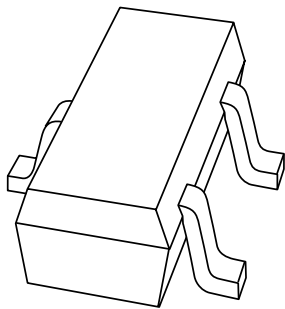


# DATA SHEET



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

Product specification  
Supersedes data of 1999 Feb 11

2000 Mar 14

## 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.

## APPLICATIONS

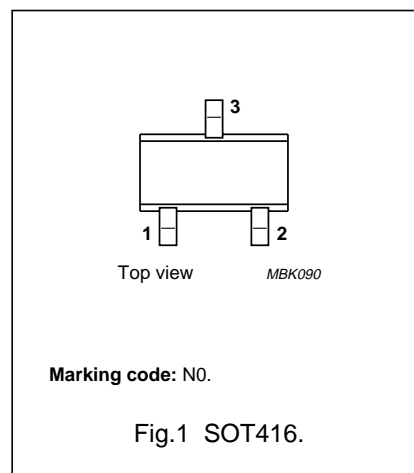
Low power amplifiers, oscillators and mixers particularly in RF portable communication equipment (cellular phones, cordless phones and pagers) up to 2 GHz.

## DESCRIPTION

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

## PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



## 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

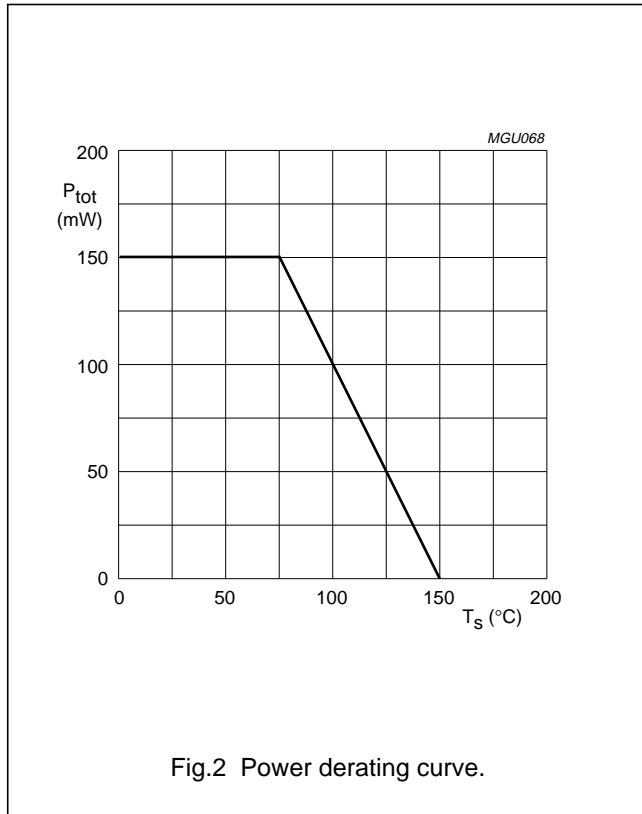
1.  $T_s$  is the temperature at the soldering point of the collector pin.

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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	$I_C = 0$ ; $V_{CB} = 0.5\text{ V}$ ; $f = 1\text{ MHz}$	–	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

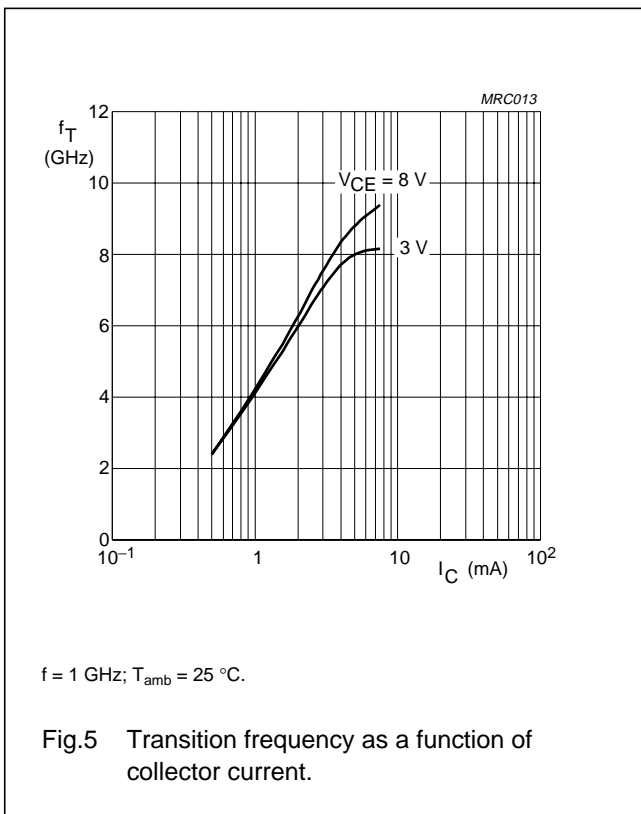
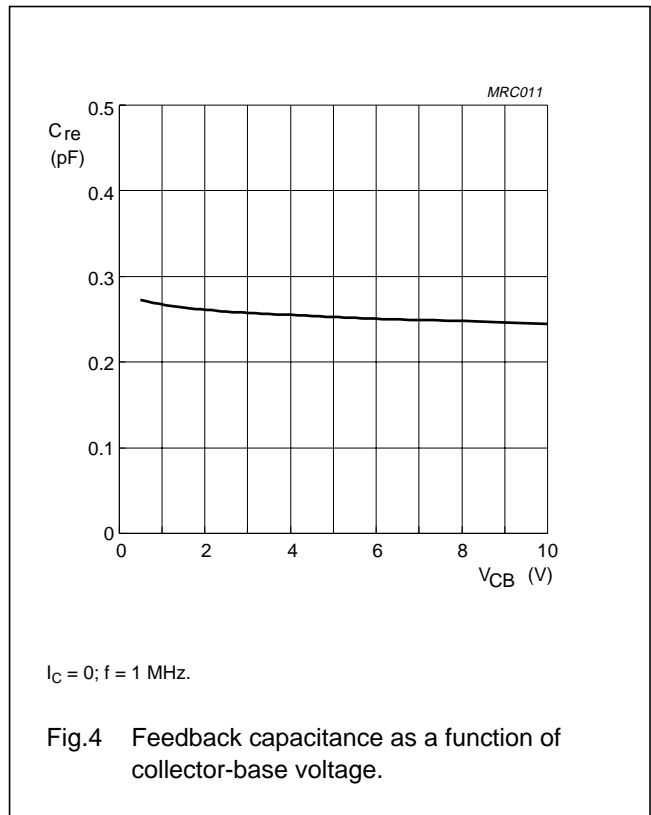
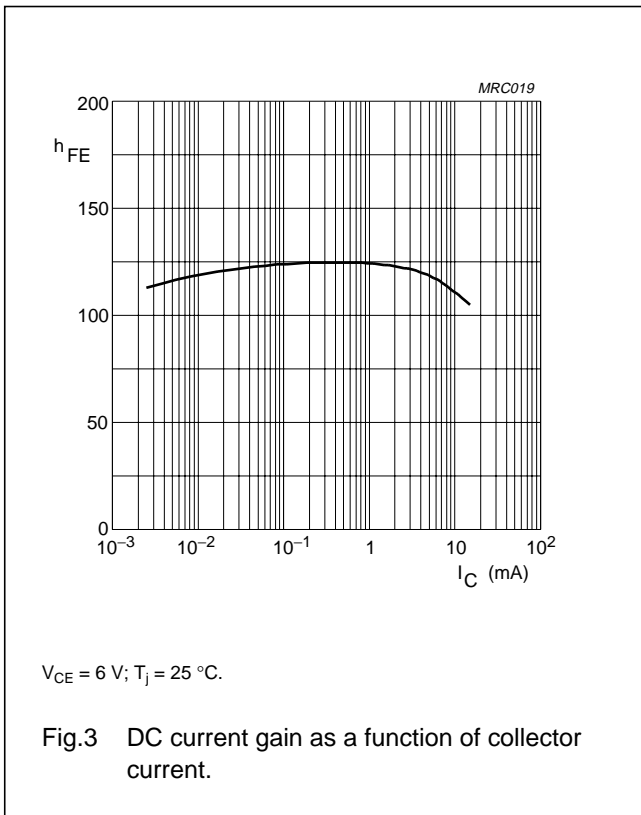
1.  $G_{UM}$  is the maximum unilateral power gain, assuming  $S_{12}$  is zero and

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

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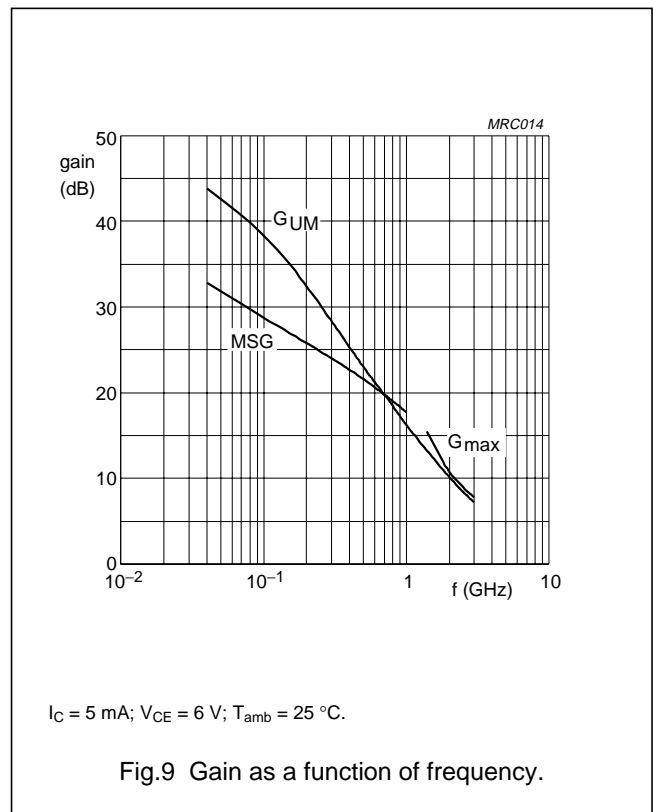
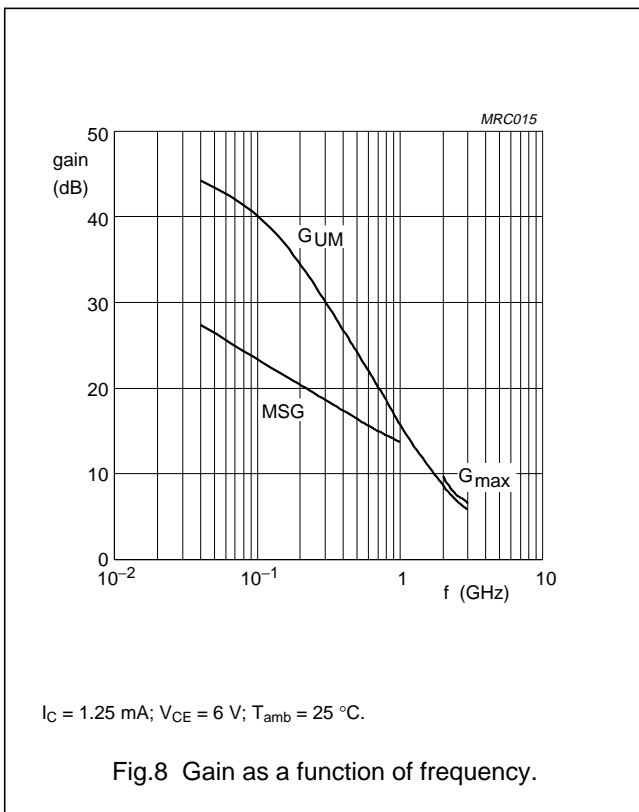
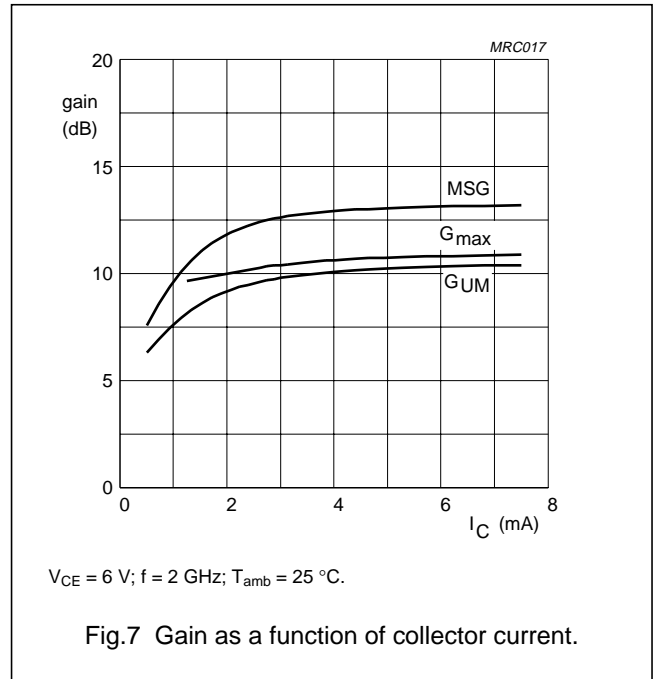
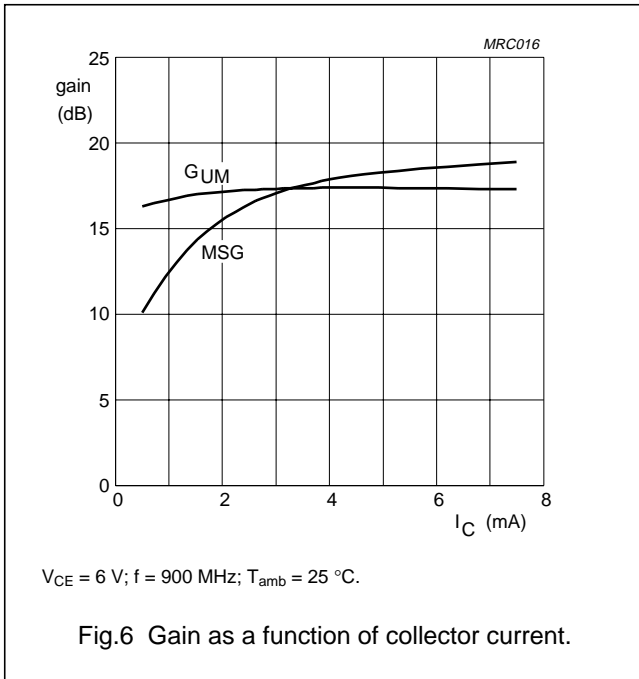
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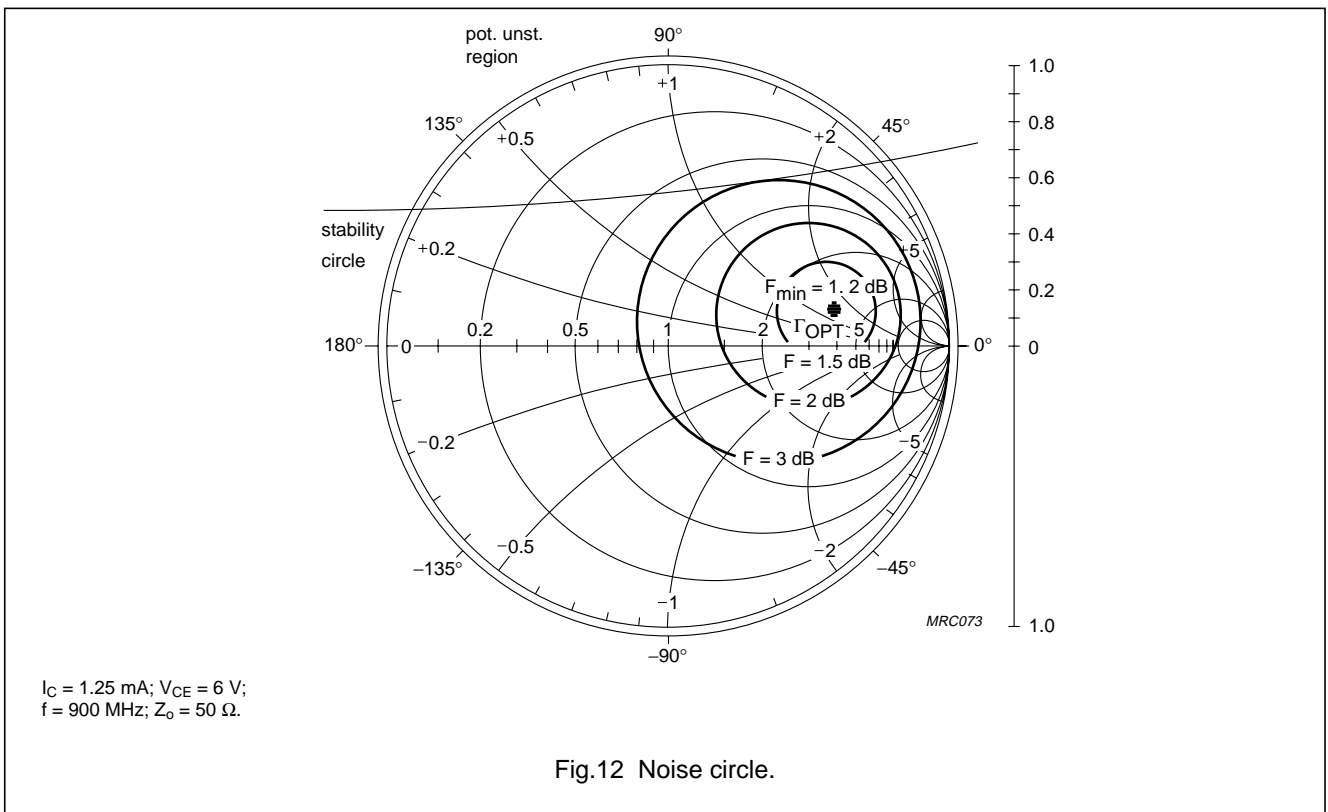
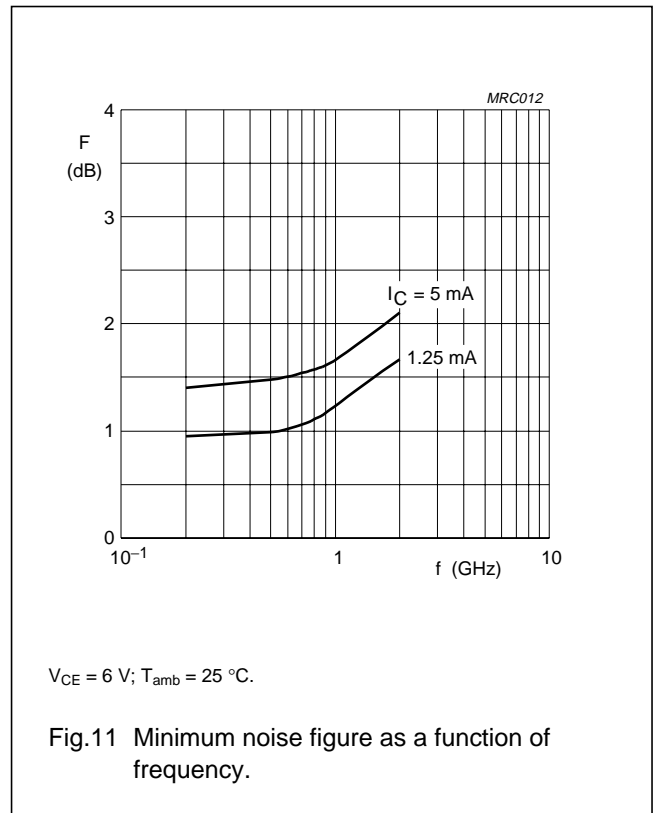
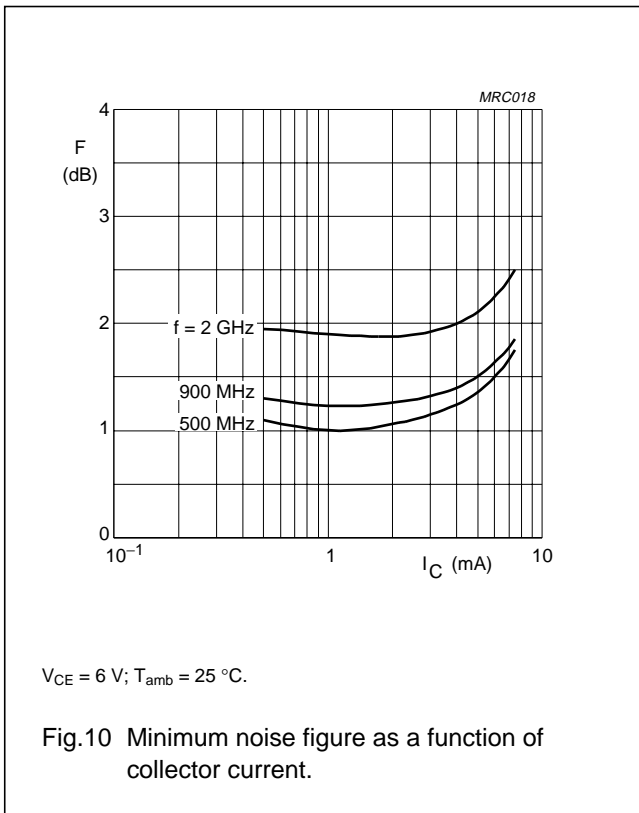
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In Figs 6 to 9,  $G_{UM}$  = maximum unilateral power gain;  $MSG$  = maximum stable gain;  $G_{max}$  = maximum available gain.



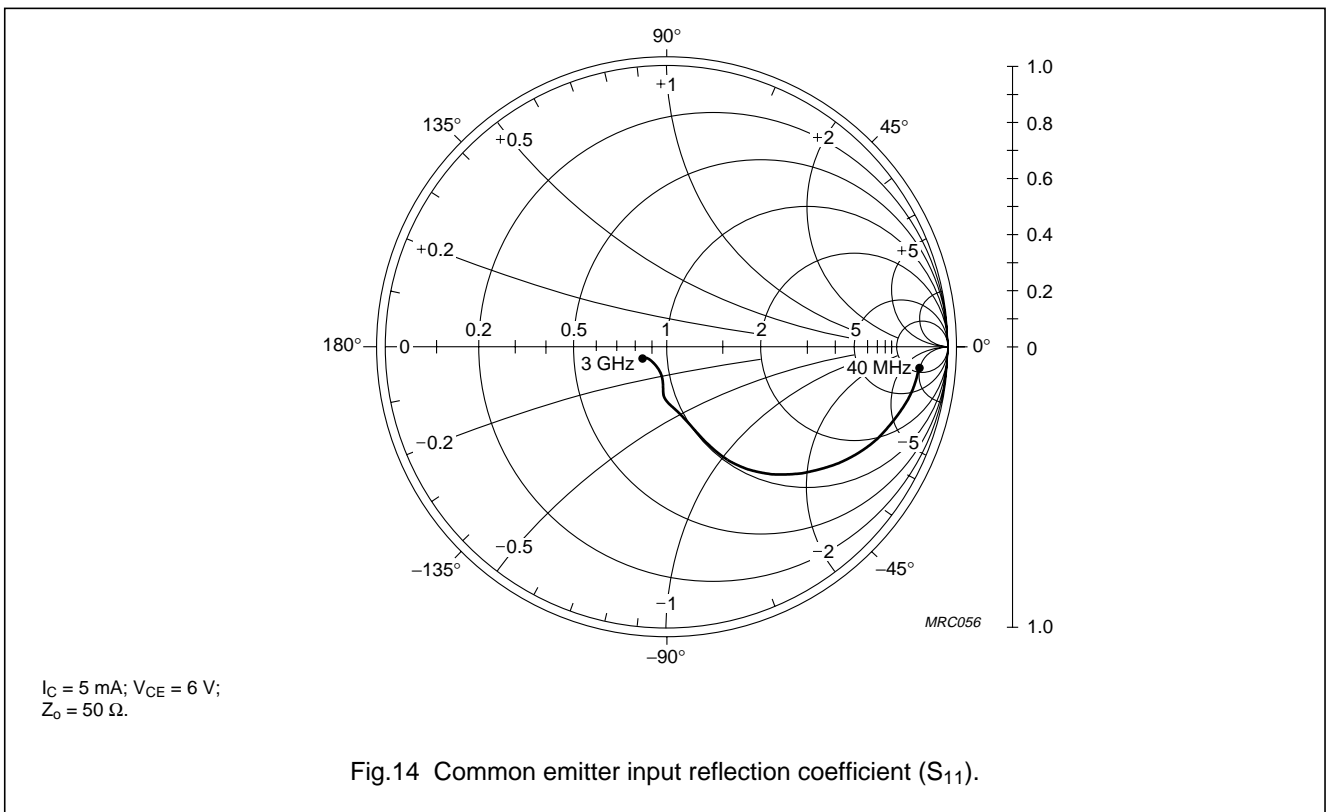
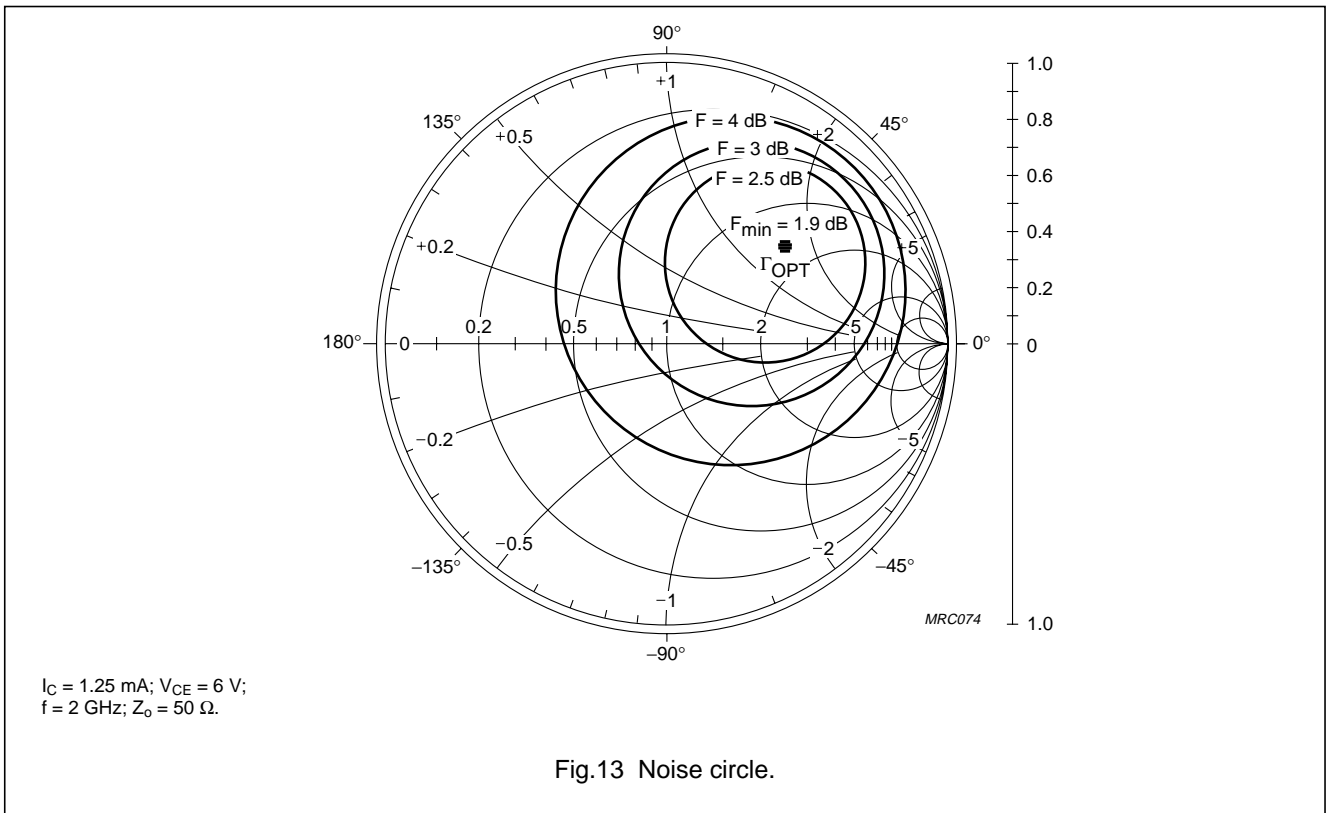
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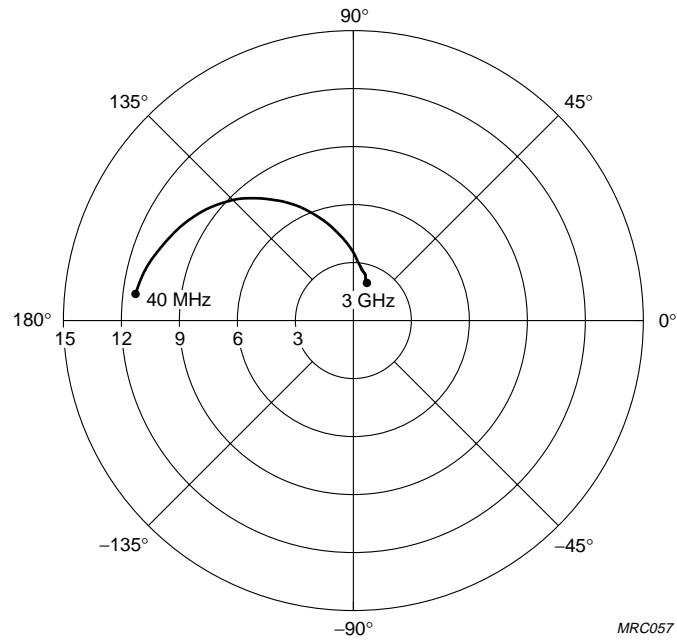
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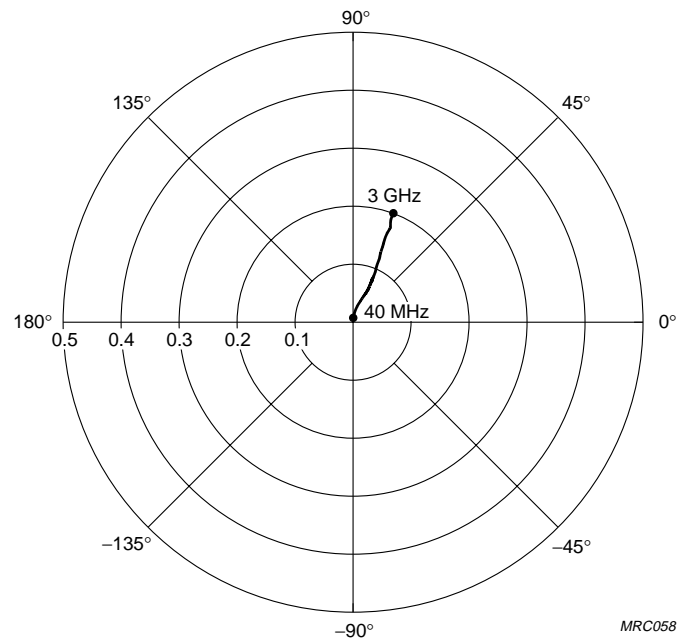
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$I_C = 5 \text{ mA}; V_{CE} = 6 \text{ V}.$

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

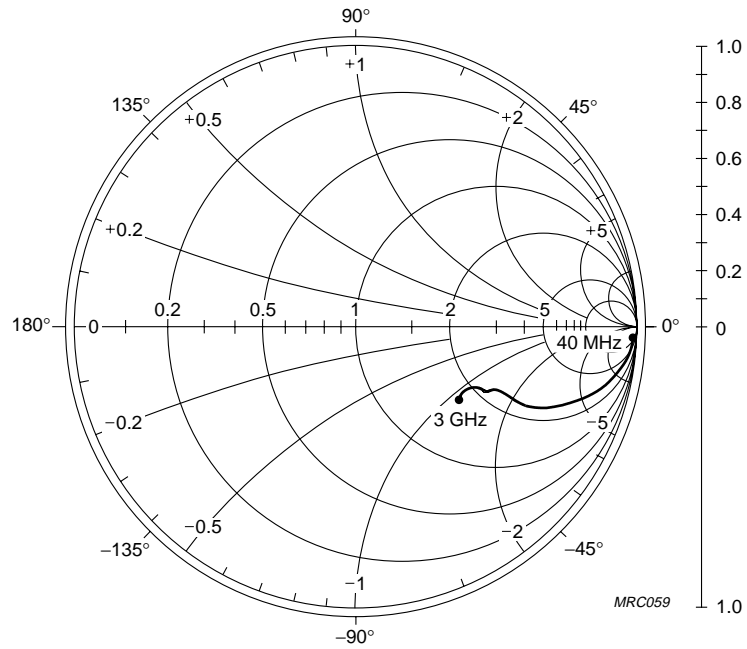


$I_C = 5 \text{ mA}; V_{CE} = 6 \text{ V}.$

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

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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 ( $S_{22}$ ).

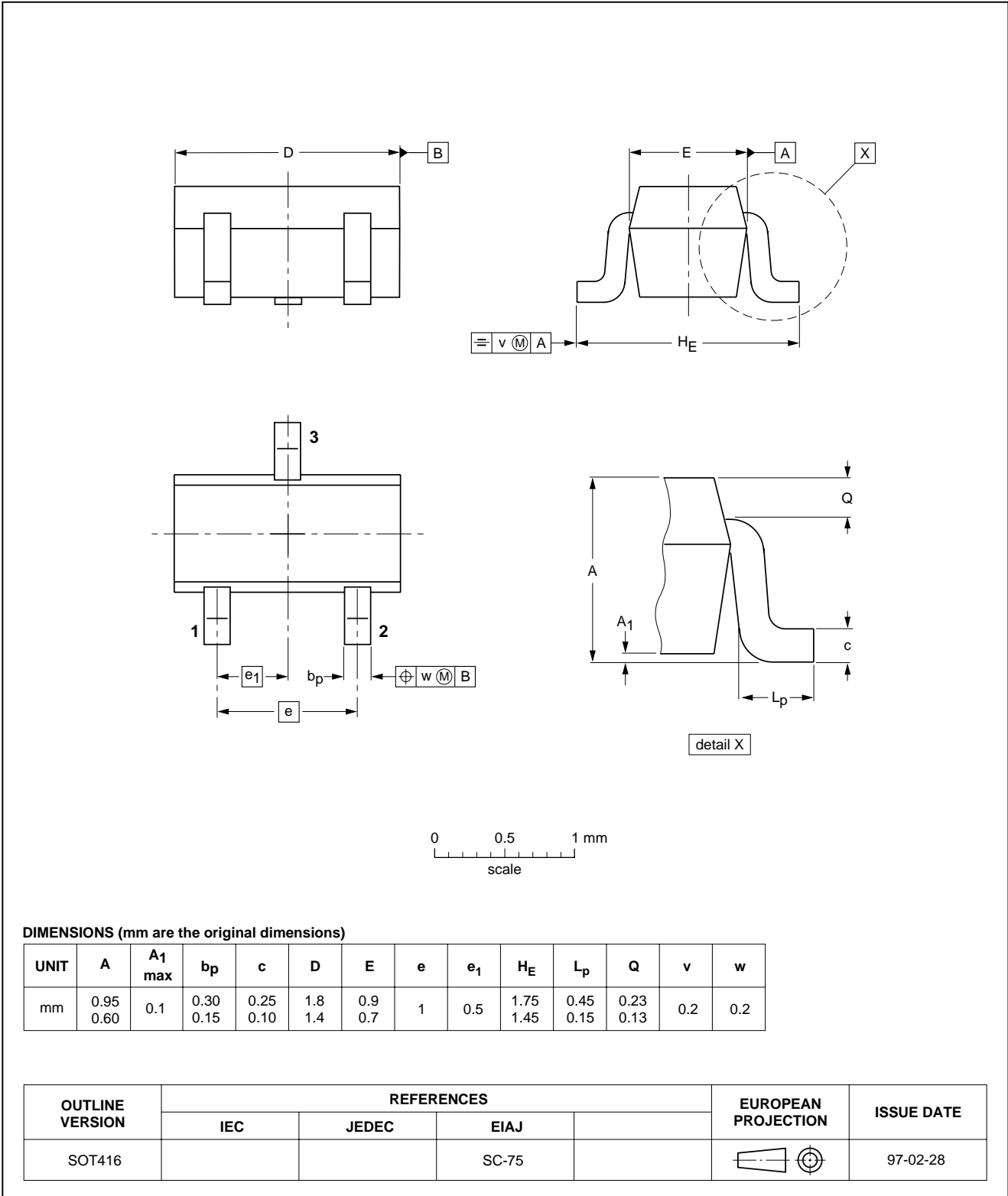
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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT416



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**DEFINITIONS**

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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