

DATA SHEET

BFG94

NPN 6 GHz wideband transistor

Product specification

September 1995



NPN 6 GHz wideband transistor

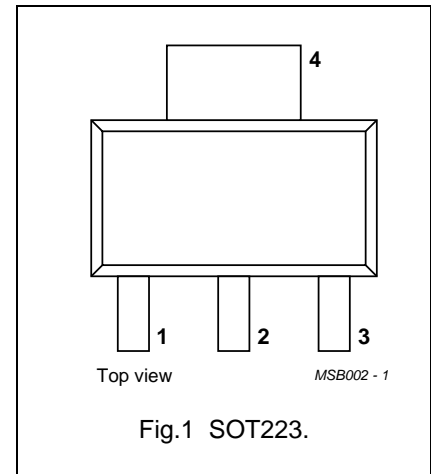
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FEATURES

- High power gain
- Low noise figure
- Low intermodulation distortion
- Gold metallization ensures excellent reliability.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	emitter
4	collector



DESCRIPTION

NPN transistor mounted in a plastic SOT223 envelope. It is primarily intended for use in communication and instrumentation systems.

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	DC collector current		–	–	60	mA
P_{tot}	total power dissipation	up to $T_s = 140\text{ °C}$ (note 1)	–	–	700	mW
C_{re}	feedback capacitance	$I_C = 0$; $V_{CE} = 10\text{ V}$; $f = 1\text{ MHz}$	–	–	0.8	pF
f_T	transition frequency	$I_C = 45\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	4	6	–	GHz
G_{UM}	maximum unilateral power gain	$I_C = 45\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	11.5	13.5	–	dB
V_O	output voltage	$I_C = 45\text{ mA}$; $V_{CE} = 10\text{ V}$; $d_{im} = -60\text{ dB}$; $R_L = 75\text{ }\Omega$; $f = 800\text{ MHz}$; $T_{amb} = 25\text{ °C}$	–	500	–	mV
P_{L1}	output power at 1 dB gain compression	$I_C = 45\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ °C}$	–	21.5	–	dBm

Note

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

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LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	15	V
V_{CEO}	collector-emitter voltage	open base	–	12	V
V_{EBO}	emitter-base voltage	open collector	–	2	V
I_C	DC collector current		–	60	mA
P_{tot}	total power dissipation	up to $T_s = 140\text{ °C}$ (note 1)	–	700	mW
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j-s}$	thermal resistance from junction to soldering point	up to $T_s = 140\text{ °C}$ (note 1)	50 K/W

Note

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

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CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I _{CBO}	collector cut-off current	I _E = 0; V _{CB} = 10 V	–	–	100	nA
h _{FE}	DC current gain	I _C = 30 mA; V _{CE} = 5 V	45	90	–	
		I _C = 45 mA; V _{CE} = 10 V	–	100	–	
C _c	collector capacitance	I _E = i _e = 0; V _{CB} = 10 V; f = 1 MHz	–	0.9	2	pF
C _e	emitter capacitance	I _C = i _e = 0; V _{EB} = 0.5 V; f = 1 MHz	–	2.9	4.5	pF
C _{re}	feedback capacitance	I _C = i _c = 0; V _{CE} = 10 V; f = 1 MHz	–	0.5	0.8	pF
f _T	transition frequency	I _C = 45 mA; V _{CE} = 10 V; f = 1 GHz; T _{amb} = 25 °C	4	–	–	GHz
		I _C = 30 mA; V _{CE} = 5 V; f = 1 GHz; T _{amb} = 25 °C	4	6	–	GHz
G _{UM}	maximum unilateral power gain (note1)	I _C = 45 mA; V _{CE} = 10 V; f = 1 GHz; T _{amb} = 25 °C	11.5	13.5	–	dB
F	minimum noise figure	Γ _s = Γ _{opt} ; I _C = 45 mA; V _{CE} = 10 V; f = 500 MHz	–	2.7	–	dB
		Γ _s = Γ _{opt} ; I _C = 45 mA; V _{CE} = 10 V; f = 1 GHz	–	3	–	dB
V _O	output voltage	note 2	–	500	–	mV
d ₂	second order intermodulation distortion	note 3	–	–51	–	dB
P _{L1}	output power at 1 dB gain compression	I _C = 45 mA; V _{CE} = 10 V; R _L = 50 Ω; T _{amb} = 25 °C; measured at f = 1 GHz	–	21.5	–	dBm
ITO	third order intercept point	note 4	–	34	–	dBm

Notes

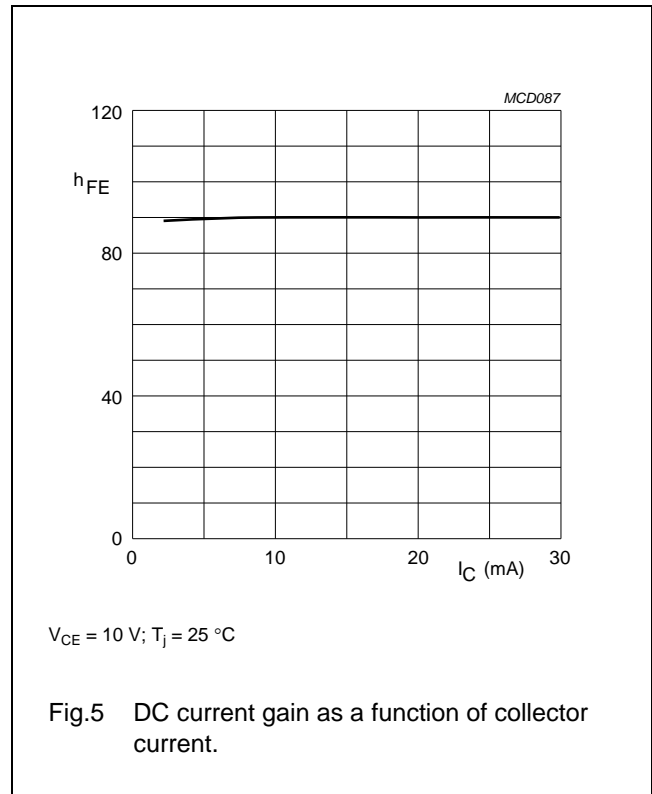
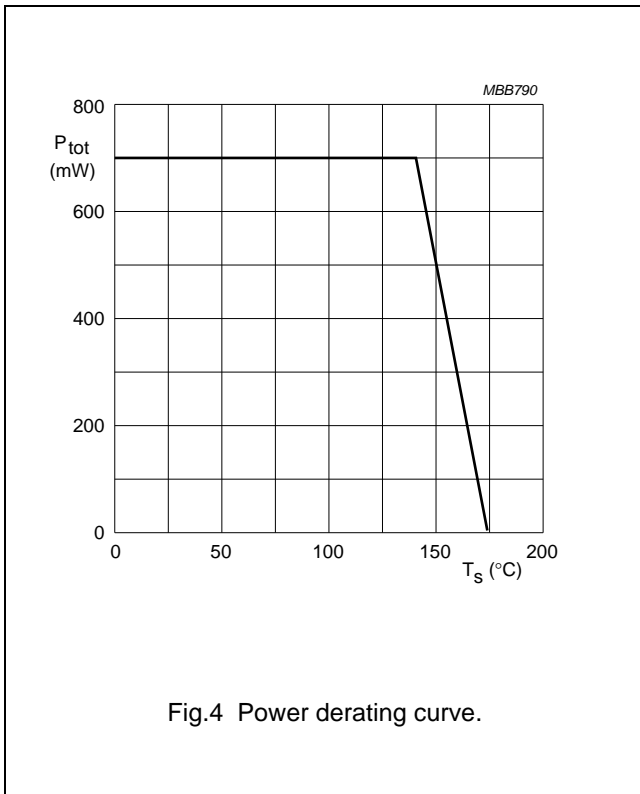
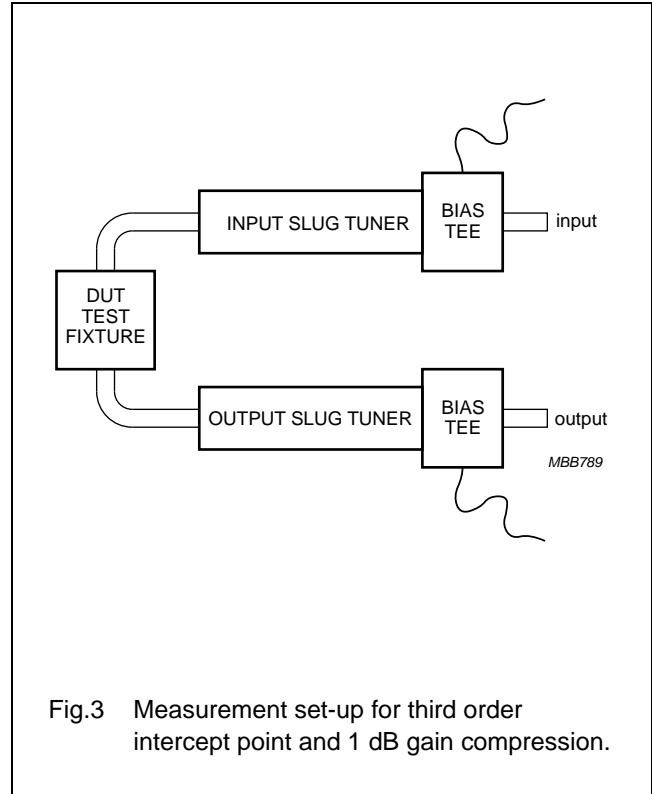
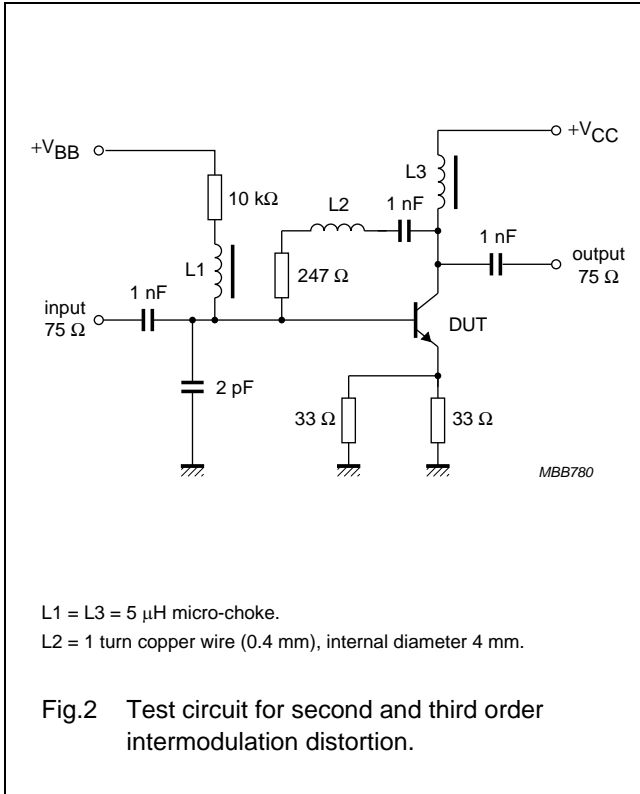
1. G_{UM} is the maximum unilateral power gain, assuming S₁₂ is zero and

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

2. d_{im} = –60 dB (DIN 45004B, par 6.3: 3-tone); I_C = 45 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C;
V_p = V_O at d_{im} = –60 dB; f_p = 795.25 MHz;
V_q = V_O –6 dB; V_r = V_O –6 dB;
f_q = 803.25 MHz; f_r = 805.25 MHz;
measured at f_(p+q-r) = 793.25 MHz.
3. I_C = 45 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C;
V_q = V_O = 280 mV;
f_p = 250 MHz; f_q = 560 MHz;
measured at f_(p+q) = 810 MHz.
4. I_C = 45 mA; V_{CE} = 10 V; R_L = 50 Ω; T_{amb} = 25 °C;
f_p = 1000 MHz; f_q = 1001 MHz;
measured at f_(2p-q) and f_(2q-p).

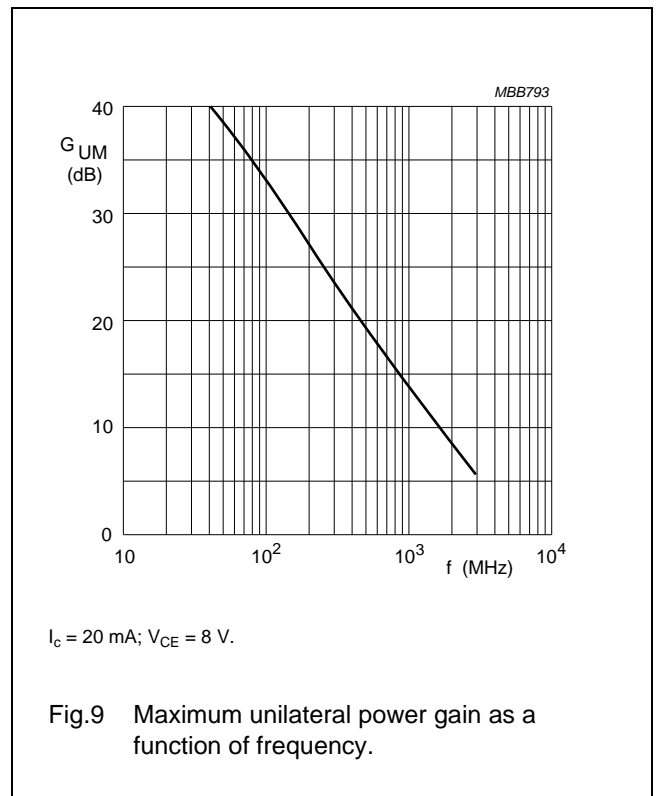
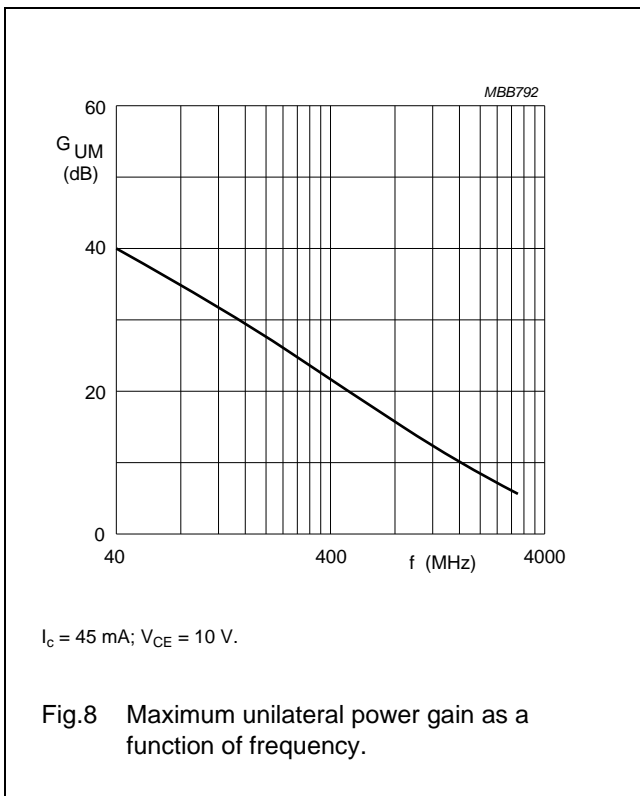
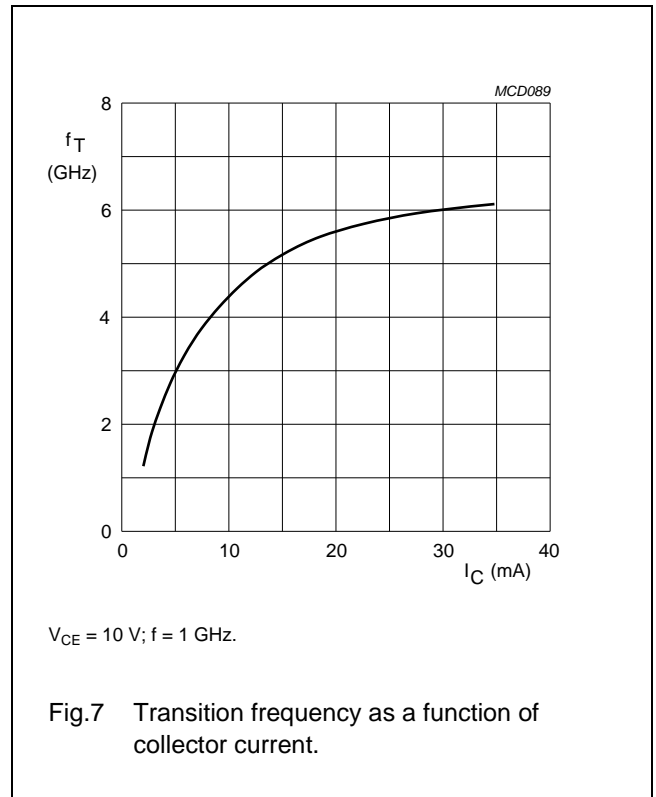
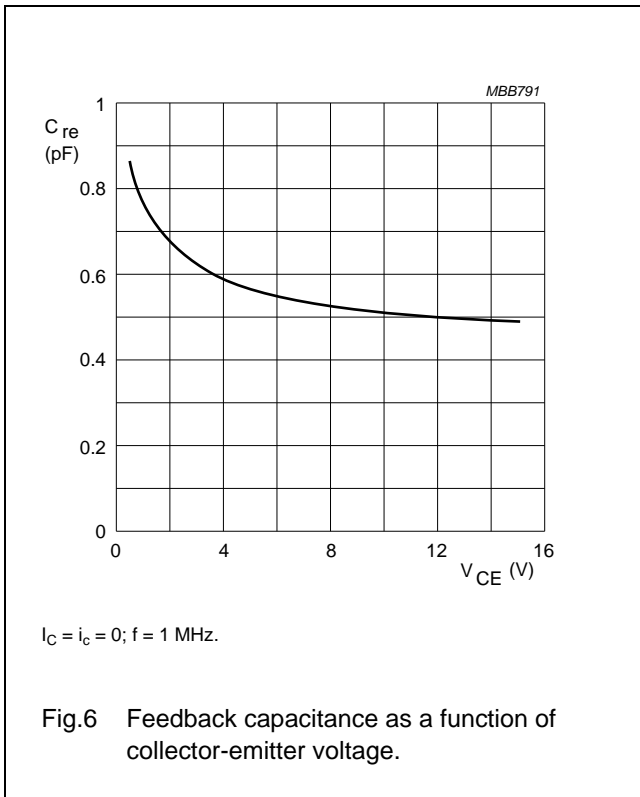
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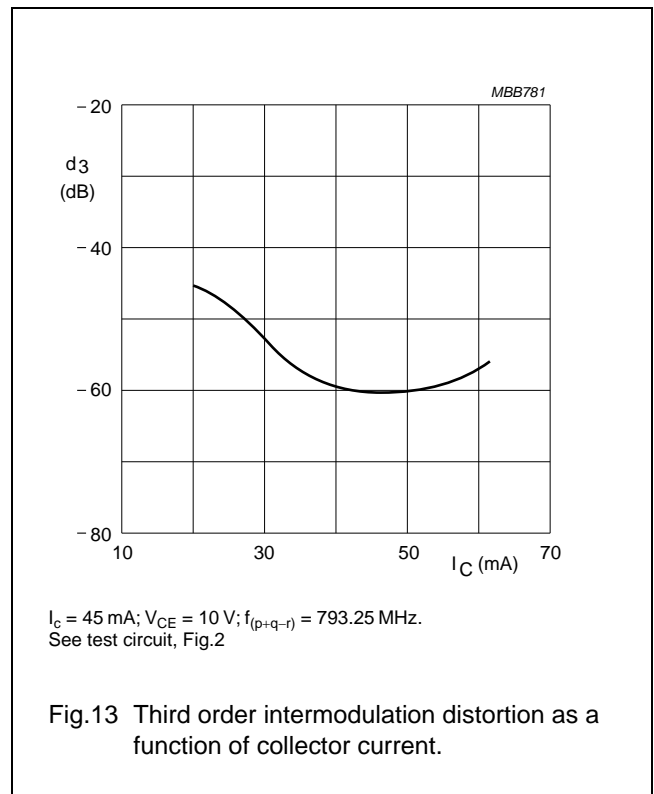
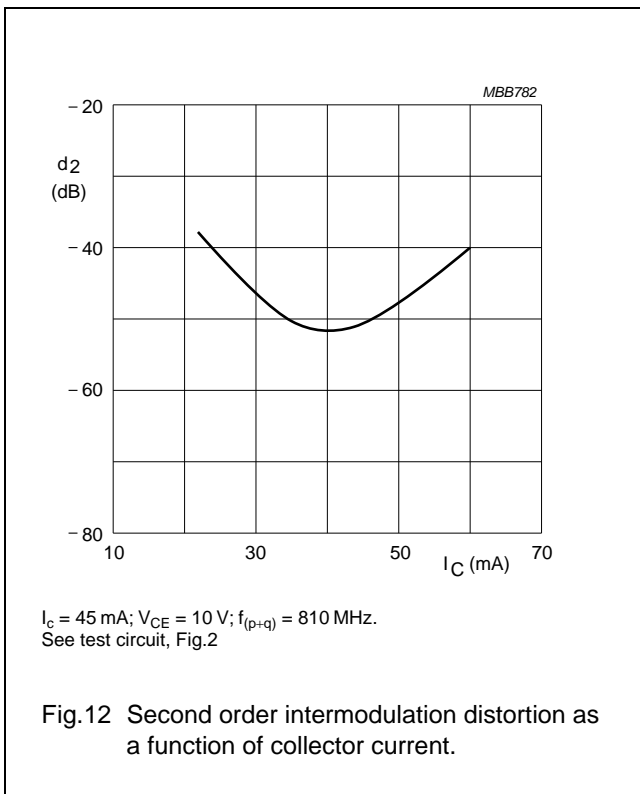
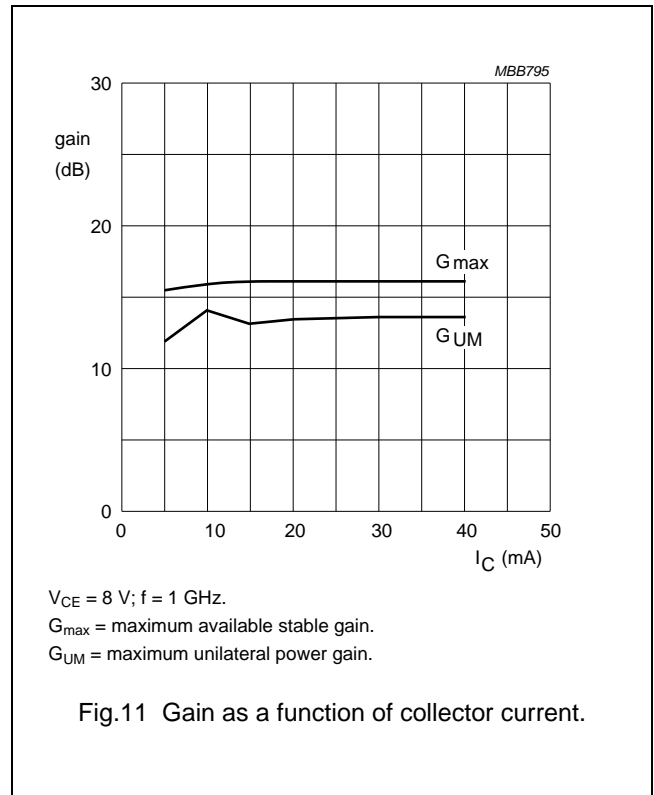
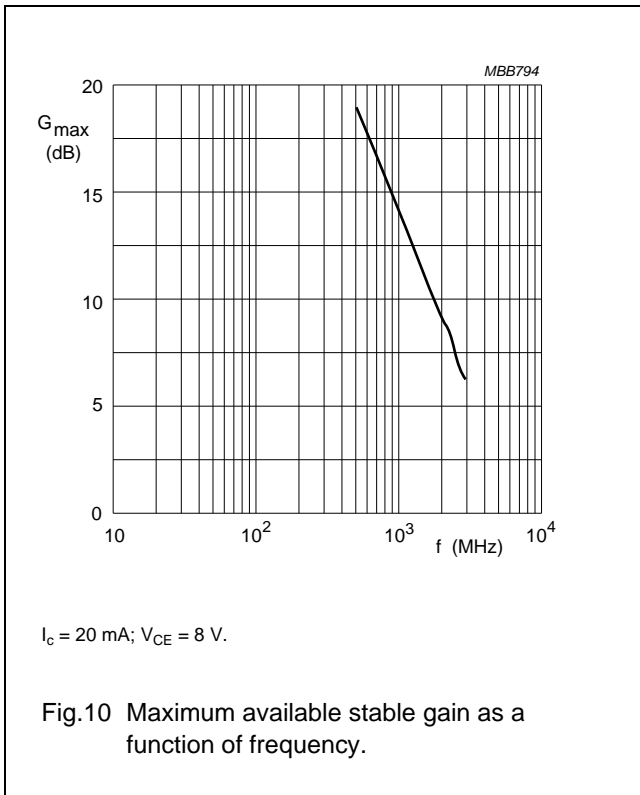
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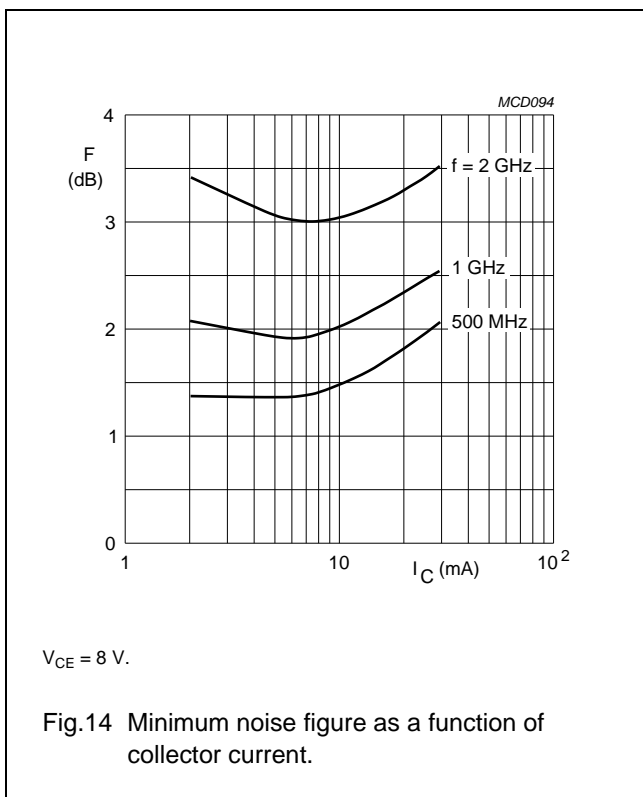
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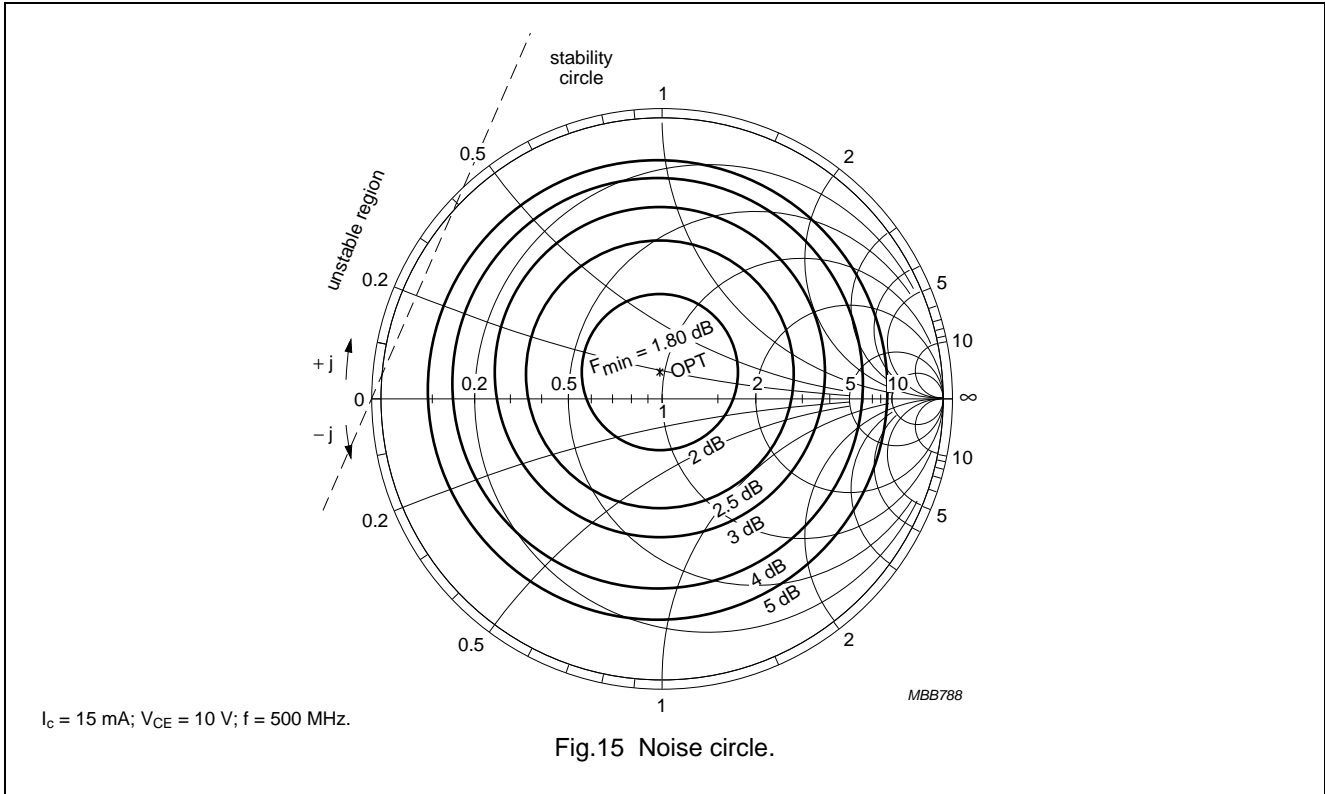


Fig.15 Noise circle.

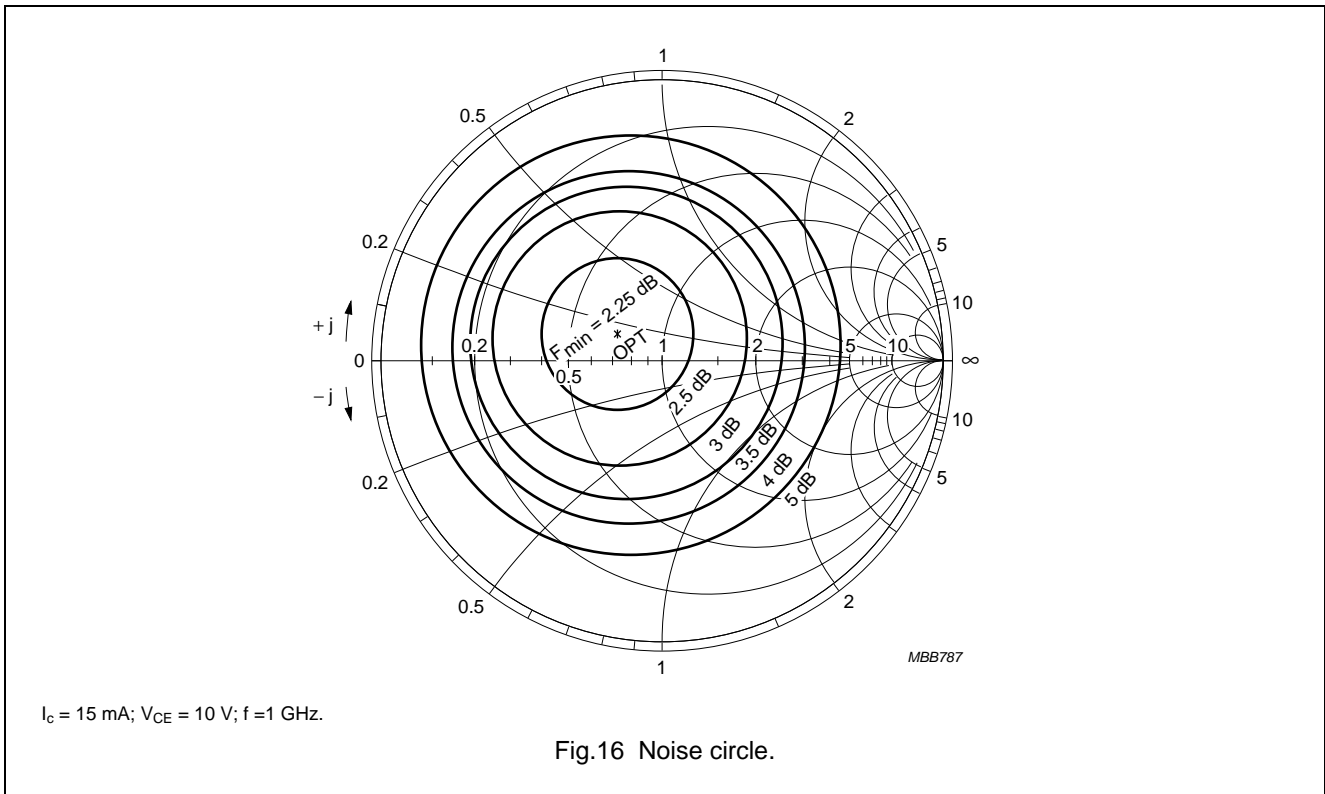
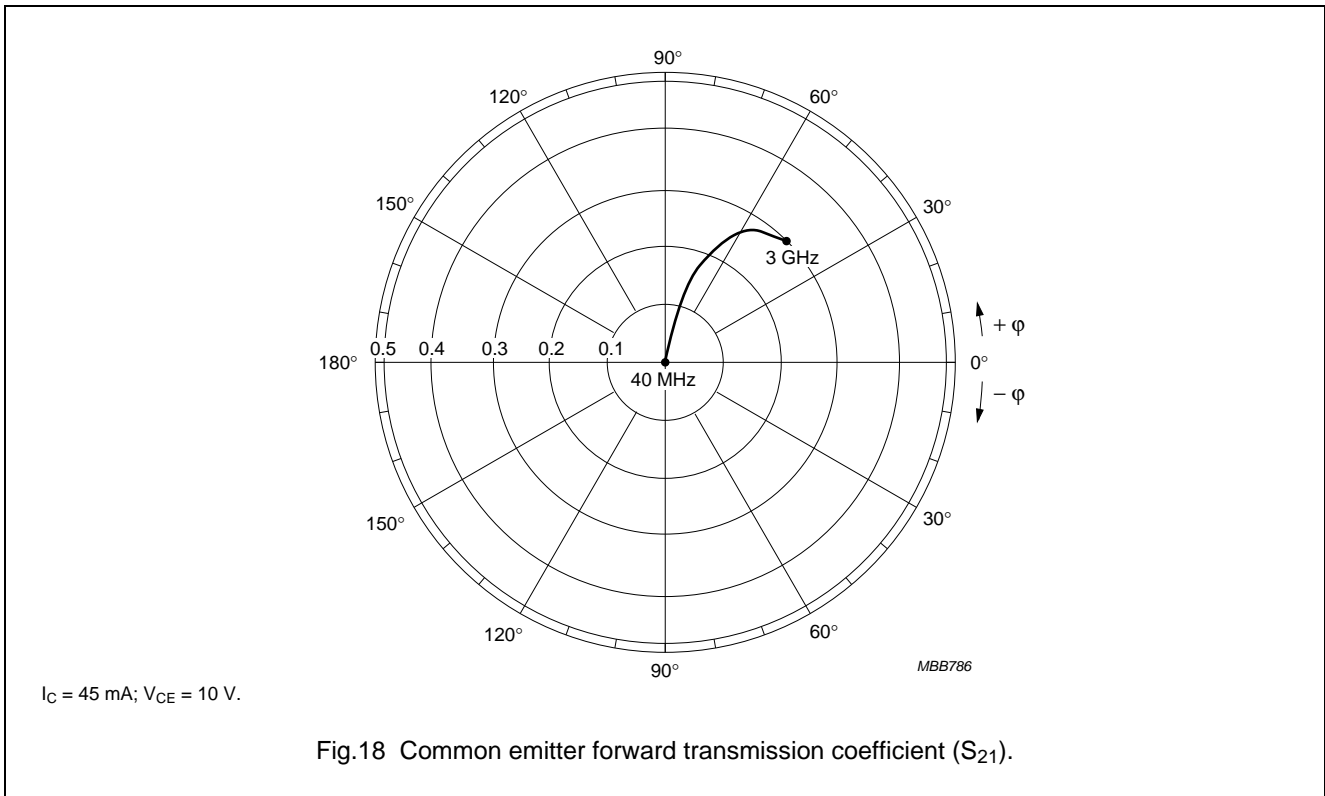
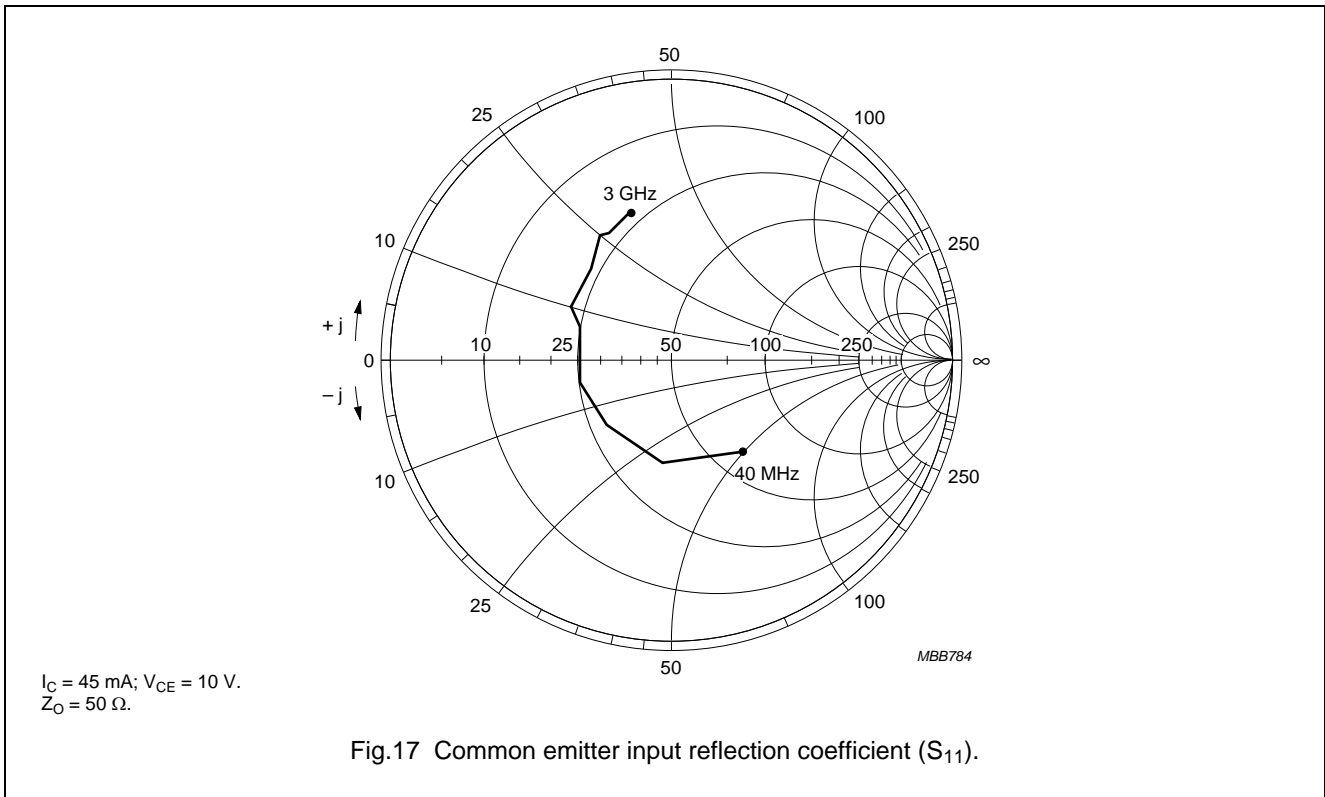


Fig.16 Noise circle.

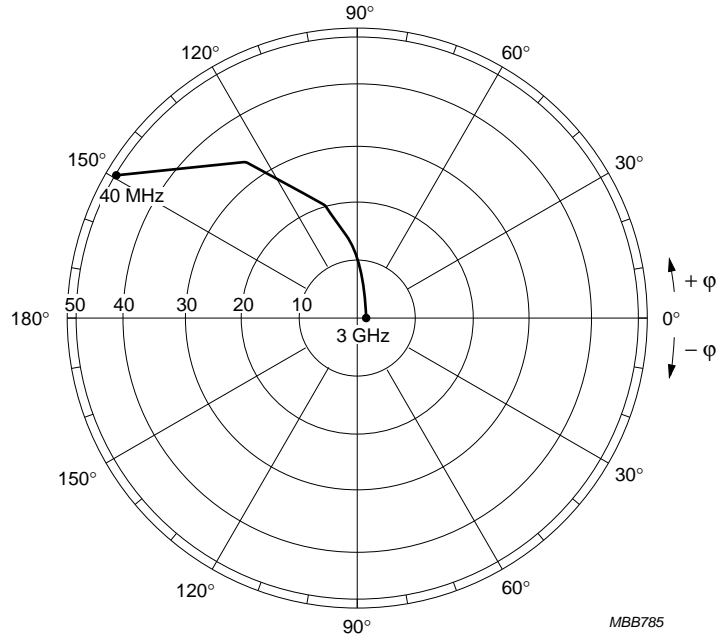
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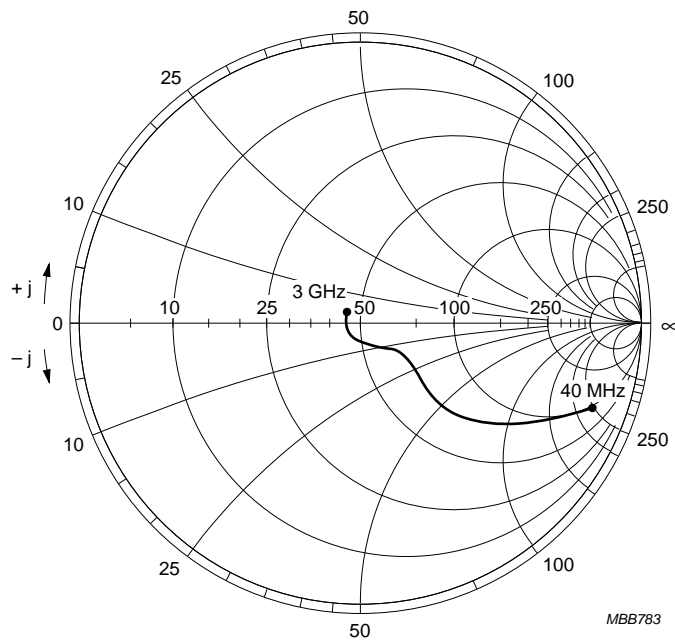
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$I_C = 45 \text{ mA}$; $V_{CE} = 10 \text{ V}$.

Fig.19 Common emitter reverse transmission coefficient (S_{12}).



$I_C = 45 \text{ mA}$; $V_{CE} = 10 \text{ V}$.
 $Z_O = 50 \Omega$.

Fig.20 Common emitter output reflection coefficient (S_{22}).

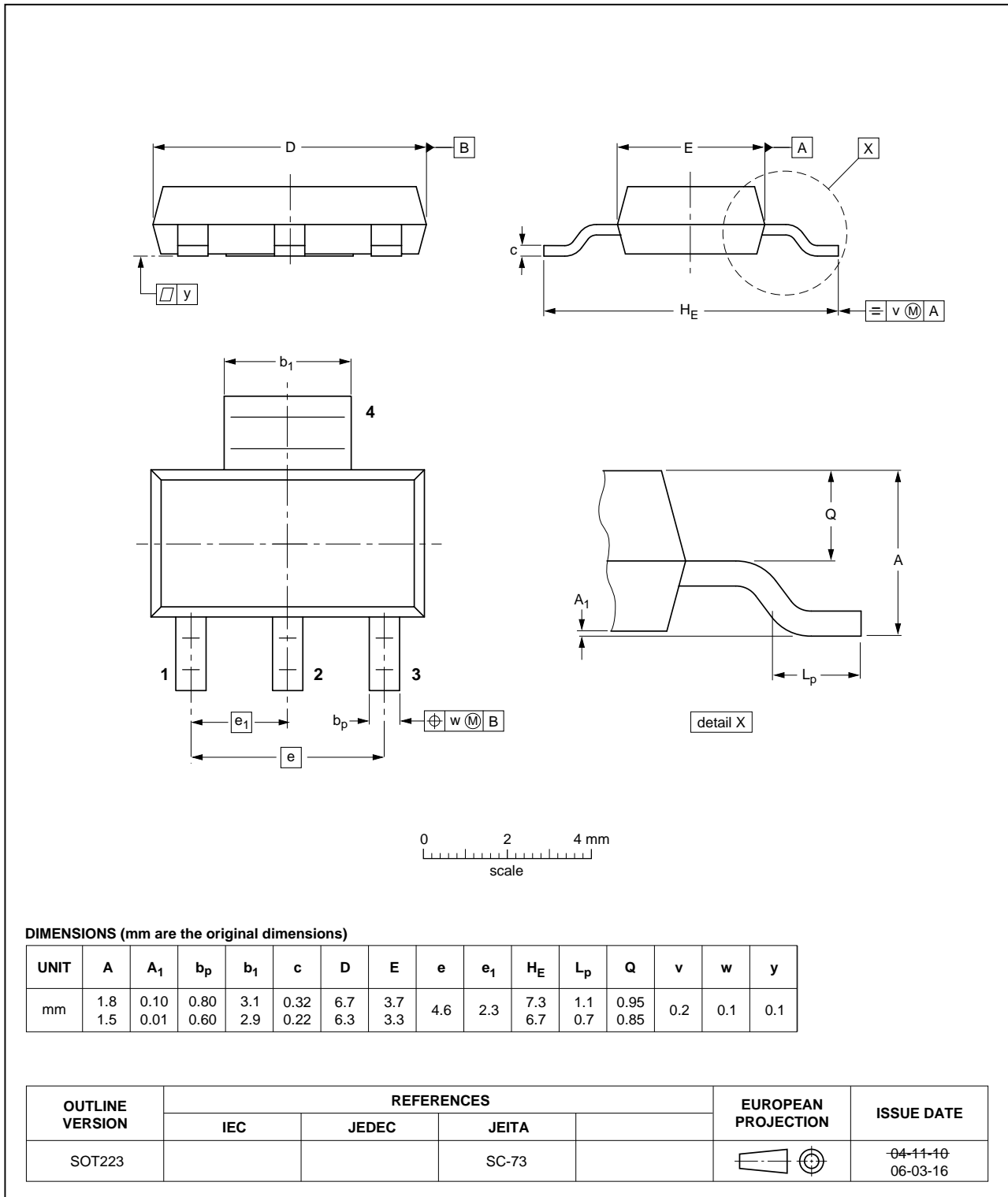
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PACKAGE OUTLINE

Plastic surface-mounted package with increased heatsink; 4 leads

SOT223



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DATA SHEET STATUS

DOCUMENT STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾	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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