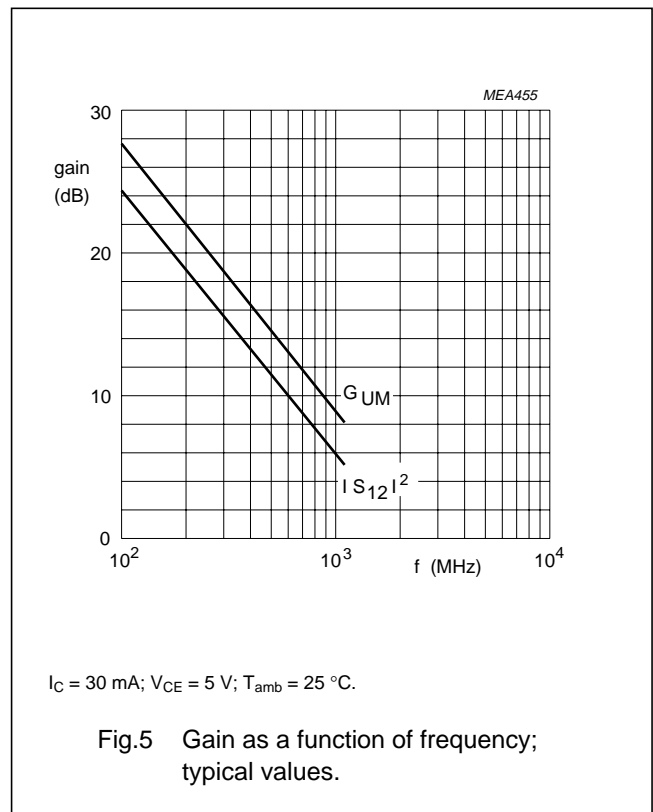
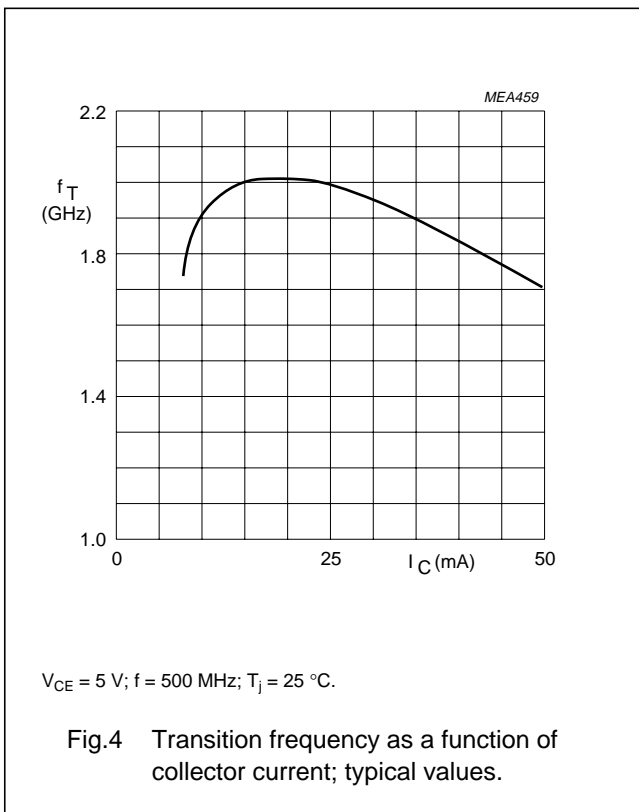
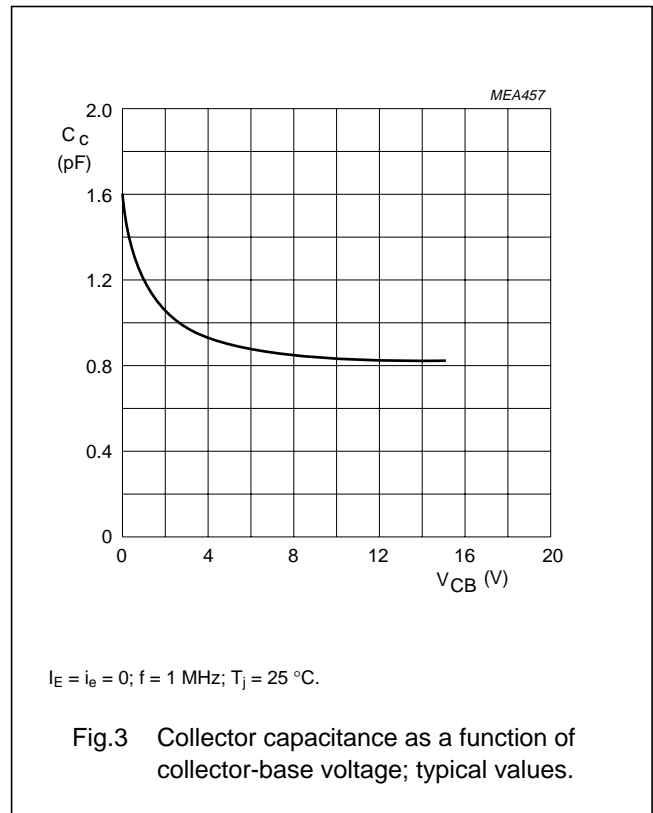
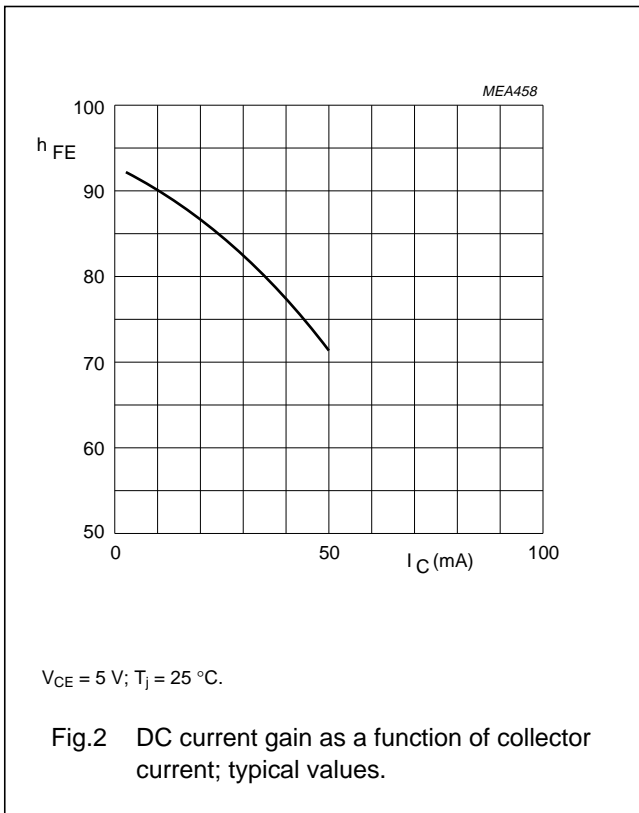
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$I_E = 0$ ; $V_{CB} = 10\text{ V}$	–	–	50	nA
$h_{FE}$	DC current gain	$I_C = 25\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; see Fig.2	25	–	–	
		$I_C = 50\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; see Fig.2	25	–	–	
$C_c$	collector 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.

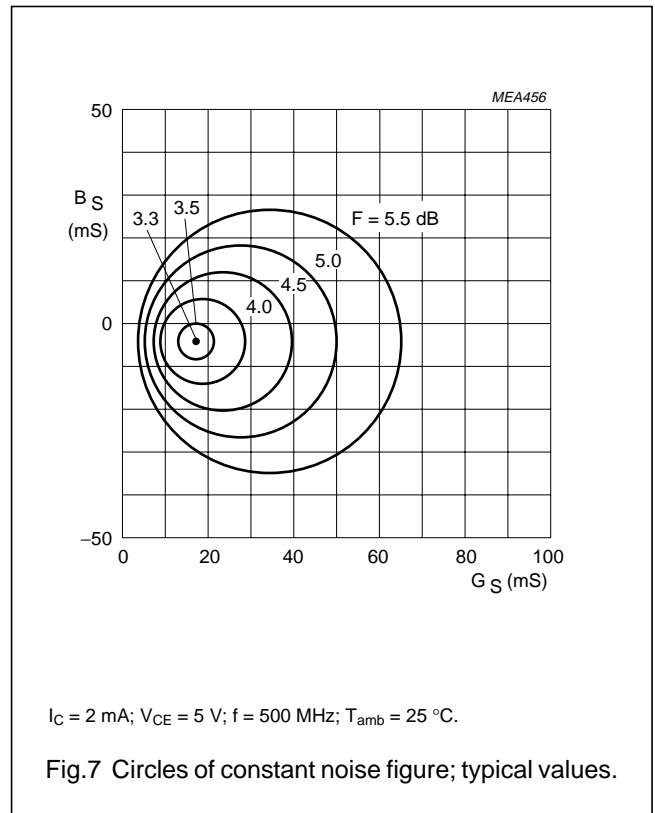
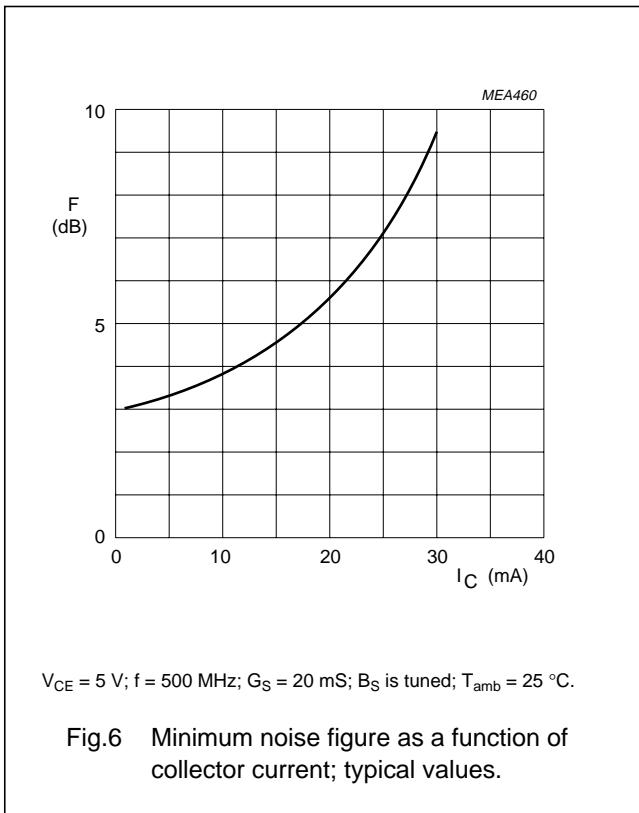
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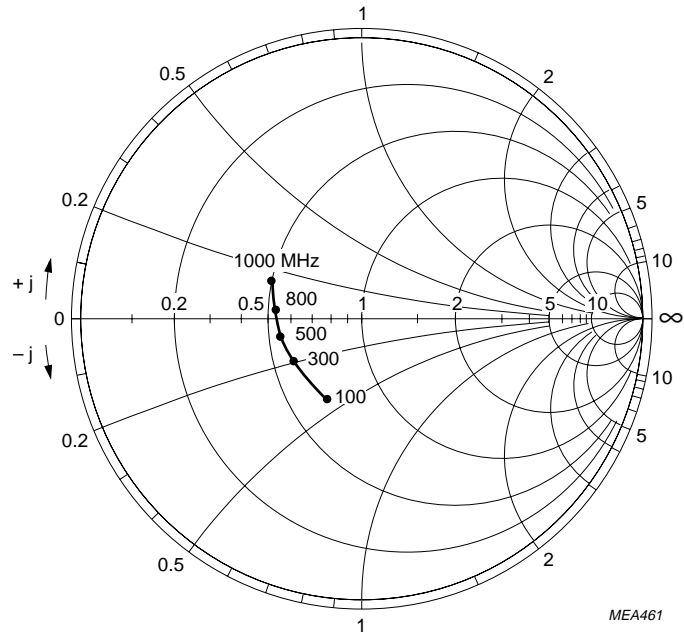
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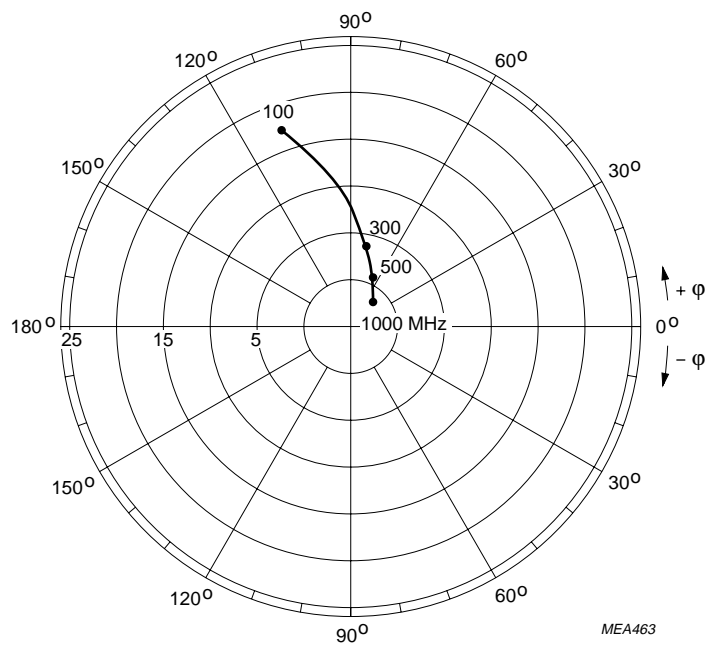
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MEA461

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

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



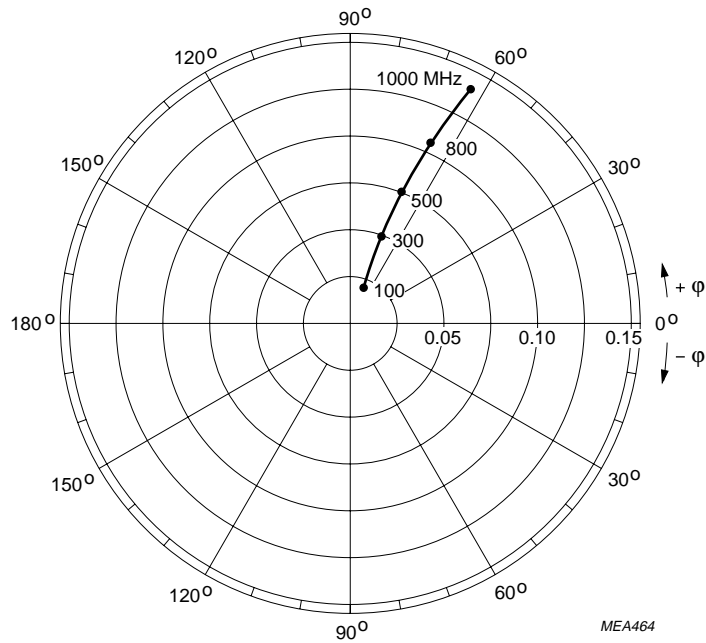
MEA463

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

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

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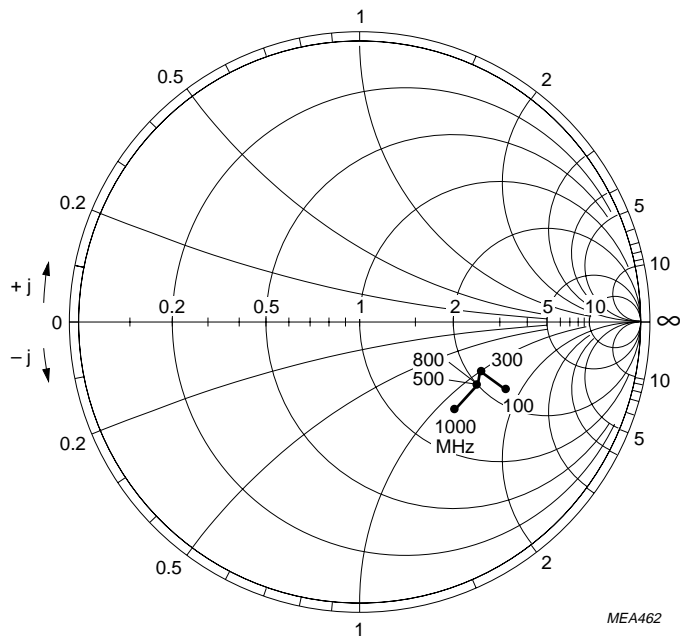
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$I_C = 30 \text{ mA}$ ;  $V_{CE} = 5 \text{ V}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ .

MEA464

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



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

MEA462

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

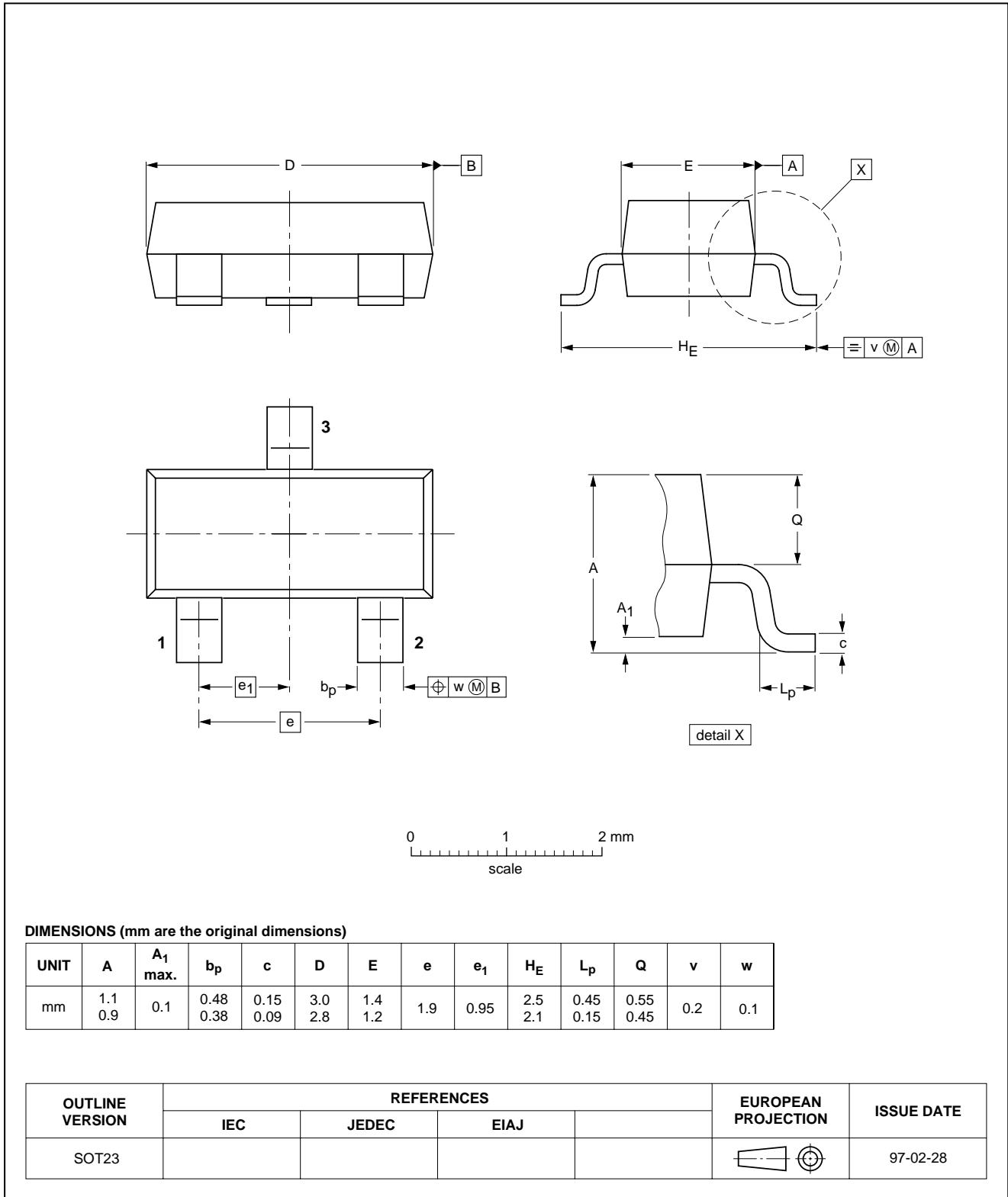
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PACKAGE OUTLINES

Plastic surface mounted package; 3 leads

SOT23





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**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.
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.
<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>	
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**NOTES**

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