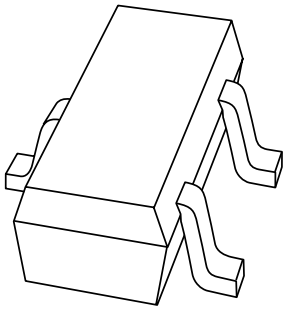
DATA SHEET



BFR92AT
NPN 5 GHz wideband transistor

Product specification
Supersedes data of 1999 Nov 02

2000 Mar 28

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NPN 5 GHz wideband transistor BFR92AT

FEATURES

- High power gain
- Gold metallization ensures excellent reliability
- SOT416 (SC-75) package.

APPLICATIONS

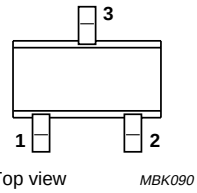
RF amplifiers, mixers and oscillators with signal frequencies up to 1 GHz.

DESCRIPTION

Silicon NPN transistor encapsulated in a plastic SOT416 (SC-75) package. The BFR92AT uses the same crystal as the SOT23 version: BFR92A.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



Top view MBK090

Marking code: P2.

Fig.1 SOT416.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	–	15	V
I_C	collector current (DC)		–	–	25	mA
P_{tot}	total power dissipation	up to T_s = 75 °C; note 1	–	–	150	mW
h_{FE}	current gain	I_C = 15 mA; V_{CE} = 10 V	40	90	–	
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 10 V; f = 1 MHz; T_{amb} = 25 °C	–	0.35	–	pF
f_T	transition frequency	I_C = 15 mA; V_{CE} = 10 V; f = 500 MHz	3.5	5	–	GHz
G_{UM}	maximum unilateral power gain	I_C = 15 mA; V_{CE} = 10 V; f = 1 GHz; T_{amb} = 25 °C	–	14	–	dB
		I_C = 15 mA; V_{CE} = 10 V; f = 2 GHz; T_{amb} = 25 °C	–	8	–	dB
F	noise figure	I_C = 5 mA; V_{CE} = 10 V; f = 1 GHz; $\Gamma_s = \Gamma_{opt}$	–	2	–	dB
T_j	junction temperature		–	–	150	°C

Note

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

LIMITING VALUES

In accordance with the Absolute Maximum 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	–	15	V
V_{EBO}	emitter-base voltage	open collector	–	2	V
I_C	collector current (DC)		–	25	mA
P_{tot}	total power dissipation	up to T_s = 75 °C; see Fig.2; note 1	–	150	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
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	500	K/W

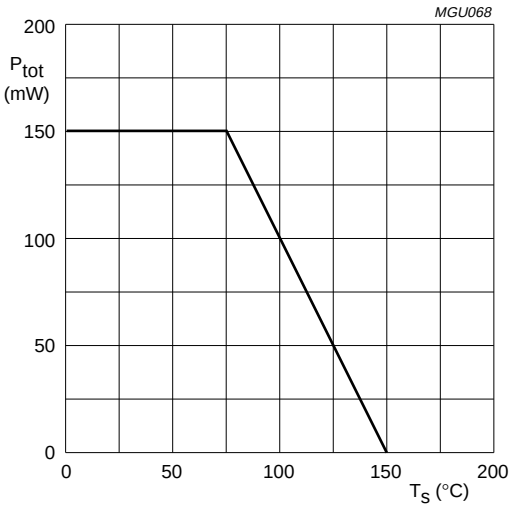


Fig.2 Power derating curve.

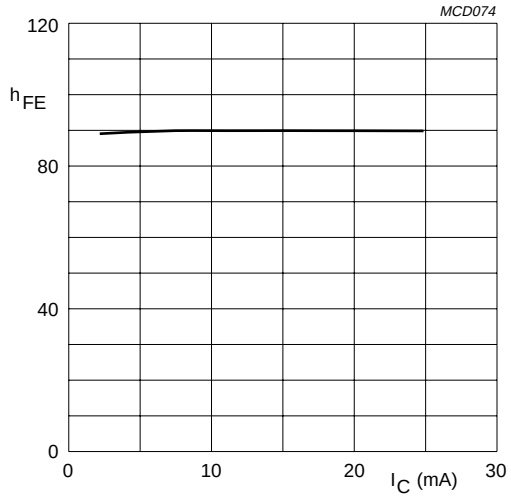
CHARACTERISTICS

T_j = 25 °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector leakage current	I_E = 0; V_{CB} = 10 V	–	–	50	nA
h_{FE}	DC current gain	I_C = 15 mA; V_{CE} = 10 V	40	90	–	
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = 10 V; f = 1 MHz	–	0.6	–	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = 0.5 V; f = 1 MHz	–	0.9	–	pF
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 10 V; f = 1 MHz	–	0.35	–	pF
f_T	transition frequency	I_C = 15 mA; V_{CE} = 10 V; f = 500 MHz	3.5	5	–	GHz
G_{UM}	maximum unilateral power gain; note 1	I_C = 15 mA; V_{CE} = 10 V; f = 1 GHz; T_{amb} = 25 °C	–	14	–	dB
		I_C = 15 mA; V_{CE} = 10 V; f = 2 GHz; T_{amb} = 25 °C	–	8	–	dB
F	noise figure	I_C = 5 mA; V_{CE} = 10 V; f = 1 GHz; $\Gamma_s = \Gamma_{opt}$	–	2	–	dB
		I_C = 5 mA; V_{CE} = 10 V; f = 2 GHz; $\Gamma_s = \Gamma_{opt}$	–	3	–	dB

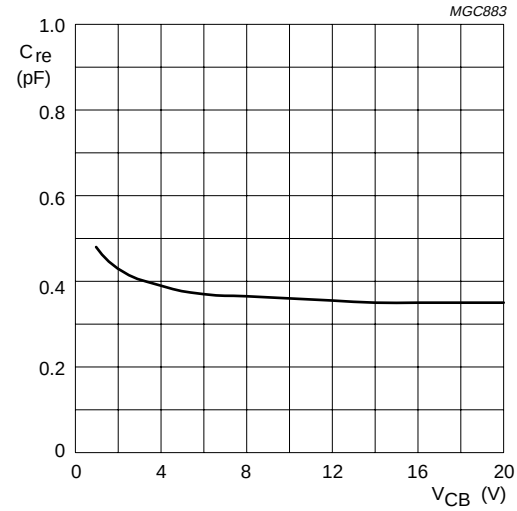
Note

1. 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



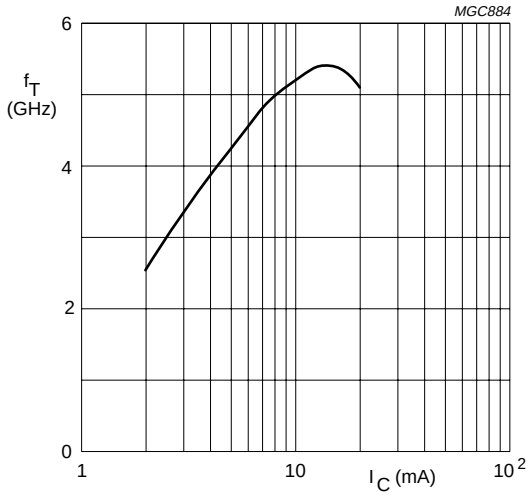
V_{CE} = 10 V.

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



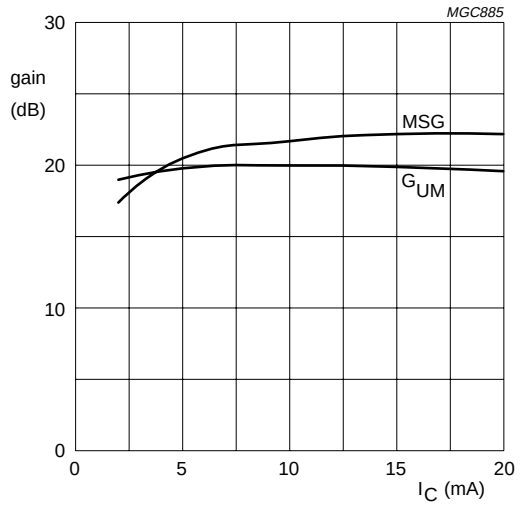
I_C = 0; f = 1 MHz.

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



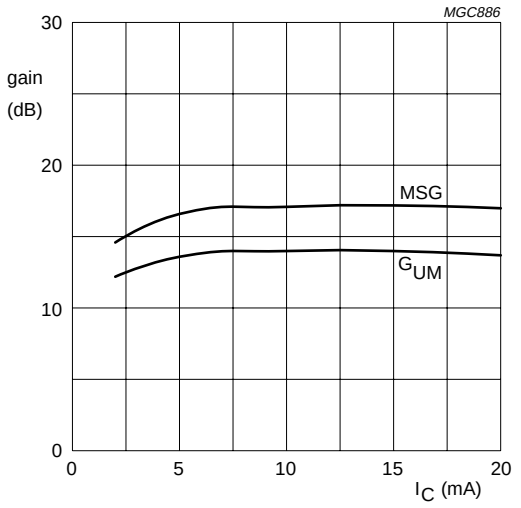
V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C.

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



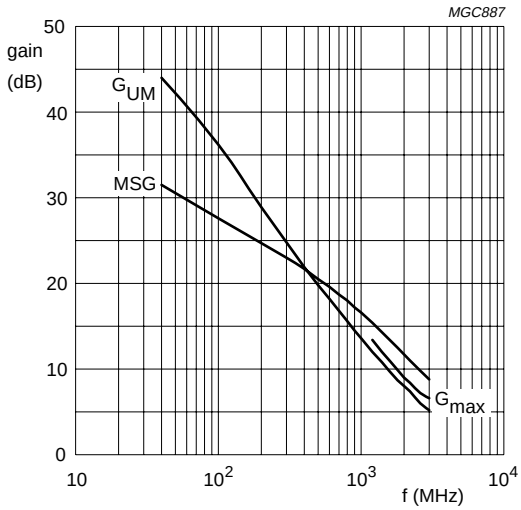
V_{CE} = 10 V; f = 500 MHz.

Fig.6 Gain as a function of collector current; typical values.



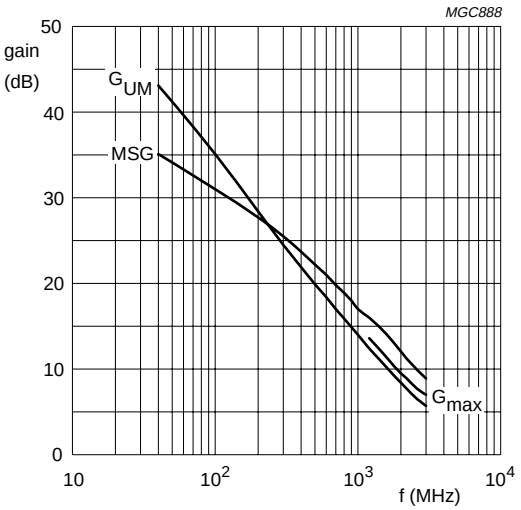
V_{CE} = 10 V; f = 1 GHz.

Fig.7 Gain as a function of collector current; typical values.



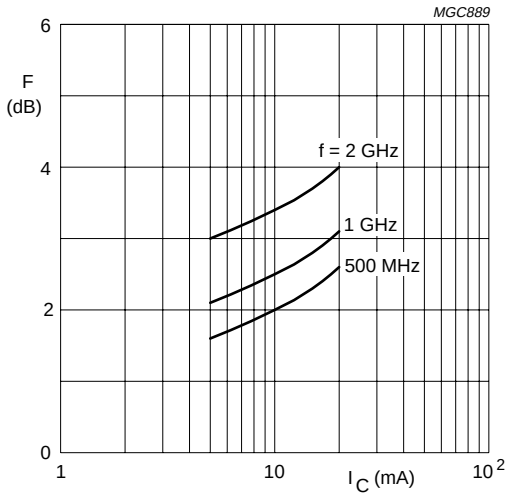
V_{CE} = 10 V; I_C = 5 mA.

Fig.8 Gain as a function of frequency; typical values.



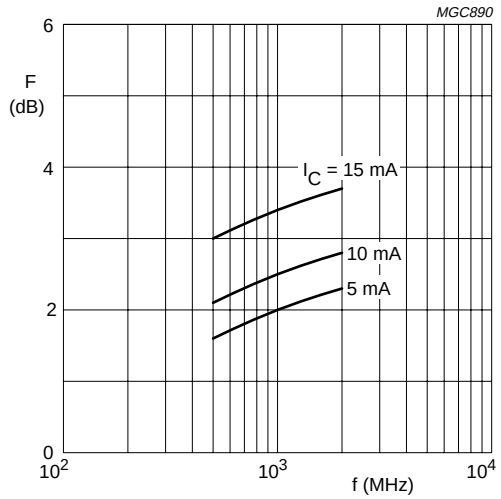
V_{CE} = 10 V; I_C = 15 mA.

Fig.9 Gain as a function of frequency; typical values.



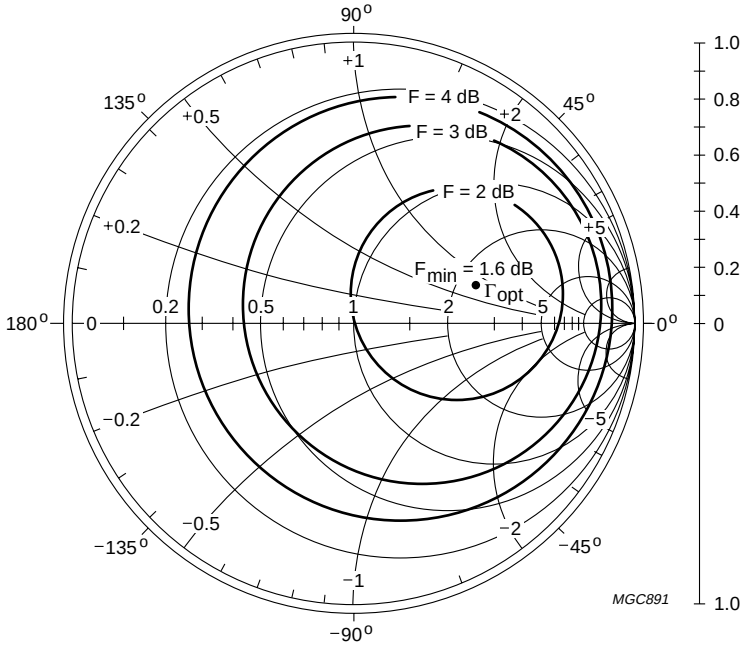
V_{CE} = 10 V.

Fig.10 Minimum noise figure as a function of collector current; typical values.



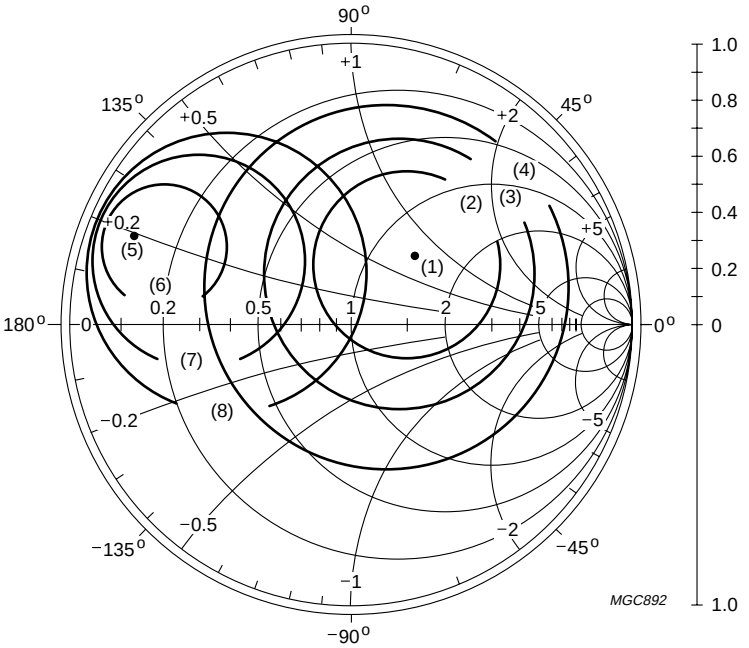
V_{CE} = 10 V.

Fig.11 Minimum noise figure as a function of frequency; typical values.



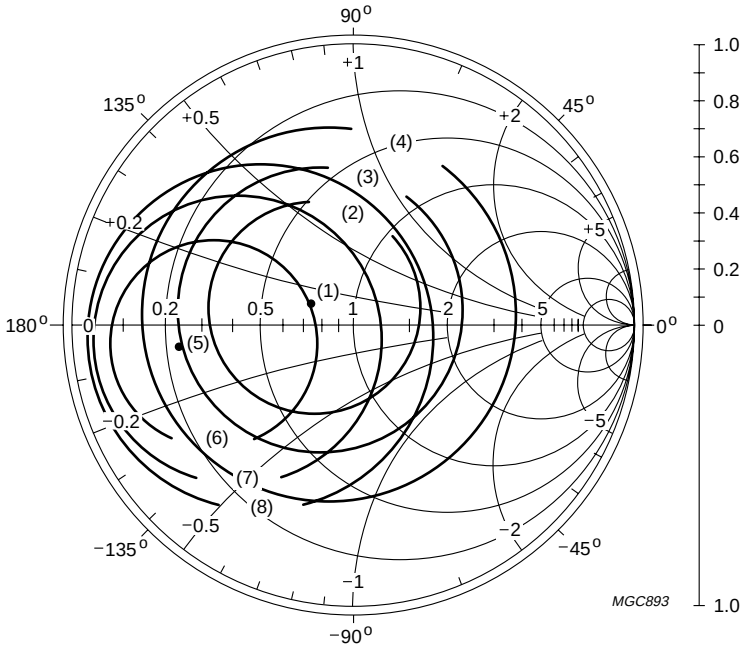
f = 500 MHz; V_{CE} = 10 V; I_C = 5 mA; Z_o = 50 Ω.

Fig.12 Common emitter noise figure circles; typical values.



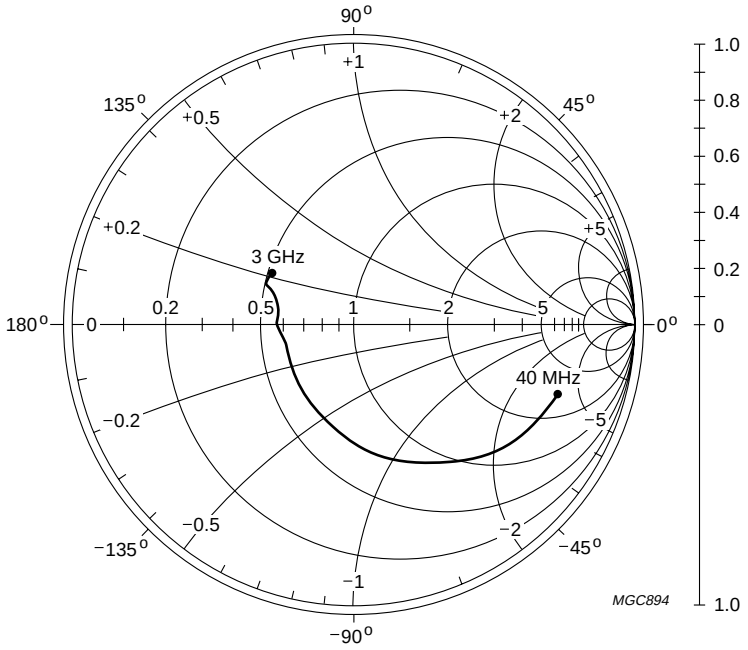
(1) Γ_{opt}; F_{min} = 2.1 dB.
(2) F = 2.5 dB.
(3) F = 3 dB.
(4) F = 4 dB.
(5) Γ_{ms}; G_{max} = 15.7 dB.
(6) G = 15 dB.
(7) G = 14 dB.
(8) G = 13 dB.
f = 1 GHz; V_{CE} = 10 V; I_C = 5 mA; Z_o = 50 Ω.

Fig.13 Common emitter noise figure circles; typical values.



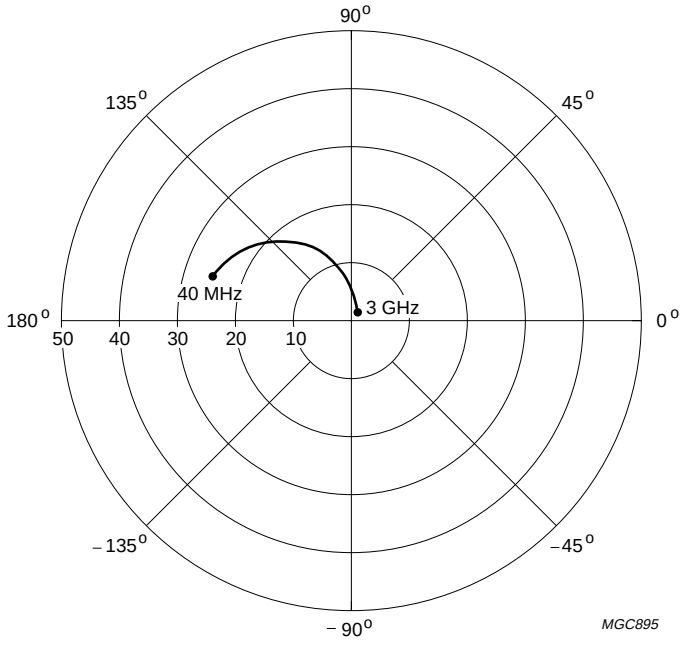
(1) Γ_{opt}; F_{min} = 3 dB.
(2) F = 3.5 dB.
(3) F = 4 dB.
(4) F = 5 dB.
(5) Γ_{ms}; G_{max} = 9.1 dB.
(6) G = 8 dB.
(7) G = 7 dB.
(8) G = 6 dB.
f = 2 GHz; V_{CE} = 10 V; I_C = 5 mA; Z_o = 50 Ω.

Fig.14 Common emitter noise figure circles; typical values.



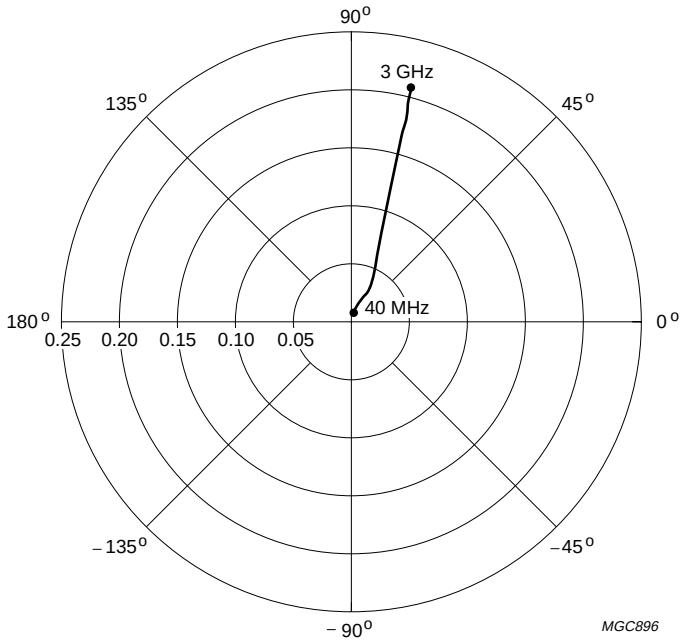
V_{CE} = 10 V; I_C = 15 mA; Z_o = 50 Ω.

Fig.15 Common emitter input reflection coefficient (s_{11}); typical values.



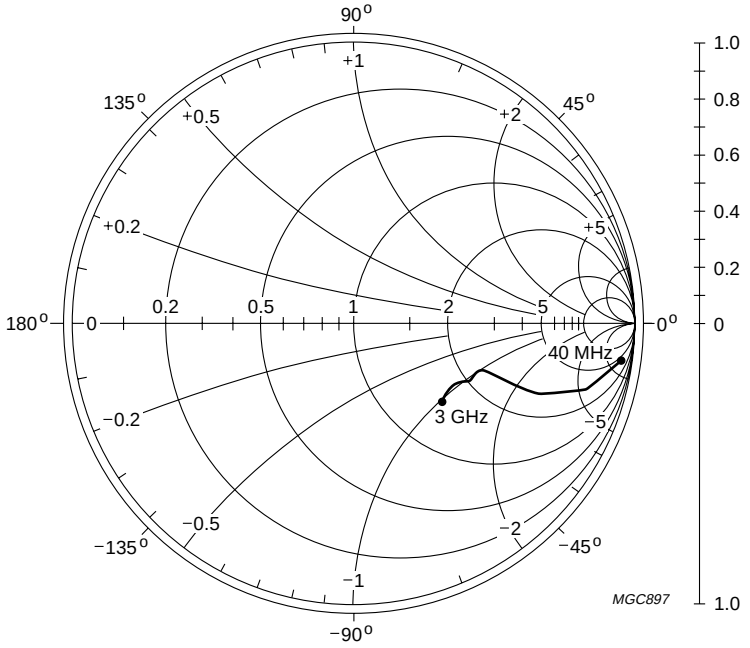
V_{CE} = 10 V; I_C = 15 mA.

Fig.16 Common emitter forward transmission coefficient (s_{21}); typical values.



V_{CE} = 10 V; I_C = 15 mA.

Fig.17 Common emitter reverse transmission coefficient (s_{12}); typical values.

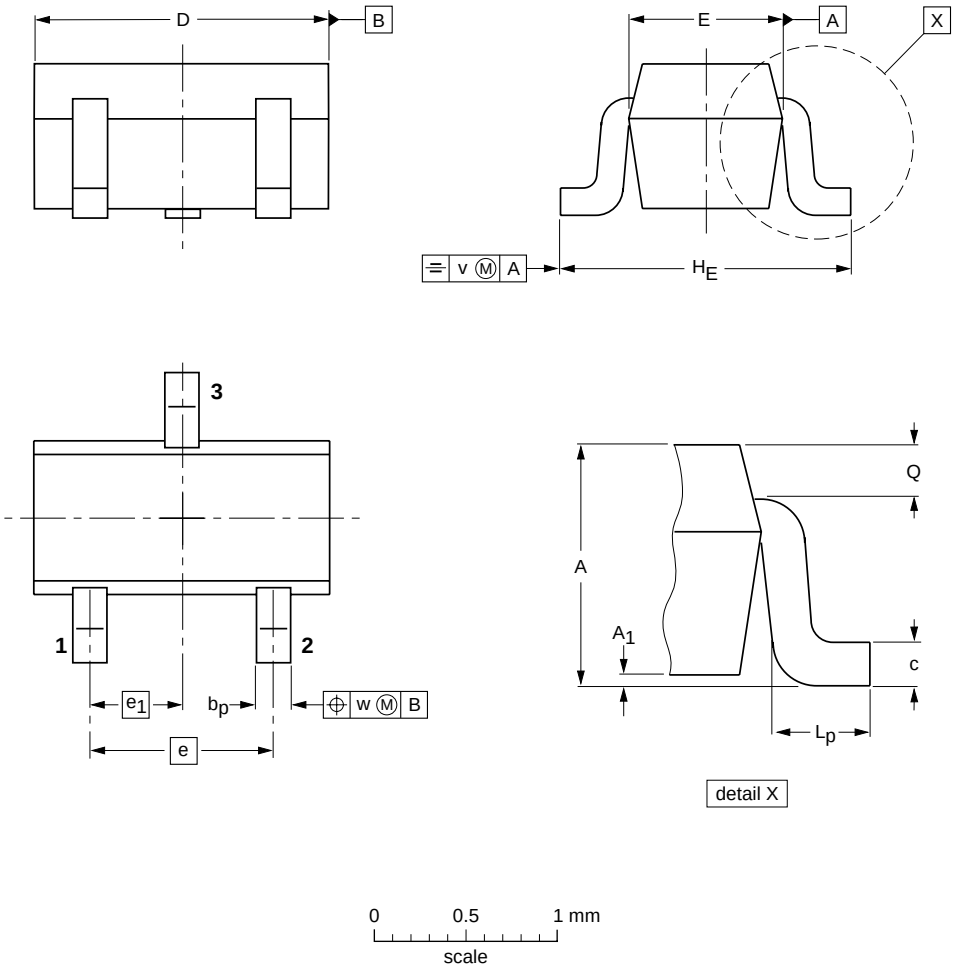


V_{CE} = 10 V; I_C = 15 mA; Z_o = 50 Ω.

Fig.18 Common emitter output reflection coefficient (s_{22}); typical values.

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads **SOT416**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	0.95 0.60	0.1	0.30 0.15	0.25 0.10	1.8 1.4	0.9 0.7	1	0.5	1.75 1.45	0.45 0.15	0.23 0.13	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT416			SC-75			97-02-28

DATA SHEET STATUS

DATA SHEET STATUS	PRODUCT STATUS	DEFINITIONS (1)
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.

DEFINITIONS

Short-form specification — The data in a short-form 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 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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