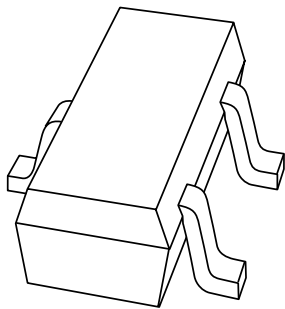


DATA SHEET



BFR505T NPN 9 GHz wideband transistor

Product specification
Supersedes data of 2000 Mar 14

2000 May 17

NPN 9 GHz wideband transistor

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FEATURES

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

APPLICATIONS

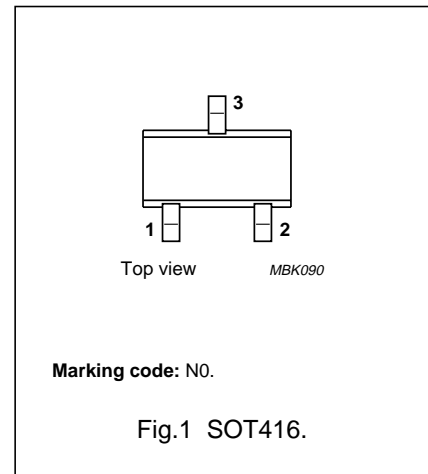
Low power amplifiers, oscillators and mixers particularly in RF portable communication equipment (cellular phones, cordless phones and pagers) up to 2 GHz.

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	$T_s \leq 75\text{ }^\circ\text{C}$; note 1	–	–	150	mW
h_{FE}	DC current gain	$I_C = 5\text{ mA}$; $V_{CE} = 6\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$	60	120	250	
f_T	transition frequency	$I_C = 5\text{ mA}$; $V_{CE} = 6\text{ V}$; $f = 1\text{ GHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$	–	9	–	GHz
G_{UM}	maximum unilateral power gain	$I_C = 5\text{ mA}$; $V_{CE} = 6\text{ V}$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$	–	17	–	dB
F	noise figure	$I_C = 1.25\text{ mA}$; $V_{CE} = 6\text{ V}$; $f = 900\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$	–	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	$T_s \leq 75\text{ }^\circ\text{C}$; note 1	–	150	mW
T_{stg}	storage temperature		–65	+150	$^\circ\text{C}$
T_j	junction temperature		–	150	$^\circ\text{C}$

Note

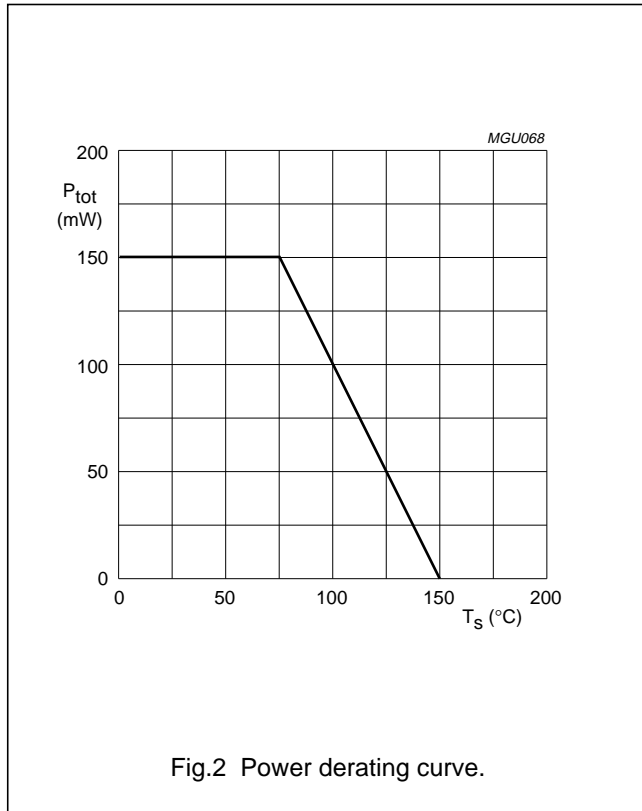
1. T_s is the temperature at the soldering point of the collector pin.

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THERMAL RESISTANCE

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



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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

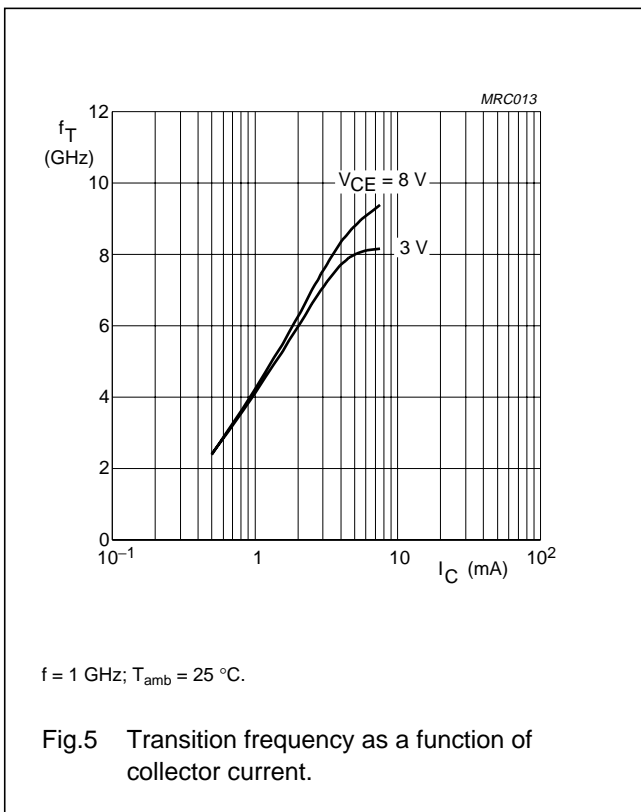
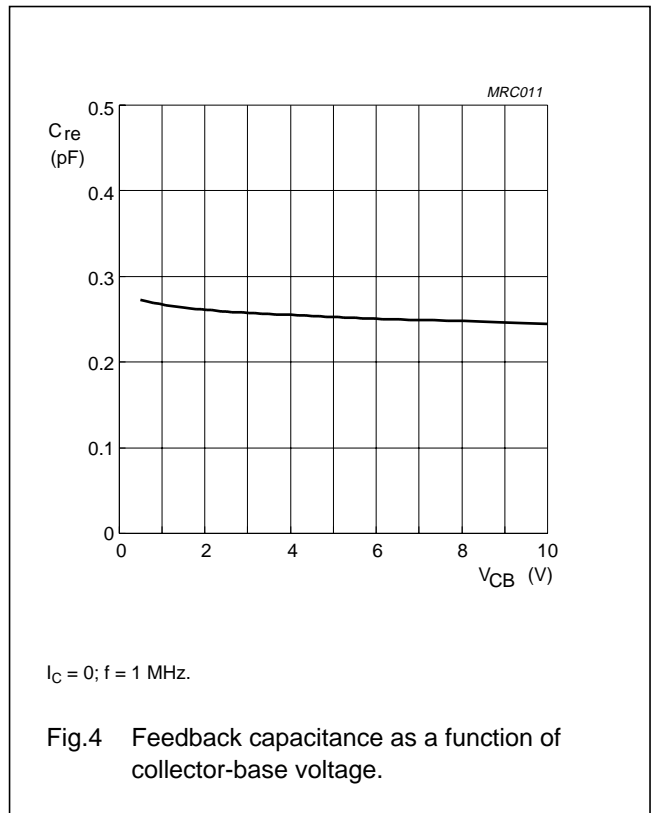
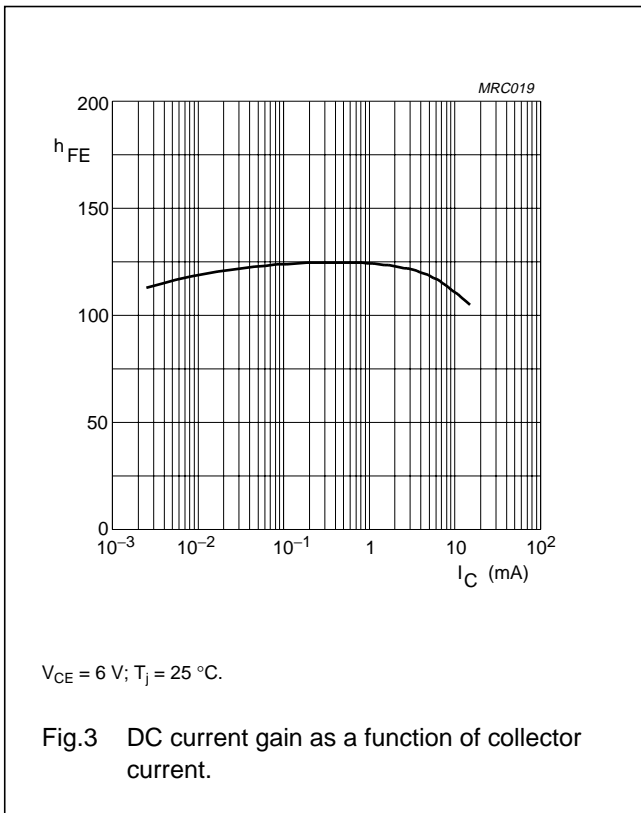
1. G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and

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

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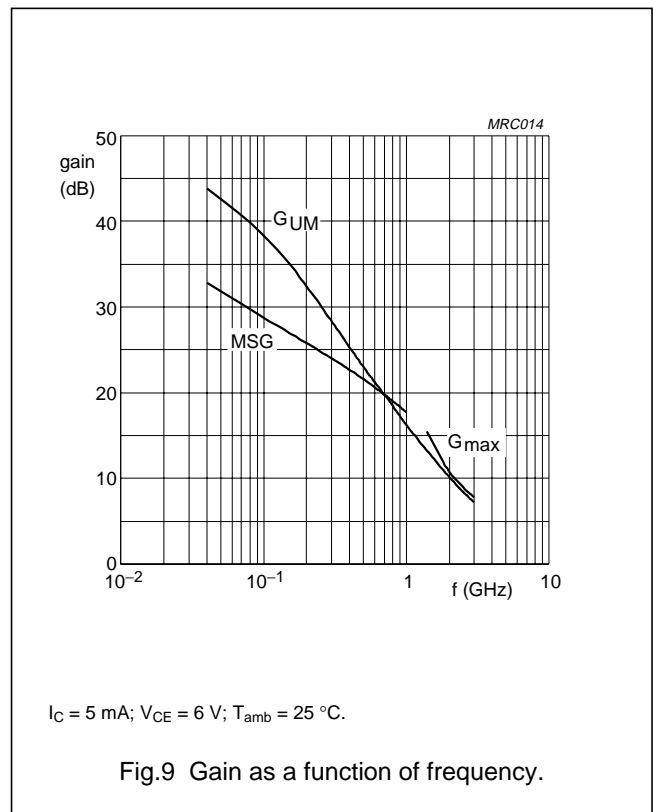
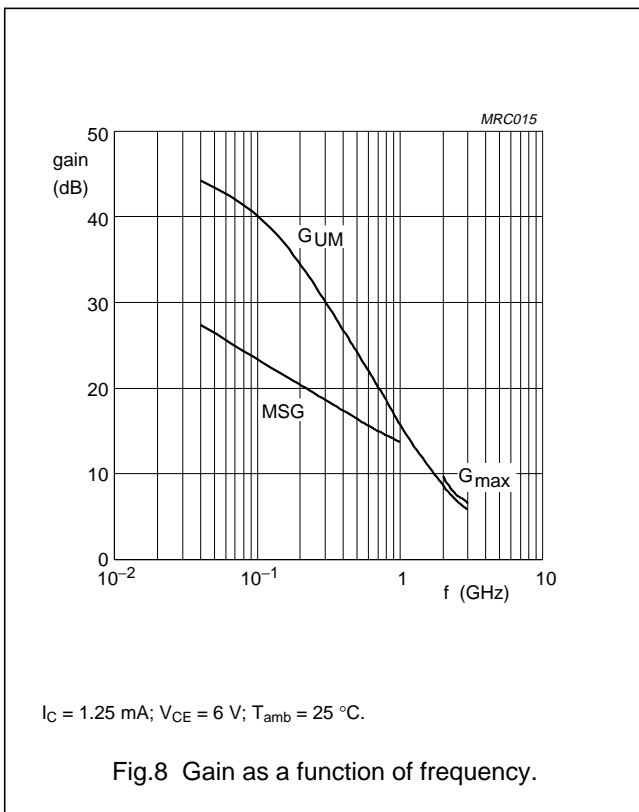
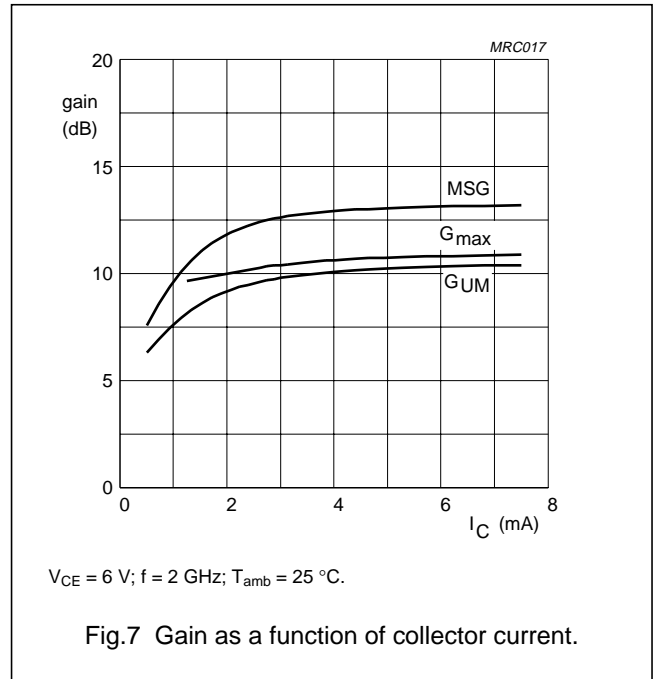
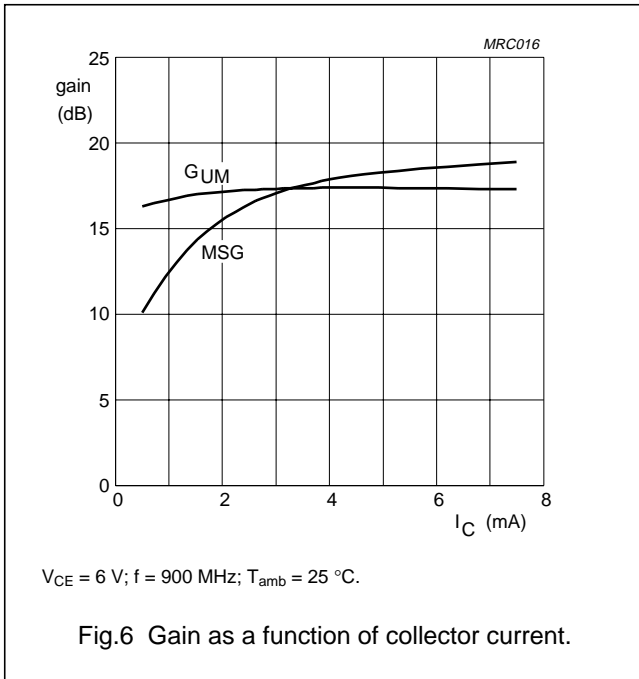
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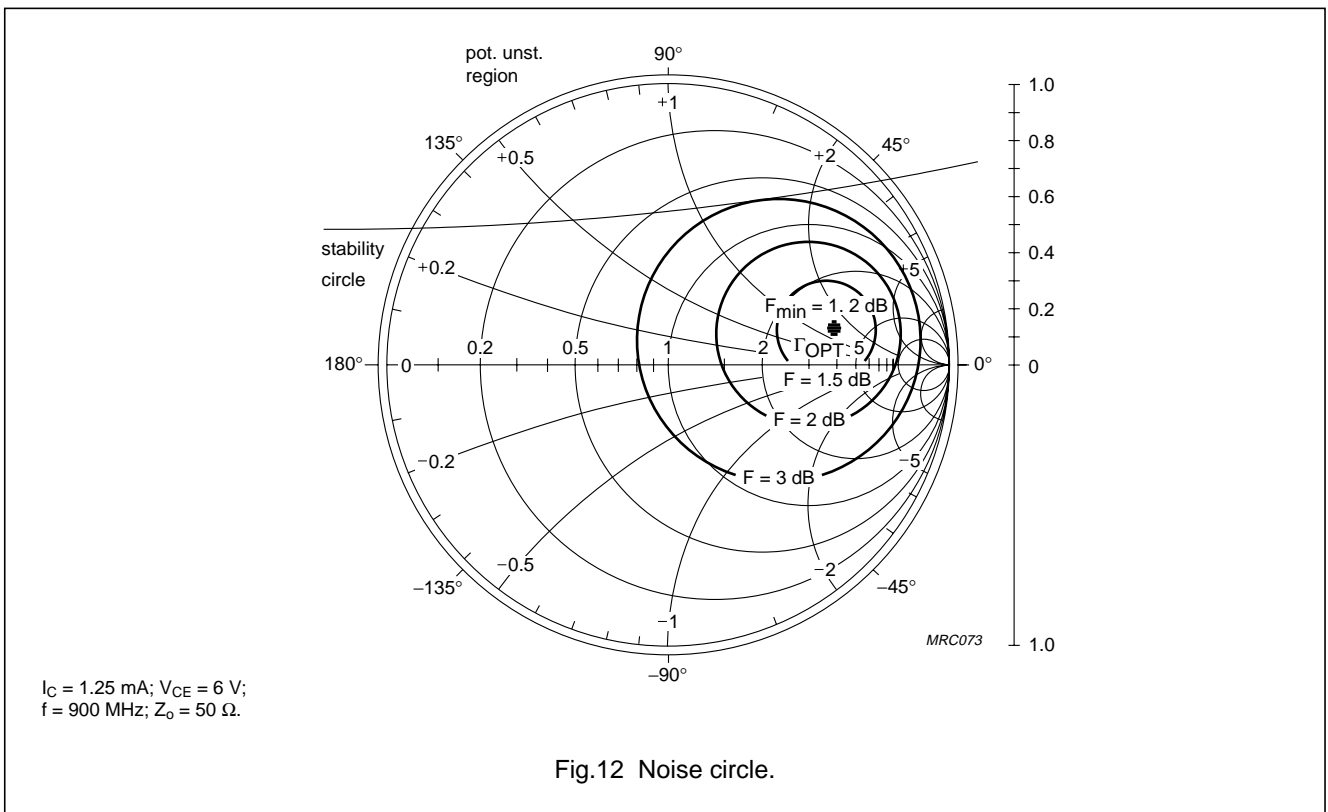
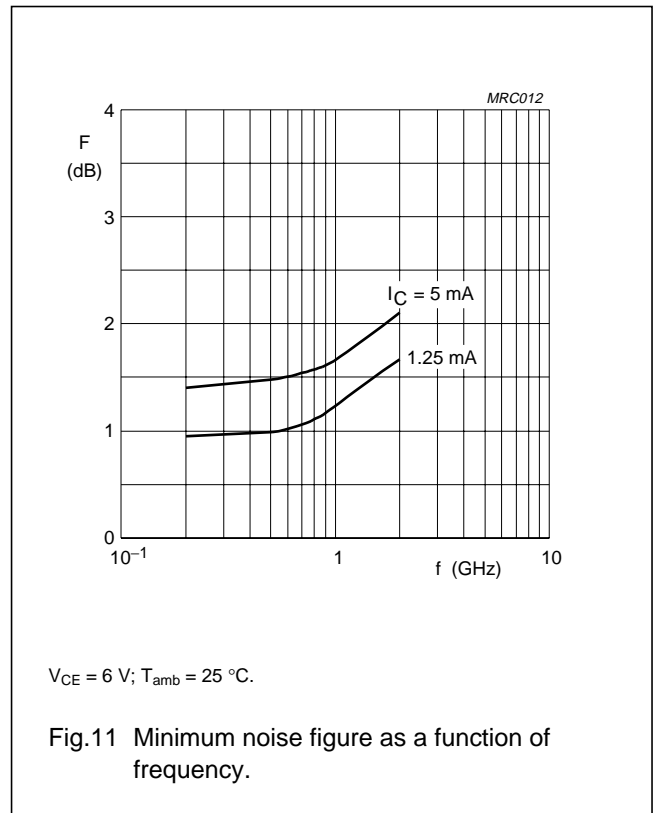
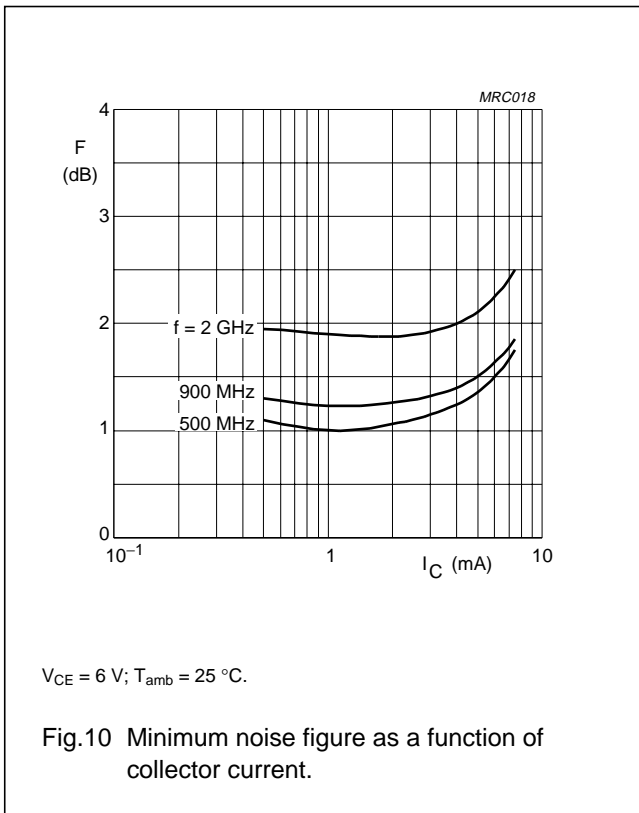
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In Figs 6 to 9, G_{UM} = maximum unilateral power gain; MSG = maximum stable gain; G_{max} = maximum available gain.



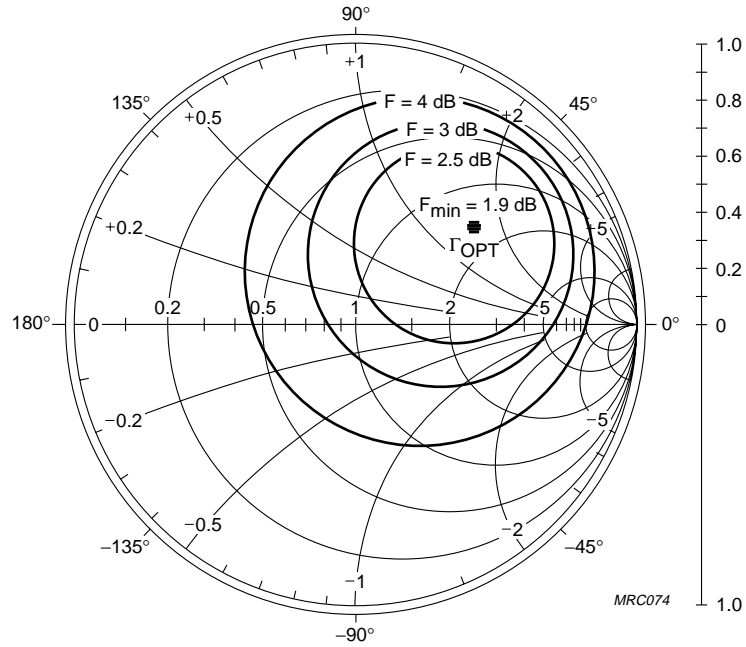
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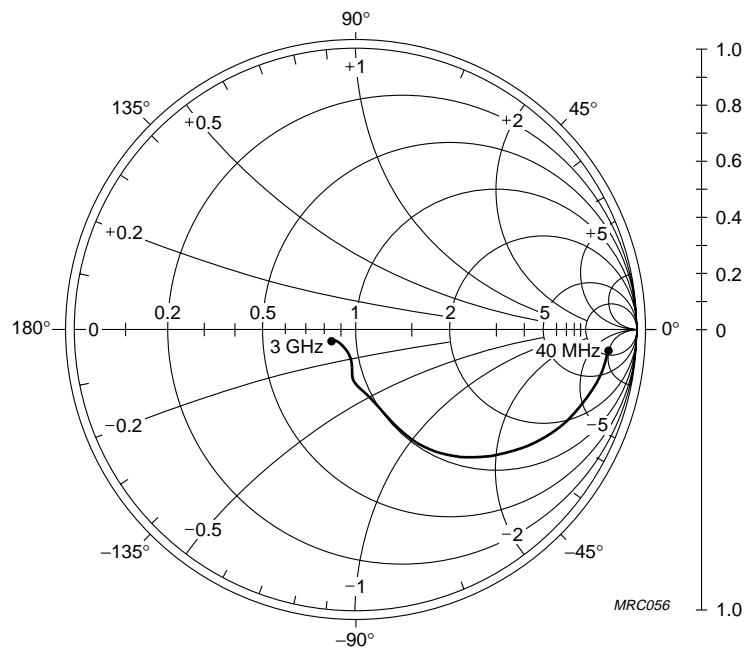
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$I_C = 1.25 \text{ mA}$; $V_{CE} = 6 \text{ V}$;
 $f = 2 \text{ GHz}$; $Z_o = 50 \Omega$.

Fig.13 Noise circle.

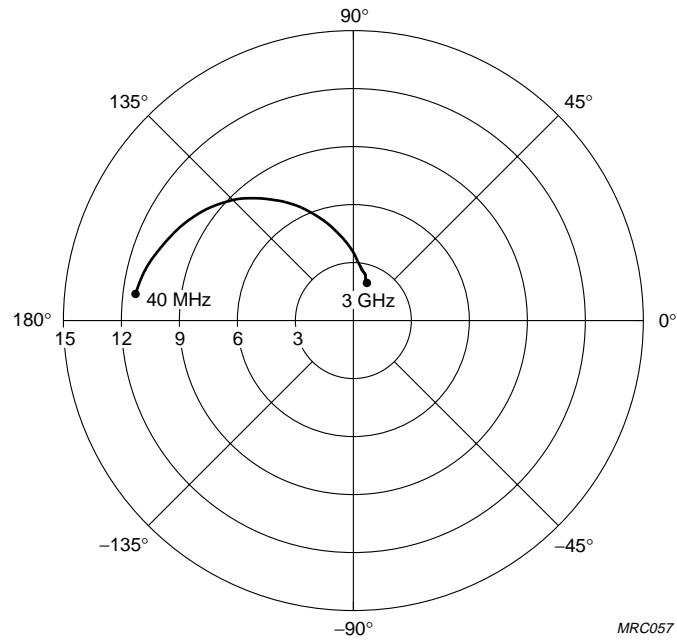


$I_C = 5 \text{ mA}$; $V_{CE} = 6 \text{ V}$;
 $Z_o = 50 \Omega$.

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

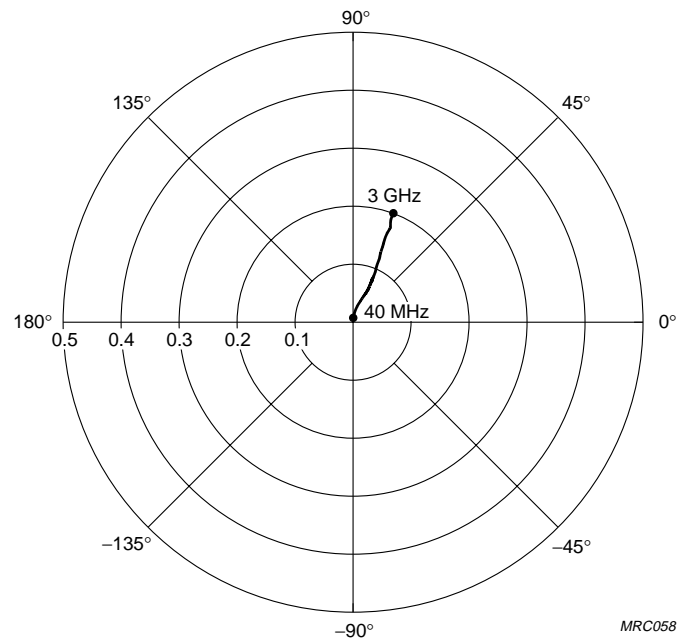
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$I_C = 5 \text{ mA}; V_{CE} = 6 \text{ V}.$

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

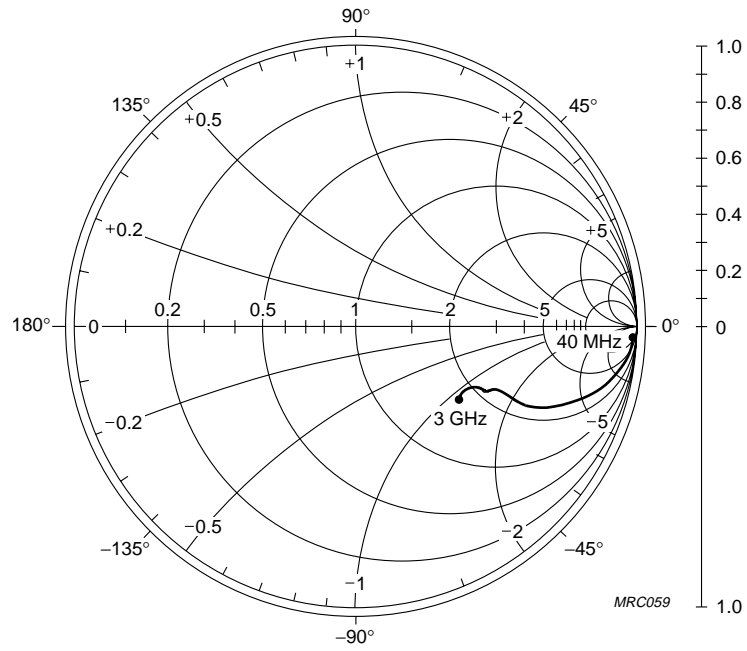


$I_C = 5 \text{ mA}; V_{CE} = 6 \text{ V}.$

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}).

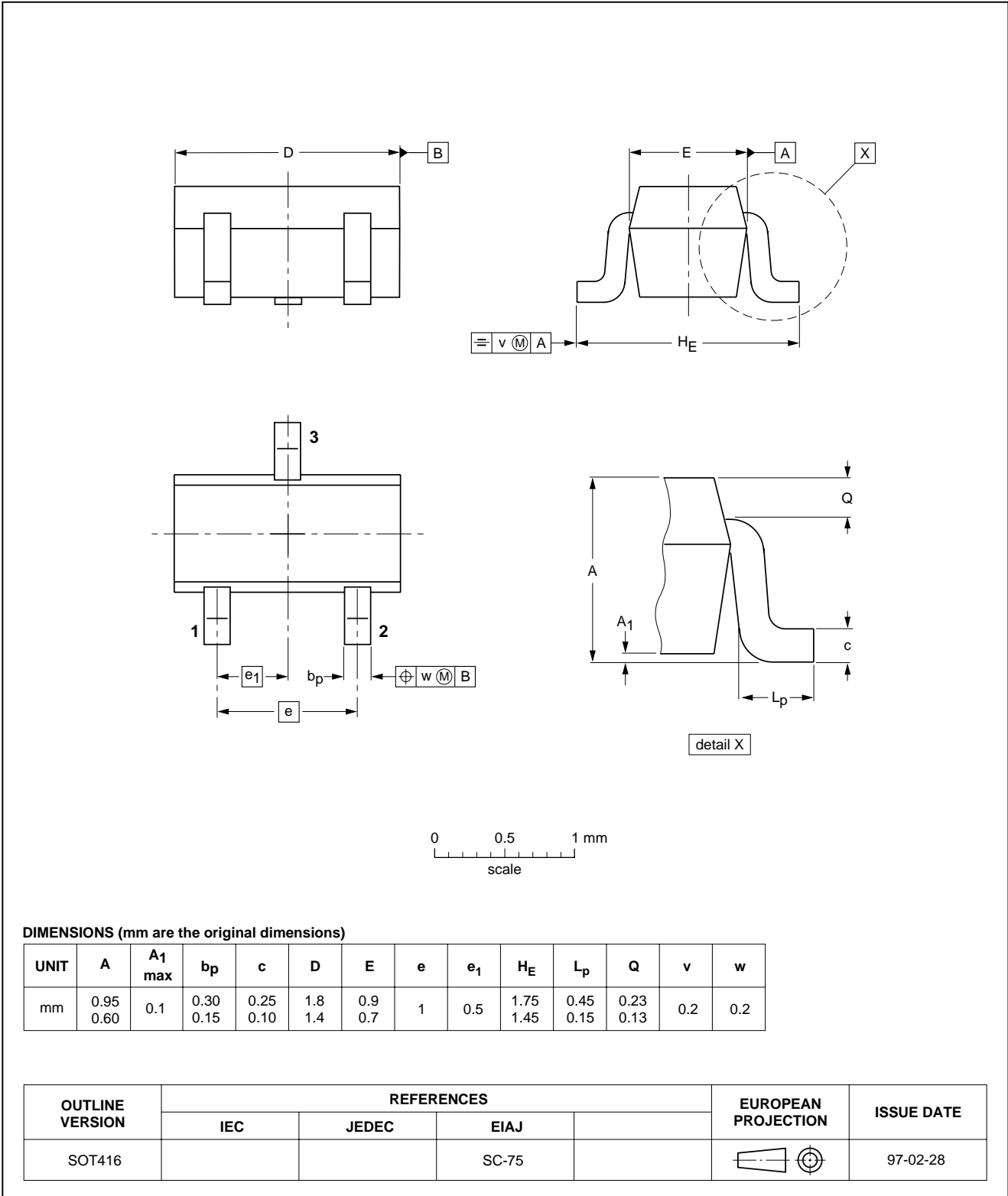
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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT416



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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.
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NOTES

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