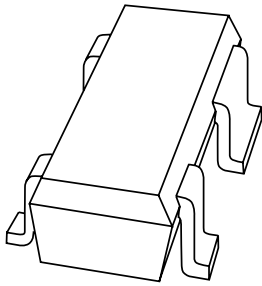


# DATA SHEET



## **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

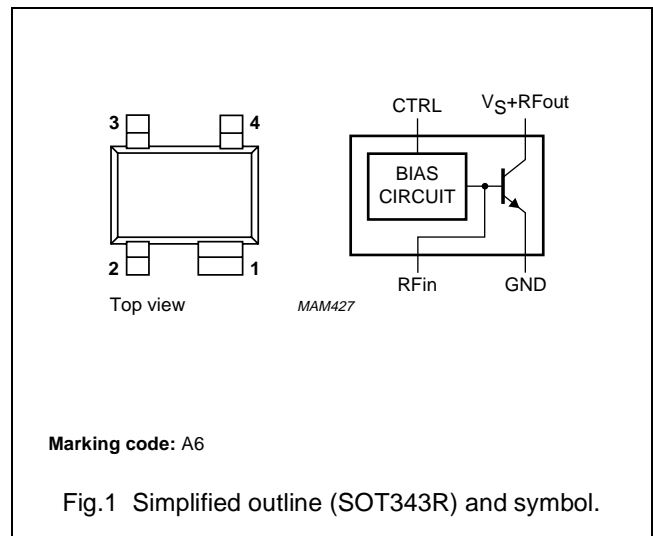
- RF front end
- Wideband applications, e.g. analog and digital cellular telephones, cordless telephones (PHS, DECT, etc.)
- Low noise amplifiers
- Satellite television tuners (SATV)
- High frequency oscillators.

## 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

## SiGe MMIC amplifier

BGU2003

**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

SiGe MMIC amplifier

BGU2003

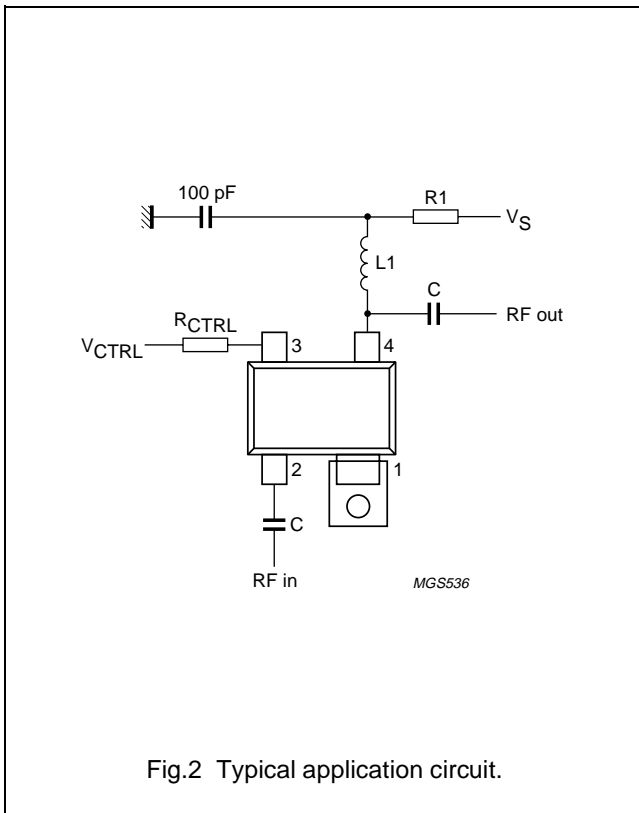


Fig.2 Typical application circuit.

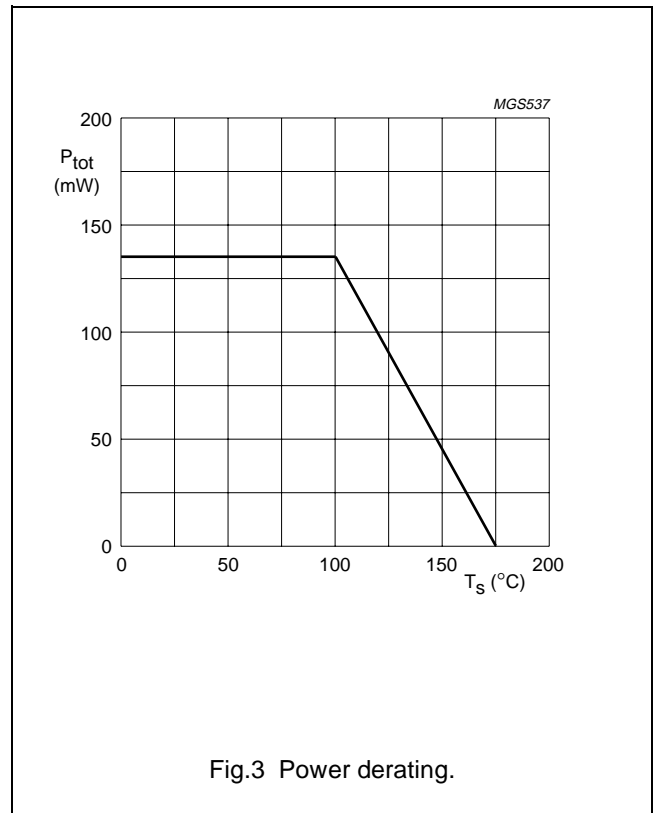


Fig.3 Power derating.

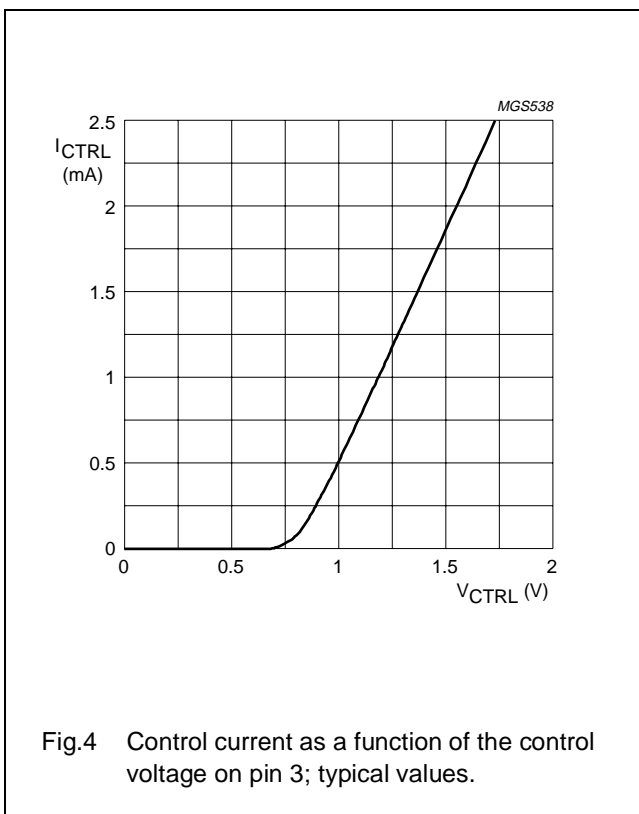


Fig.4 Control current as a function of the control voltage on pin 3; typical values.

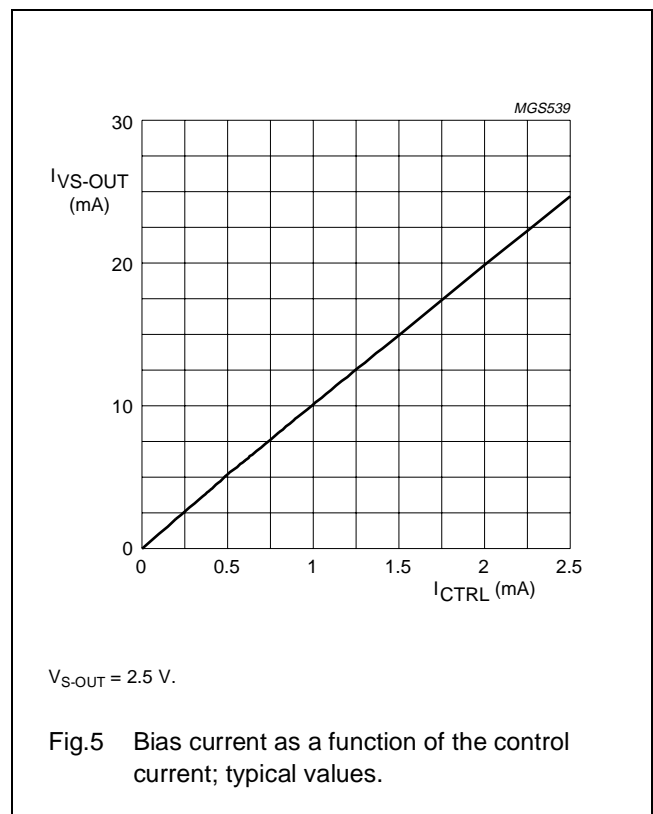


Fig.5 Bias current as a function of the control current; typical values.

## SiGe MMIC amplifier

## BGU2003

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

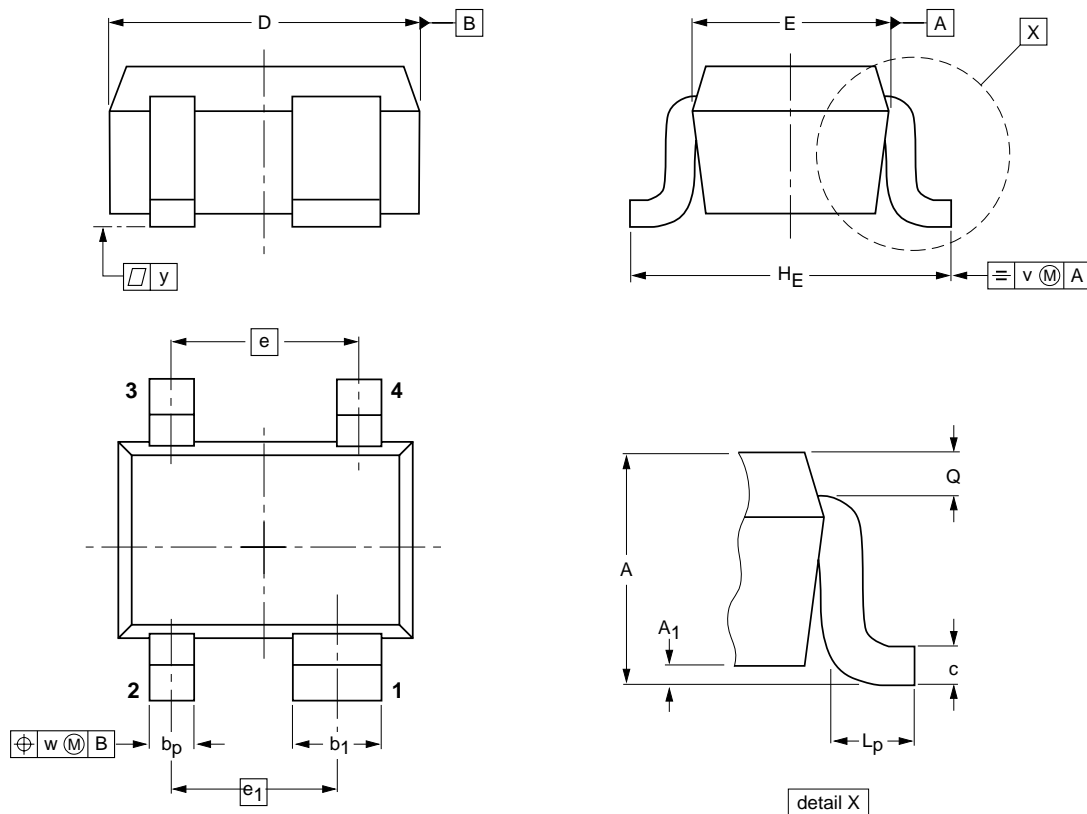
SiGe MMIC amplifier

BGU2003

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

## SiGe MMIC amplifier

BGU2003

## DATA SHEET STATUS

DATA SHEET STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITIONS
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A.

## Notes

1. Please consult the most recently issued data sheet before initiating or completing a design.
2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

## DEFINITIONS

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — 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.

**Application information** — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

## DISCLAIMERS

**Life support applications** — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

**Right to make changes** — Philips Semiconductors reserves the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no licence or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

# ***Philips Semiconductors – a worldwide company***

## **Contact information**

For additional information please visit <http://www.semiconductors.philips.com>. Fax: +31 40 27 24825

For sales offices addresses send e-mail to: [sales.addresses@www.semiconductors.philips.com](mailto:sales.addresses@www.semiconductors.philips.com).

© Koninklijke Philips Electronics N.V. 2001

SCA73

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

125006/04/pp8

Date of release: 2002 May 17

Document order number: 9397 750 09849

*Let's make things better.*

**Philips  
Semiconductors**



**PHILIPS**