

BGA622

Silicon Germanium
Wide Band Low Noise Amplifier

Wireless
Silicon Discretes



Never stop thinking.

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BGA622**Data Sheet****Revision History: 2002-12-18**Previous Version: 2002-09-13

Page	Subjects (major changes since last revision)
5 - 6	Min. / max. limits for gain and noise figure added

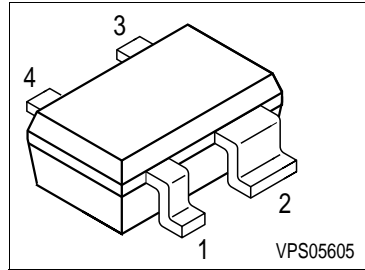
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Silicon Germanium Wide Band Low Noise Amplifier

BGA622

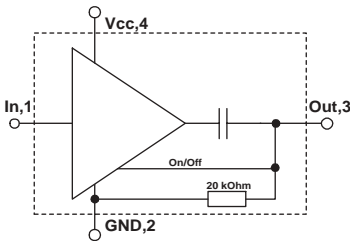
Features

- High gain, $|S_{21}|^2=14.8$ dB at 1.575 GHz
 $|S_{21}|^2=13.9$ dB at 1.9 GHz
 $|S_{21}|^2=13.3$ dB at 2.14 GHz
 $|S_{21}|^2=12.7$ dB at 2.4 GHz
- Low noise figure, NF=1.1 dB at 2.14 GHz
- Operating frequency range 0.5 - 6 GHz
- Typical supply voltage: 2.75 V
- On/Off - Switch
- Output-match on chip, input pre-matched
- Low part count
- 70 GHz f_T - Silicon Germanium technology



Applications

- LNA for GSM, GPS, DCS, PCS, UMTS, Bluetooth, ISM and WLAN



Description

The BGA622 is a wide band low noise amplifier, based on Infineon Technologies' Silicon Germanium Technology B7HF. In order to provide the LNA in a small package the out-pin is simultaneously used for RF out and On/Off switch. This functionality can be accessed using a RF-Choke at the Out pin, where a DC level of 0 V or an open switches the device on and a DC level of V_{cc} switches the device off. While the device is switched off, it provides an insertion loss of 20 dB together with a high IIP3 up to 18 dBm.

ESD: Electrostatic discharge sensitive device, observe handling precaution!

Type	Package	Marking	Chip
BGA622	SOT343	BRs	T0535

Maximum Ratings

Parameter	Symbol	Value	Unit
Voltage at pin Vcc	V_{CC}	3.5	V
Voltage at pin Out	V_{OUT}	4	V
Current into pin In	I_{IN}	0.1	mA
Current into pin Out	I_{OUT}	1	mA
Current into pin Vcc	I_{VCC}	10	mA
RF input power	P_{IN}	6	dBm
Total power dissipation, $T_S < 139\text{ °C}^{1)}$	P_{tot}	35	mW
Junction temperature	T_j	150	°C
Ambient temperature range	T_A	-65 ... +150	°C
Storage temperature range	T_{STG}	-65 ... +150	°C
Thermal resistance: junction-soldering point	R_{thJS}	300	K/W

¹⁾ T_S is measured on the ground lead at the soldering point

Note: All Voltages refer to GND-Node

Electrical Characteristics at $T_A=25\text{ °C}$ (measured according to fig. 1)
 $V_{CC}=2.75\text{ V}$, Frequency= 1.575 GHz , unless otherwise specified

Parameter	Symbol	min.	typ.	max.	Unit
Insertion power gain	$ S_{21} ^2$	12.7	14.8	16.7	dB
Insertion power gain (Off-State)	$ S_{21} ^2$		-24		dB
Input Return Loss (On-State)	RL_{IN}		6		dB
Output Return Loss (On-State)	RL_{OUT}		12		dB
Noise Figure ($Z_S=50\Omega$)	$F_{50\Omega}$		1.05	1.6	dB
Input Third Order Intercept Point ¹⁾ (On-State) $\Delta f=1\text{ MHz}$, $P_{IN}=-28\text{ dBm}$	IIP_3		0		dBm
Input Third Order Intercept Point ¹⁾ (Off-State) $\Delta f=1\text{ MHz}$, $P_{IN}=-8\text{ dBm}$	IIP_3		18		dBm
Input Power at 1dB Gain Compression	P_{-1dB}		-16.5		dBm
Total Device Off Current, $V_{CC}=2.75\text{ V}$, $V_{out}=V_{CC}$	$I_{tot-off}$		260		μA
Total Device On Current, $V_{CC}=2.75\text{ V}$	I_{tot-on}		5.8		mA

¹⁾ IIP_3 value depends on termination of all intermodulation frequency components. Termination used for this measurement is $50\ \Omega$ from 0.1 to 6 GHz

Electrical Characteristics at $T_A=25^{\circ}\text{C}$ (measured according to fig. 1)

$V_{CC}=2.75\text{ V}$, Frequency= 2.14 GHz , unless otherwise specified

Parameter	Symbol	min.	typ.	max.	Unit
Insertion power gain	$ S_{21} ^2$	11.4	13.3	15.0	dB
Insertion power gain (Off-State)	$ S_{21} ^2$		-20		dB
Input Return Loss (On-State)	RL_{IN}		8		dB
Output Return Loss (On-State)	RL_{OUT}		10		dB
Noise Figure ($Z_S=50\Omega$)	$F_{50\Omega}$		1.1	1.6	dB
Input Third Order Intercept Point ¹⁾ (On-State) $\Delta f=1\text{MHz}$, $P_{IN}=-28\text{dBm}$	IIP_3		3		dBm
Input Third Order Intercept Point ¹⁾ (Off-State) $\Delta f=1\text{MHz}$, $P_{IN}=-8\text{dBm}$	IIP_3		18		dBm
Input Power at 1dB Gain Compression	P_{-1dB}		-13		dBm

¹⁾ IP3 value depends on termination of all intermodulation frequency components. Termination used for this measurement is $50\ \Omega$ from 0.1 to 6 GHz

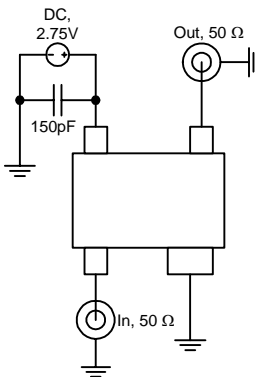


Figure 1 S-Parameter Test Circuit (loss-free microstrip test-fixture)

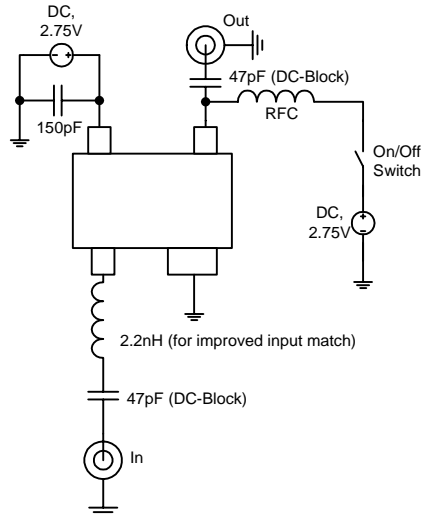
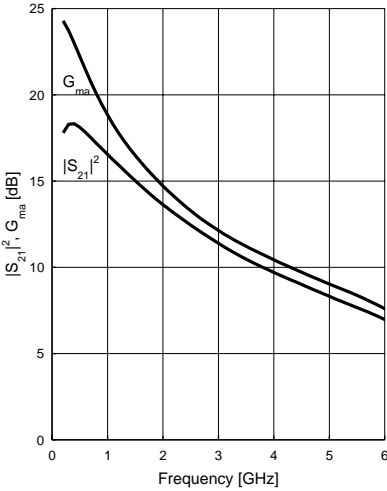


Figure 2 Application Circuit

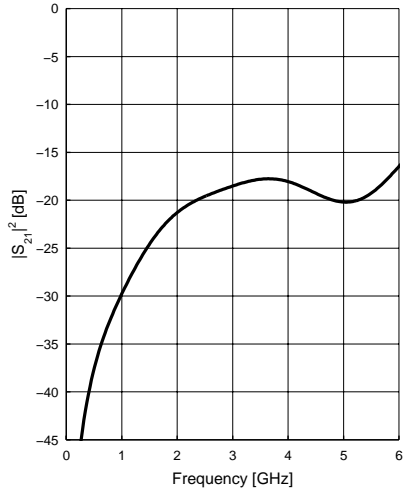
Power Gain $|S_{21}|^2, G_{ma} = f(f)$

$V_{CC} = 2.75V, I_{tot-on} = 5.8mA$



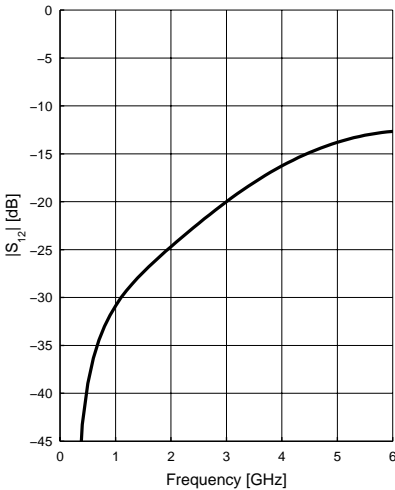
Off Gain $|S_{21}|^2 = f(f)$

$V_{CC} = 2.75V, V_{OUT} = 2.75V, I_{tot-off} = 0.3mA$



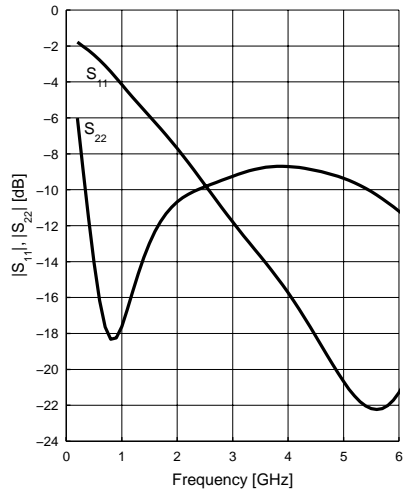
Reverse Isolation $|S_{12}| = f(f)$

$V_{CC} = 2.75V, I_{tot-on} = 5.8mA$



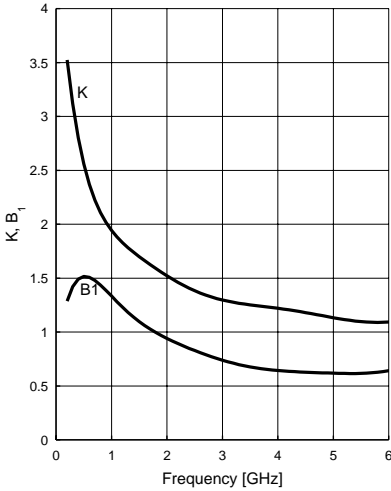
Matching $|S_{11}|, |S_{22}| = f(f)$

$V_{CC} = 2.75V, I_{tot-on} = 5.8mA$



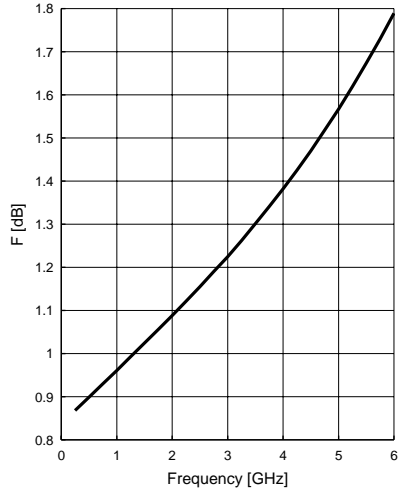
Stability K, B₁ = f(f)

V_{CC} = 2.75V, I_{tot-on} = 5.8mA



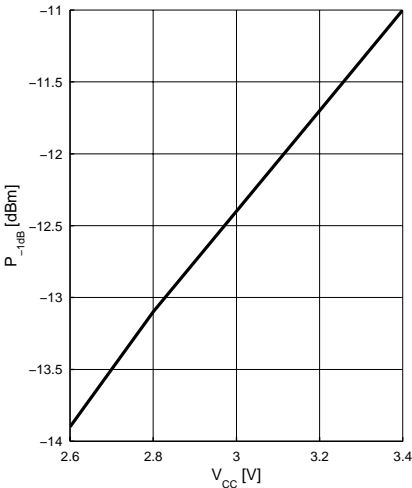
Noise Figure F = f(f)

V_{CC} = 2.75V, I_{tot-on} = 5.8mA, Z_S = 50Ω



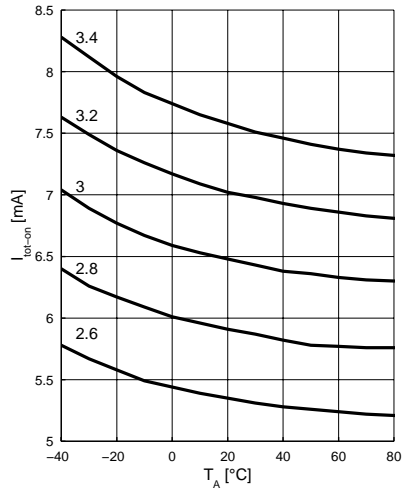
Input Compression Point P_{-1dB} = f(V_{CC})

f = 2.14GHz, T_A = -40 ... +85°C

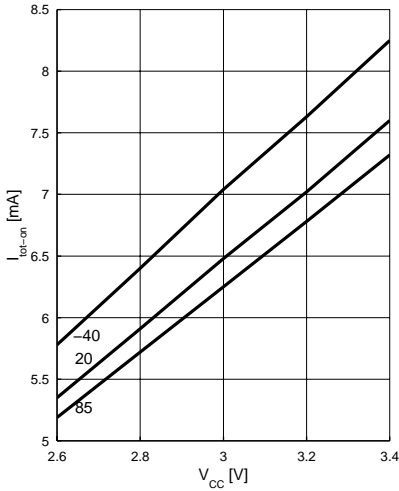


Device Current I_{tot-on} = f(T_A, V_{CC})

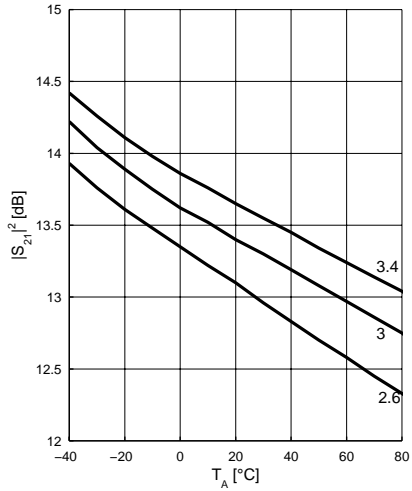
V_{CC} = parameter in V



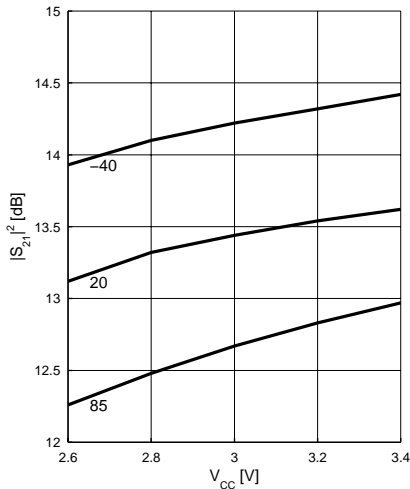
Device Current $I_{\text{tot-on}} = f(V_{\text{CC}}, T_A)$
 $T_A = \text{parameter in } ^\circ\text{C}$



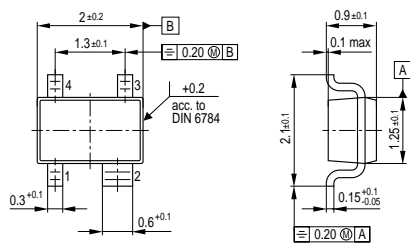
Power Gain $|S_{21}|^2 = f(T_A, V_{\text{CC}})$
 $f = 2.14\text{GHz}, V_{\text{CC}} = \text{parameter in V}$



Power Gain $|S_{21}|^2 = f(V_{\text{CC}}, T_A)$
 $f = 2.14\text{GHz}, T_A = \text{parameter in } ^\circ\text{C}$



Package Outline



GPS06605