

# BGA622

Silicon Germanium  
Wide Band Low Noise Amplifier

Wireless  
Silicon Discretes



Never stop thinking.

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**BGA622****Data Sheet****Revision History:        2002-09-13**Previous Version:        2002-08-08

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Page	Subjects (major changes since last revision)
5	Max. RF input power added
1-9	Preliminary status removed

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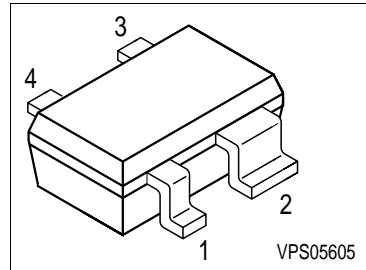
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# Silicon Germanium Wide Band Low Noise Amplifier

**BGA622**

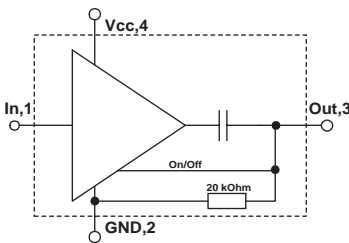
## Features

- 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

<sup>1)</sup>  $T_S$  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= $1.575\text{ GHz}$ , unless otherwise specified**

Parameter	Symbol	min.	typ.	max.	Unit
Insertion power gain	$ S_{21} ^2$		14.8		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		dB
Input Third Order Intercept Point <sup>1)</sup> (On-State) $\Delta f=1\text{ MHz}$ , $P_{IN}=-28\text{ dBm}$	$IIP_3$		0		dBm
Input Third Order Intercept Point <sup>1)</sup> (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		$\mu\text{A}$
Total Device On Current, $V_{CC}=2.75\text{ V}$	$I_{tot-on}$		5.8		mA

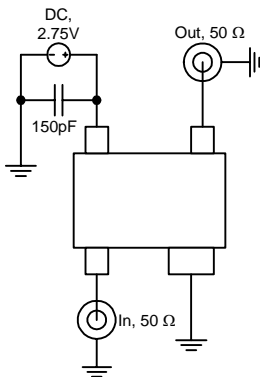
<sup>1)</sup>  $IIP_3$  value depends on termination of all intermodulation frequency components. Termination used for this measurement is  $50\ \Omega$  from 0.1 to 6 GHz

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

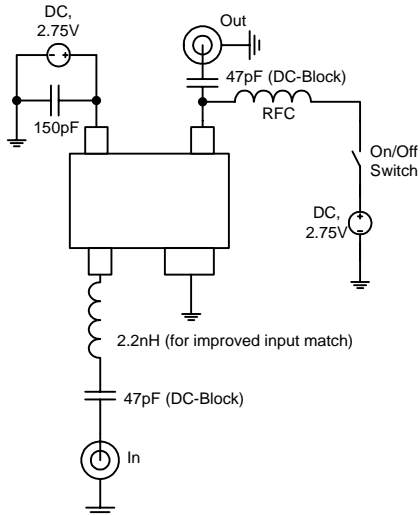
**$V_{CC}=2.75\text{ V}$ , Frequency= $2.14\text{ GHz}$ , unless otherwise specified**

Parameter	Symbol	min.	typ.	max.	Unit
Insertion power gain	$ S_{21} ^2$		13.3		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		dB
Input Third Order Intercept Point <sup>1)</sup> (On-State) $\Delta f=1\text{MHz}$ , $P_{IN}=-28\text{dBm}$	$IIP_3$		3		dBm
Input Third Order Intercept Point <sup>1)</sup> (Off-State) $\Delta f=1\text{MHz}$ , $P_{IN}=-8\text{dBm}$	$IIP_3$		18		dBm
Input Power at 1dB Gain Compression	$P_{-1\text{dB}}$		-13		dBm

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



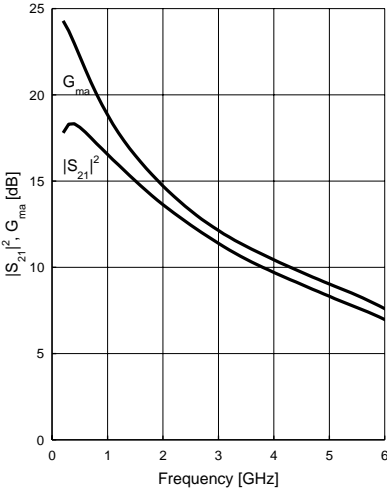
**Figure 1 S-Parameter Test Circuit (loss-free microstrip test-fixture)**



**Figure 2 Application Circuit**

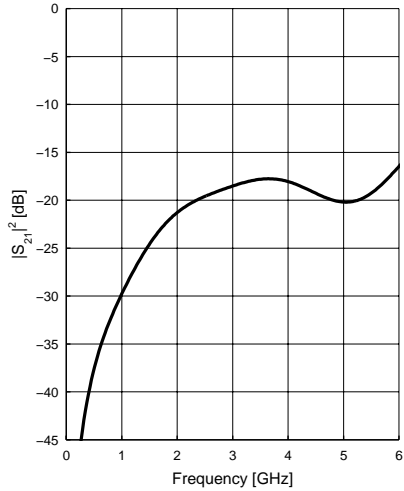
**Power Gain**  $|S_{21}|^2, G_{ma} = f(f)$

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



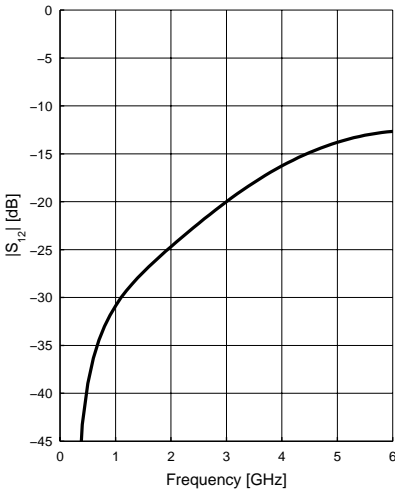
**Off Gain**  $|S_{21}|^2 = f(f)$

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



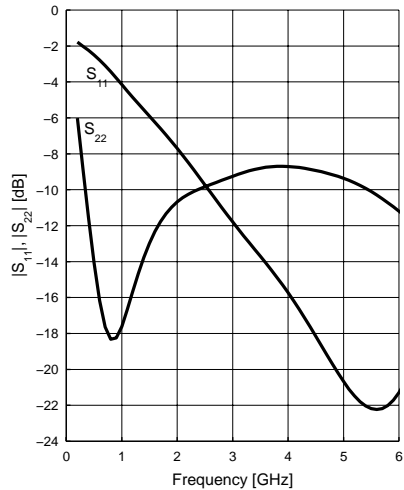
**Reverse Isolation**  $|S_{12}| = f(f)$

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



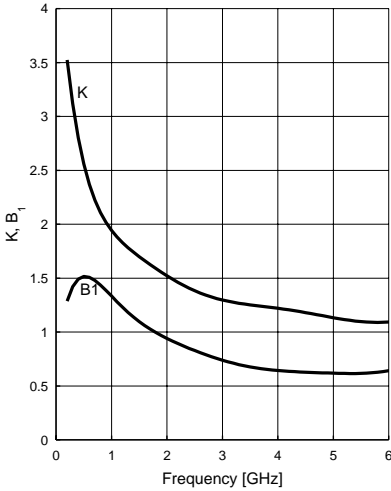
**Matching**  $|S_{11}|, |S_{22}| = f(f)$

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



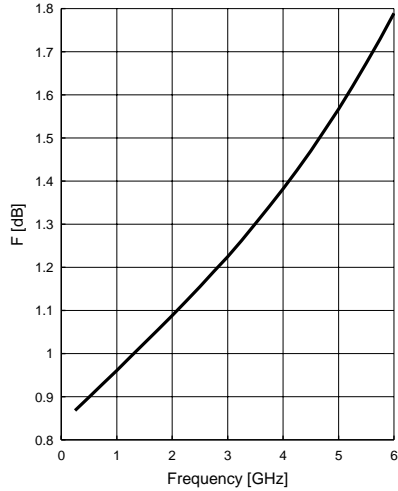
**Stability K, B<sub>1</sub> = f(f)**

V<sub>CC</sub> = 2.75V, I<sub>tot-on</sub> = 5.8mA



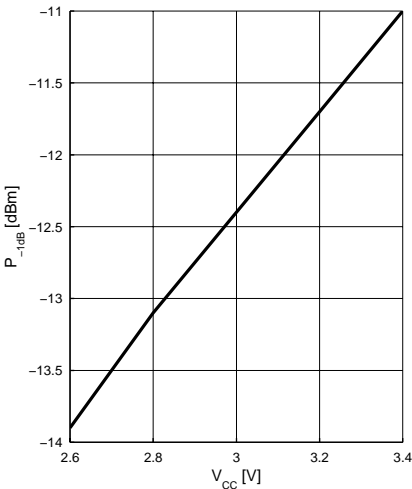
**Noise Figure F = f(f)**

V<sub>CC</sub> = 2.75V, I<sub>tot-on</sub> = 5.8mA, Z<sub>S</sub> = 50Ω



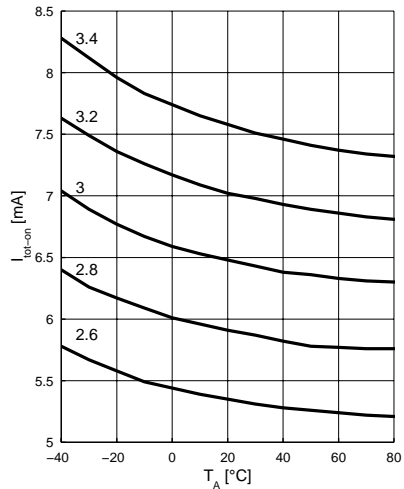
**Input Compression Point P<sub>-1dB</sub> = f(V<sub>CC</sub>)**

f = 2.14GHz, T<sub>A</sub> = -40 ... +85°C



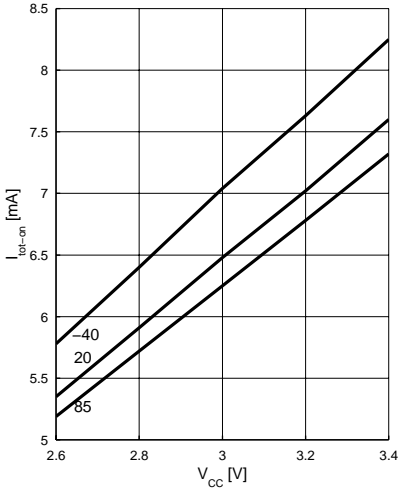
**Device Current I<sub>tot-on</sub> = f(T<sub>A</sub>, V<sub>CC</sub>)**

V<sub>CC</sub> = parameter in V

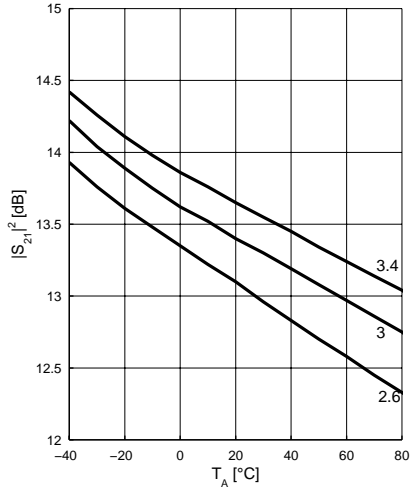




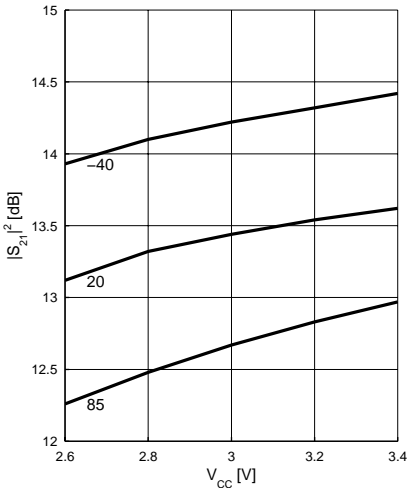
**Device Current**  $I_{\text{tot-on}} = f(V_{\text{CC}}, T_A)$   
 $T_A = \text{parameter in } ^\circ\text{C}$



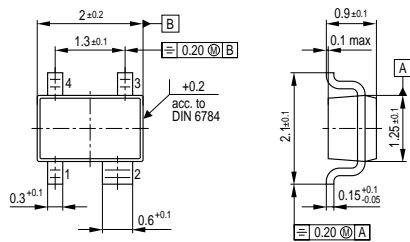
**Power Gain**  $|S_{21}|^2 = f(T_A, V_{\text{CC}})$   
 $f = 2.14\text{GHz}, V_{\text{CC}} = \text{parameter in V}$



**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

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Datasheets for electronics components.