BGA7124

400 MHz to 2700 MHz 1/4 W high linearity Si amplifier

Rev. 00.07 — 16 July 2009 Objective data sheet

1. Product profile

1.1 General description

The BGA7124 MMIC is a one-stage driver amplifier, offered in a low-cost leadless surface-mount package. It delivers 25 dBm output power at 1 dB gain compression and a superior performance for various narrowband-tuned application circuits for frequencies up to 2700 MHz.

1.2 Features

- 400 MHz to 2700 MHz frequency operating range
- 16 dB small signal gain at 2 GHz
- 25 dBm output power at 1 dB gain compression
- Integrated active biasing
- External matching allows broad application optimization of the electrical performance
- 3.3 V / 5 V single supply operation
- Power savings features:
  - Simple quiescent current adjustment allows class-AB operation
  - Logic-level shutdown control pin reduces supply current to 4 μA
- ESD protection at all pins

1.3 Applications

- Wireless infrastructure (base station, repeater)
- E-metering
- Broadband CPE
- Satellite Master Antenna TV (SMATV)
- Industrial applications
- W-LAN / ISM / RFID

1.4 Quick reference data

Table 1. Quick reference data

$Z_S = Z_L = 50\ \Omega$, $\overline{SHDN} = V_{I(D)H(SHDN)}$ (shutdown disabled). Typical values at $V_{CC} = 5$ V; $T_{case} = 25$ °C, ; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{Cq}	adjustable quiescent collector current		5	-	170	mA
f	frequency	[1]	400	-	2700	MHz

founded by Philips

Table 1. Quick reference data *...continued*

$Z_S = Z_L = 50\ \Omega$, $\overline{SHDN} = V_{I(D)H(SHDN)}$ (shutdown disabled). Typical values at $V_{CC} = 5$ V; $T_{case} = 25$ °C, ; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
G_p	gain power	f = 2140 MHz	[3]	-	15	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 2140 MHz	[3]	-	25	-	dBm
$IP3_O$	output third-order intercept point	f = 2140 MHz	[2][3]	-	38	-	dBm

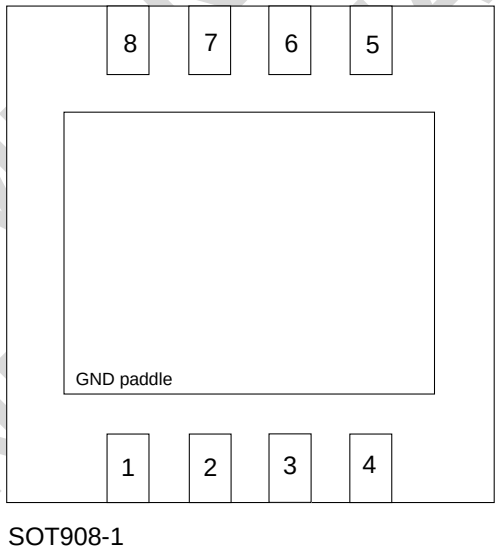
[1] Operation outside this range is possible but parameters are not guaranteed.

[2] $P_{o(tone)}$ = 8 dBm; tone spacing = 10 MHz, f_1 = 850 MHz to 1000 MHz; f_2 = 1800 MHz to 2400 MHz; higher IMD3 product.

[3] Applicable to class-A operation; I_{Cq} = <tbd> mA.

2. Pinning information

2.1 Pinning



SOT908-1

Transparent top view

Fig 1. Pin configuration

2.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
n.c.	1, 4	not connected
RF_OUT/V_{CC}	2, 3	RF output for the power amplifier and DC supply input for the RF transistor collector[1]
$V_{CC(bias)}$	5	bias supply voltage[2]
$\overline{SHDN}$	6	shutdown control function enabled / disabled
RF_IN	7	RF input for the power amplifier[1]
ICQ_ADJ	8	I_{Cq} quiescent collector current adjustment by an external resistor
GND	GND paddle	RF ground and DC ground[3]

[1] This pin is DC-coupled and requires an external DC-blocking capacitor.

[2] RF decoupled.

[3] The center metal base of the SOT908-1 also functions as heatsink for the power amplifier.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BGA7124	HVSON8	plastic thermal enhanced very thin small outline package; no leads; 8 terminals; body 3 × 3 × 0.85 mm	SOT908-1

4. Functional diagram

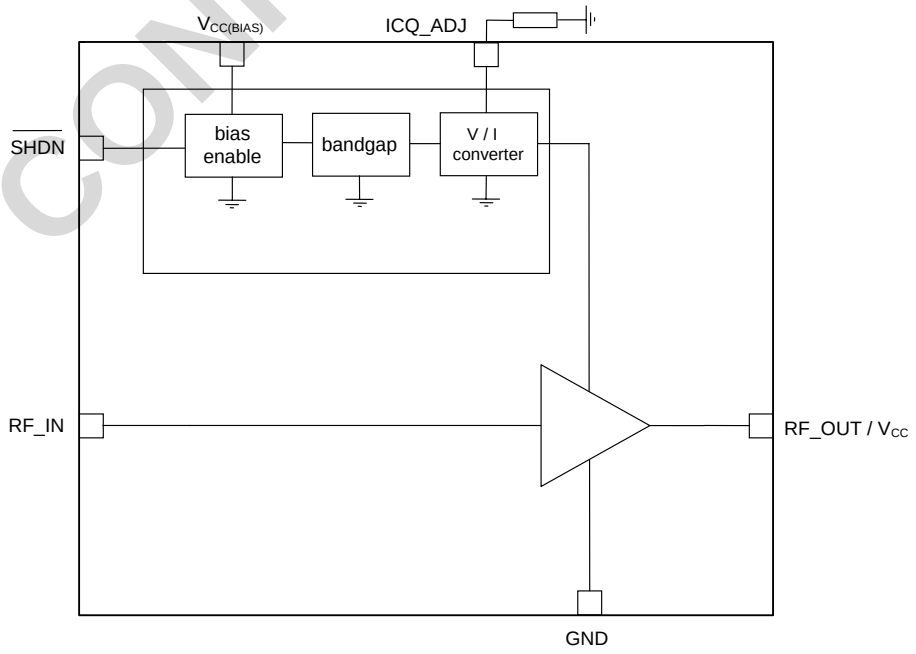


Fig 2. Functional diagram

5. Shutdown control

Table 4. Shutdown control

Mode	Mode description	Function description	$\overline{SHDN}$	Unit
Idle	medium power MMIC fully off; minimal supply current	shutdown control enabled	0	digital logic
TX	medium power MMIC transmit mode	shutdown control enabled	1	digital logic

6. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-	5.2	V
I_{CC}	supply current	V_{CC} = 5.2 V	-	<tbd>	mA
$P_{i(RF)}$	RF input power		-	<tbd>	dBm
P_{tot}	total power dissipation		-	<tbd>	W
T_{case}	case temperature		–40	+85	°C
T_j	junction temperature		-	150	°C

7. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Max	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	T_{case} = 85 °C; V_{CC} = 5 V; I_{CC} = 85 mA	25	30	K/W

8. Static characteristics

Table 7. Characteristics

$Z_S = Z_L = 50\ \Omega$, $\overline{SHDN} = V_{I(D)H(SHDN)}$ (shutdown disabled). Typical values at V_{CC} = 3.3 V / 5 V; T_{case} = 25 °C, ; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CC}	supply voltage	range for V_{CC} = <tbd> V (typ)		3.0	3.3	3.6	V
		range for V_{CC} = <tbd> V (typ)		4.8	5.0	5.2	V
I_{Cq}	adjustable quiescent collector current			5	-	170	mA
I_{CC}	supply current	V_{CC} = 5.2 V		-	-	<tbd>	mA
$I_{CC(SHDN)}$	shutdown supply current	$\overline{SHDN} = V_{I(D)L(SHDN)}$;	[1]	2	4	<tbd>	µA
$V_{I(D)L(SHDN)}$	shutdown logic LOW digital input voltage			0	-	1.5	V
$V_{I(D)H(SHDN)}$	shutdown logic HIGH digital input voltage			2.5	-	V_{CC}	V
$I_{I(D)L(SHDN)}$	shutdown logic LOW digital input current	$\overline{SHDN} = V_{I(D)L(SHDN)}$	[1]	-	-	1	µA
$I_{I(D)H(SHDN)}$	shutdown logic HIGH digital input current	$\overline{SHDN} = V_{I(D)H(SHDN)}$	[1]	-	-	1	µA

[1] Defined across V_{CC} = 3.0 V to 3.6 V and 4.8 V to 5.2 V; T_{case} = –40 °C to +85 °C.

9. Dynamic characteristics

Table 8. Characteristics at V_{CC} = 5 V

$Z_S = Z_L$ = 50 Ω, $\overline{SHDN} = V_{I(D)H(SHDN)}$ (shutdown disabled). Typical values at V_{CC} = 5 V; T_{case} = 25 °C, NXP application circuit; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
f	frequency		[1]	400	-	2700	MHz
G_p	gain power	f = 900 MHz	[2]	-	23	-	dB
		f = 1900 MHz	[2]	-	16	-	dB
		f = 2140 MHz	[2]	-	15	-	dB
		f = 2450 MHz	[2]	-	<tbd>	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 900 MHz	[2]	-	25	-	dBm
		f = 1900 MHz	[2]	-	25	-	dBm
		f = 2140 MHz	[2]	-	25	-	dBm
		f = 2450 MHz	[2]	-	<tbd>	-	dB
$IP3_O$	output third-order intercept point	f = 900 MHz	[2][3]	-	38	-	dBm
		f = 1900 MHz	[2][3]	-	38	-	dBm
		f = 2140 MHz	[2][3]	-	38	-	dBm
		f = 2450 MHz	[2][3]	-	<tbd>	-	dB
NF	noise figure	f = 900 MHz	[2][4]	-	4.5	-	dB
		f = 1900 MHz	[2][4]	-	5.5	-	dB
		f = 2140 MHz	[2][4]	-	6.5	-	dB
		f = 2450 MHz	[2][4]	-	<tbd>	-	dB
RL_{in}	input return loss	f = 900 MHz	[2]	-	−12.0	-	dB
		f = 1900 MHz	[2]	-	−10.0	-	dB
		f = 2140 MHz	[2]	-	−11.0	-	dB
		f = 2450 MHz	[2]	-	<tbd>	-	dB
RL_{out}	output return loss	f = 900 MHz	[2]	-	−8.0	-	dB
		f = 1900 MHz	[2]	-	−14.0	-	dB
		f = 2140 MHz	[2]	-	−13.0	-	dB
		f = 2450 MHz	[2]	-	<tbd>	-	dB
I_{CC}	supply current	V_{CC} = 5 V	[2]	-	175	-	mA

[1] Operation outside this range is possible but parameters are not guaranteed.

[2] Applicable to class-A operation; I_{Cq} = 175 mA.

[3] $P_{o(tone)}$ = 8 dBm; tone spacing = 10 MHz, f_1 = 840 MHz to 960 MHz; f_2 = 1900 MHz to 2200 MHz; higher IMD3 product.

[4] Defined at P_{IN} = −40 dBm; small signal conditions.

Table 9. Characteristics at V_{CC} = 3.3 V

$Z_S = Z_L$ = 50 Ω; $\overline{SHDN} = V_{I(D)H(SHDN)}$ (shutdown disabled). Typical values at V_{CC} = 3.3 V; T_{case} = 25 °C, NXP application circuit; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
f	frequency		[1]	400	-	2700	MHz
G_p	gain power	f = 900 MHz	[2][3]	-	<tbd>	-	dB
		f = 1900 MHz	[2][3]	-	16	-	dB
		f = 2140 MHz	[2][3]	-	<tbd>	-	dB
		f = 2450 MHz	[2][3]	-	<tbd>	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 900 MHz	[2][3]	-	<tbd>	-	dBm
		f = 1900 MHz	[2][3]	-	23	-	dBm
		f = 2140 MHz	[2][3]	-	<tbd>	-	dBm
		f = 2450 MHz	[2][3]	-	<tbd>	-	dB
$IP3_O$	output third-order intercept point	f = 900 MHz	[2][3][4]	-	<tbd>	-	dBm
		f = 1900 MHz	[2][3][4]	-	36	-	dBm
		f = 2140 MHz	[2][3][4]	-	<tbd>	-	dBm
		f = 2450 MHz	[2][3][4]	-	<tbd>	-	dB
NF	noise figure	f = 900 MHz	[2][3][5]	-	<tbd>	-	dB
		f = 1900 MHz	[2][3][5]	-	4.7	-	dB
		f = 2140 MHz	[2][3][5]	-	<tbd>	-	dB
		f = 2450 MHz	[2][3][5]	-	<tbd>	-	dB
RL_{in}	input return loss	f = 900 MHz	[3]	-	<tbd>	-	dB
		f = 1900 MHz	[3]	-	<tbd>	-	dB
		f = 2140 MHz	[3]	-	<tbd>	-	dB
		f = 2450 MHz	[3]	-	<tbd>	-	dB
RL_{out}	output return loss	f = 900 MHz	[3]	-	<tbd>	-	dB
		f = 1900 MHz	[3]	-	<tbd>	-	dB
		f = 2140 MHz	[3]	-	<tbd>	-	dB
		f = 2450 MHz	[3]	-	<tbd>	-	dB
I_{CC}	supply current	V_{CC} = 3.3 V	[2][3]	-	175	-	mA

[1] Operation outside this range is possible but parameters are not guaranteed.

[2] Defined across V_{CC} = 3.0 V to 3.6 V; T_{case} = −40 °C to +85 °C.

[3] Applicable to class-A operation; I_{Cq} = 175 mA.

[4] $P_{o(tone)}$ = 8 dBm; tone spacing = 10 MHz, f_1 = 850 MHz to 1000 MHz; f_2 = 1800 MHz to 2400 MHz; higher IMD3 product.

[5] Defined at P_{IN} = −40 dBm; small signal conditions.

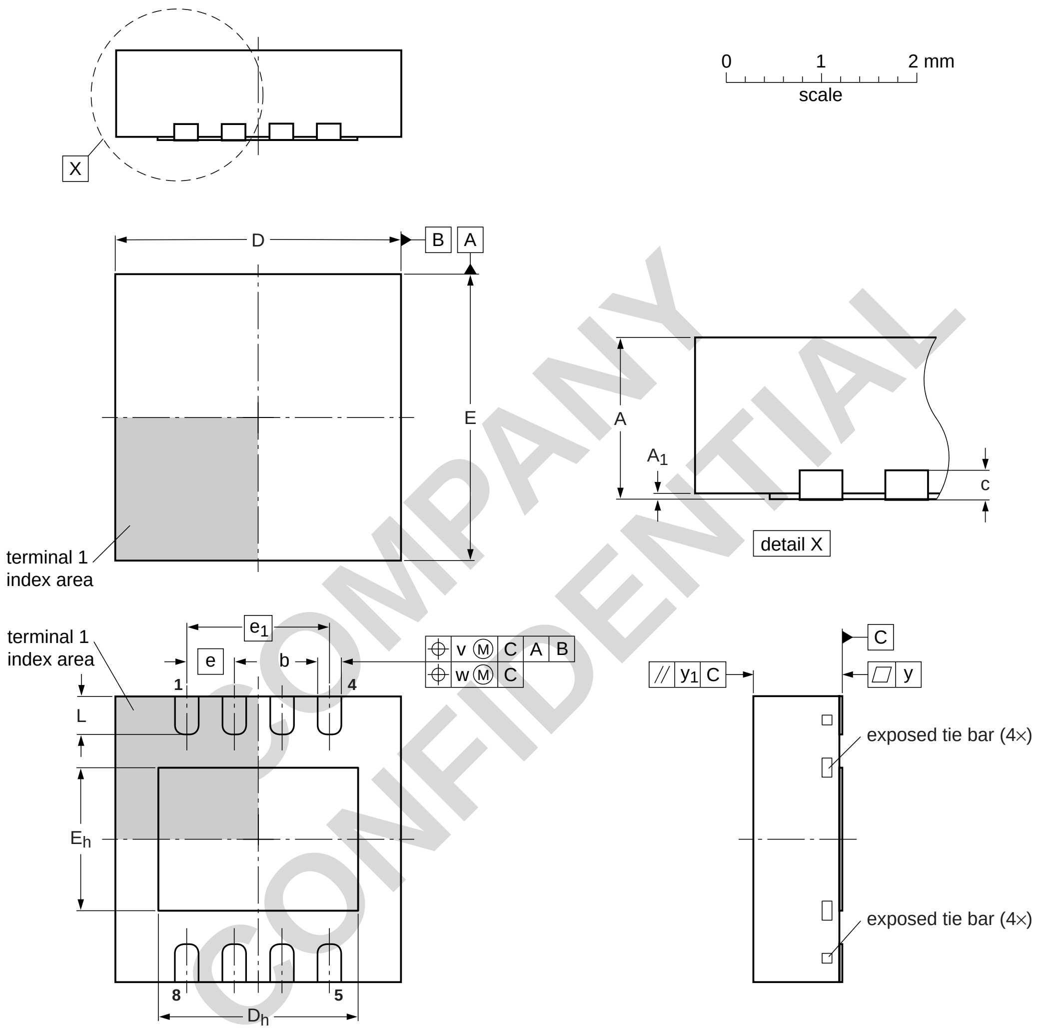
10. Reliability information

Table 10. Reliability

Life test	Conditions	Intrinsic failure rate
HTOL	confidence level 60 %; T_j = 55 °C; activation energy = 0.7 eV; acceleration factor determined by Arrhenius	XX

11. Package outline

HVSON8: plastic thermal enhanced very thin small outline package; no leads; 8 terminals; body 3 x 3 x 0.85 mm **SOT908-1**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max.	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.3 0.2	0.2	3.1 2.9	2.25 1.95	3.1 2.9	1.65 1.35	0.5	1.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT908-1		MO-229				~~05-09-26~~ 05-10-05

Fig 3. Package outline SOT908-1 (HVSON8)

12. Abbreviations

Table 11. Abbreviations

Acronym	Description
CPE	Customer-Premises Equipment
ESD	ElectroStatic Discharge
HTOL	High Temperature Operating Life
ISM	Industrial, Scientific and Medical
MMIC	Monolithic Microwave Integrated Circuit
RFID	Radio Frequency IDentification
TX	Transmit
W-LAN	Wideband Code Division Multiple Access

13. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGA7124_1	<tbd>	Objective data sheet	-	-

14. Legal information

14.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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16. Contents

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