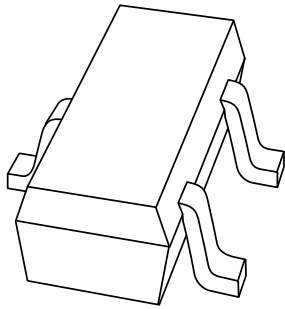


# DATA SHEET



## **BFR505T** NPN 9 GHz wideband transistor

Product specification  
Supersedes data of 2000 Mar 14

2000 May 17



# NPN 9 GHz wideband transistor

# BFR505T

## FEATURES

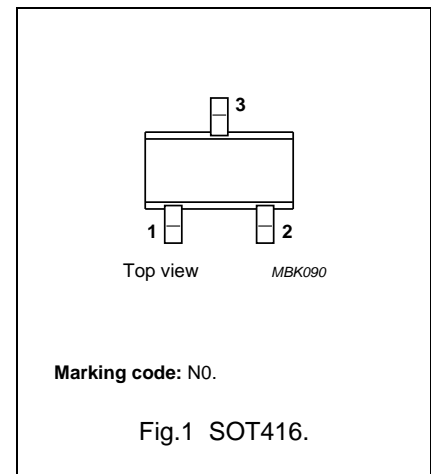
- Low current consumption
- High power gain
- Low noise figure
- High transition frequency
- Gold metallization ensures excellent reliability
- SOT416 (SC-75) package.

## DESCRIPTION

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

## PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



## APPLICATIONS

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

## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CB0}$	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	$T_s \leq 75\text{ °C}$ ; note 1	–	–	150	mW
$h_{FE}$	DC current gain	$I_C = 5\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $T_j = 25\text{ °C}$	60	120	250	
$f_T$	transition frequency	$I_C = 5\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 1\text{ GHz}$ ; $T_{amb} = 25\text{ °C}$	–	9	–	GHz
$G_{UM}$	maximum unilateral power gain	$I_C = 5\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	17	–	dB
F	noise figure	$I_C = 1.25\text{ mA}$ ; $V_{CE} = 6\text{ V}$ ; $f = 900\text{ MHz}$ ; $T_{amb} = 25\text{ °C}$	–	1.2	1.7	dB

## LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CB0}$	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	$T_s \leq 75\text{ °C}$ ; note 1	–	150	mW
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	junction temperature		–	150	°C

## Note

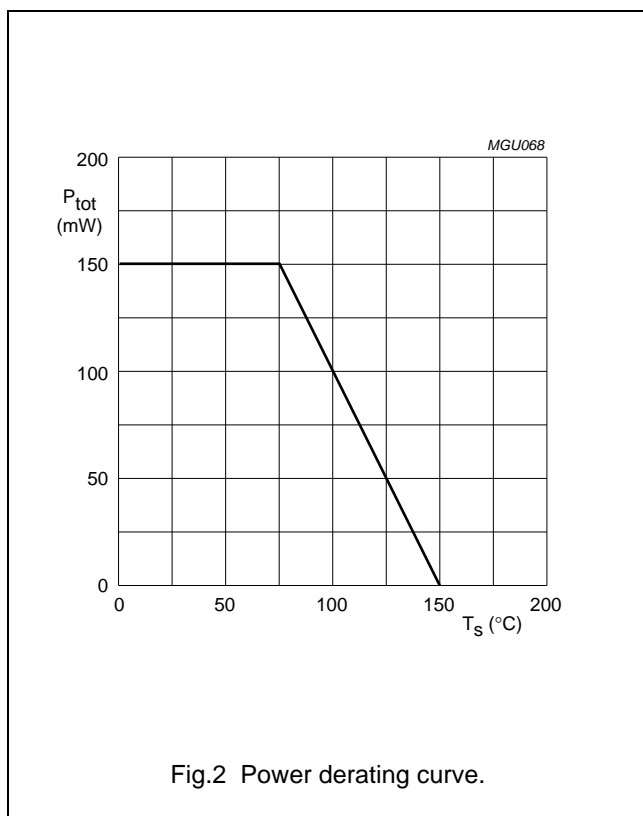
1.  $T_s$  is the temperature at the soldering point of the collector pin.

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**THERMAL RESISTANCE**

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



## NPN 9 GHz wideband transistor

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## CHARACTERISTICS

$T_j = 25\text{ °C}$ ; unless otherwise specified.

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

## Notes

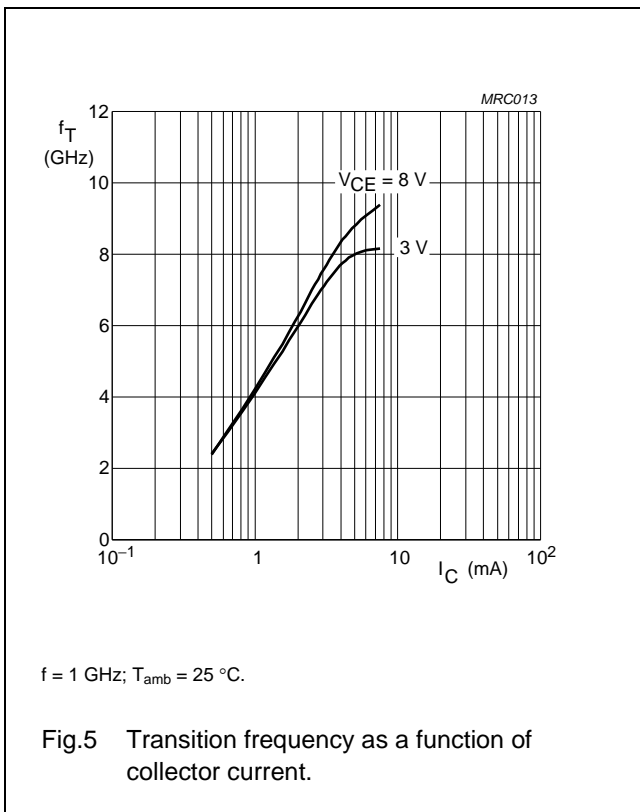
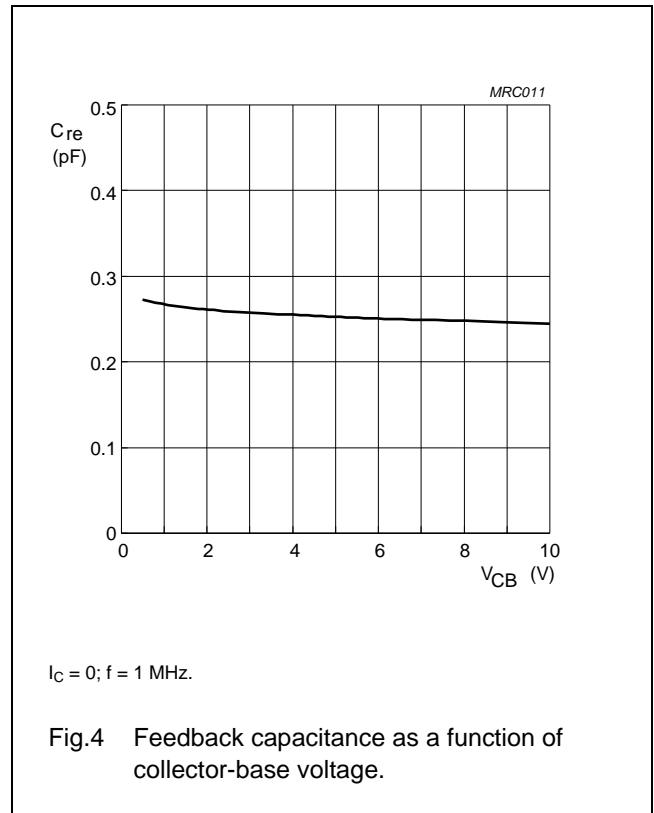
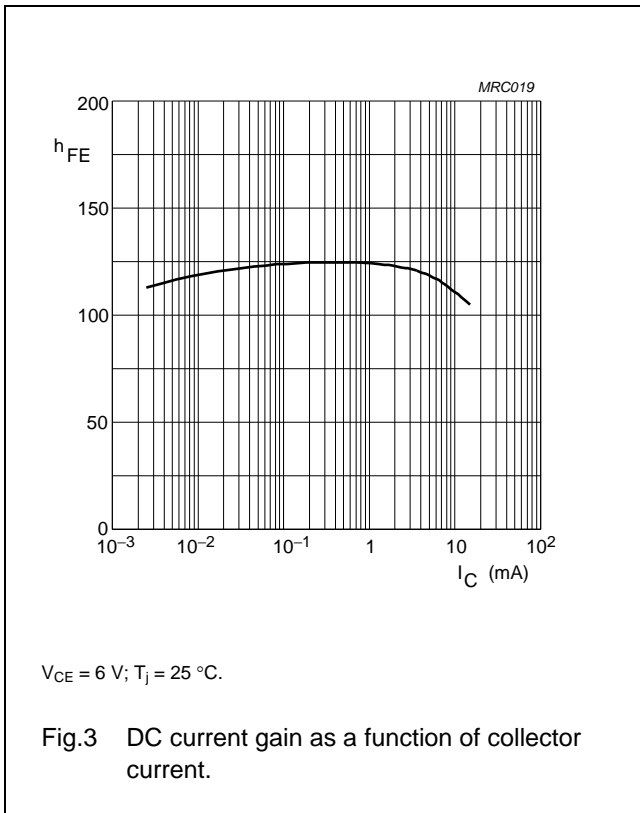
1.  $G_{UM}$  is the maximum unilateral power gain, assuming  $S_{12}$  is zero and

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

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

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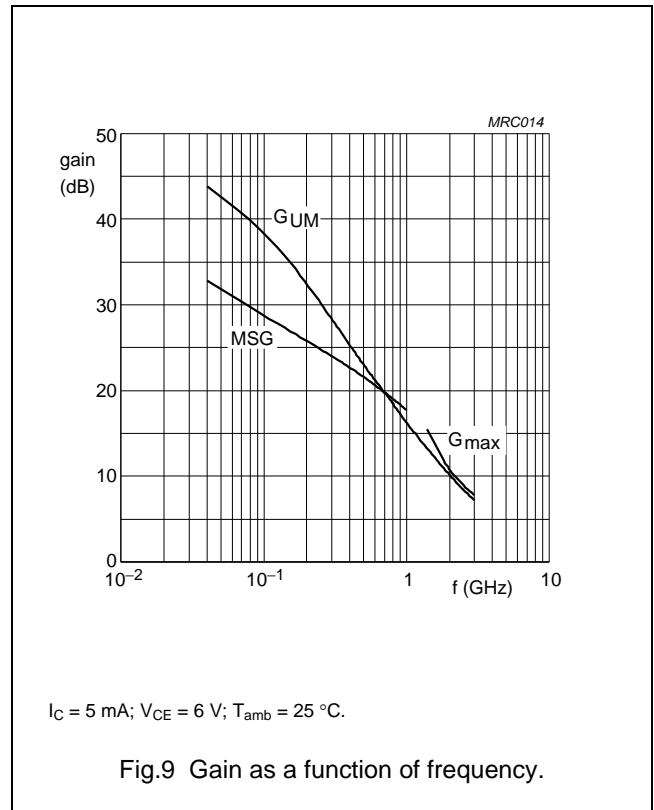
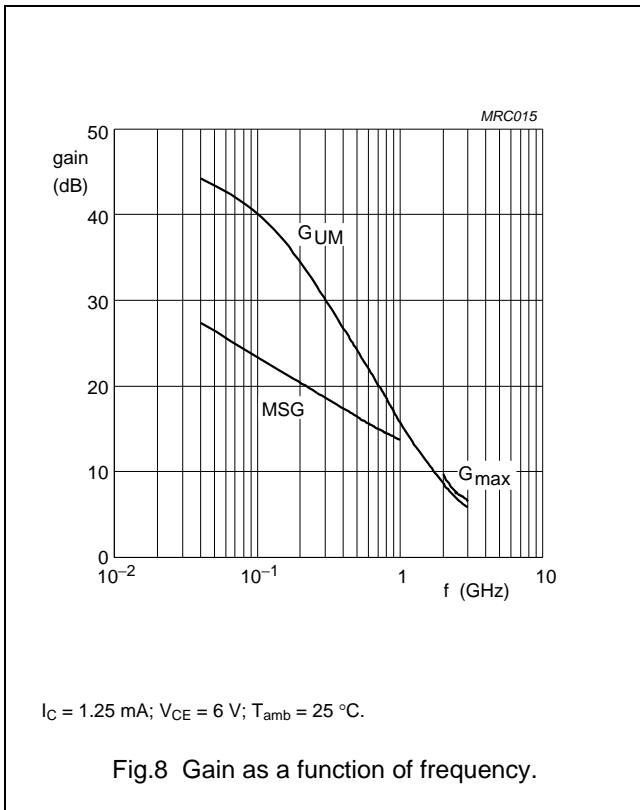
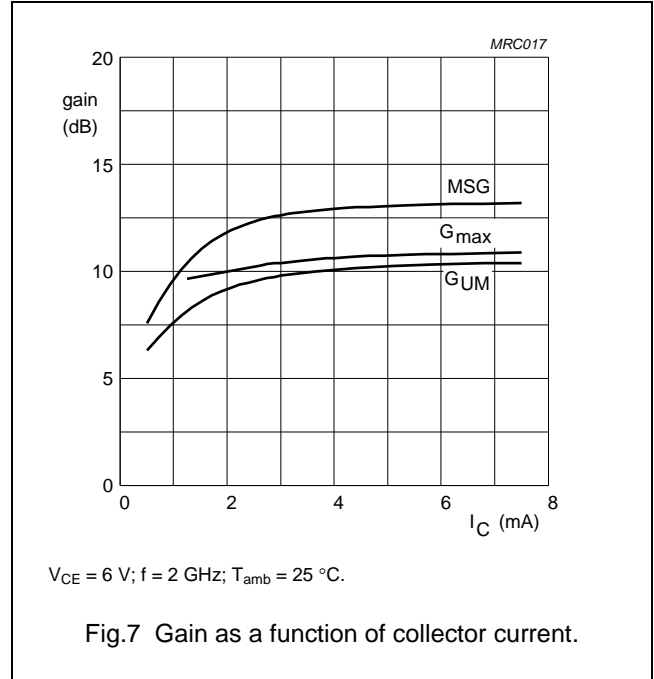
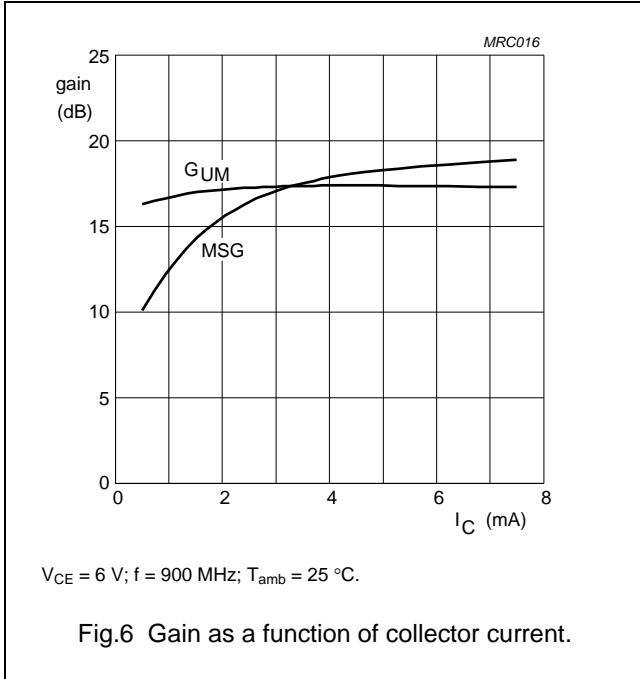
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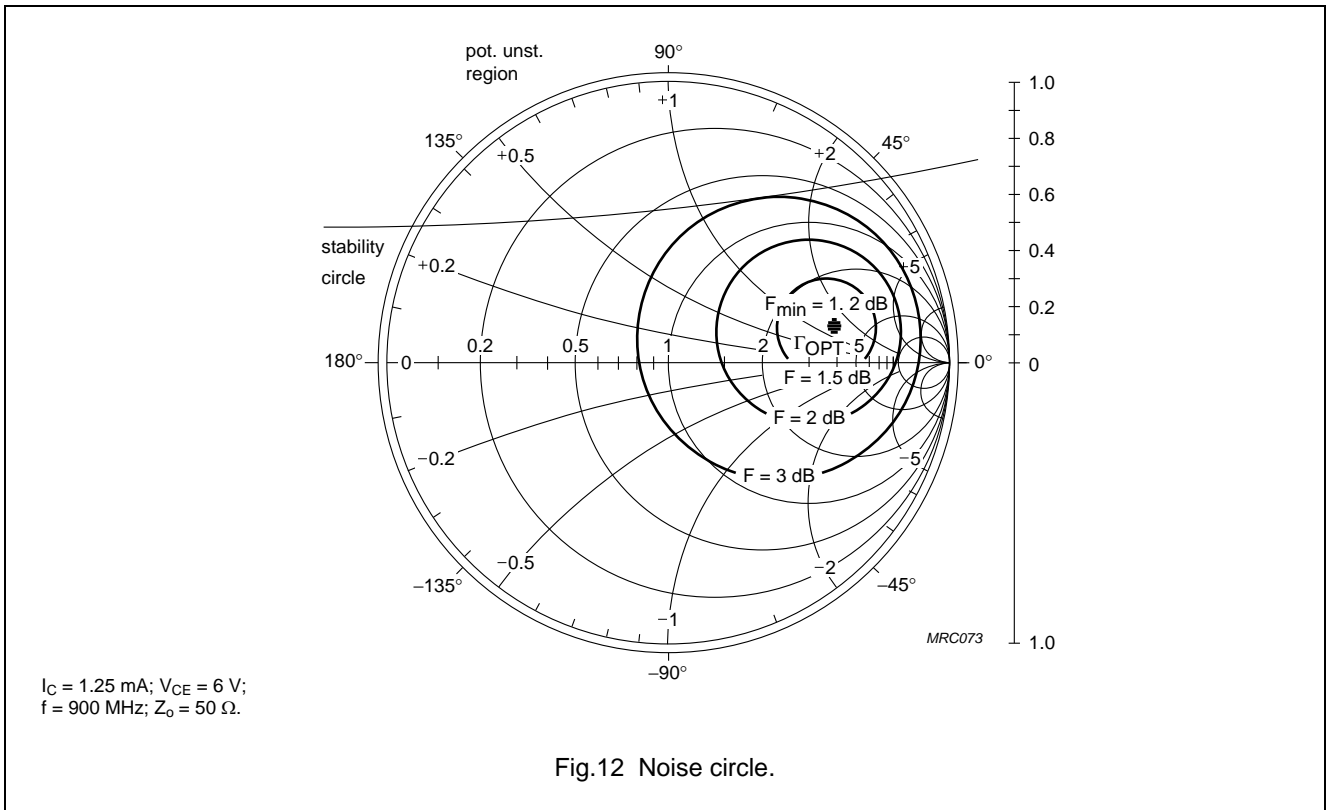
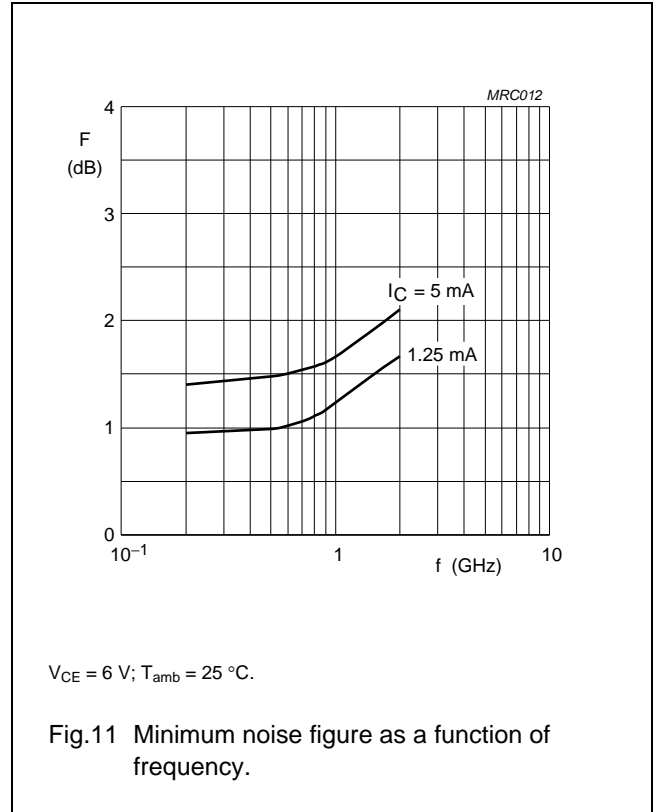
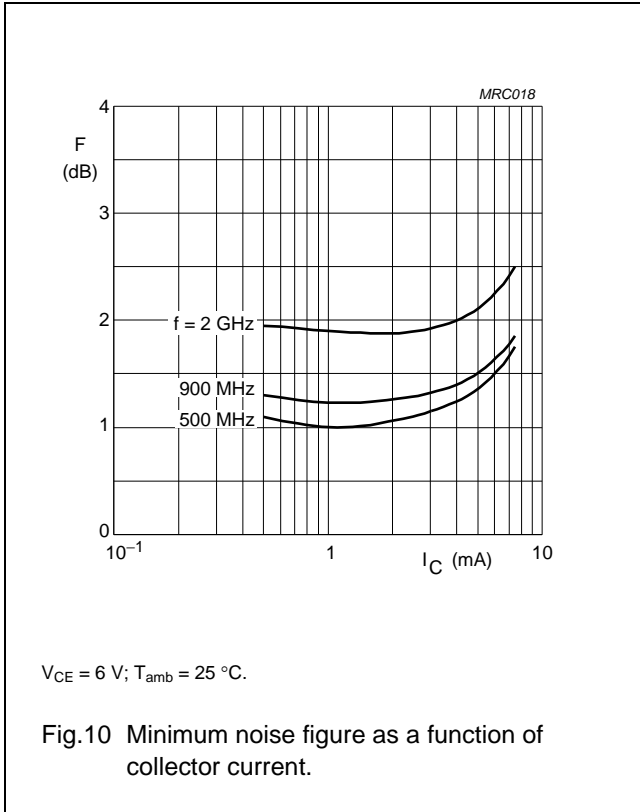
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In Figs 6 to 9,  $G_{UM}$  = maximum unilateral power gain; MSG = maximum stable gain;  $G_{max}$  = maximum available gain.



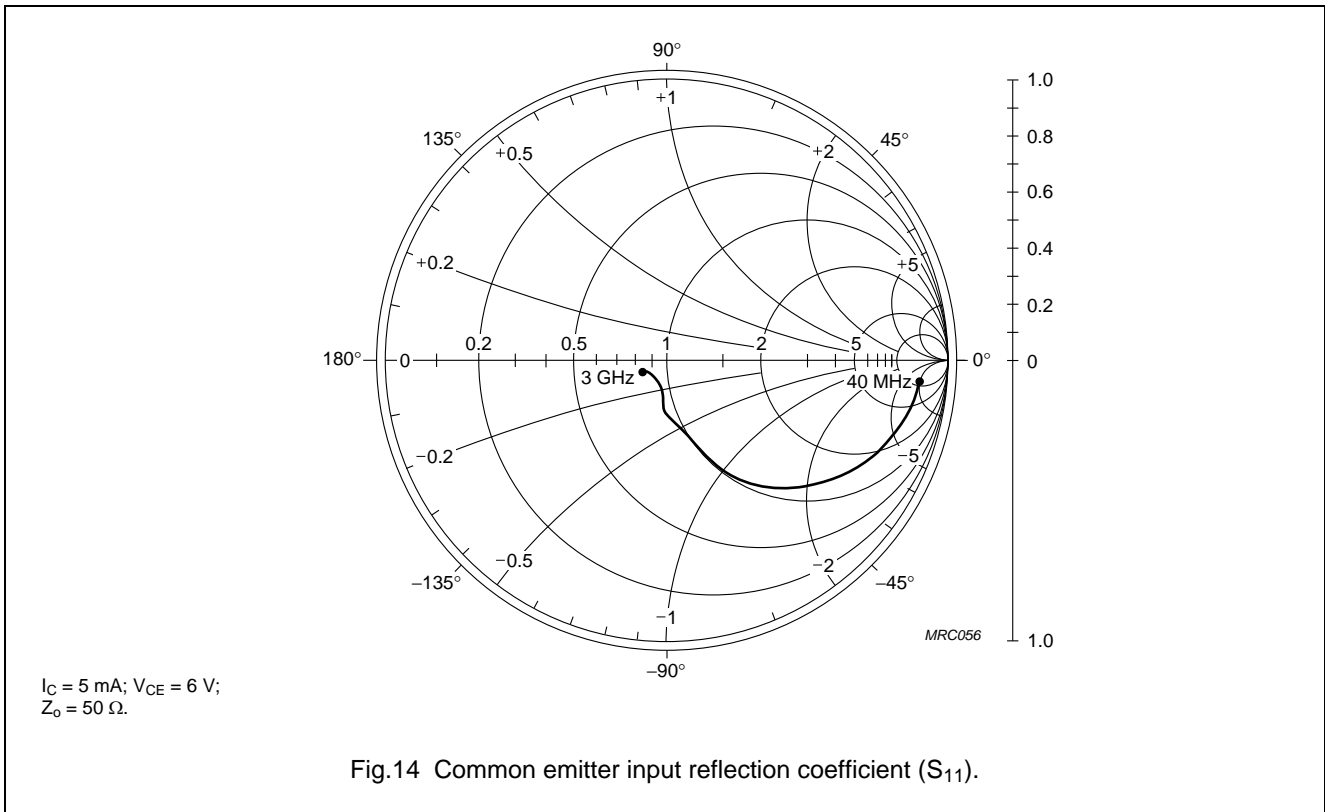
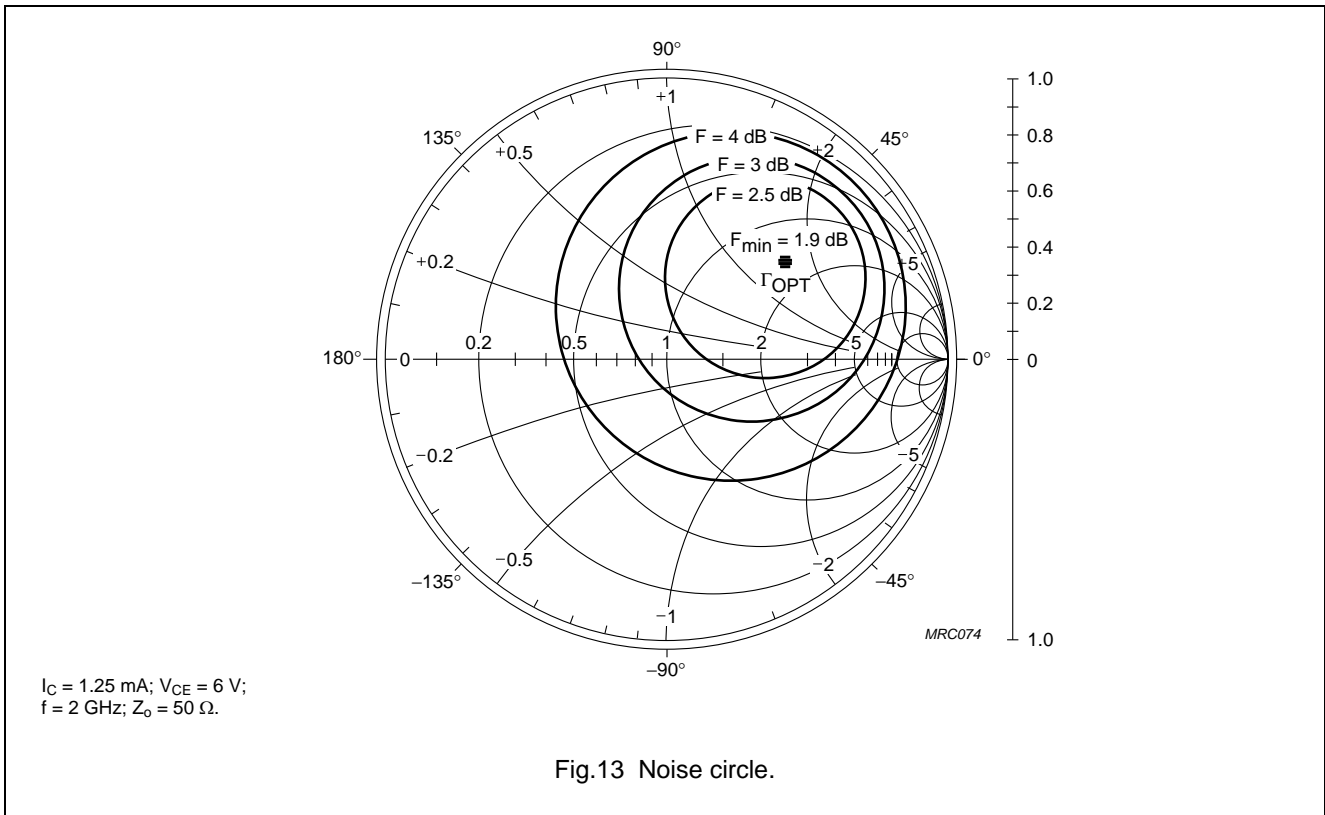
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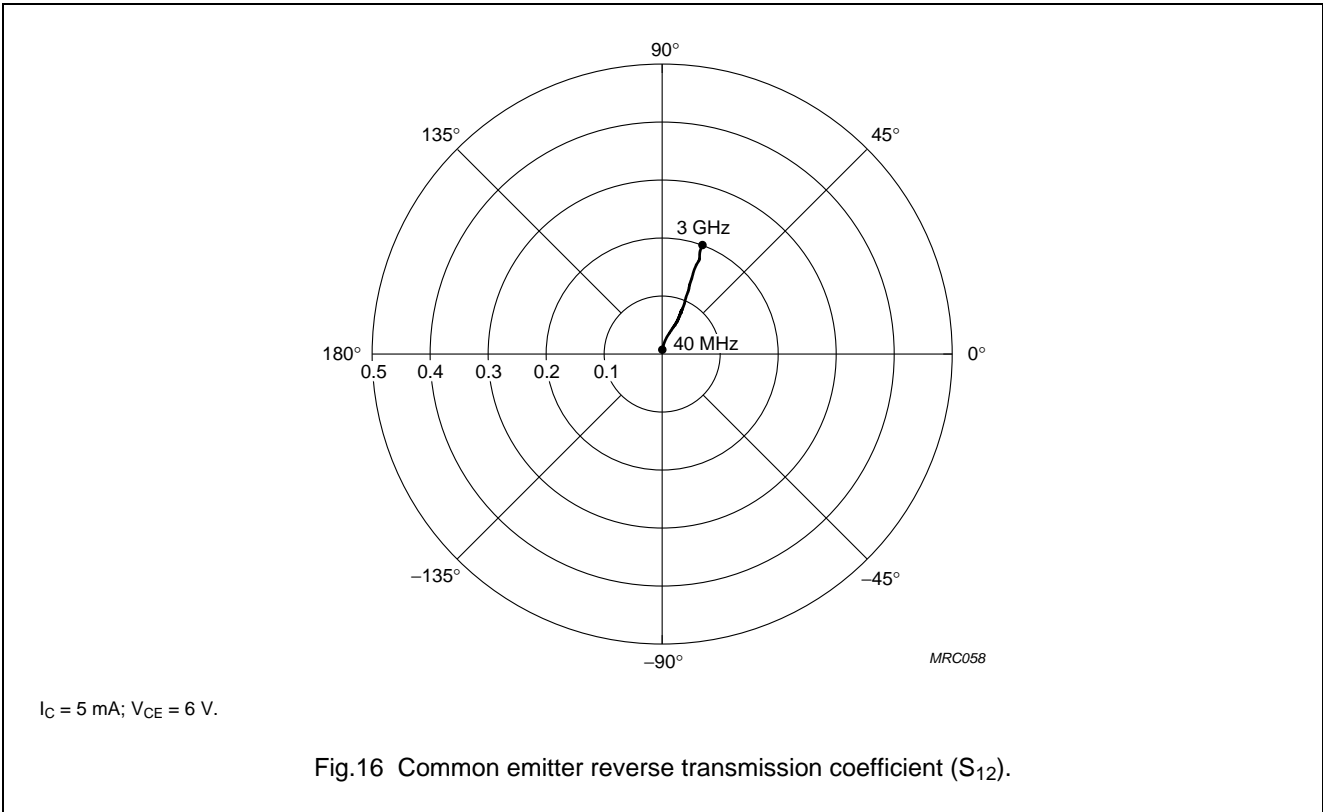
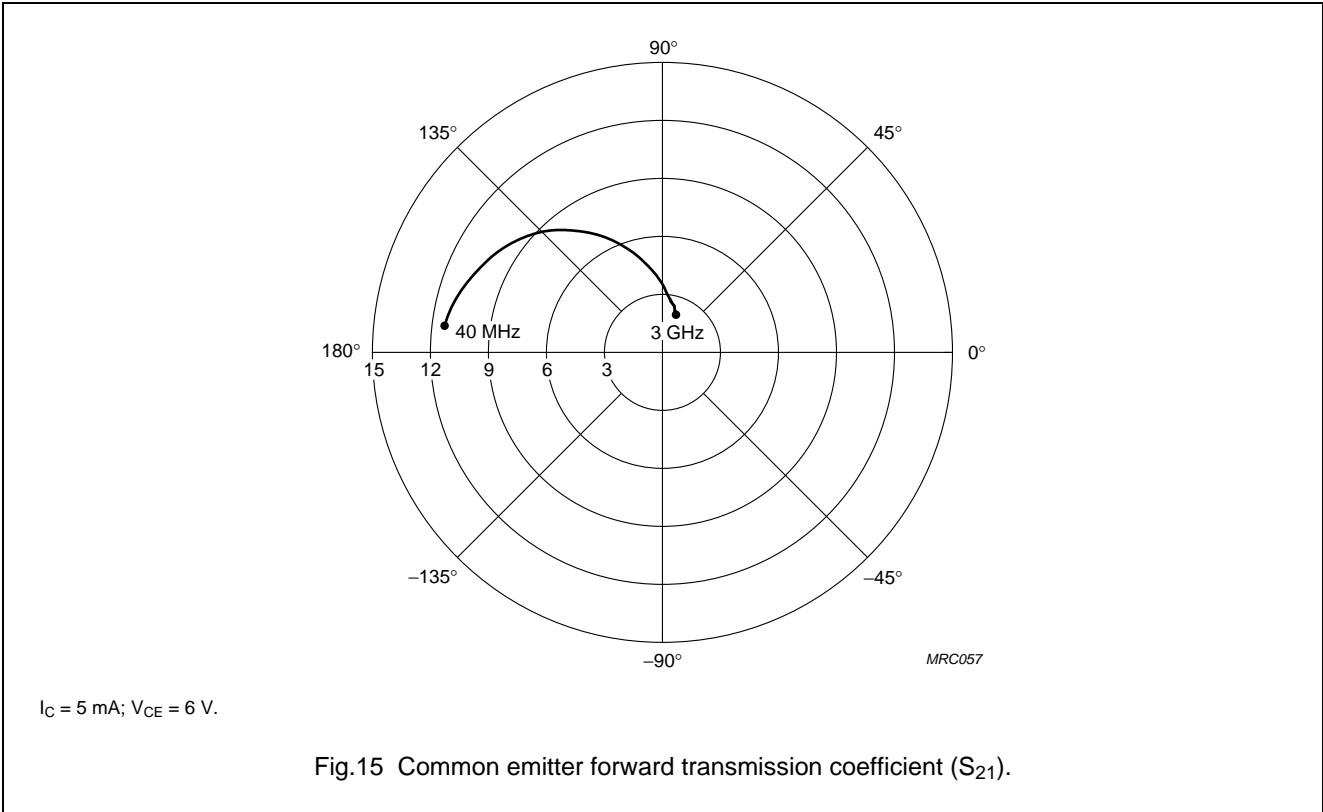
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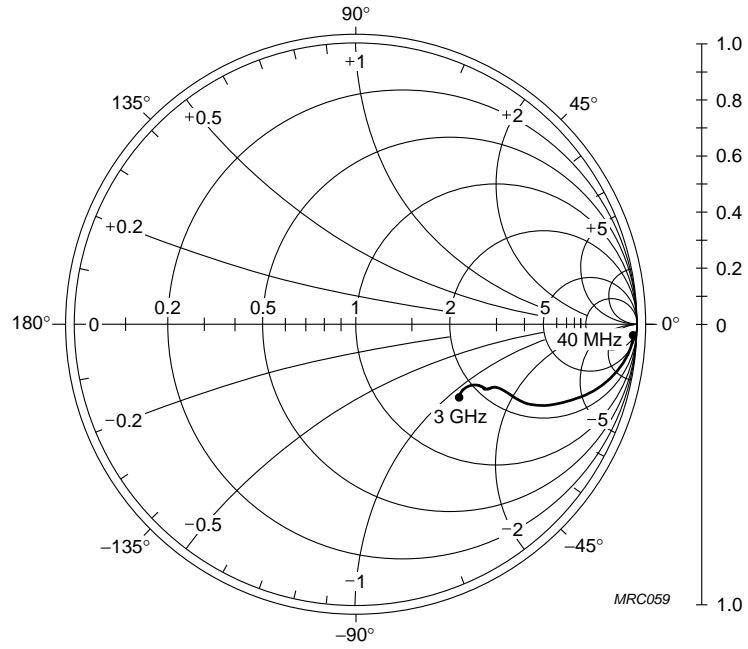
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$I_C = 5 \text{ mA}; V_{CE} = 6 \text{ V};$   
 $Z_0 = 50 \Omega.$

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

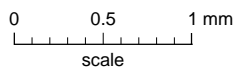
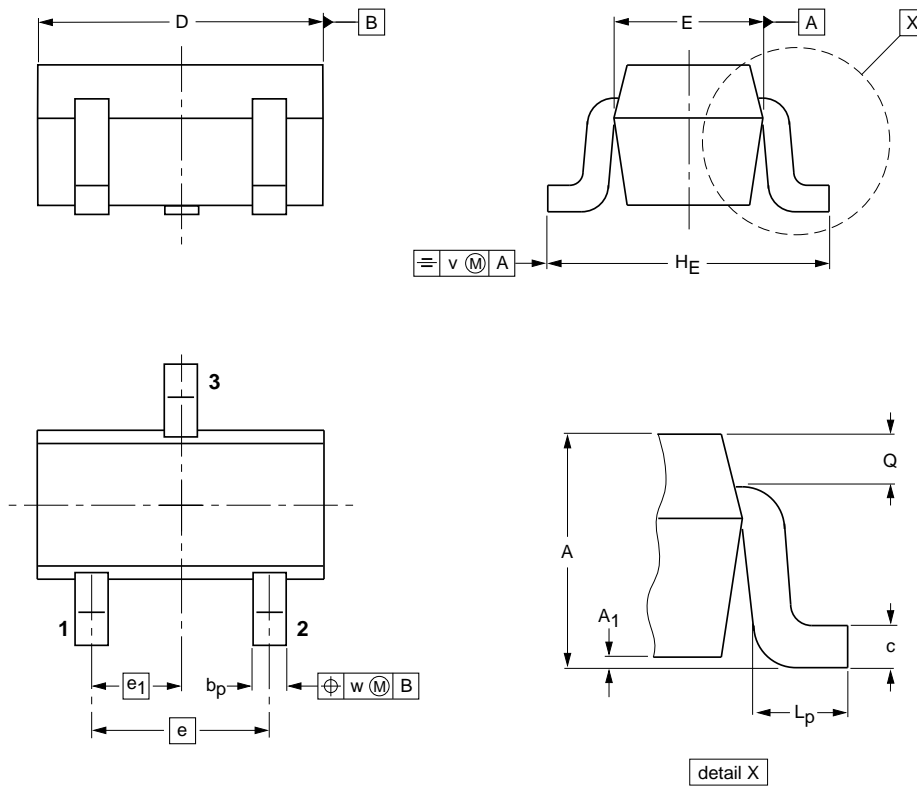
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PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads

SOT416



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	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

## NPN 9 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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