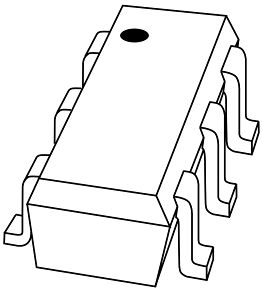
DATA SHEET



BGA2031/1
MMIC variable gain amplifier

Preliminary specification 2000 Feb 17

Philips
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PHILIPS

FEATURES

- High gain
- Excellent adjacent channel power rejection
- Small SMD package
- Low dissipation.

APPLICATIONS

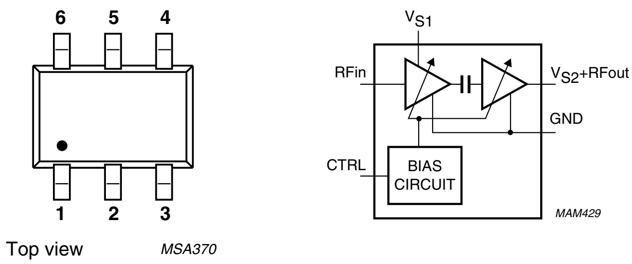
- General purpose variable gain amplifier for low voltage and medium power
- Driver for power amplifiers in systems that require good linearity, such as CDMA, both cellular band (850 MHz) and PCS (1.9 GHz). This is because of the high output power and good linearity.

DESCRIPTION

Silicon Monolitic Microwave Integrated Circuit (MMIC) 2 stage variable gain amplifier in double polysilicon technology in a 6-pin SOT363 plastic SMD package for low voltage medium power applications.

PINNING

PIN	DESCRIPTION
1	RF in
2	CTRL
3	V_{S1}
4	V_{S2} + RF out
5	GND
6	GND



Marking code: A3–

Fig.1 Simplified outline (SOT363) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{S1}, V_{S2}	supply voltages		3	3.3	V
I_S	supply current into pin 3 + pin 4	V_{CTRL} = 0	0	10	μA
		V_{CTRL} = 2.7 V; V_S = 3 V	51	63	mA
		V_{CTRL} = 2.4 V; V_S = 3 V	30	37	mA
P_L	load power	at 1 dB gain compression point; f = 1.9 GHz	13	–	dBm
ACPR	adjacent channel power rejection	f = 1.9 GHz; P_L = 10 dBm	49	–	dBc
		f = 836 MHz; P_L = 8 dBm	48	–	dBc
G_p	power gain	f = 1.9 GHz; P_L = 12 dBm	23	–	dB
		f = 836 MHz; P_L = 8 dBm	24	–	dB
ΔG	gain control range	f = 836 MHz; P_L = 8 dBm	62	–	dB

CAUTION
This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A and SNW-FQ-302B.

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_S	DC supply voltage		–	3.3	V
V_{CTRL}	control voltage		–	$< V_S$	V
I_{CTRL}	control current		–	1.2	mA
I_{S1}	current into pin 3		–	27	mA
I_{S2}	current into pin 4		–	50	mA
P_D	drive power		–	tbf	dBm
P_{tot}	total power dissipation	$T_s \leq 80$ °C	–	200	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	150	°C

THERMAL RESISTANCE

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

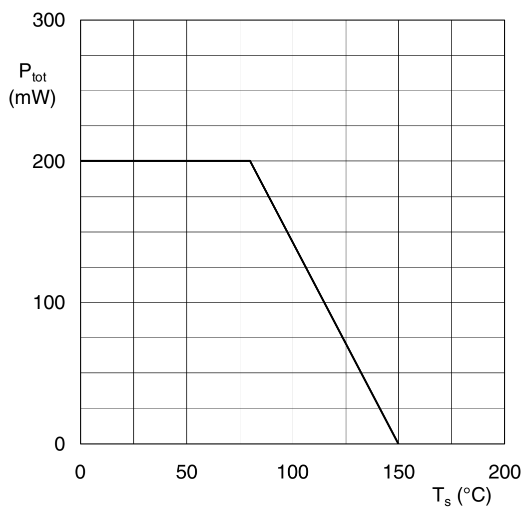


Fig.2 Power derating.

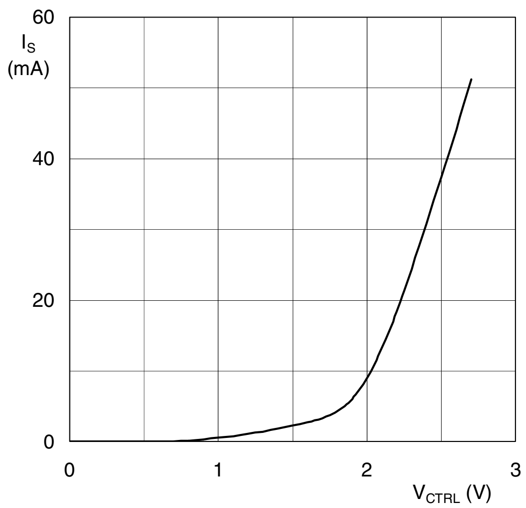
CHARACTERISTICS

T_j = 25 °C; Z_S = Z_L = 50 Ω; V_S = 3 V; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
f	frequency range		800	–	2500	MHz
V_{S1}, V_{S2}	supply voltages		2.7	3	3.3	V
I_S	supply current (in pin 3 + pin 4)	V_{CTRL} = 0; P_D = 0 mW	–	0	10	μA
		V_{CTRL} = 2.7 V; V_S = 3 V; P_D = 0 mW	37	51	63	mA
		V_{CTRL} = 2.4 V; V_S = 3 V; P_D = 0 mW	23	30	37	mA
I_{CTRL}	control current	V_{CTRL} = 2.7 V	0.7	0.92	1.1	mA
f = 1900 MHz						
f	frequency range		1850	–	1950	MHz
G_P	power gain	V_{CTRL} = 2.7 V; P_L = 12 dBm	–	23	–	dB
ΔG	gain control range	0 < V_{CTRL} < 2.7 V	–	56	–	dB
G_{CS}	gain control slope	note 1	–	21	–	dB/V
ACPR	adjacent channel power rejection	±1.23 MHz offset; BW_{ACP} = 30 kHz; $BW_{carrier}$ = 1.23 MHz; P_L = 10 dBm	–	49	–	dBc
		±1.98 MHz offset; BW_{ACP} = 30 kHz; $BW_{carrier}$ = 1.23 MHz; P_L = 10 dBm	–	74	–	dBc
P_L	load power	at 1 dB gain compression point	–	13	–	dBm
P_N	noise power	in CDMA receive band (1895 – 1955 MHz)	–	tbf	–	dBm/Hz
$VSWR_{IN}$	input VSWR	V_{CTRL} = 2.7 V	–	1:3.5	–	
$VSWR_{OUT}$	output VSWR	V_{CTRL} = 2.7 V	–	1:1.3	–	
f = 836 MHz						
f	frequency range		824	–	849	MHz
G_P	power gain	V_{CTRL} = 2.7 V; P_L = 8 dBm	–	24	–	dB
ΔG	gain control range	0 < V_{CTRL} < 2.7 V	–	62	–	dB
G_{CS}	gain control slope	note 1	–	22	–	dB/V
ACPR	adjacent channel power rejection	±885 kHz offset; BW_{ACP} = 30 kHz; $BW_{carrier}$ = 1.23 MHz; P_L = 8 dBm	–	49	–	dBc
		±1.98 MHz offset; BW_{ACP} = 30 kHz; $BW_{carrier}$ = 1.23 MHz; P_L = 8 dBm	–	74	–	dBc
P_L	load power	at 1 dB gain compression point	–	11	–	dBm
P_N	noise power	in CDMA receive band (869 to 894 MHz)	–	tbf	–	dBm/Hz
$VSWR_{IN}$	input VSWR	V_{CTRL} = 2.7 V	–	1:2	–	
$VSWR_{OUT}$	output VSWR	V_{CTRL} = 2.7 V	–	1:1.4	–	

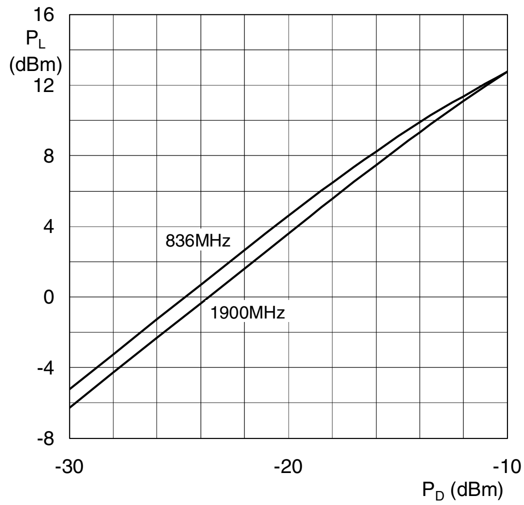
Notes

1. G_{CS} = (G @ V_{ctrl} = 2.5 V – G @ V_{ctrl} = 1.5 V) / (V_{ctrl} = 2.5 V – V_{ctrl} = 1.5V)



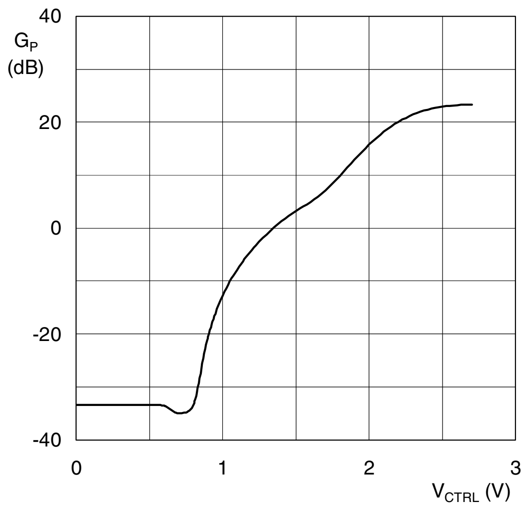
V_S = 3 V.

Fig.2 Total supply current as a function of control voltage; typical values.



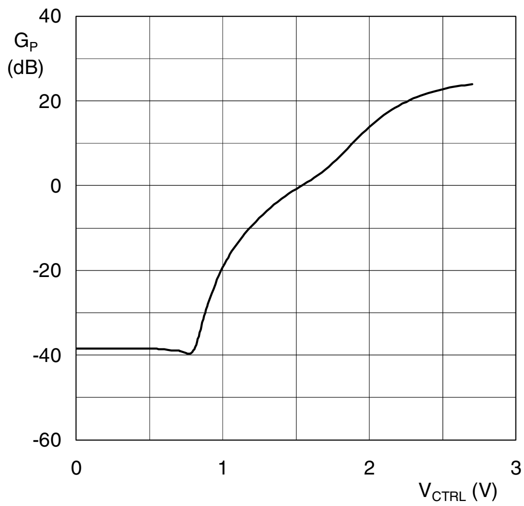
V_S = 3 V; V_{CTRL} = 2.7 V.

Fig.3 Load power as a function of the drive power; typical values.



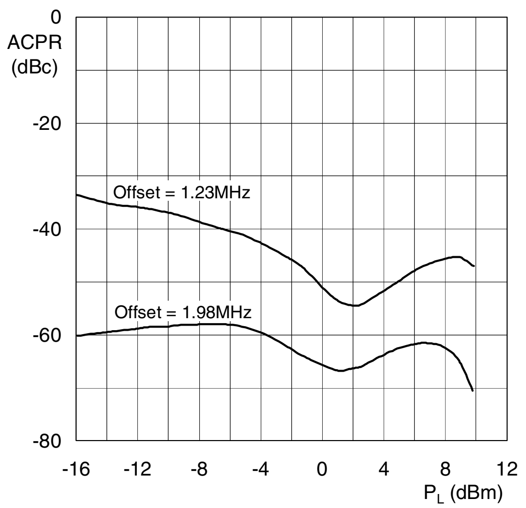
V_S = 3 V; P_D = −14 dBm; f = 1.9 GHz.

Fig.4 Power gain as a function of control voltage; typical values.



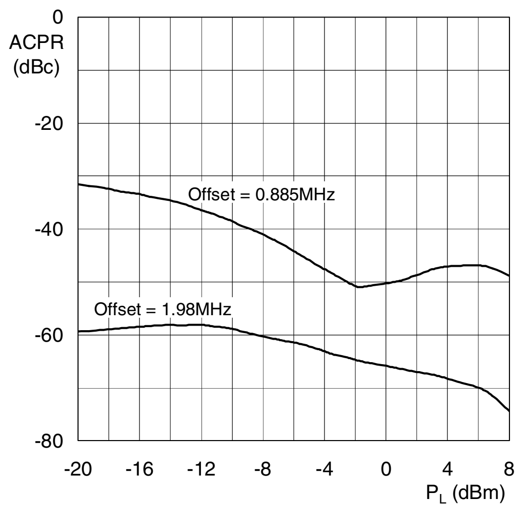
V_S = 3 V; P_D = −14 dBm; f = 836 MHz.

Fig.5 Power gain as a function of control voltage; typical values.



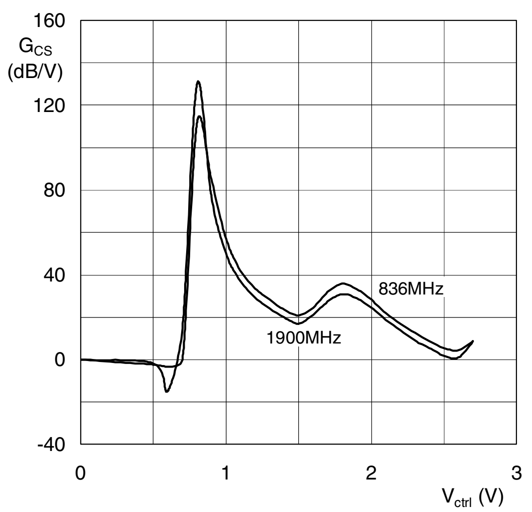
V_S = 3 V; f = 1.9 GHz; P_D = −12.8 dBm.

Fig.6 Adjacent channel power rejection as a function of the load power; typical values.



V_S = 3.6 V; f = 836 MHz; P_D = −16 dBm.

Fig.7 Adjacent channel power rejection as a function of the load power; typical values.



V_S = 3 V; P_D = −14 dBm.

Fig.8 Gain control slope as a function of the control voltage; typical values.

ELECTRICAL BLOCK DIAGRAM

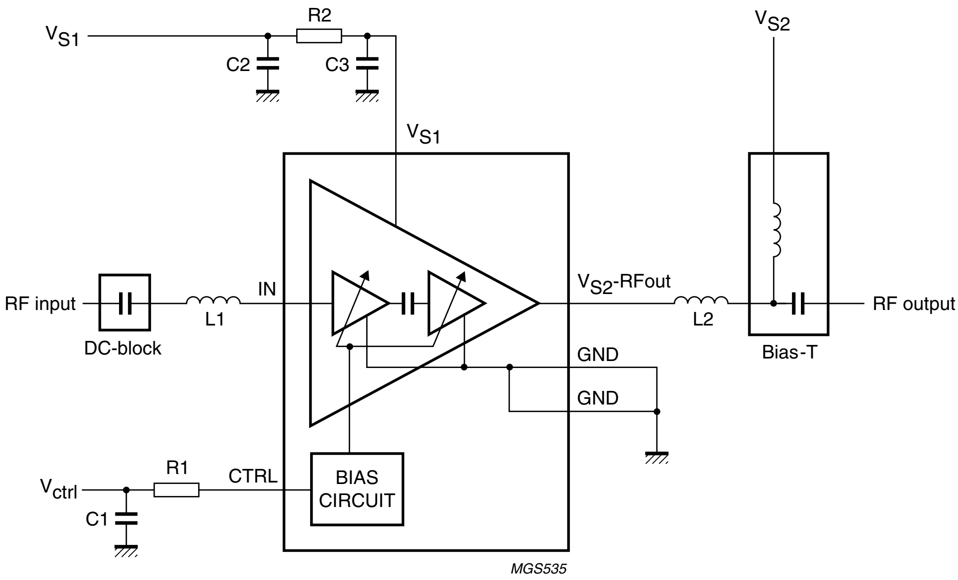


Fig.9 Test diagram.

List of components (see Fig.3)

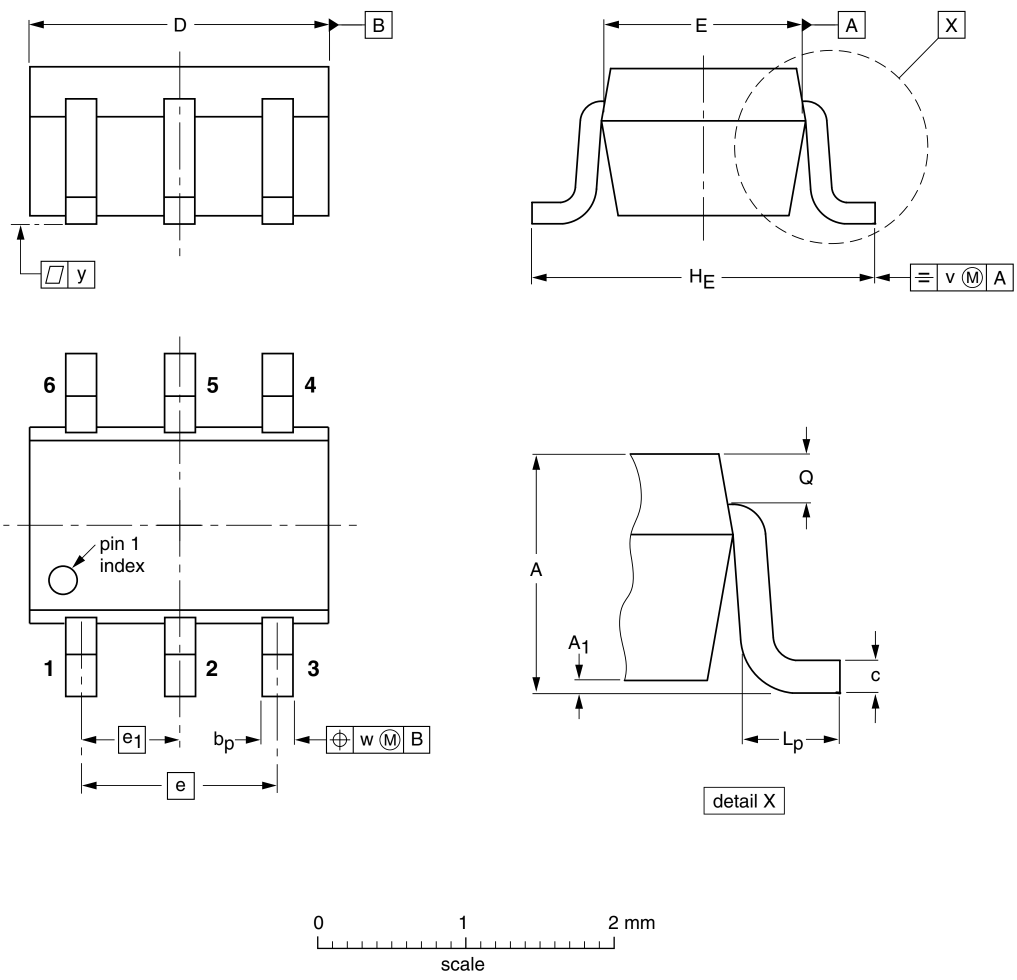
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1	multilayer ceramic chip capacitor	10 nF	0603	tbf
C2	multilayer ceramic chip capacitor	22 nF	0603	tbf
C3	multilayer ceramic chip capacitor	1.5 nF	0603	tbf
L1, L2	stripline; note 1	50 Ω		tbf
R1	SMD resistor	22 Ω; 0.16 W	0603	tbf
R2	SMD resistor	2.4 Ω; 0.16 W	0603	tbf

Note

1. The striplines are on a gold plated double copper-clad printed-circuit board (ε_r = 6.15), board thickness = 0.64 mm, copper thickness = 35 μm, gold thickness = 5 μm.

PACKAGE OUTLINE

Plastic surface mounted package; 6 leads **SOT363**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.1 0.8	0.1	0.30 0.20	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.25 0.15	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT363			SC-88			97-02-28

DEFINITIONS

Data Sheet Status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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	
Where application information is given, it is advisory and does not form part of the specification.	

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