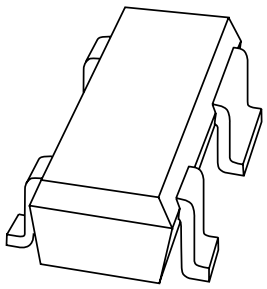
DATA SHEET



BGU2003
SiGe MMIC amplifier

Preliminary specification

2002 May 17

Philips
Semiconductors

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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_S + RF out

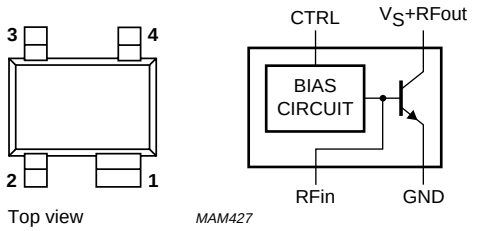

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Fig.1 Simplified outline (SOT343R) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_S	DC supply voltage	RF input AC coupled	–	4.5	V
I_S	DC supply current	V_{VS-OUT} = 2.5 V; I_{CTRL} = 1 mA; RF input AC coupled	10	–	mA
MSG	maximum stable gain	V_{VS-OUT} = 2.5 V; f = 1800 MHz; T_{amb} = 25 °C	18	–	dB
NF	noise figure	V_{VS-OUT} = 2.5 V; f = 1800 MHz; $\Gamma_S = \Gamma_{opt}$	1.1	–	dB

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	$T_s \leq 100$ °C	–	135	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	150	°C

THERMAL CHARACTERISTICS

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

CHARACTERISTICS

RF input AC coupled; T_j = 25 °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_S	supply current	$V_{VS\text{-}OUT}$ = 2.5 V; I_{CTRL} = 0.4 mA	2.5	4.5	6.5	mA
		$V_{VS\text{-}OUT}$ = 2.5 V; I_{CTRL} = 1.0 mA	6	10	15	mA
MSG	maximum stable gain	$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 10 mA; f = 900 MHz	–	23	–	dB
		$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 10 mA; f = 1800 MHz	–	18	–	dB
$\|s_{21}\|^2$	insertion power gain	$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 10 mA; f = 900 MHz	18	19	–	dB
		$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 10 mA; f = 1800 MHz	13	14	–	dB
s_{12}	isolation	$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 0; f = 900 MHz	–	26	–	dB
		$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 0; f = 1800 MHz	–	20	–	dB
NF	noise figure	$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 10 mA; f = 900 MHz; $\Gamma_S = \Gamma_{opt}$	–	1.0	2	dB
		$V_{VS\text{-}OUT}$ = 2.5 V; $I_{VS\text{-}OUT}$ = 10 mA; f = 1800 MHz; $\Gamma_S = \Gamma_{opt}$	–	1.1	2	dB
$IP3_{(out)}$	output intercept point; $Z_S = Z_L$ 50 Ω	$V_{VS\text{-}OUT}$ = 2.3 V; $I_{VS\text{-}OUT}$ = 10 mA; f = 900 MHz	–	19	–	dBm
		$V_{VS\text{-}OUT}$ = 2.3 V; $I_{VS\text{-}OUT}$ = 10 mA; f = 1800 MHz	–	21	–	dBm

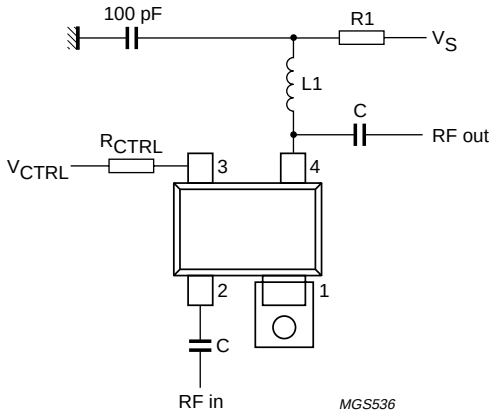


Fig.2 Typical application circuit.

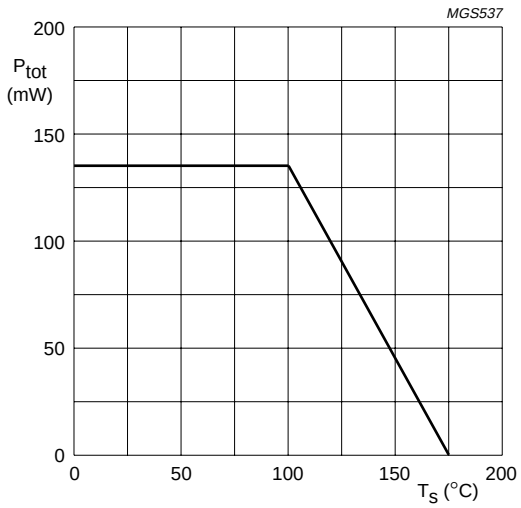


Fig.3 Power derating.

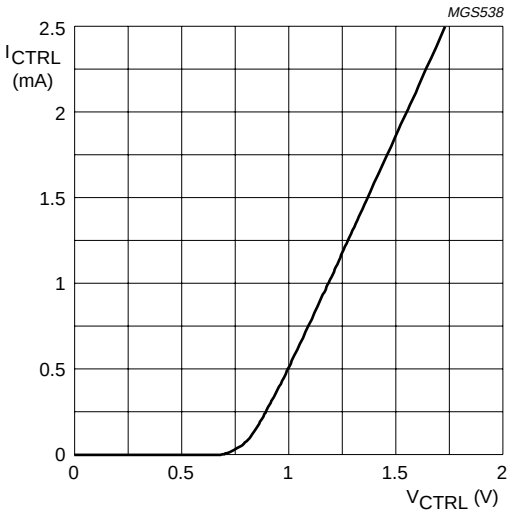
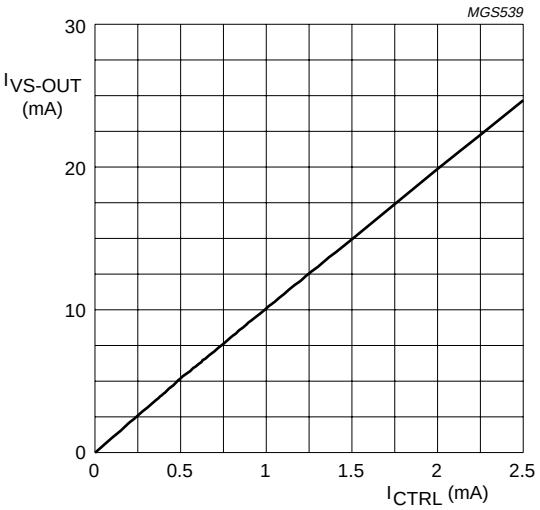


Fig.4 Control current as a function of the control voltage on pin 3; typical values.



V_{S-OUT} = 2.5 V.

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

Scattering parameters: V_S = 2.5 V; I_S = 10 mA; T_{amb} = 25 °C

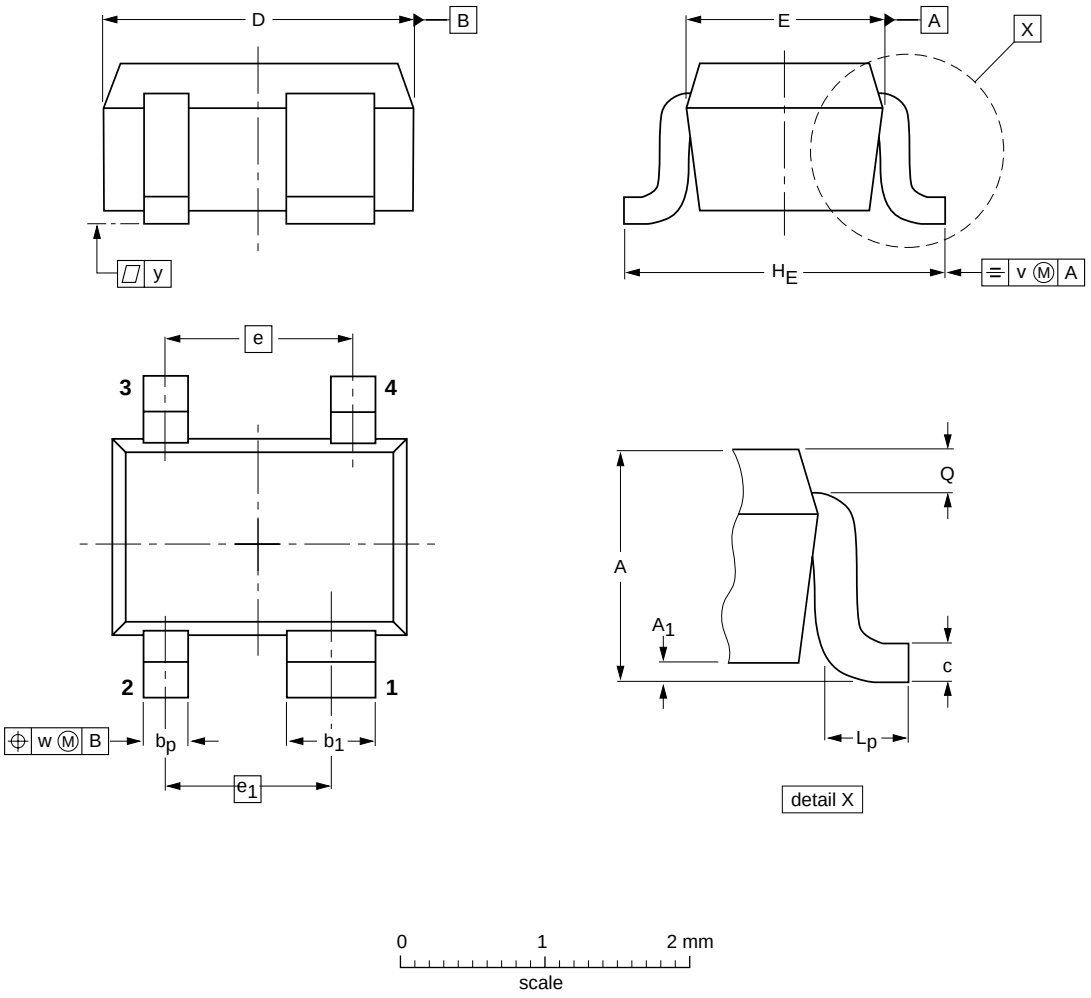
f (MHz)	s_{11}		s_{21}		s_{12}		s_{22}	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
100	0.837	–10.6	19.216	163.9	0.007	77.3	0.976	–7.1
200	0.783	–19.9	17.589	151.7	0.012	77.2	0.920	–13.2
300	0.713	–28.4	16.321	142.4	0.018	76.7	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 V; I_S = 10 mA; T_{amb} = 25 °C

f (MHz)	NF_{min} (dB)	gamma opt.		R_n / 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

PACKAGE OUTLINE

Plastic surface mounted package; reverse pinning; 4 leads **SOT343R**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	b_1	c	D	E	e	e_1	H_E	L_p	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

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