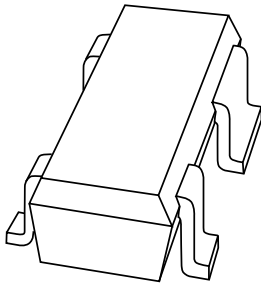


# DATA SHEET



## **BGA2001** Silicon MMIC amplifier

Product specification  
Supersedes data of 1999 Jul 23

1999 Aug 11



# Silicon MMIC amplifier

# BGA2001

## FEATURES

- Low current, low voltage
- Very high power gain
- Low noise figure
- Integrated temperature compensated biasing
- Supply and RF output pin combined.

## APPLICATIONS

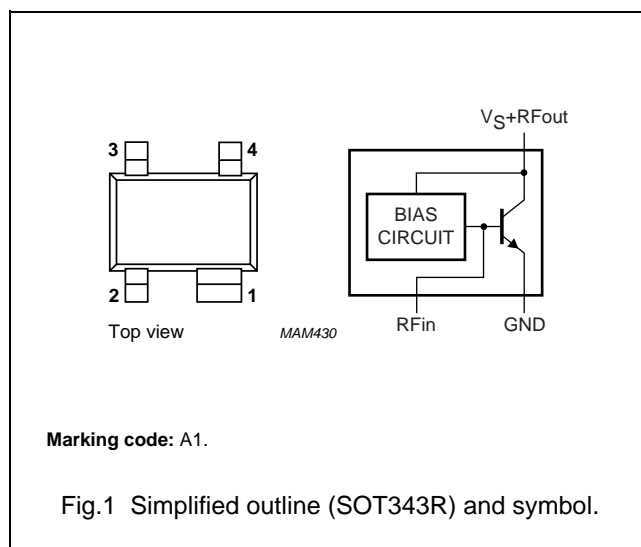
- RF front end
- Wideband applications, e.g. analog and digital cellular telephones, cordless telephones (PHS, DECT, etc.)
- Radar detectors
- Low noise amplifiers
- Satellite television tuners (SATV)
- High frequency oscillators.

## DESCRIPTION

Silicon MMIC amplifier consisting of an NPN double polysilicon transistor with integrated biasing for low voltage applications in a plastic, 4-pin dual-emitter SOT343R package.

## PINNING

PIN	DESCRIPTION
1	GND
2	RF in
3	GND
4	V <sub>S</sub> + RFout



## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V <sub>S</sub>	DC supply voltage	RF input AC coupled	–	4.5	V
I <sub>S</sub>	DC supply current	V <sub>V<sub>S</sub>-OUT</sub> = 2.5 V; RF input AC coupled	4.5	–	mA
MSG	maximum stable gain	V <sub>V<sub>S</sub>-OUT</sub> = 2.5 V; f = 1.8 GHz; T <sub>amb</sub> = 25 °C	19.5	–	dB
NF	noise figure	V <sub>V<sub>S</sub>-OUT</sub> = 2.5 V; f = 1.8 GHz; Γ <sub>S</sub> = Γ <sub>opt</sub>	1.3	–	dB

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**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_S$	supply voltage	RF input AC coupled	–	4.5	V
$I_S$	supply current (DC)	forced by DC voltage on RF input	–	30	mA
$P_{tot}$	total power dissipation	$T_s \leq 100\text{ °C}$	–	135	mW
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	operating junction temperature		–	150	°C

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	350	K/W

**CHARACTERISTICS**RF input AC coupled;  $T_j = 25\text{ °C}$ ; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_S$	supply current	$V_{VS-OUT} = 1\text{ V}$	–	0.7	–	mA
		$V_{VS-OUT} = 2.5\text{ V}$	3	4.5	6	mA
		$V_{VS-OUT} = 4.5\text{ V}$	–	11	–	mA
MSG	maximum stable gain	$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 4\text{ mA}$ ; $f = 900\text{ MHz}$	–	22	–	dB
		$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 4\text{ mA}$ ; $f = 1.8\text{ GHz}$	–	19.5	–	dB
$ s_{21} ^2$	insertion power gain	$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 4\text{ mA}$ ; $f = 900\text{ MHz}$	–	18	–	dB
		$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 4\text{ mA}$ ; $f = 1.8\text{ GHz}$	–	14	–	dB
$P_L$	load power	at 1 dB gain compression point; $V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 4.4\text{ mA}$ ; $f = 900\text{ MHz}$ ;	–	–2	–	dBm
NF	noise figure	$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 4\text{ mA}$ ; $f = 900\text{ MHz}$ ; $\Gamma_S = \Gamma_{opt}$	–	1.3	–	dB
		$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 4\text{ mA}$ ; $f = 1.8\text{ GHz}$ ; $\Gamma_S = \Gamma_{opt}$	–	1.3	–	dB
IP3 <sub>(in)</sub>	input intercept point; note 1	$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 4.4\text{ mA}$ ; $f = 900\text{ MHz}$	–	–7.4	–	dBm
		$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 4.5\text{ mA}$ ; $f = 1800\text{ MHz}$	–	–4.5	–	dBm

**Note**

1. See application note: RNR-T45-99-B-0513.

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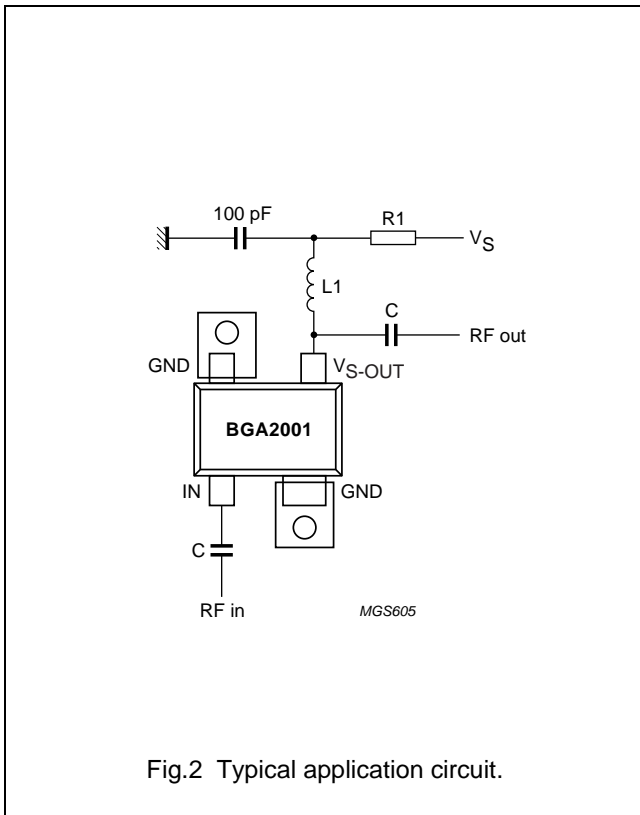


Fig.2 Typical application circuit.

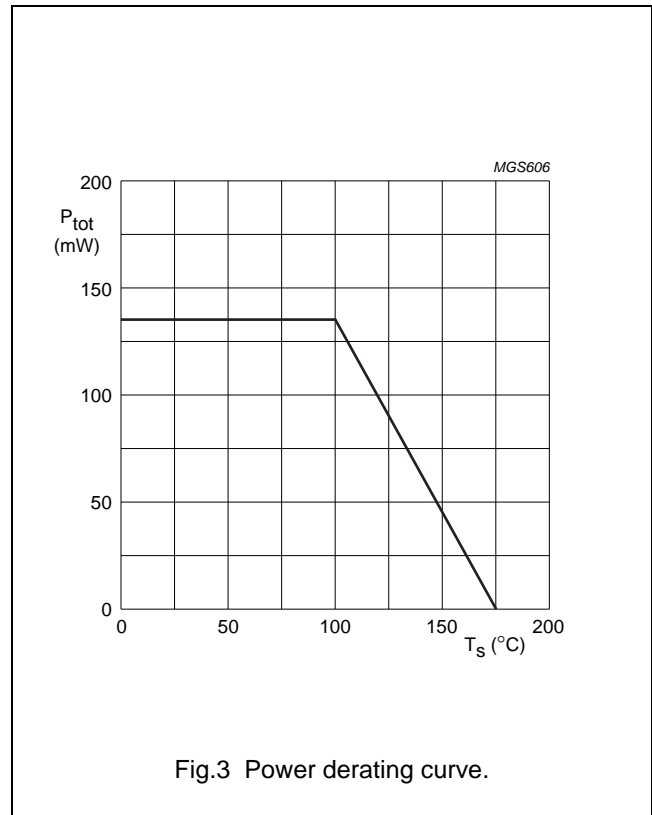
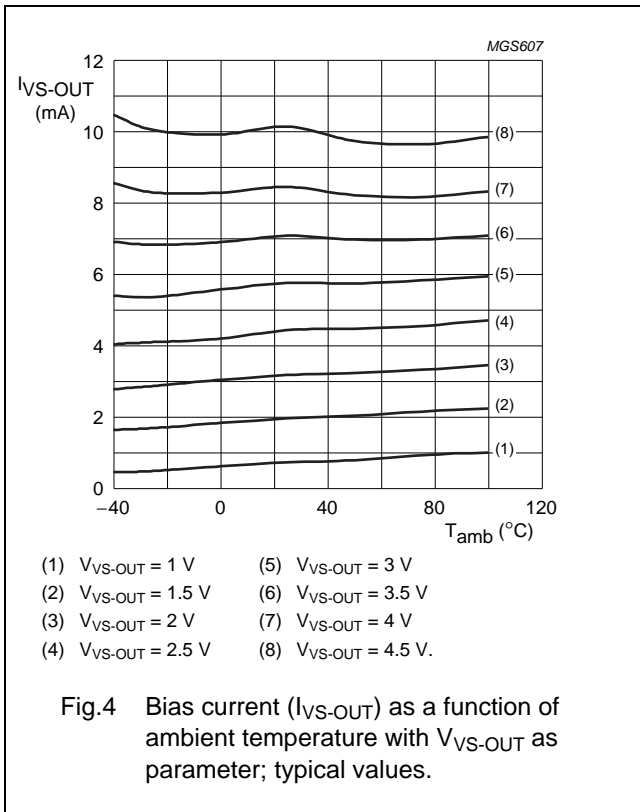


Fig.3 Power derating curve.



- (1) V<sub>VS-OUT</sub> = 1 V
- (2) V<sub>VS-OUT</sub> = 1.5 V
- (3) V<sub>VS-OUT</sub> = 2 V
- (4) V<sub>VS-OUT</sub> = 2.5 V
- (5) V<sub>VS-OUT</sub> = 3 V
- (6) V<sub>VS-OUT</sub> = 3.5 V
- (7) V<sub>VS-OUT</sub> = 4 V
- (8) V<sub>VS-OUT</sub> = 4.5 V.

Fig.4 Bias current (I<sub>VS-OUT</sub>) as a function of ambient temperature with V<sub>VS-OUT</sub> as parameter; typical values.

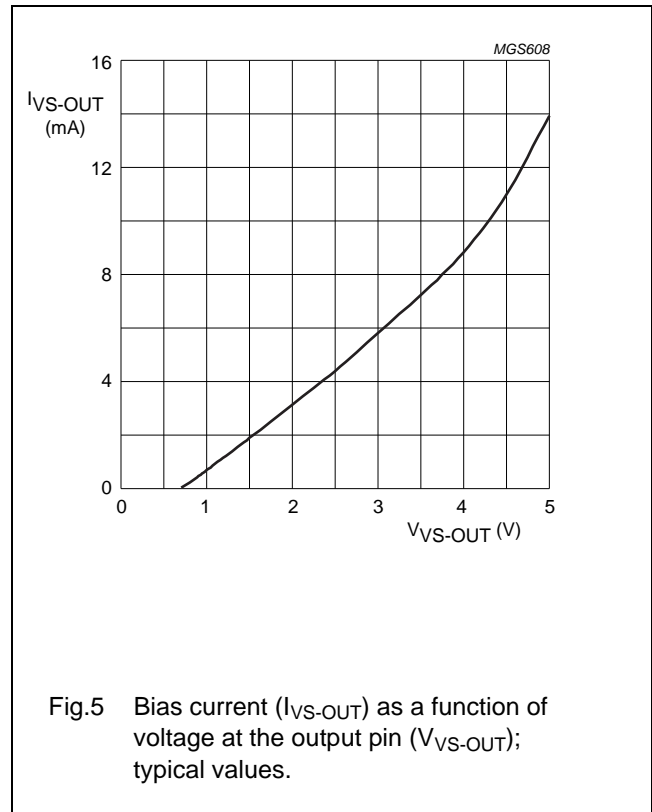
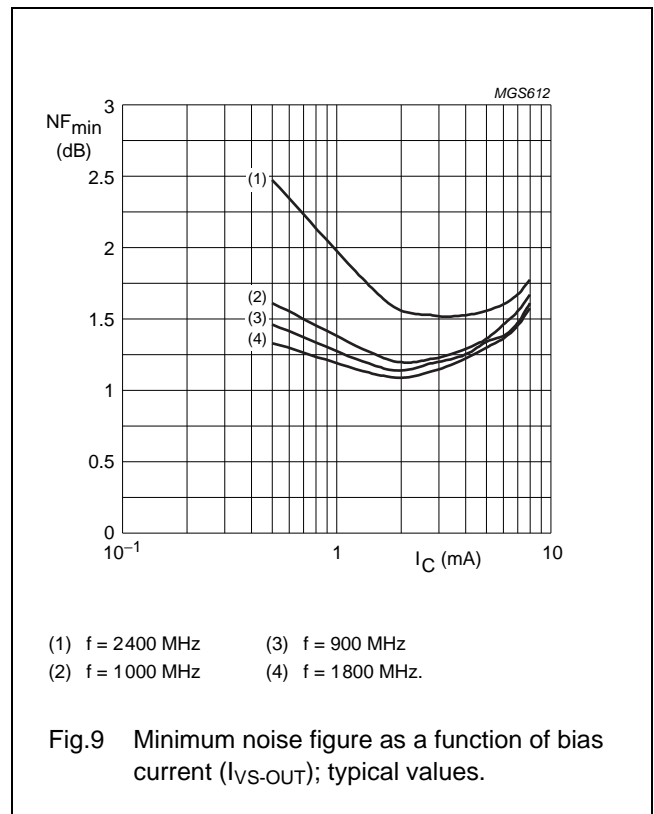
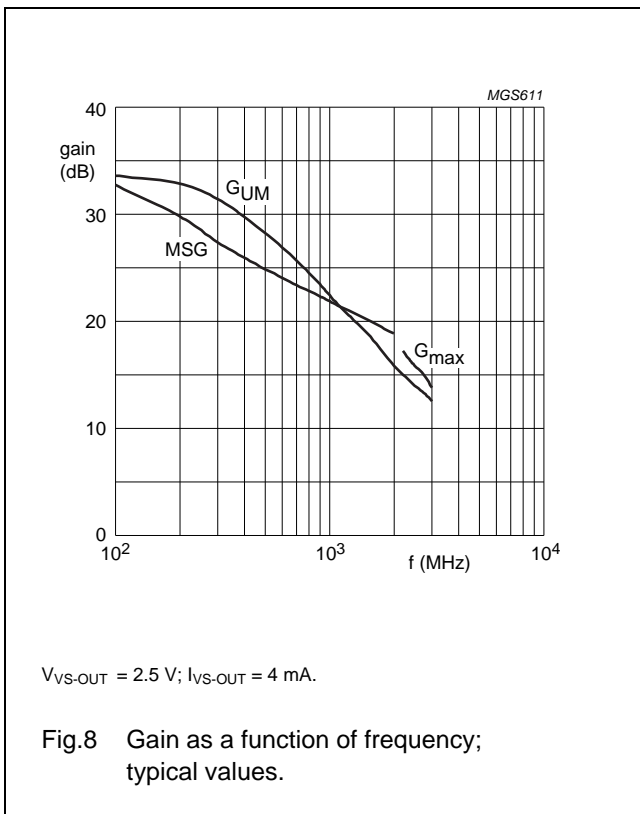
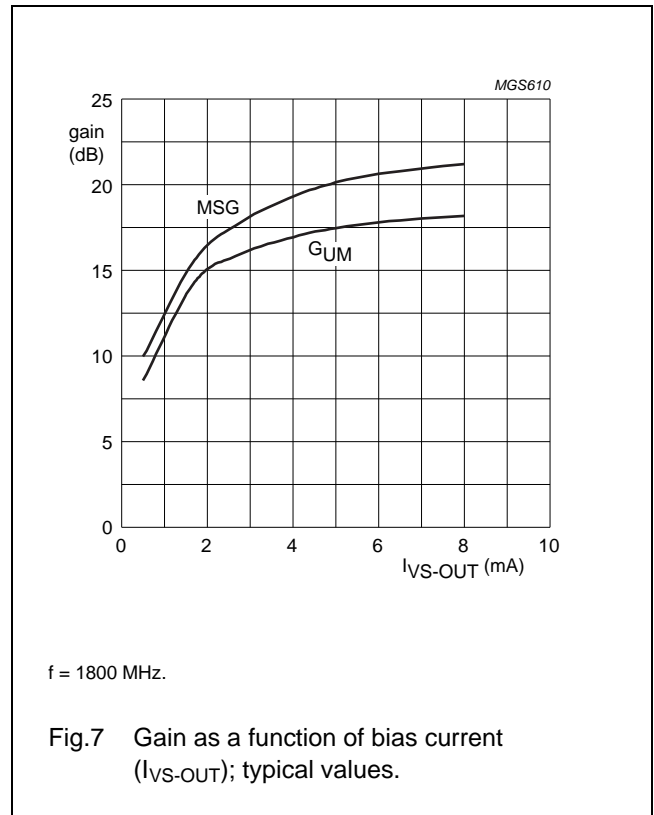
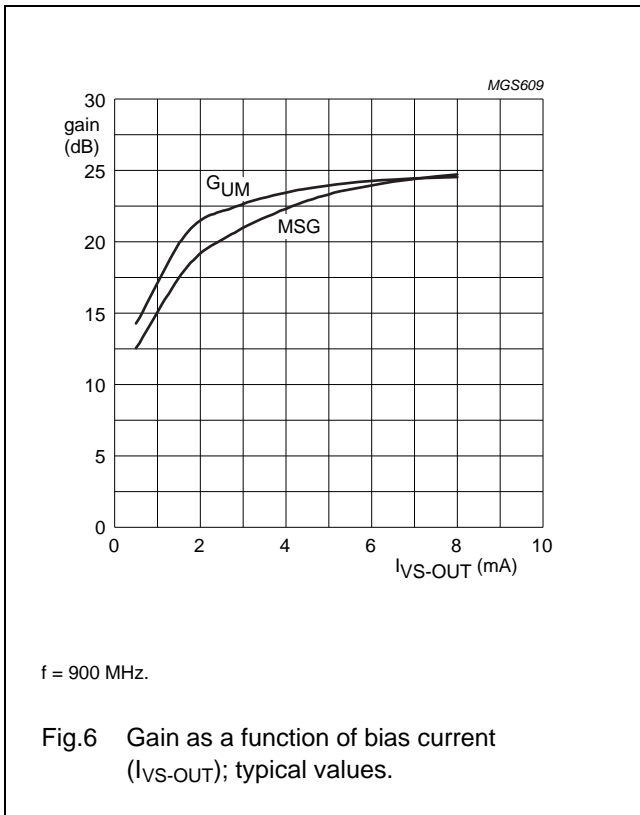


Fig.5 Bias current (I<sub>VS-OUT</sub>) as a function of voltage at the output pin (V<sub>VS-OUT</sub>); typical values.

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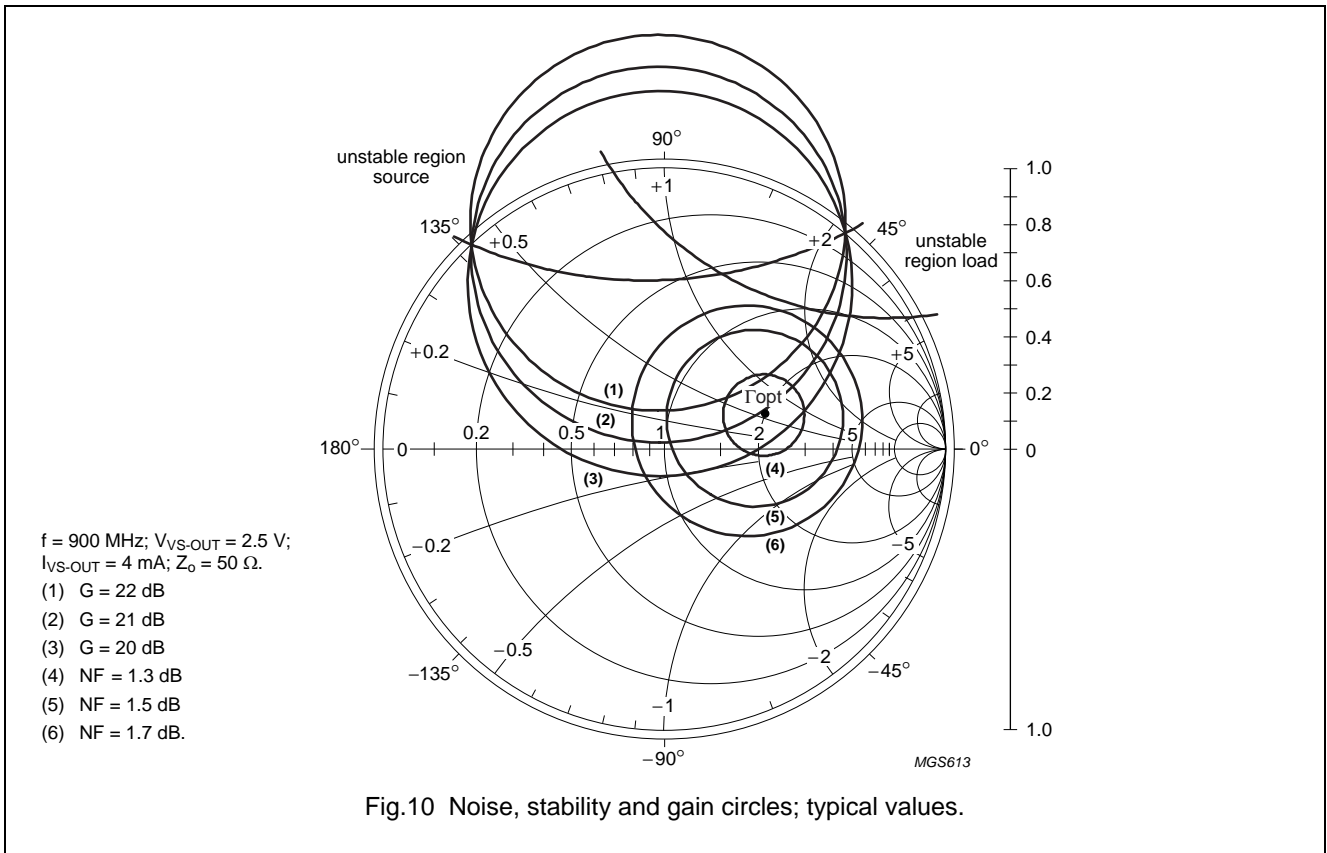


Fig.10 Noise, stability and gain circles; typical values.

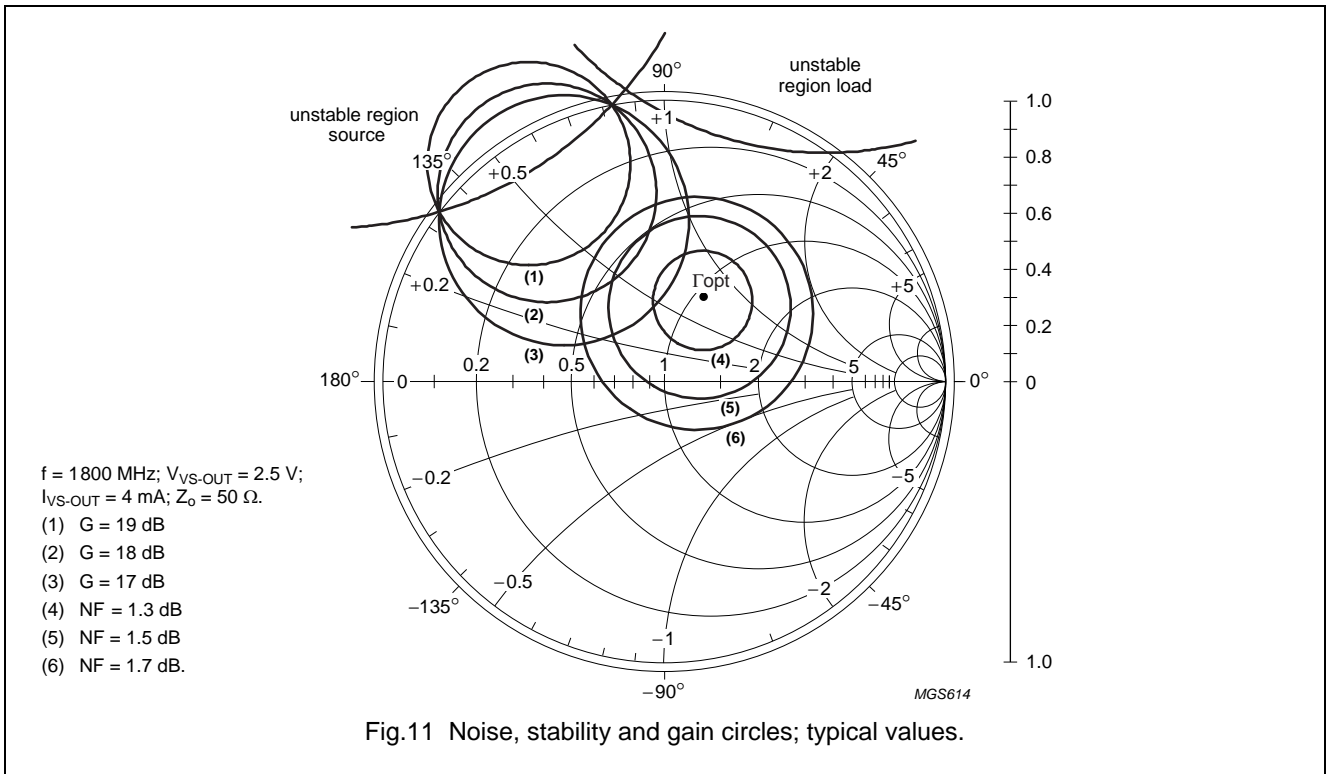


Fig.11 Noise, stability and gain circles; typical values.

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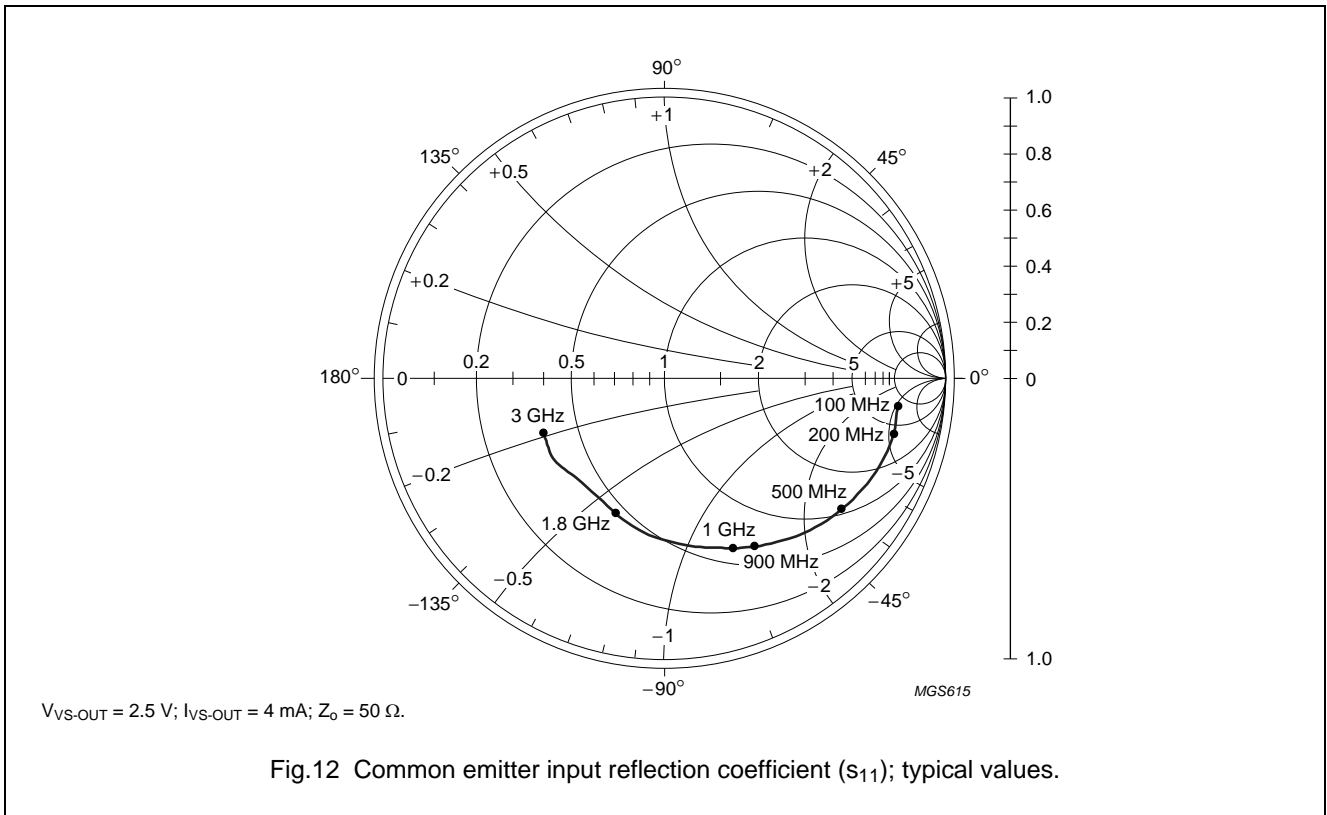


Fig.12 Common emitter input reflection coefficient ( $s_{11}$ ); typical values.

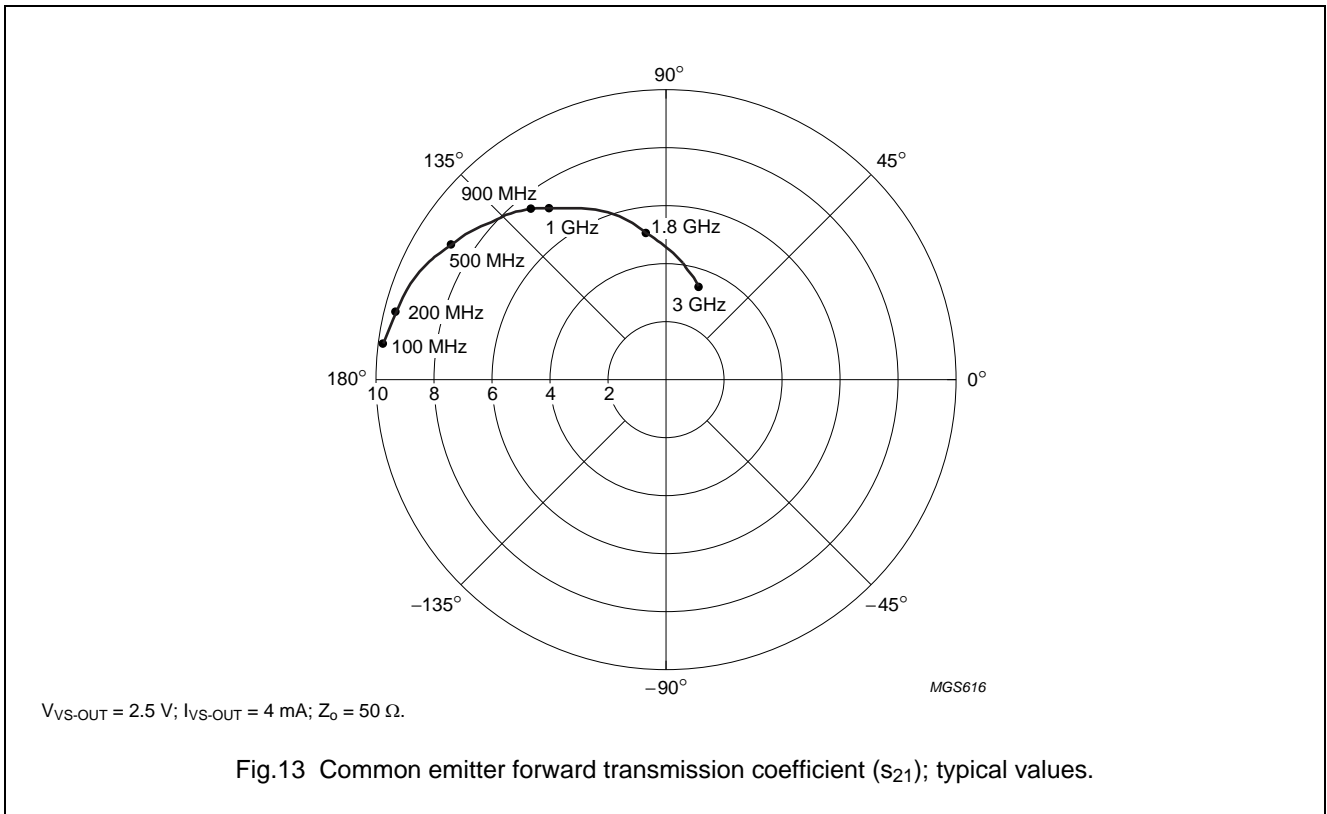
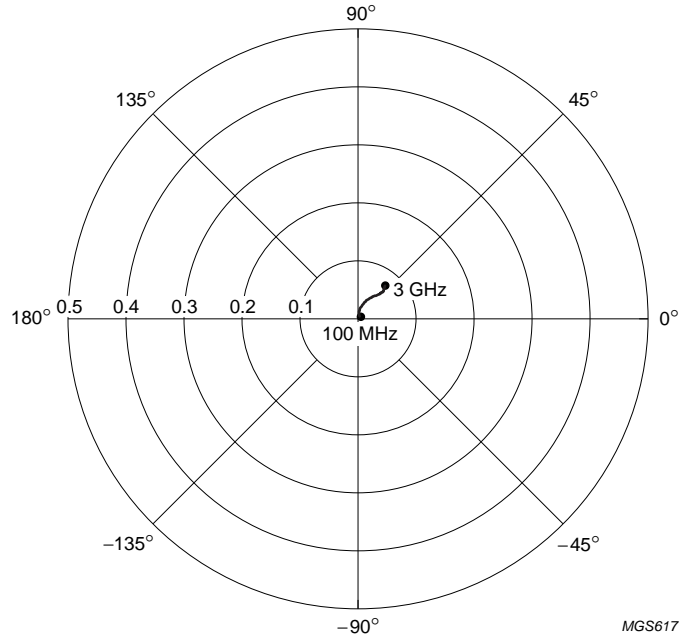


Fig.13 Common emitter forward transmission coefficient ( $s_{21}$ ); typical values.

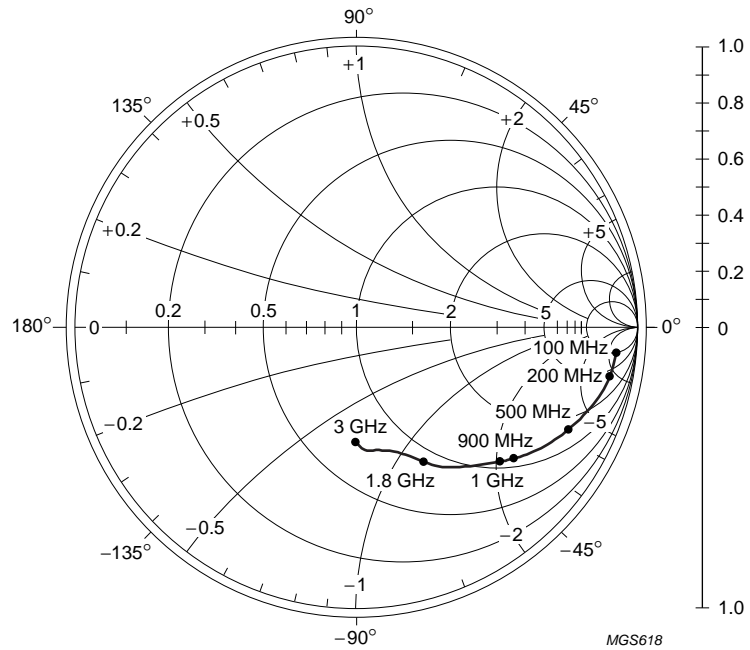
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$V_{VS-OUT} = 2.5\text{ V}$ ;  $I_{VS-OUT} = 4\text{ mA}$ ;  $Z_o = 50\ \Omega$ .

Fig.14 Common emitter reverse transmission coefficient ( $s_{12}$ ); typical values.



$V_{VS-OUT} = 2.5\text{ V}$ ;  $I_{VS-OUT} = 4\text{ mA}$ ;  $Z_o = 50\ \Omega$ .

Fig.15 Common emitter output reflection coefficient ( $s_{22}$ ); typical values.

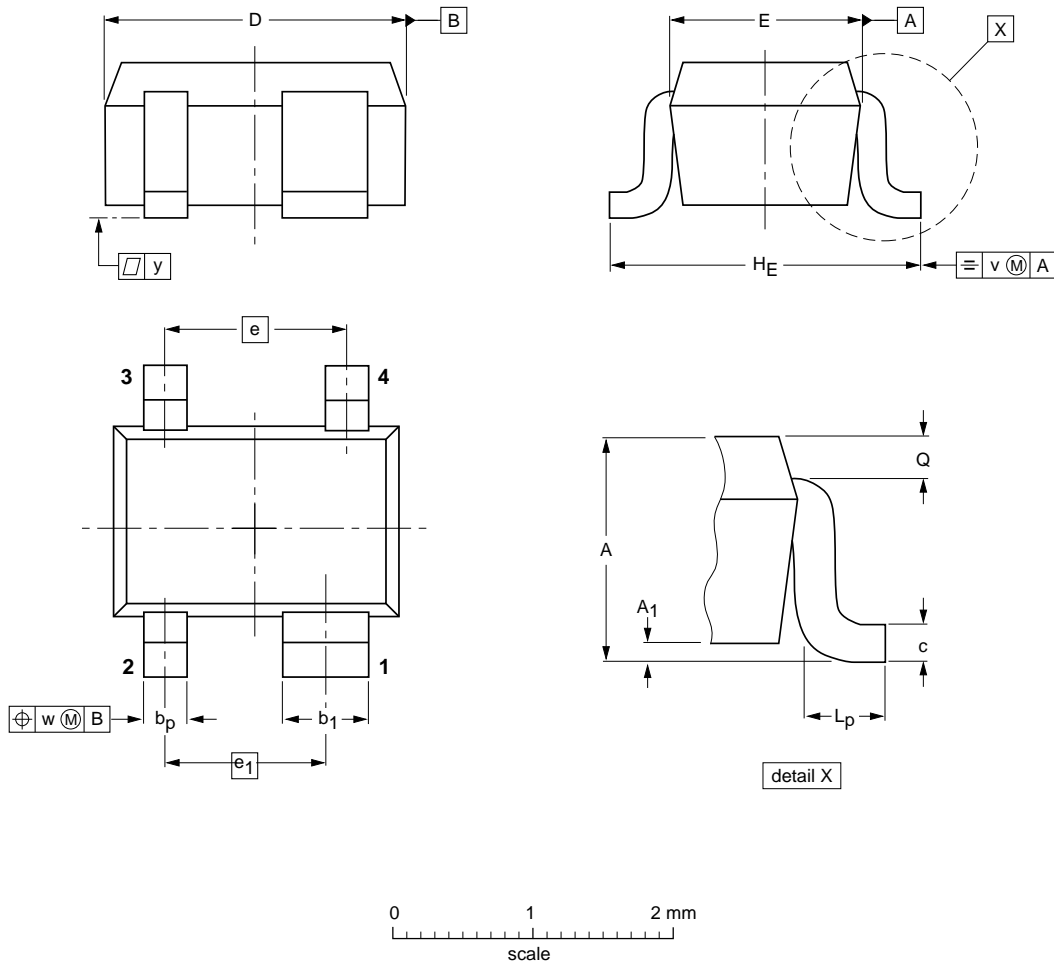
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PACKAGE OUTLINE

Plastic surface-mounted package; reverse pinning; 4 leads

SOT343R



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	b <sub>1</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w	y
mm	1.1 0.8	0.1	0.4 0.3	0.7 0.5	0.25 0.10	2.2 1.8	1.35 1.15	1.3	1.15	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT343R						97-05-21 06-03-16

## Silicon MMIC amplifier

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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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