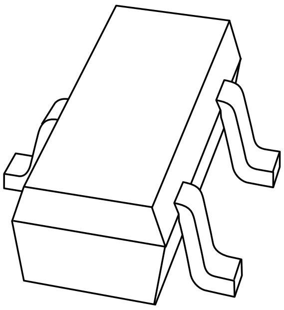
DATA SHEET



BFR505T
NPN 9 GHz wideband transistor

Product specification
Supersedes data of 2000 Mar 14

2000 May 17

FEATURES

- Low current consumption
- High power gain
- Low noise figure
- High transition frequency
- Gold metallization ensures excellent reliability
- SOT416 (SC-75) package.

APPLICATIONS

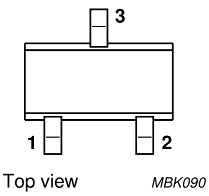
Low power amplifiers, oscillators and mixers particularly in RF portable communication equipment (cellular phones, cordless phones and pagers) up to 2 GHz.

DESCRIPTION

NPN transistor in a plastic SOT416 (SC-75) package.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



Marking code: N0.

Fig.1 SOT416.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–	20	V
V_{CES}	collector-emitter voltage	$R_{BE} = 0$	–	–	15	V
I_C	DC collector current		–	–	18	mA
P_{tot}	total power dissipation	$T_s \leq 75$ °C; note 1	–	–	150	mW
h_{FE}	DC current gain	$I_C = 5$ mA; $V_{CE} = 6$ V; $T_j = 25$ °C	60	120	250	
f_T	transition frequency	$I_C = 5$ mA; $V_{CE} = 6$ V; f = 1 GHz; $T_{amb} = 25$ °C	–	9	–	GHz
G_{UM}	maximum unilateral power gain	$I_C = 5$ mA; $V_{CE} = 6$ V; f = 900 MHz; $T_{amb} = 25$ °C	–	17	–	dB
F	noise figure	$I_C = 1.25$ mA; $V_{CE} = 6$ V; f = 900 MHz; $T_{amb} = 25$ °C	–	1.2	1.7	dB

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_{CE}	collector-emitter voltage	$R_{BE} = 0$	–	15	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	DC collector current		–	18	mA
P_{tot}	total power dissipation	$T_s \leq 75$ °C; 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 RESISTANCE

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	500	K/W

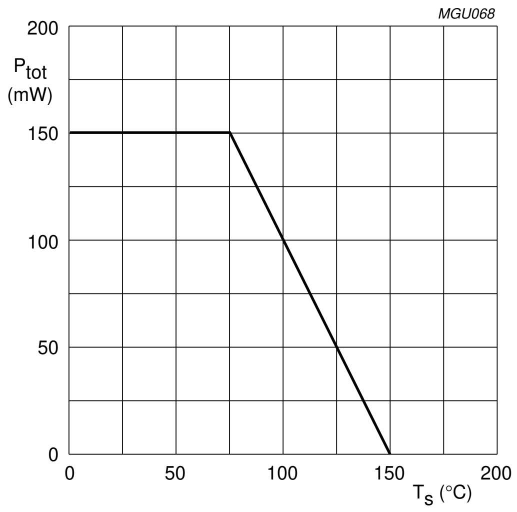


Fig.2 Power derating curve.

CHARACTERISTICS

T_j = 25 °C; unless otherwise specified.

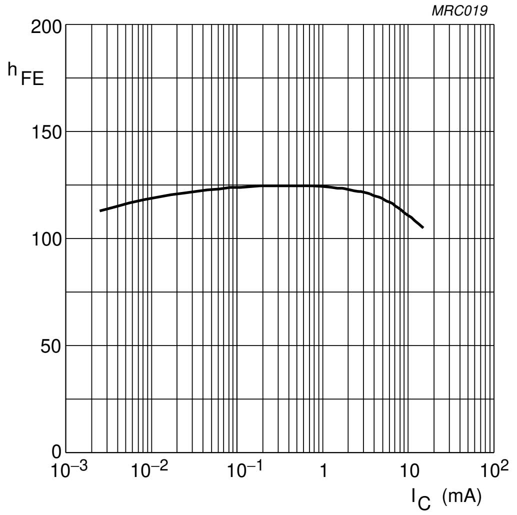
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 6$ V	–	–	50	nA
h_{FE}	DC current gain	$I_C = 5$ mA; $V_{CE} = 6$ V	60	120	250	
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 6$ V; f = 1 MHz	–	0.4	–	pF
C_e	emitter capacitance	$I_C = i_c = 0$; $V_{EB} = 0.5$ V; f = 1 MHz	–	0.4	–	pF
C_{re}	feedback capacitance	$I_C = 0$; $V_{CB} = 6$ V; f = 1 MHz	–	0.3	–	pF
f_T	transition frequency	$I_C = 5$ mA; $V_{CE} = 6$ V; f = 1 GHz; $T_{amb} = 25$ °C	–	9	–	GHz
G_{UM}	maximum unilateral power gain; note 1	$I_C = 5$ mA; $V_{CE} = 6$ V; $T_{amb} = 25$ °C;				
		f = 900 MHz	–	17	–	dB
		f = 2 GHz	–	10	–	dB
$\lvert S_{21}\rvert^2$	insertion power gain	$I_C = 5$ mA; $V_{CE} = 6$ V; f = 900 MHz; $T_{amb} = 25$ °C	13	14	–	dB
F	noise figure	$\Gamma_s = \Gamma_{opt}$; $I_C = 1.25$ mA; $V_{CE} = 6$ V; f = 900 MHz; $T_{amb} = 25$ °C	–	1.2	1.7	dB
		$\Gamma_s = \Gamma_{opt}$; $I_C = 5$ mA; $V_{CE} = 6$ V; f = 900 MHz; $T_{amb} = 25$ °C	–	1.6	2.1	dB
		$\Gamma_s = \Gamma_{opt}$; $I_C = 1.25$ mA; $V_{CE} = 6$ V; f = 2 GHz; $T_{amb} = 25$ °C	–	1.9	–	dB
P_{L1}	output power at 1 dB gain compression	$I_C = 5$ mA; $V_{CE} = 6$ V; $R_L = 50\ \Omega$; f = 900 MHz; $T_{amb} = 25$ °C	–	4	–	dBm
ITO	third-order intercept point	note 2	–	10	–	dBm

Notes

1. G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and

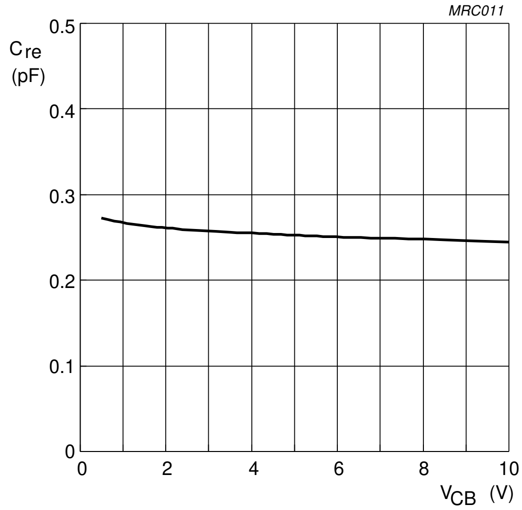
$$G_{UM} = 10\log\frac{\lvert S_{21}\rvert^2}{(1-\lvert S_{11}\rvert^2)(1-\lvert S_{22}\rvert^2)}\ \text{dB}$$

2. $I_C = 5$ mA; $V_{CE} = 6$ V; $R_L = 50\ \Omega$; f = 900 MHz; $T_{amb} = 25$ °C; $f_p = 900$ MHz; $f_q = 902$ MHz; measured at $f_{(2p-q)} = 898$ MHz and at $f_{(2q-p)} = 904$ MHz.



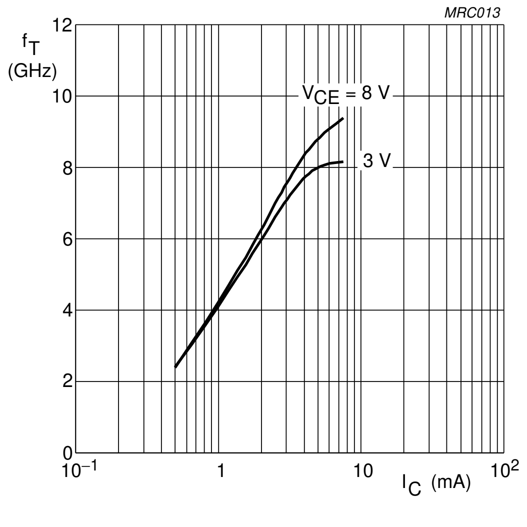
V_{CE} = 6 V; T_j = 25 °C.

Fig.3 DC current gain as a function of collector current.



I_C = 0; f = 1 MHz.

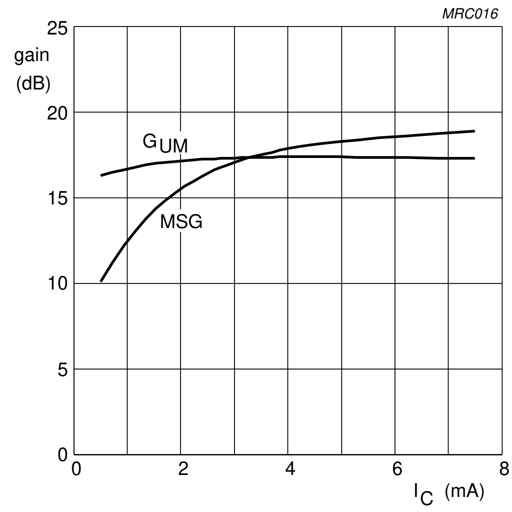
Fig.4 Feedback capacitance as a function of collector-base voltage.



f = 1 GHz; T_{amb} = 25 °C.

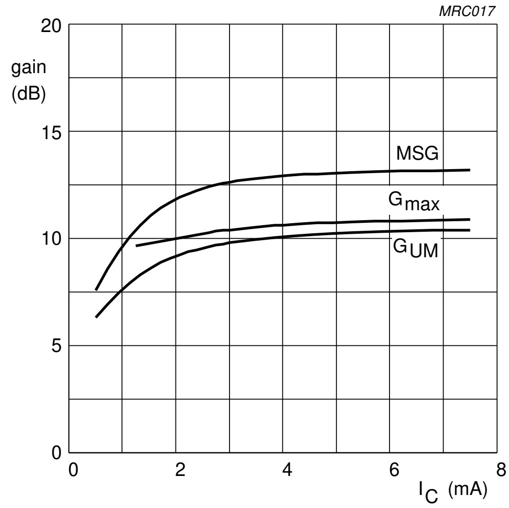
Fig.5 Transition frequency as a function of collector current.

In Figs 6 to 9, G_{UM} = maximum unilateral power gain; MSG = maximum stable gain; G_{max} = maximum available gain.



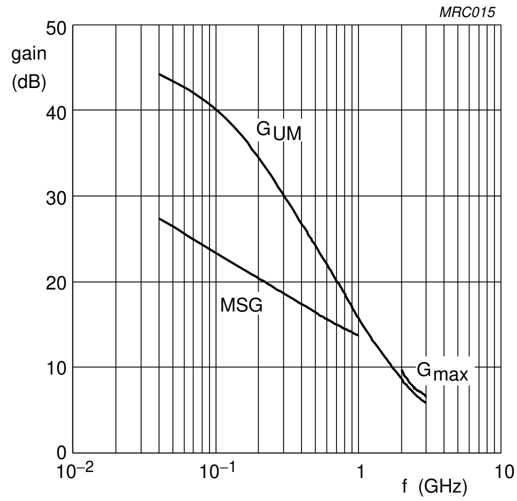
V_{CE} = 6 V; f = 900 MHz; T_{amb} = 25 °C.

Fig.6 Gain as a function of collector current.



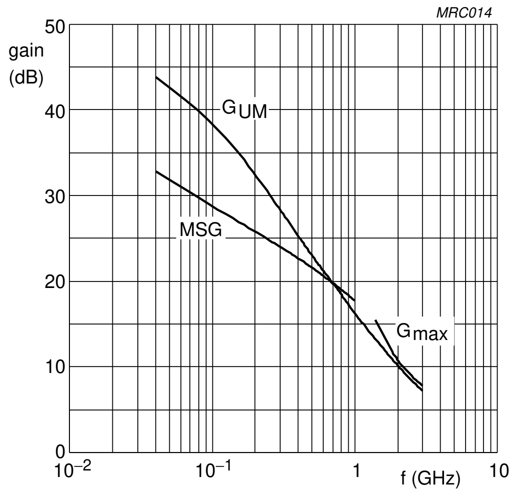
V_{CE} = 6 V; f = 2 GHz; T_{amb} = 25 °C.

Fig.7 Gain as a function of collector current.



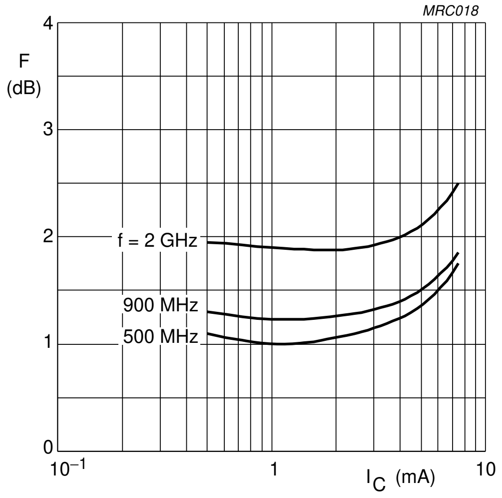
I_C = 1.25 mA; V_{CE} = 6 V; T_{amb} = 25 °C.

Fig.8 Gain as a function of frequency.



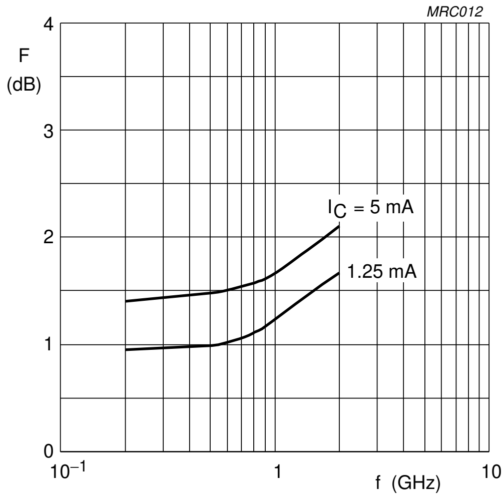
I_C = 5 mA; V_{CE} = 6 V; T_{amb} = 25 °C.

Fig.9 Gain as a function of frequency.



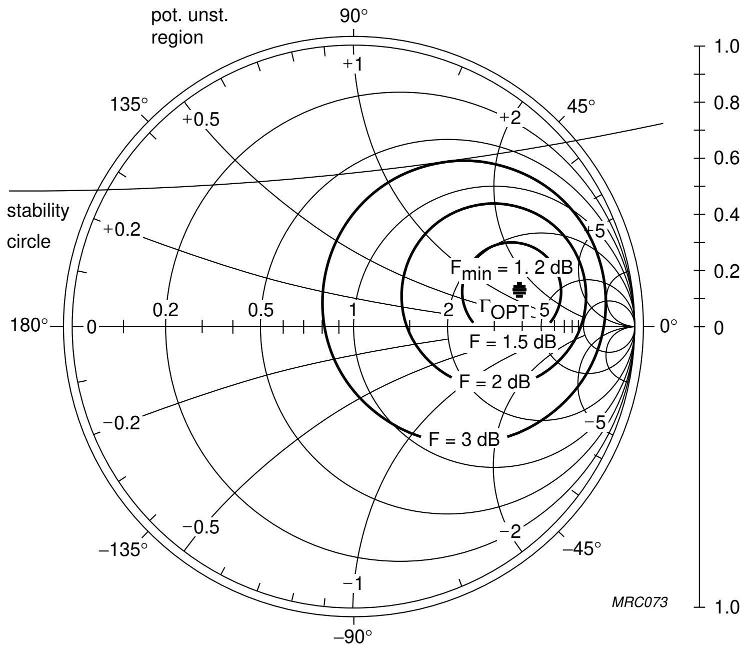
V_{CE} = 6 V; T_{amb} = 25 °C.

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



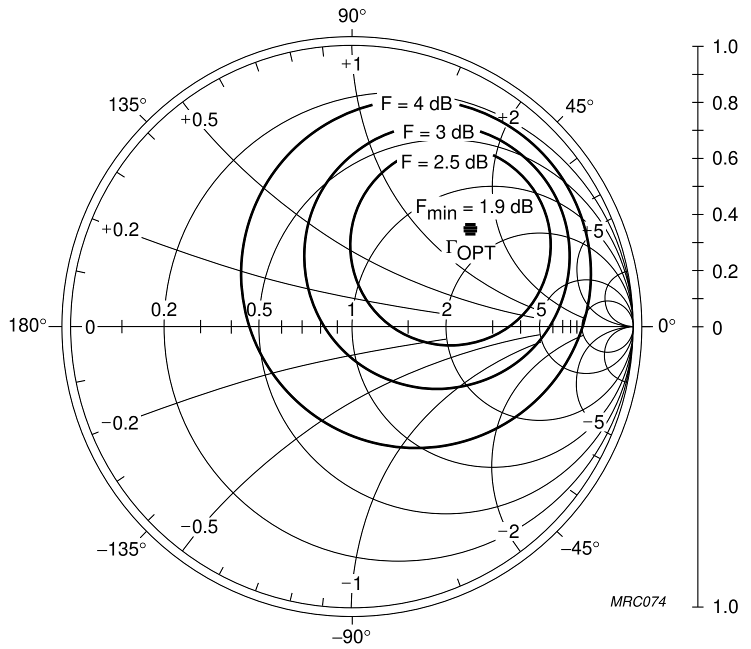
V_{CE} = 6 V; T_{amb} = 25 °C.

Fig.11 Minimum noise figure as a function of frequency.



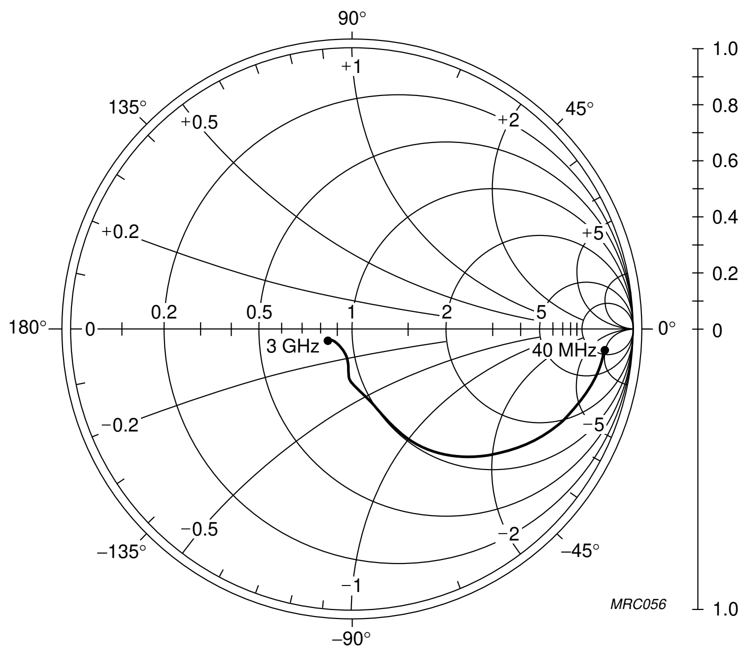
I_C = 1.25 mA; V_{CE} = 6 V;
f = 900 MHz; Z_o = 50 Ω.

Fig.12 Noise circle.



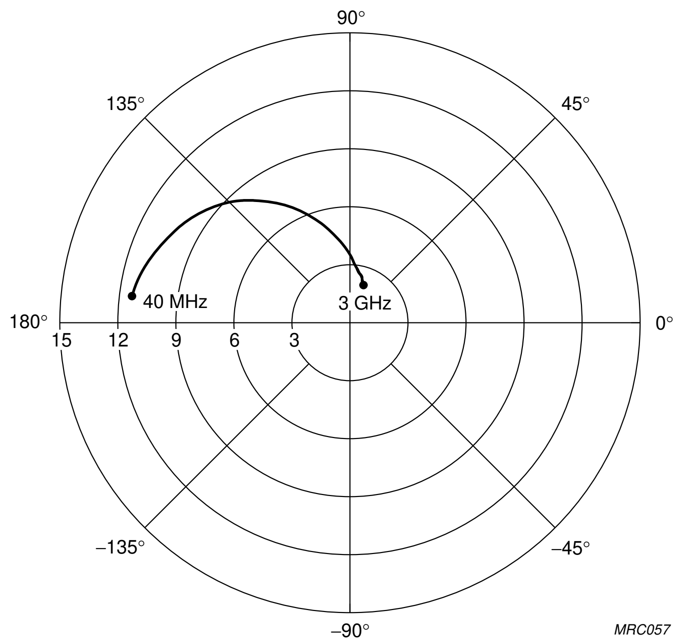
I_C = 1.25 mA; V_{CE} = 6 V;
f = 2 GHz; Z_o = 50 Ω.

Fig.13 Noise circle.



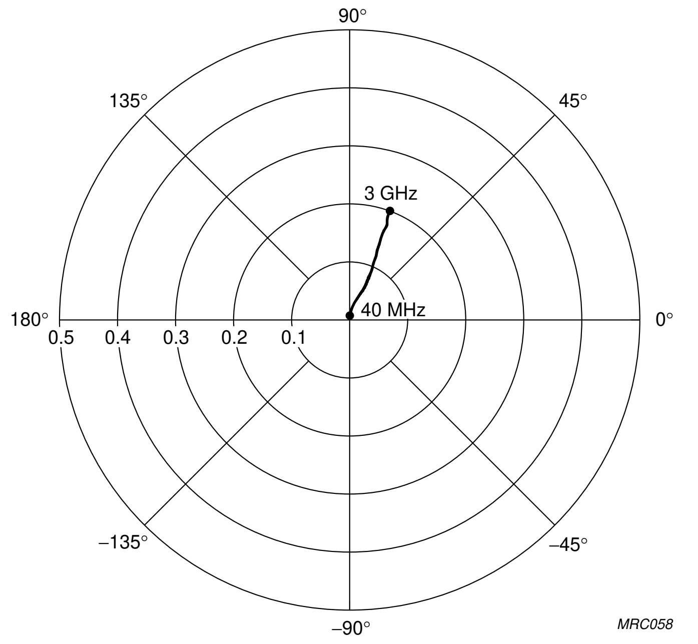
I_C = 5 mA; V_{CE} = 6 V;
Z_o = 50 Ω.

Fig.14 Common emitter input reflection coefficient (S_{11}).



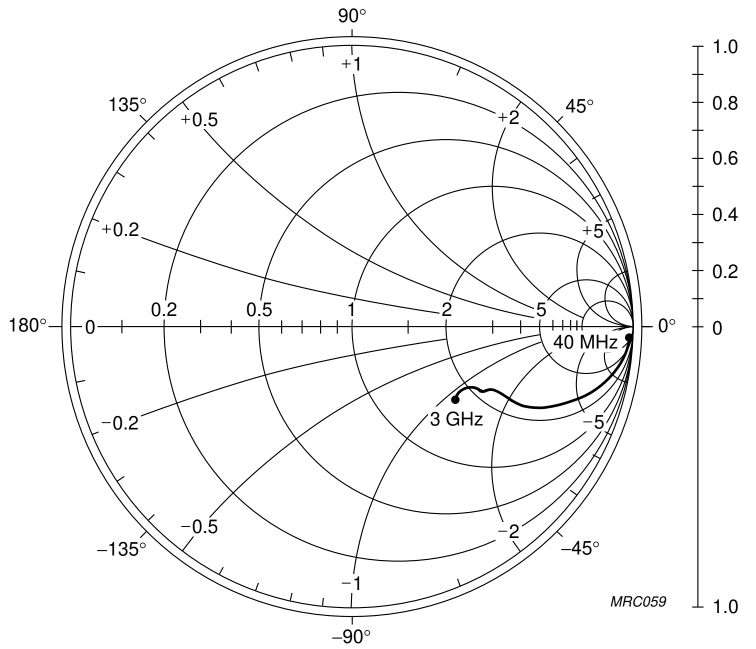
I_C = 5 mA; V_{CE} = 6 V.

Fig.15 Common emitter forward transmission coefficient (S_{21}).



I_C = 5 mA; V_{CE} = 6 V.

Fig.16 Common emitter reverse transmission coefficient (S_{12}).

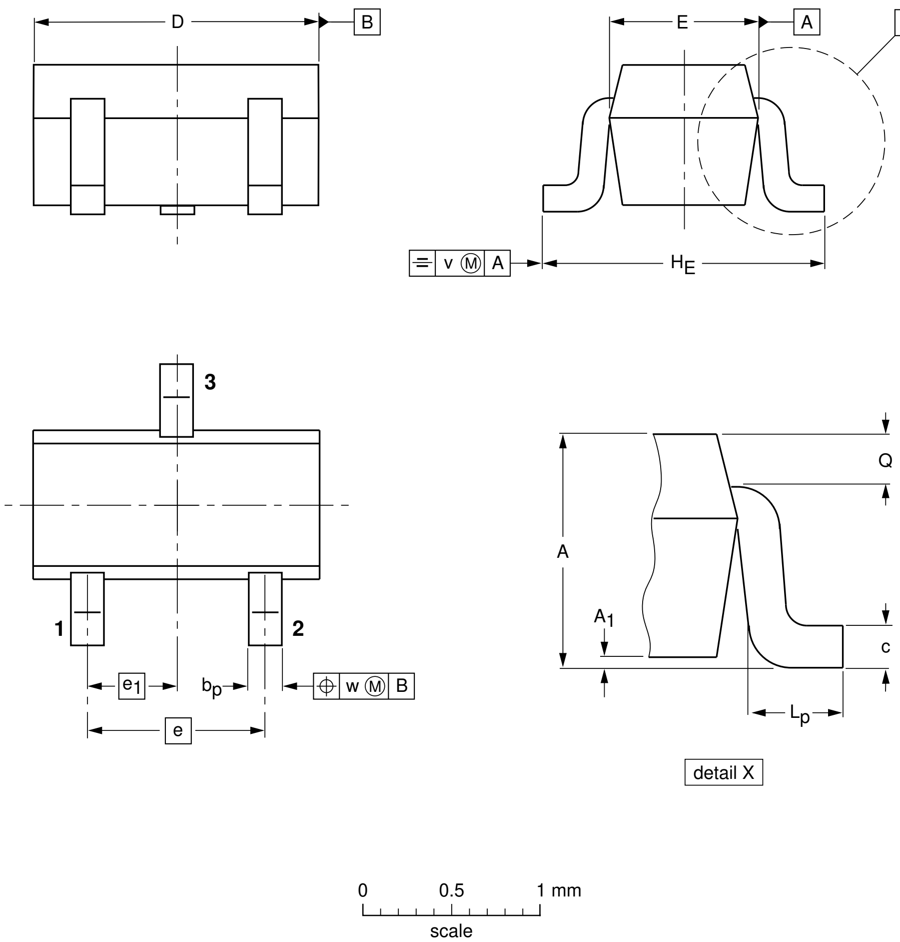


I_C = 5 mA; V_{CE} = 6 V;
Z_o = 50 Ω.

Fig.17 Common emitter output reflection coefficient (S_{22}).

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	JEITA			
SOT416			SC-75			~~04-11-04~~ 06-03-16

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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This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

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