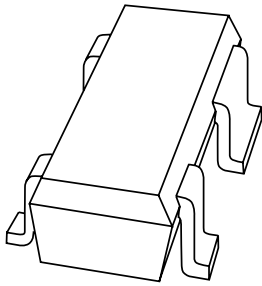


# DATA SHEET



## **BGU2003** SiGe MMIC amplifier

Preliminary specification

2002 May 17

# SiGe MMIC amplifier

# BGU2003

### FEATURES

- Low current
- Very high power gain
- Low noise figure
- Integrated temperature compensated biasing
- Control pin for adjustment bias current
- Supply and RF output pin combined.

### APPLICATIONS

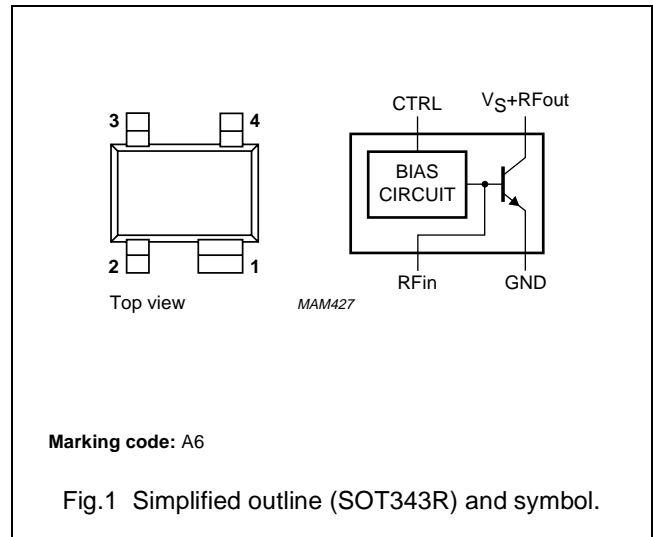
- RF front end
- Wideband applications, e.g. analog and digital cellular telephones, cordless telephones (PHS, DECT, etc.)
- Low noise amplifiers
- Satellite television tuners (SATV)
- High frequency oscillators.

### DESCRIPTION

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

### PINNING

PIN	DESCRIPTION
1	GND
2	RF in
3	CTRL (bias current control)
4	V <sub>S</sub> + RF out



### 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; I <sub>CTRL</sub> = 1 mA; RF input AC coupled	10	–	mA
MSG	maximum stable gain	V <sub>V<sub>S</sub>-OUT</sub> = 2.5 V; f = 1800 MHz; T <sub>amb</sub> = 25 °C	18	–	dB
NF	noise figure	V <sub>V<sub>S</sub>-OUT</sub> = 2.5 V; f = 1800 MHz; Γ <sub>S</sub> = Γ <sub>opt</sub>	1.1	–	dB

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**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_S$	supply voltage	RF input AC coupled	–	4.5	V
$V_{CTRL}$	voltage on control pin		–	2	V
$I_S$	supply current (DC)	forced by DC voltage on RF input or $I_{CTRL}$	–	30	mA
$I_{CTRL}$	control current		–	3	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	$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{CTRL} = 0.4\text{ mA}$	2.5	4.5	6.5	mA
		$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{CTRL} = 1.0\text{ mA}$	6	10	15	mA
MSG	maximum stable gain	$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 10\text{ mA}$ ; $f = 900\text{ MHz}$	–	23	–	dB
		$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 10\text{ mA}$ ; $f = 1800\text{ MHz}$	–	18	–	dB
$ S_{21} ^2$	insertion power gain	$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 10\text{ mA}$ ; $f = 900\text{ MHz}$	18	19	–	dB
		$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 10\text{ mA}$ ; $f = 1800\text{ MHz}$	13	14	–	dB
$S_{12}$	isolation	$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 0$ ; $f = 900\text{ MHz}$	–	26	–	dB
		$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 0$ ; $f = 1800\text{ MHz}$	–	20	–	dB
NF	noise figure	$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 10\text{ mA}$ ; $f = 900\text{ MHz}$ ; $\Gamma_S = \Gamma_{opt}$	–	1.0	2	dB
		$V_{VS-OUT} = 2.5\text{ V}$ ; $I_{VS-OUT} = 10\text{ mA}$ ; $f = 1800\text{ MHz}$ ; $\Gamma_S = \Gamma_{opt}$	–	1.1	2	dB
$IP3_{(out)}$	output intercept point; $Z_S = Z_L 50\ \Omega$	$V_{VS-OUT} = 2.3\text{ V}$ ; $I_{VS-OUT} = 10\text{ mA}$ ; $f = 900\text{ MHz}$	–	19	–	dBm
		$V_{VS-OUT} = 2.3\text{ V}$ ; $I_{VS-OUT} = 10\text{ mA}$ ; $f = 1800\text{ MHz}$	–	21	–	dBm

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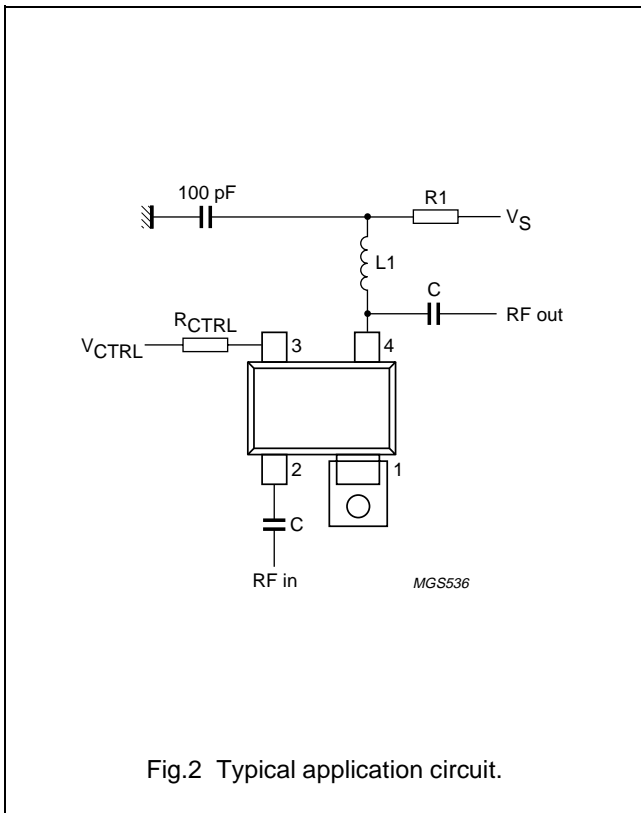


Fig.2 Typical application circuit.

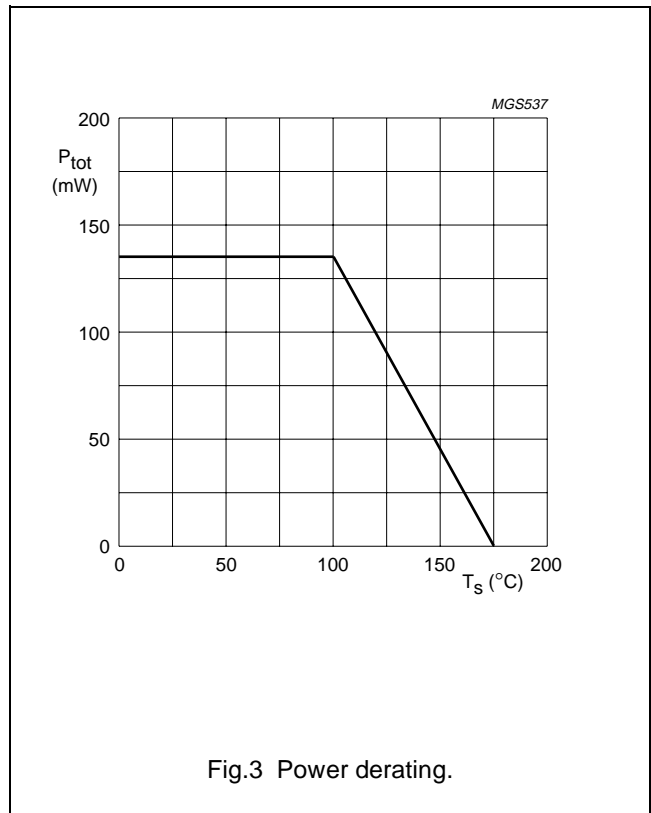


Fig.3 Power derating.

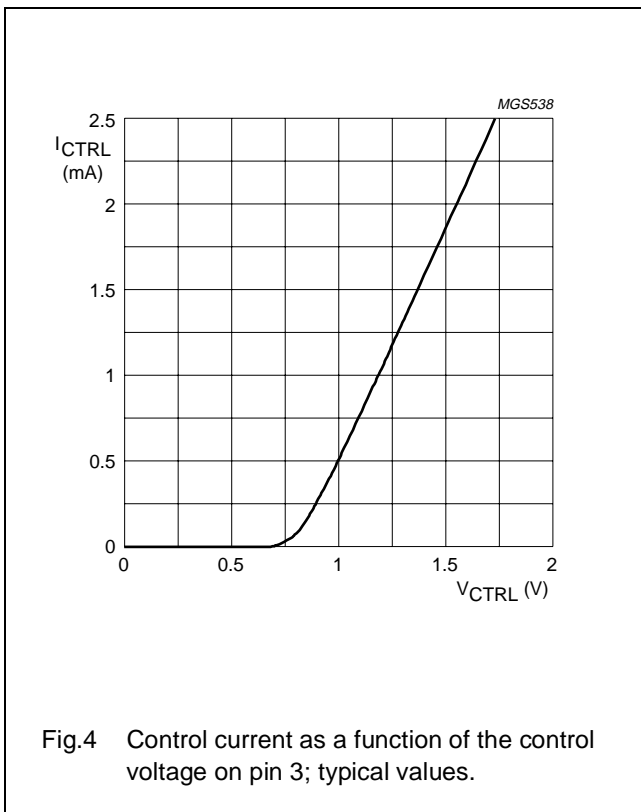


Fig.4 Control current as a function of the control voltage on pin 3; typical values.

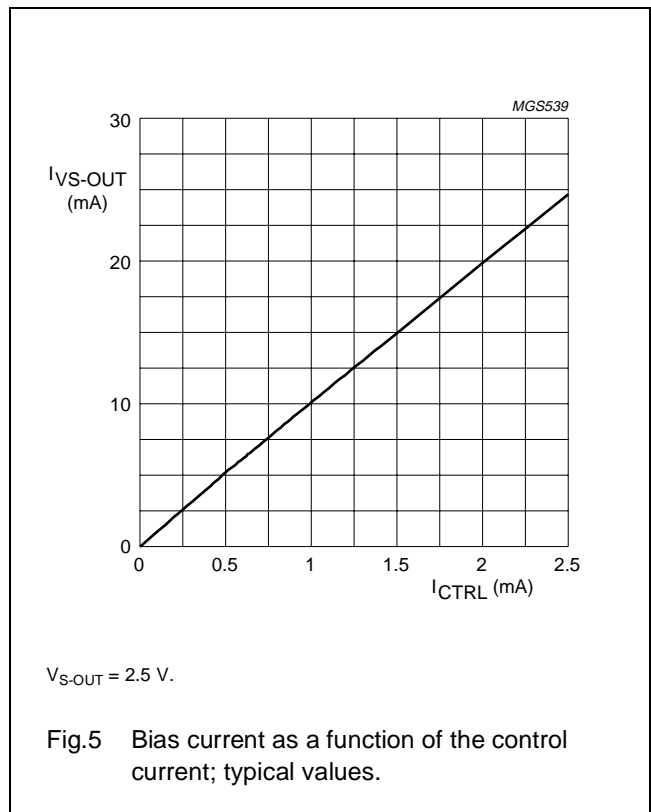


Fig.5 Bias current as a function of the control current; typical values.

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Scattering parameters:  $V_S = 2.5 \text{ V}$ ;  $I_S = 10 \text{ mA}$ ;  $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ 

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
100	0.837	-10.6	19.216	163.9	0.007	77.3	0.976	-7.1
200	0.783	-19.9	17.589	151.7	0.012	77.2	0.920	-13.2
300	0.713	-28.4	16.321	142.4	0.018	76.7	0.861	-17.1
400	0.645	-36.0	15.046	134.5	0.022	72.9	0.805	-19.8
500	0.581	-42.0	13.701	127.7	0.027	75.2	0.759	-21.9
600	0.519	-47.1	12.709	121.6	0.031	74.8	0.718	-22.8
700	0.474	-50.8	11.602	116.8	0.034	75.0	0.689	-23.4
800	0.433	-53.3	10.631	112.6	0.038	75.3	0.664	-24.1
900	0.397	-55.2	9.791	108.8	0.042	76.3	0.644	-24.4
1000	0.369	-56.9	8.951	106.0	0.046	76.1	0.627	-25.2
1100	0.342	-58.4	8.314	103.6	0.050	77.3	0.610	-25.6
1200	0.320	-60.2	7.730	101.1	0.055	77.6	0.599	-26.4
1300	0.301	-62.1	7.275	99.4	0.058	78.4	0.591	-27.2
1400	0.286	-64.4	6.912	97.1	0.063	78.1	0.583	-28.0
1500	0.273	-66.7	6.493	94.8	0.066	78.2	0.578	-28.6
1600	0.262	-68.5	6.078	93.5	0.071	78.9	0.572	-29.0
1700	0.252	-7.08	5.783	91.8	0.074	78.9	0.564	-29.6
1800	0.241	-73.7	5.475	90.9	0.078	79.8	0.553	-30.0
1900	0.229	-77.0	5.289	89.9	0.083	79.7	0.543	-30.7
2000	0.221	-81.1	5.094	88.4	0.088	79.5	0.530	-31.9
2100	0.216	-85.5	4.911	87.2	0.092	79.4	0.518	-33.6
2200	0.215	-88.9	4.779	85.6	0.098	79.6	0.512	-35.6
2300	0.229	-91.6	4.588	84.3	0.104	78.7	0.515	-38.2
2400	0.237	-97.0	4.446	83.8	0.107	78.6	0.515	-40.7
2500	0.240	-99.3	4.325	82.3	0.111	79.1	0.523	-42.3
2600	0.243	-101.1	4.145	81.9	0.115	80.1	0.532	-43.0
2700	0.243	-102.9	4.105	81.6	0.121	80.4	0.537	-43.3
2800	0.238	-104.9	4.038	80.2	0.124	80.4	0.538	-43.0
2900	0.233	-106.8	3.924	78.5	0.129	80.3	0.532	-43.2
3000	0.224	-109.0	3.795	76.7	0.132	80.0	0.519	-43.1

Noise parameters:  $V_S = 2.5 \text{ V}$ ;  $I_S = 10 \text{ mA}$ ;  $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ 

f (MHz)	NF <sub>min</sub> (dB)	gamma opt.		R <sub>n</sub> / 50 Ω
		MAGNITUDE (ratio)	ANGLE (deg)	
900	1.0	0.19	14	0.16
1800	1.1	0.08	60	0.14
2500	1.3	0.07	90	0.14

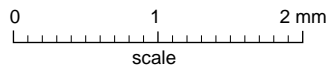
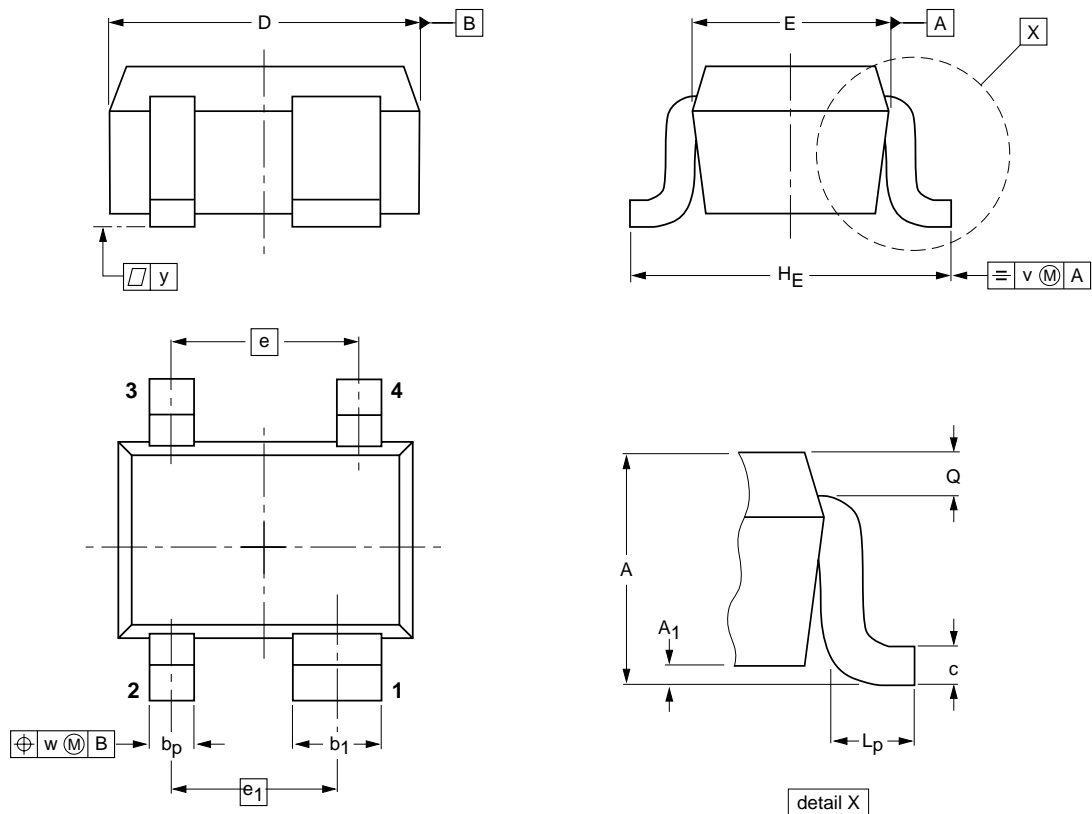
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PACKAGE OUTLINE

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