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# DATA SHEET

**BFR93AW**

**NPN 5 GHz wideband transistor**

Product specification  
Supersedes data of November 1992

1995 Sep 18



# NPN 5 GHz wideband transistor

# BFR93AW

### FEATURES

- High power gain
- Gold metallization ensures excellent reliability
- SOT323 (S-mini) package.

### APPLICATIONS

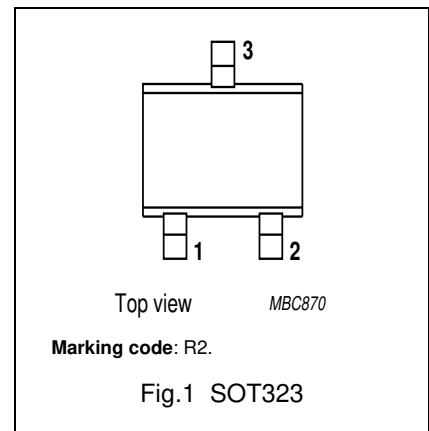
It is designed for use in RF amplifiers, mixers and oscillators with signal frequencies up to 1 GHz.

### DESCRIPTION

Silicon NPN transistor encapsulated in a plastic SOT323 (S-mini) package. The BFR93AW uses the same crystal as the SOT23 version, BFR93A.

### PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	–	15	V
$V_{CEO}$	collector-emitter voltage	open base	–	–	12	V
$I_C$	collector current (DC)		–	–	35	mA
$P_{tot}$	total power dissipation	up to $T_s = 93\text{ °C}$ ; note 1	–	–	300	mW
$h_{FE}$	DC current gain	$I_C = 30\text{ mA}$ ; $V_{CE} = 5\text{ V}$	40	90	–	
$C_{re}$	feedback capacitance	$I_C = 0$ ; $V_{CE} = 5\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	0.6	–	pF
$f_T$	transition frequency	$I_C = 30\text{ mA}$ ; $V_{CE} = 5\text{ V}$ ; $f = 500\text{ MHz}$	4	5	–	GHz
$G_{UM}$	maximum unilateral power gain	$I_C = 30\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $f = 1\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	–	13	–	dB
		$I_C = 30\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $f = 2\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	–	8	–	dB
F	noise figure	$I_C = 5\text{ mA}$ ; $V_{CE} = 8\text{ V}$ ; $f = 1\text{ GHz}$ ; $\Gamma_s = \Gamma_{opt}$	–	1.5	–	dB
$T_j$	junction temperature		–	–	150	°C

### Note

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

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**LIMITING VALUES**

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

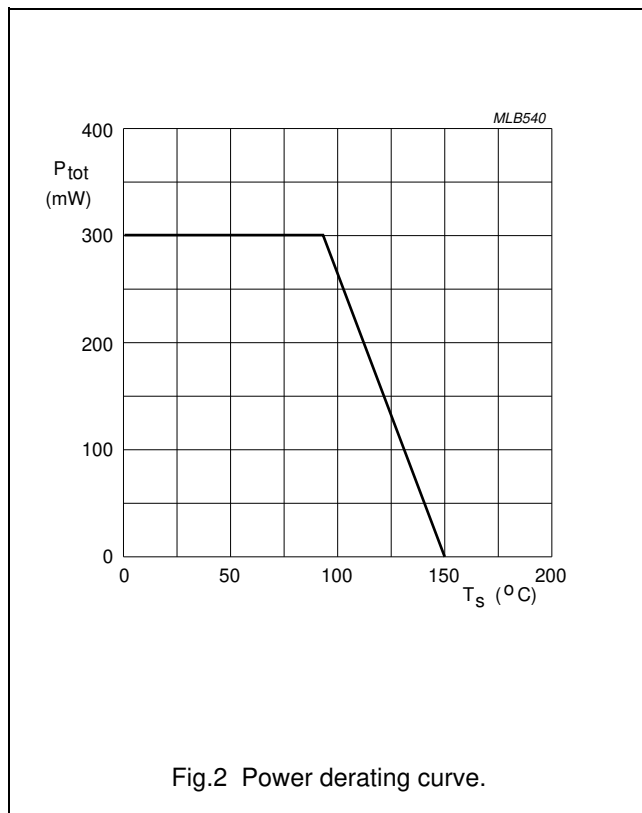
SYMBOL	PARAMETER	CONDITION	MIN.	MAX.	UNIT
V <sub>CB0</sub>	collector-base voltage	open emitter	–	15	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	12	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	2	V
I <sub>C</sub>	collector current (DC)		–	35	mA
P <sub>tot</sub>	total power dissipation	up to T <sub>s</sub> = 93 °C; see Fig.2; note 1	–	300	mW
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>j</sub>	junction temperature		–	150	°C

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITION	VALUE	UNIT
R <sub>th j-s</sub>	thermal resistance from junction to soldering point	up to T <sub>s</sub> = 93 °C; note 1	190	K/W

**Note to the Limiting values and Thermal characteristics**

1. T<sub>s</sub> is the temperature at the soldering point of the collector pin.



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**CHARACTERISTICS**T<sub>j</sub> = 25 °C (unless otherwise specified).

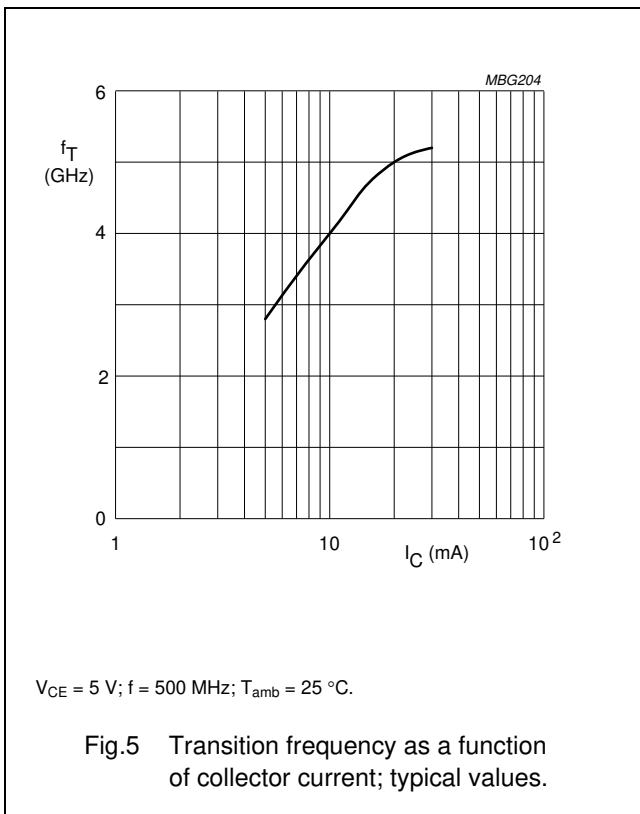
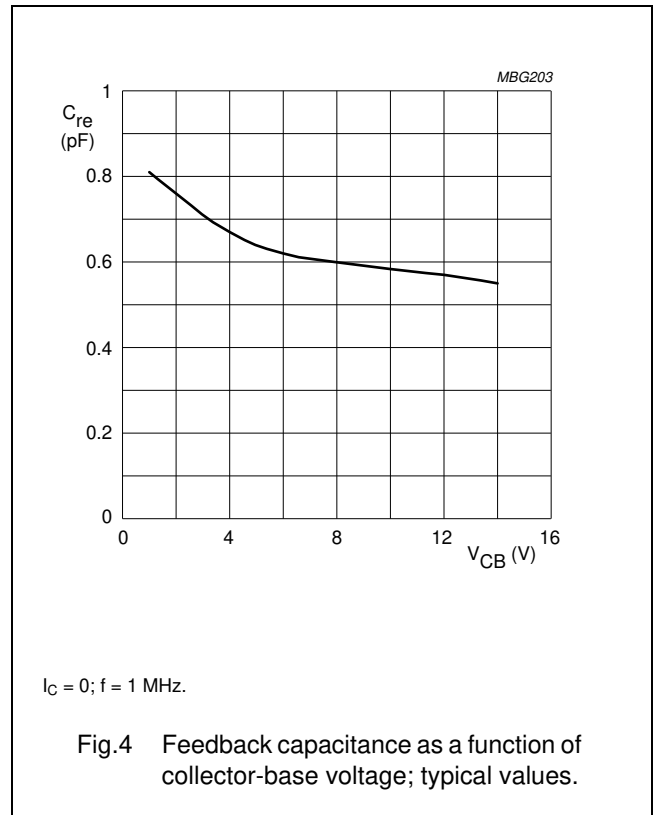
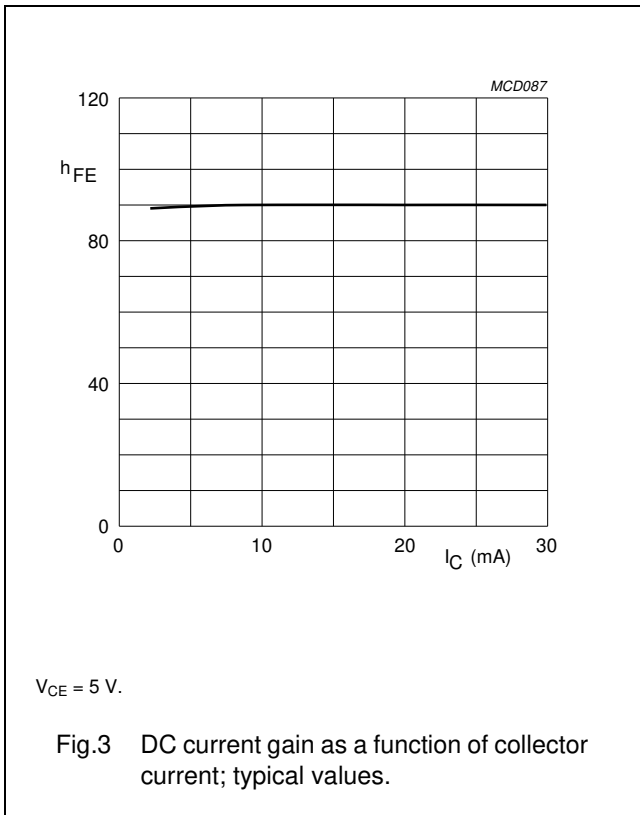
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I <sub>CBO</sub>	collector leakage current	I <sub>E</sub> = 0; V <sub>CB</sub> = 5 V	–	–	50	nA
h <sub>FE</sub>	DC current gain	I <sub>C</sub> = 30 mA; V <sub>CE</sub> = 5 V	40	90	–	
C <sub>c</sub>	collector capacitance	I <sub>E</sub> = i <sub>e</sub> = 0; V <sub>CB</sub> = 5 V; f = 1 MHz	–	0.7	–	pF
C <sub>e</sub>	emitter capacitance	I <sub>C</sub> = i <sub>c</sub> = 0; V <sub>EB</sub> = 0.5 V; f = 1 MHz	–	2.3	–	pF
C <sub>re</sub>	feedback capacitance	I <sub>C</sub> = 0; V <sub>CE</sub> = 5 V; f = 1 MHz	–	0.6	–	pF
f <sub>T</sub>	transition frequency	I <sub>C</sub> = 30 mA; V <sub>CE</sub> = 5 V; f = 500 MHz	4	5	–	GHz
G <sub>UM</sub>	maximum unilateral power gain; note 1	I <sub>C</sub> = 30 mA; V <sub>CE</sub> = 8 V; f = 1 GHz; T <sub>amb</sub> = 25 °C	–	13	–	dB
		I <sub>C</sub> = 30 mA; V <sub>CE</sub> = 8 V; f = 2 GHz; T <sub>amb</sub> = 25 °C	–	8	–	dB
F	noise figure	I <sub>C</sub> = 5 mA; V <sub>CE</sub> = 8 V; f = 1 GHz; Γ <sub>s</sub> = Γ <sub>opt</sub>	–	1.5	–	dB
		I <sub>C</sub> = 5 mA; V <sub>CE</sub> = 8 V; f = 2 GHz; Γ <sub>s</sub> = Γ <sub>opt</sub>	–	2.1	–	dB

**Note**

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

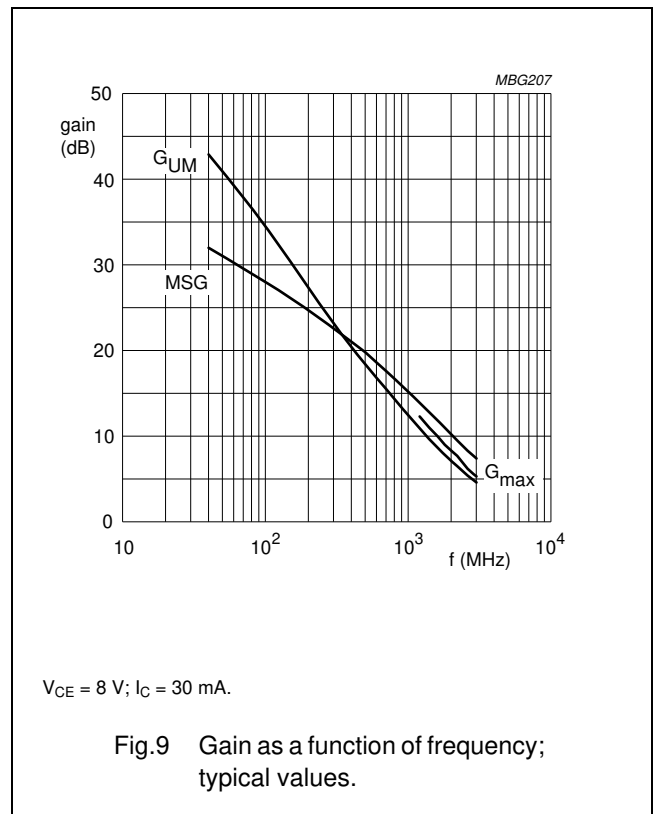
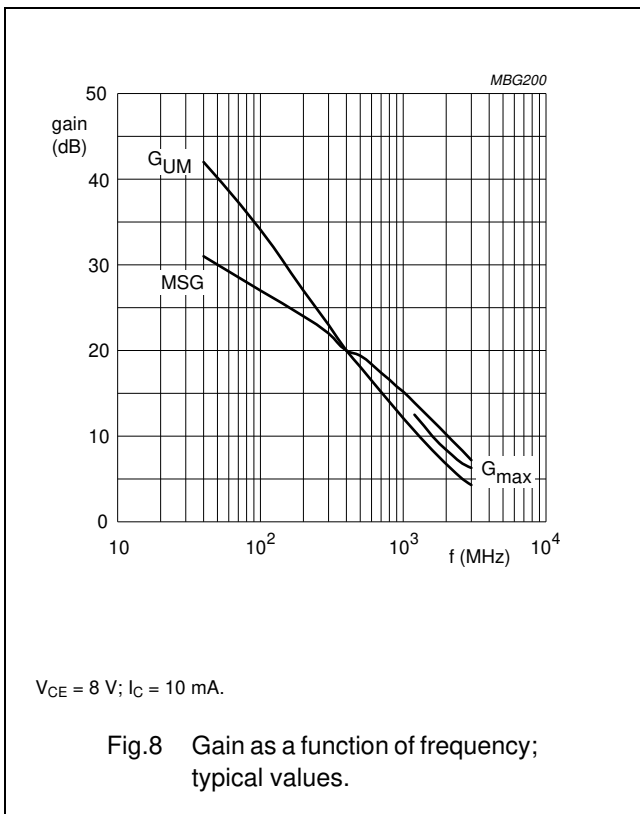
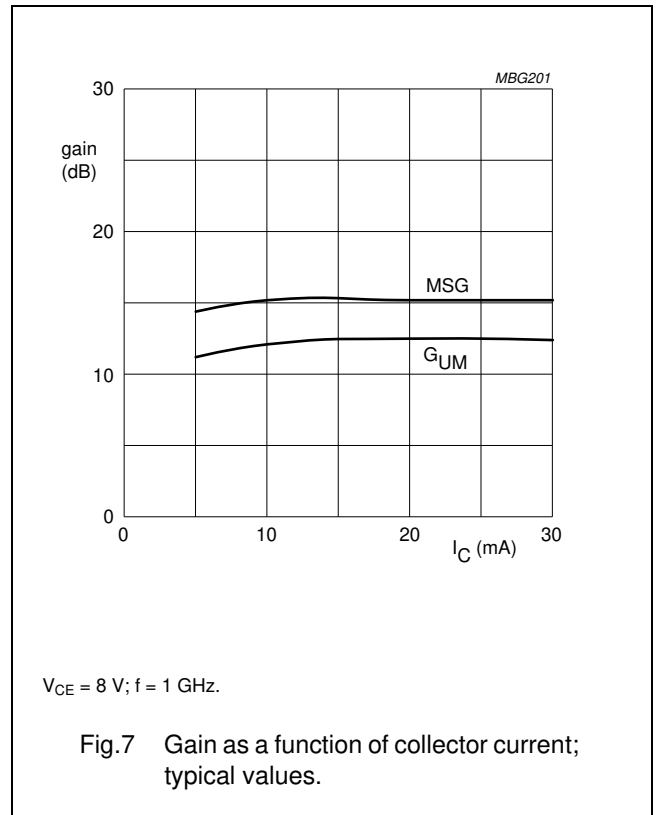
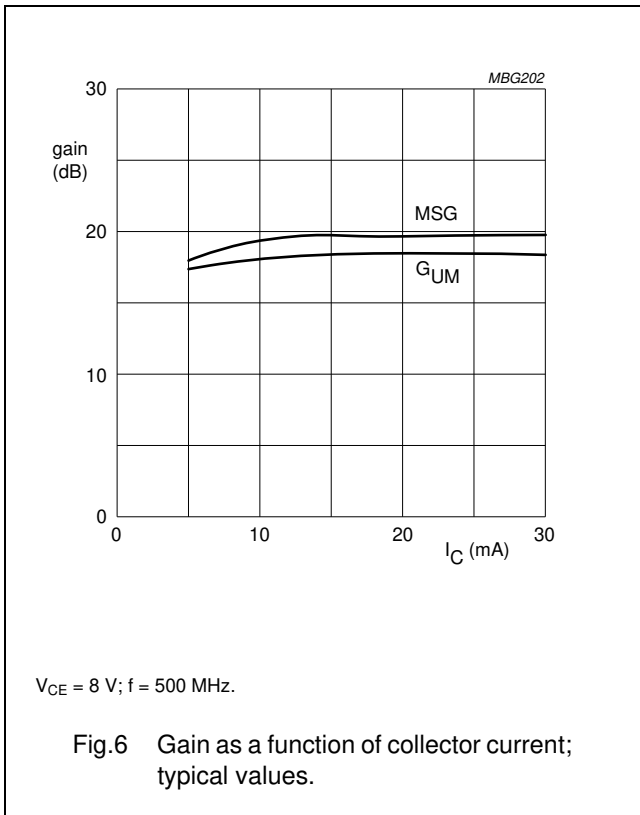
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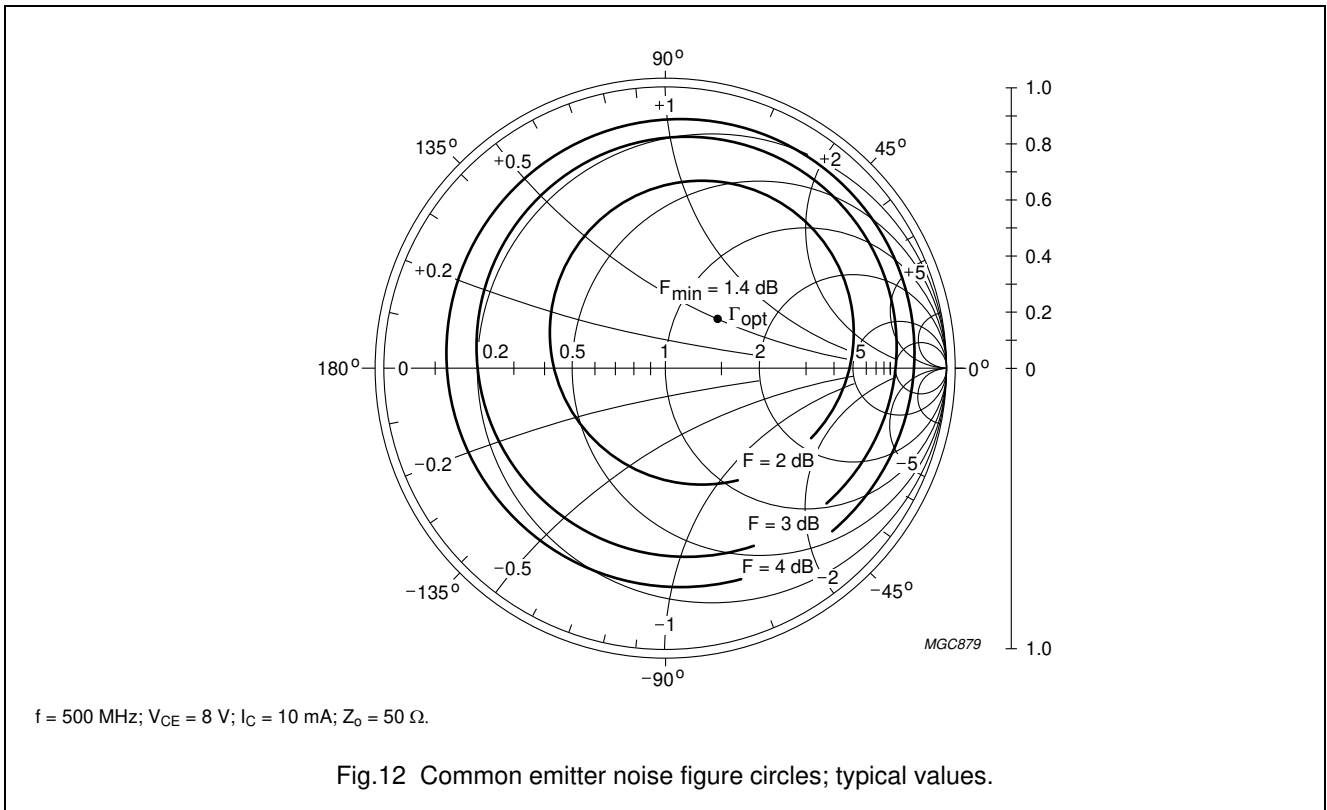
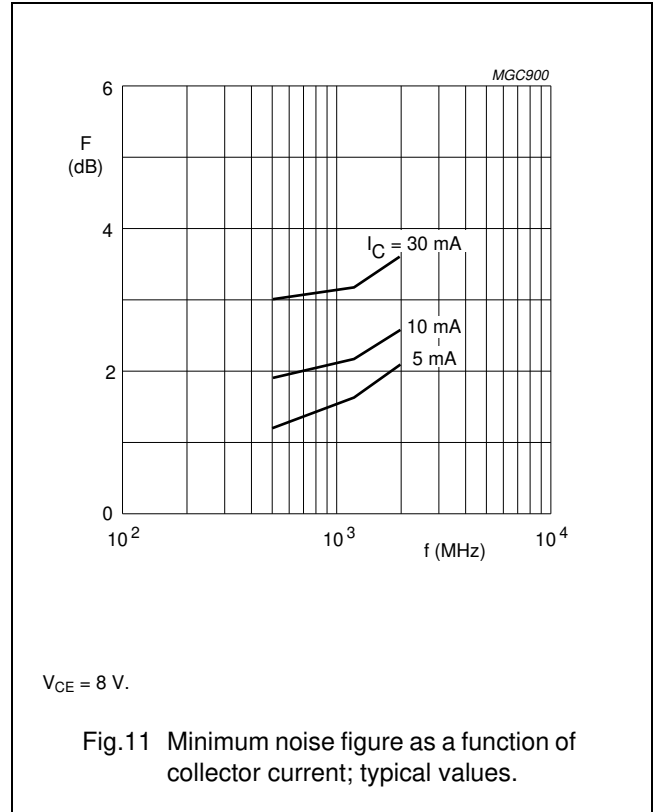
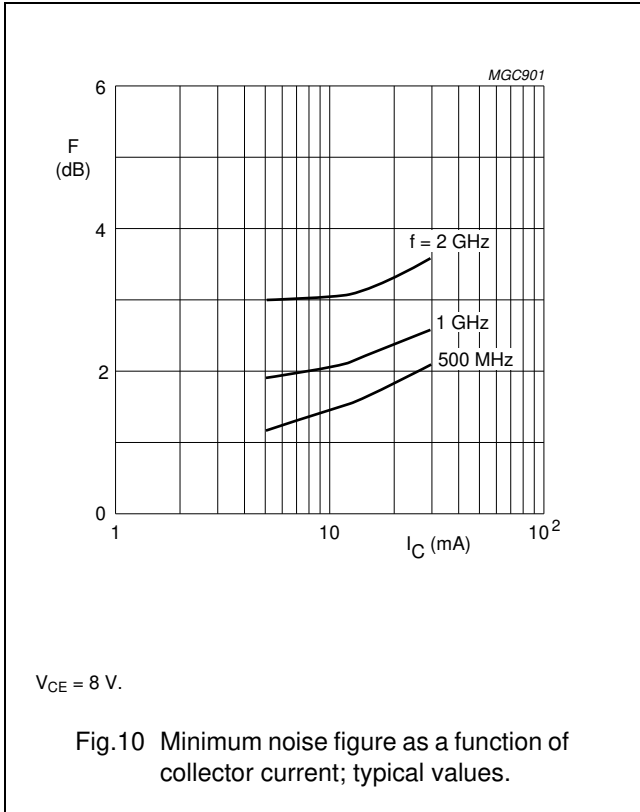
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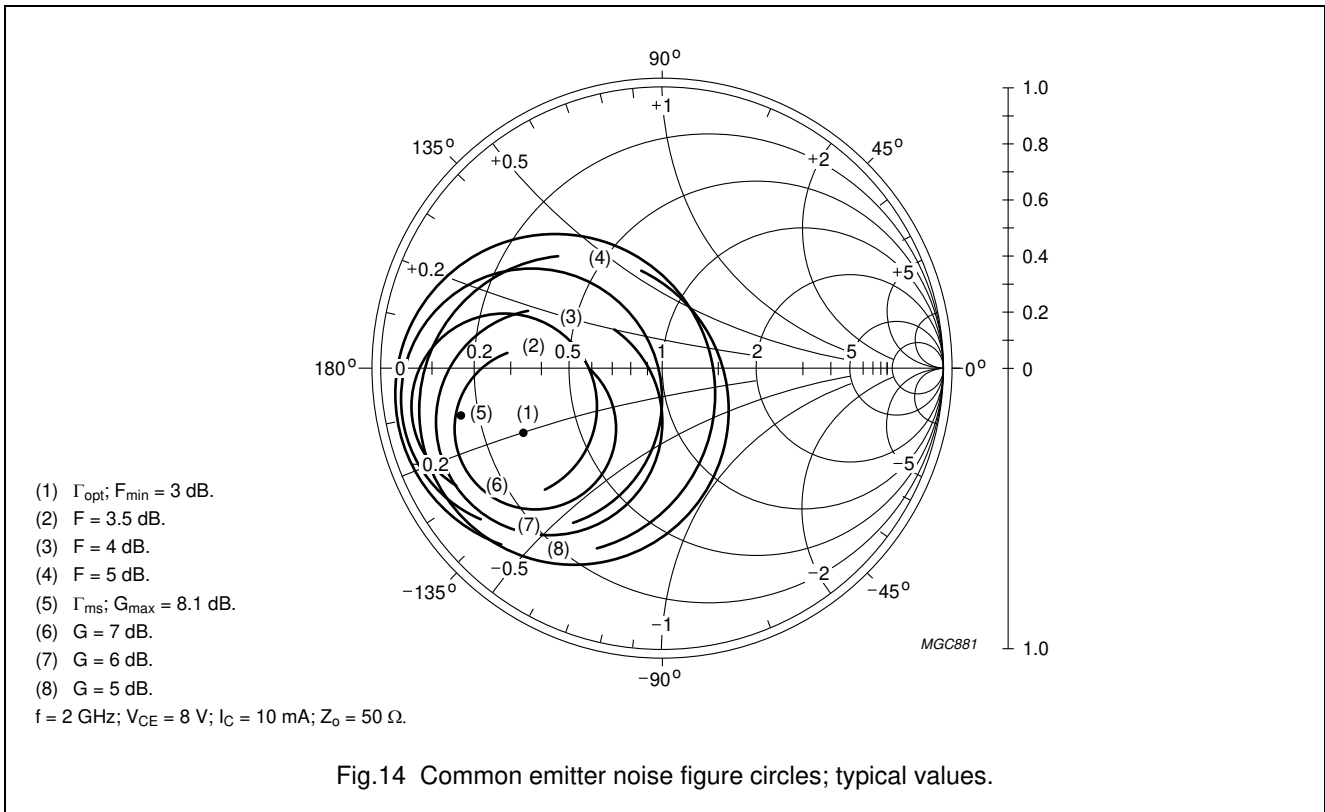
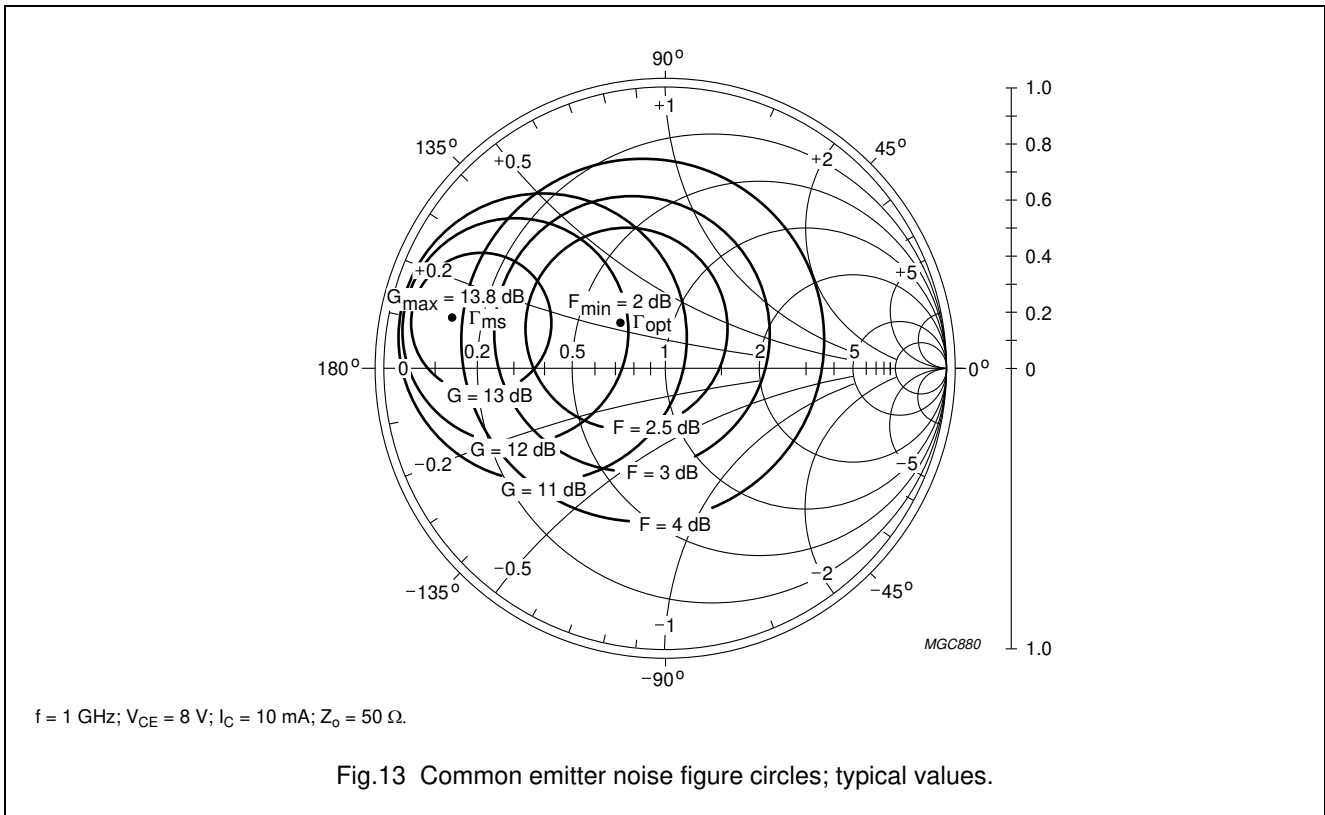
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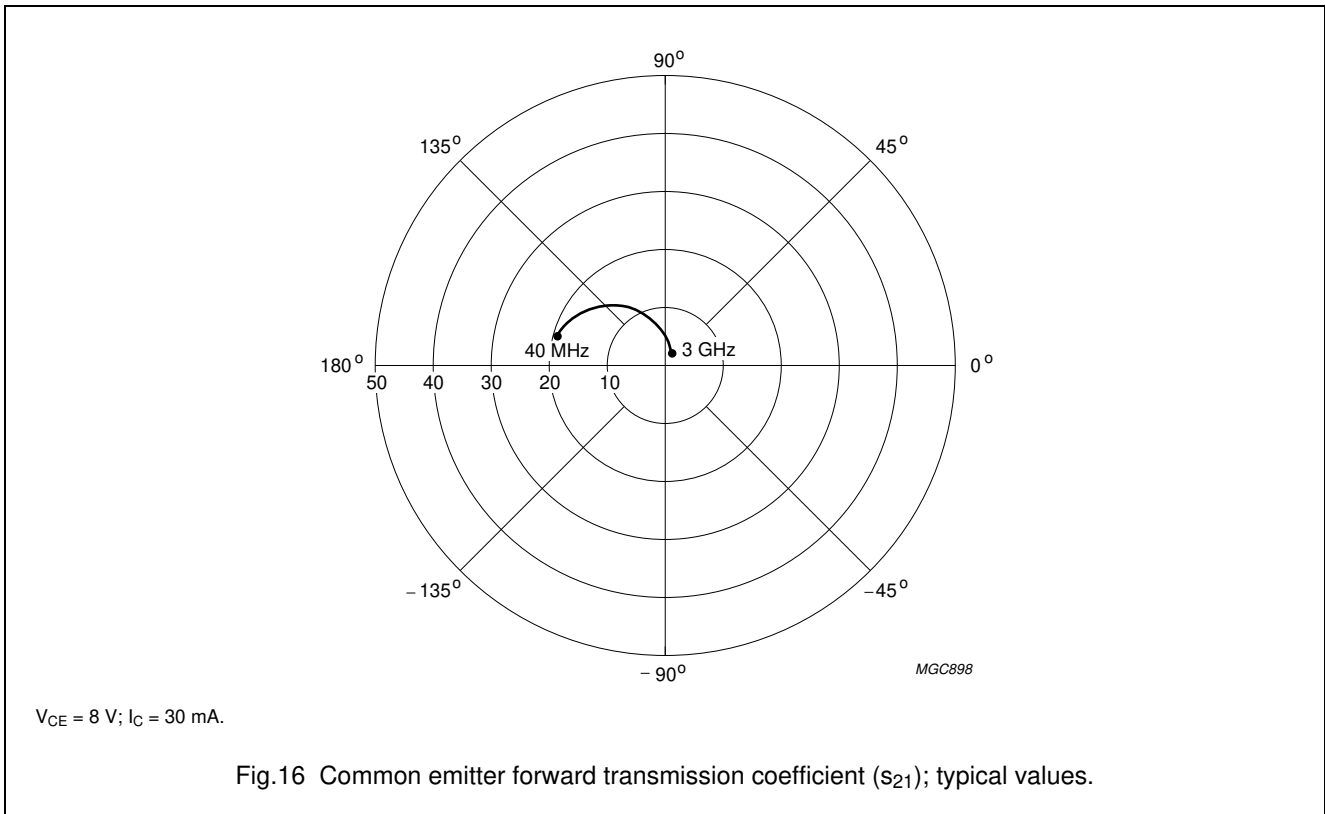
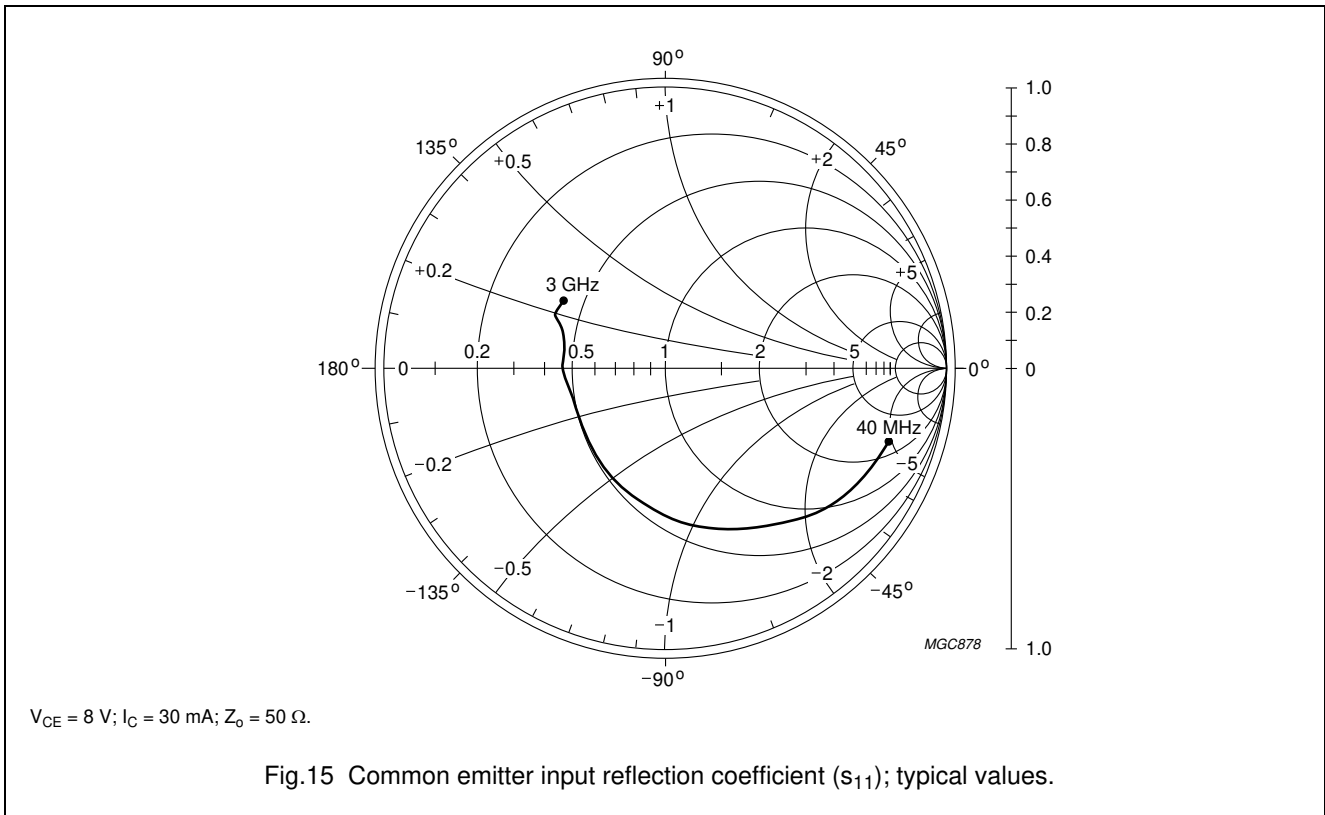
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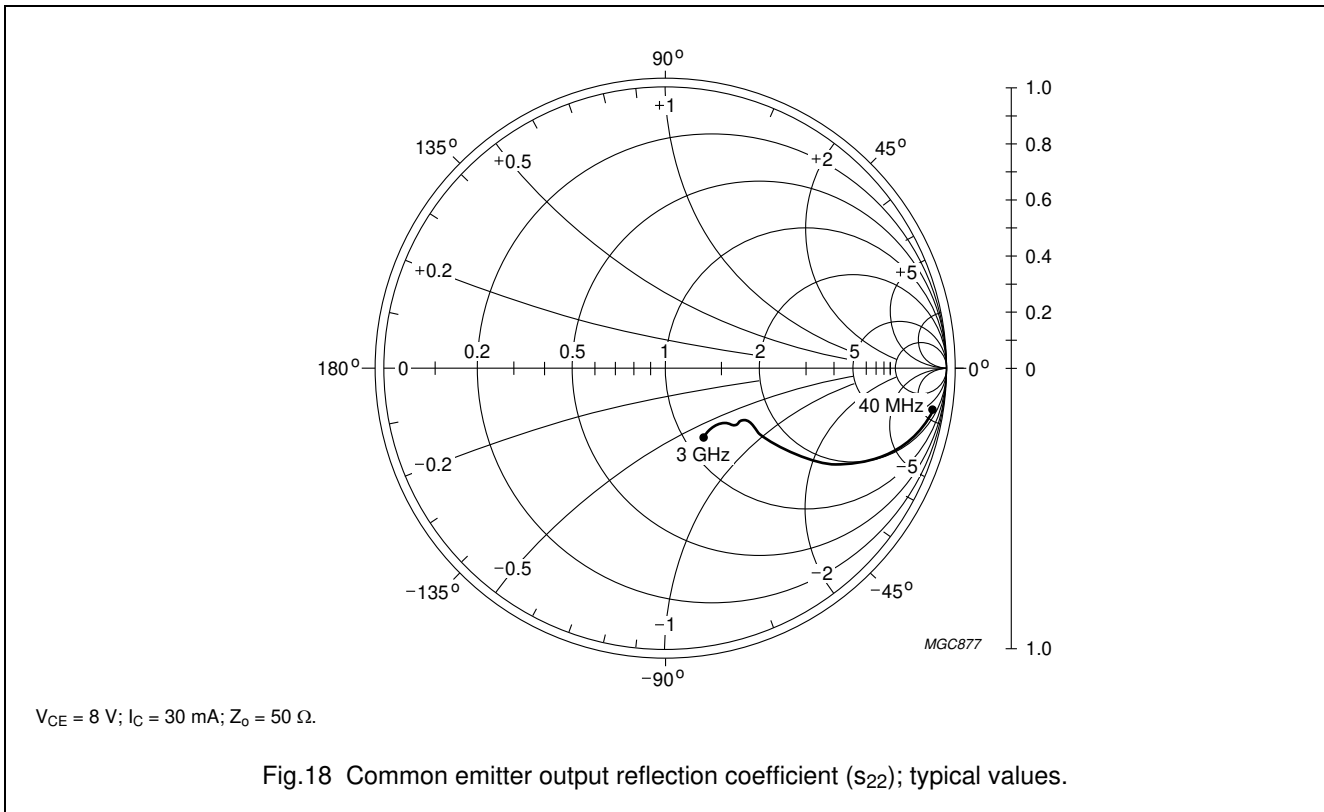
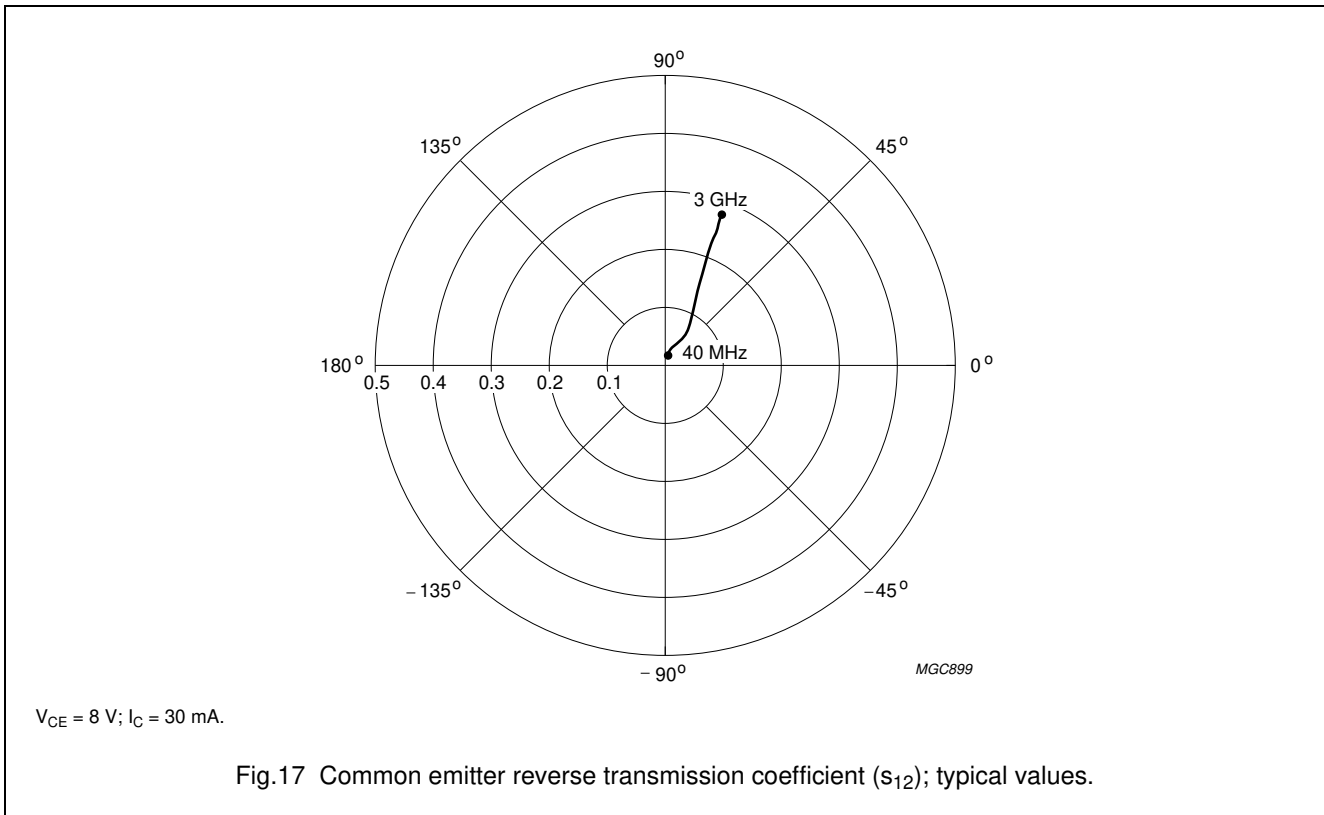
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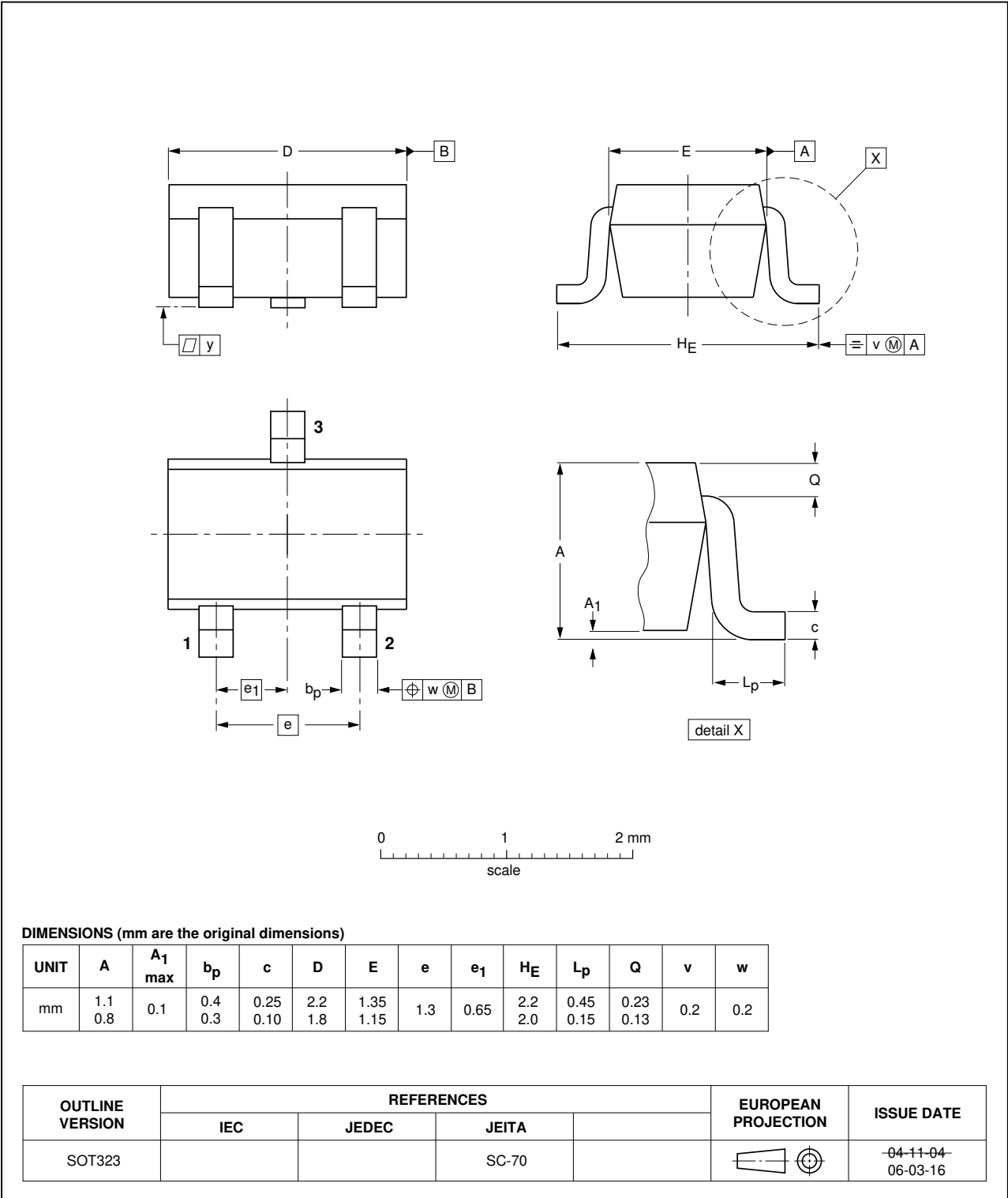
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PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads

SOT323



NPN 5 GHz wideband transistor

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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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## **Contact information**

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