BGA622

Silicon Germanium Wide Band Low Noise Amplifier with 2 kV ESD Protection

Small Signal Discretes

Never stop thinking

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BGA622, Silicon Germanium Wide Band Low Noise Amplifier with 2 kV ESD Protection

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Previous Version: 2005-11-16

Page	Subjects (major changes since last revision)
All	Document layout change

Trademarks

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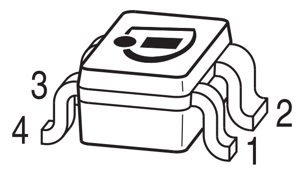
1 Silicon Germanium Wide Band Low Noise Amplifier with 2 kV ESD Protection

Feature

- High gain
  $|S_{21}|^2$ = 15.0 dB at 1.575 GHz
  $|S_{21}|^2$ = 14.2 dB at 1.9 GHz
  $|S_{21}|^2$ = 13.6 dB at 2.14 GHz
- Low noise figure, NF = 1.0 dB at 1.575 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
- 2 kV HBM ESD protection (Pin-to-Pin)
- Pb-free (RoHS compliant) package



SOT343

RoHS

Applications

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

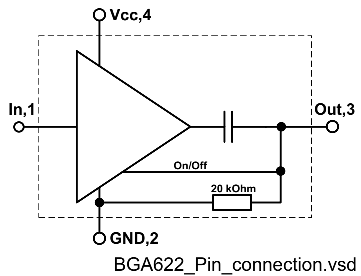


Figure 1 Pin connection

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 24 dB together with a high IIP_3 up to 20 dBm.

Type	Package	Marking
BGA622	SOT343	BXs

Note: ***ESD:*** *Electrostatic discharge sensitive device, observe handling precaution*

Maximum Ratings

Table 1 Maximum ratings

Parameter	Symbol	Limit Value	Unit
Voltage at pin V_{CC}	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 V_{CC}	I_{Vcc}	10	mA
RF input power	P_{in}	6	dBm
Total power dissipation, T_S < 139 °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
ESD capability all pins (HBM: JESD22-A114)	V_{ESD}	2000	V

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

Note: All Voltages refer to GND-Node

Thermal resistance

Table 2 Thermal resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[1)]	R_{thJS}	300	K/W

1) For calculation of R_{thJA} please refer to Application Note Thermal Resistance

2 Electrical Characteristics

2.1 Electrical characteristics at T_A = 25 °C (measured according to Figure 2) V_{CC} = 2.75 V, Frequency = 1.575 GHz, unless otherwise specified

Table 3 Electrical Characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion power gain	$\|S_{21}\|^2$		15.0		dB	
Insertion power gain (Off-State)	$\|S_{21}\|^2$		-27		dB	
Input return loss (On-State)	RL_{in}		5		dB	
Output return loss (On-State)	RL_{out}		12		dB	
Noise figure (Z_S = 50 Ω)	$F_{50\Omega}$		1.00		dB	f = 0.1 GHz
Input third order intercept point[1] (On-State)	IIP_3		0		dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input third order intercept point[1] (Off - State)	IIP_3		20		dBm	Δf = 1 MHz, P_{IN} = -8 dBm
Input power at 1 dB gain compression	P_{-1dB}		-16.5		dBm	
Total device off current	$I_{tot\text{-}off}$	130	260	420	µA	V_{CC} = 2.75 V, V_{out} = V_{CC}
Total device on current	$I_{tot\text{-}on}$	4.0	5.8	7.8	mA	V_{CC} = 2.75 V
On / Off switch control voltage	V_{on}	0		0.8	V	V_{CC} = 2.75 V ON-Mode: V_{out} = V_{on}
	V_{off}	2.0		3.5	V	V_{CC} = 2.75 V OFF-Mode: V_{out} = V_{off}

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

2.2 Electrical characteristics at T_A = 25 °C (measured according to Figure 2) V_{CC} = 2.75 V, Frequency = 2.14 GHz, unless otherwise specified

Table 4 Electrical Characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion power gain	$\|S_{21}\|^2$		13.6		dB	
Insertion power gain (Off-State)	$\|S_{21}\|^2$		-24		dB	
Input return loss (On-State)	RL_{in}		7		dB	
Output return loss (On-State)	RL_{out}		10		dB	
Noise figure (Z_S = 50 Ω)	$F_{50\Omega}$		1.05		dB	
Input third order intercept Point[1)] (On-State)	IIP_3		3		dBm	Δf = 1 MHz, P_{IN} = -28 dBm
Input third order intercept point[1)] (Off-State)	IIP_3		20		dBm	Δf = 1 MHz, P_{IN} = -8 dBm
Input power at 1 dB gain compression	P_{-1dB}		-13		dBm	

1) IP_3 values depends on termination of all intermodulation frequency components. Termination used for this measurement is 50 Ω from 0.1 to 6 GHz

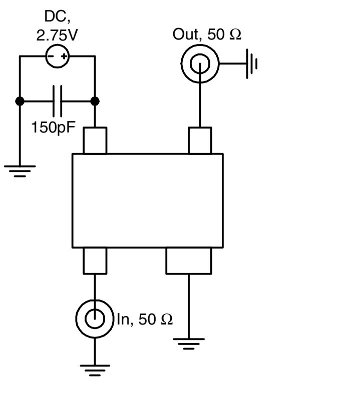


Figure 2 S-Parameter Test Circuit (loss-free microstrip test-fixture)

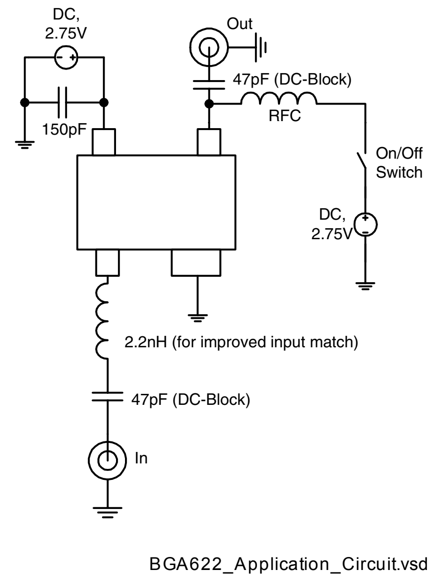
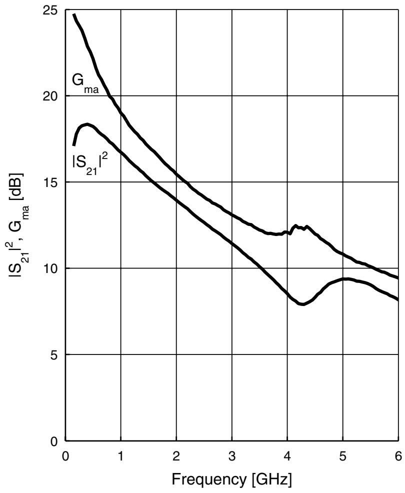


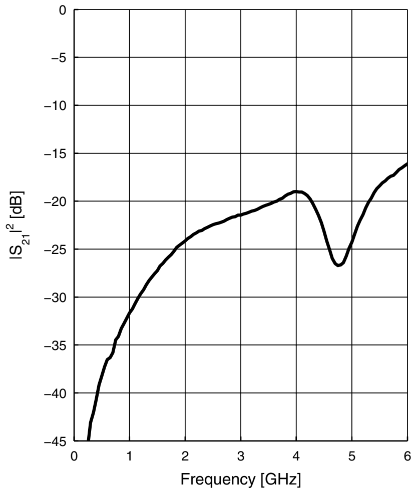
Figure 3 Application Circuit for 1800 - 2500 MHz

3 Measured Parameters

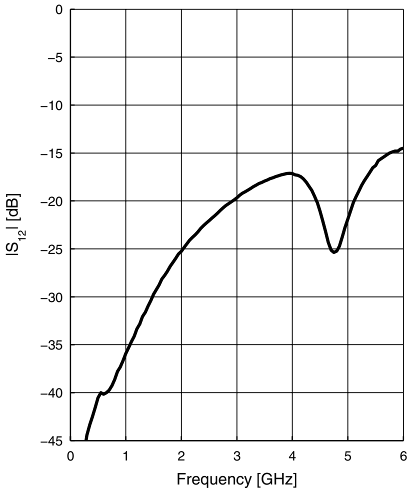
Power Gain $|S_{21}|^2$, G_{ma} = f(f)
V_{CC} = 2.75V, I_{tot-on} = 5.8mA



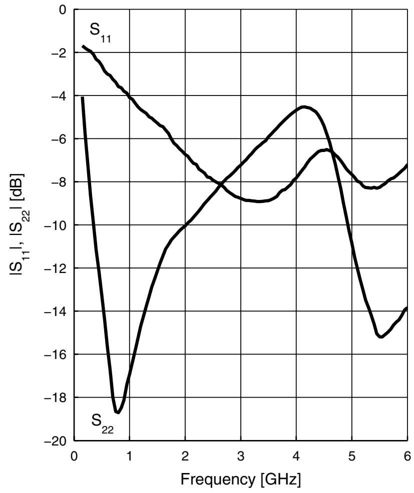
Off Gain $|S_{21}|^2$ = f(f)
V_{CC} = 2.75V, V_{OUT} = 2.75V, $I_{tot-off}$ = 0.3mA



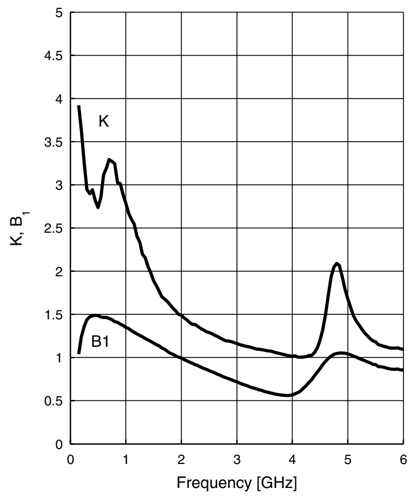
Reverse Isolation $|S_{12}|$ = f(f)
V_{CC} = 2.75V, I_{tot-on} = 5.8mA



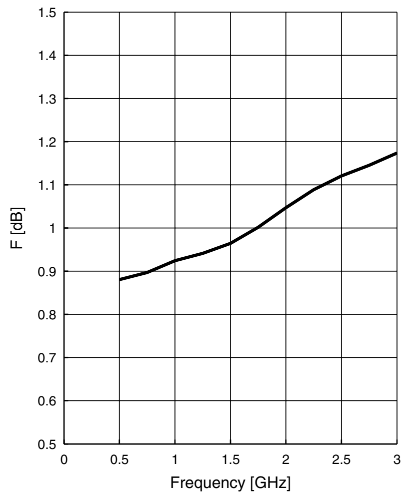
Matching $|S_{11}|$, $|S_{22}|$ = f(f)
V_{CC} = 2.75V, I_{tot-on} = 5.8mA



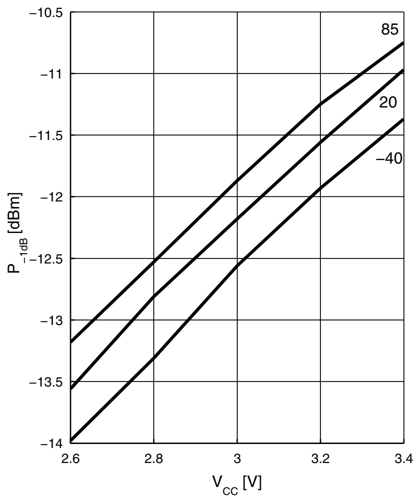
Stability K, B_1 = f(f)
V_{CC} = 2.75V, I_{tot-on} = 5.8mA



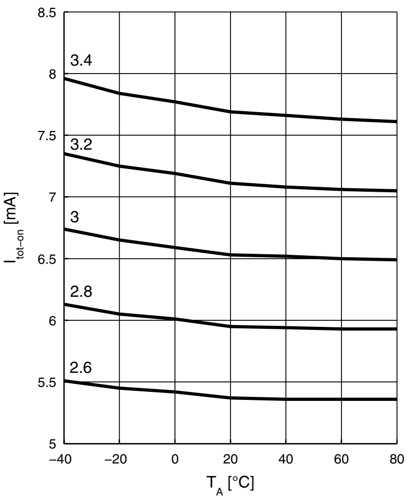
Noise Figure F = f(f)
V_{CC} = 2.75V, I_{tot-on} = 5.8mA, Z_S = 50Ω



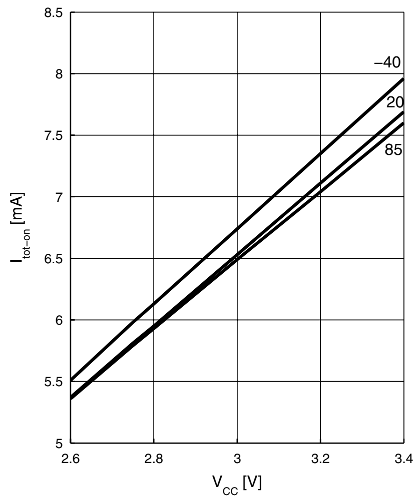
Input Compression Point P_{-1dB} = f(V_{CC})
f = 2.14GHz, T_A = parameter in °C



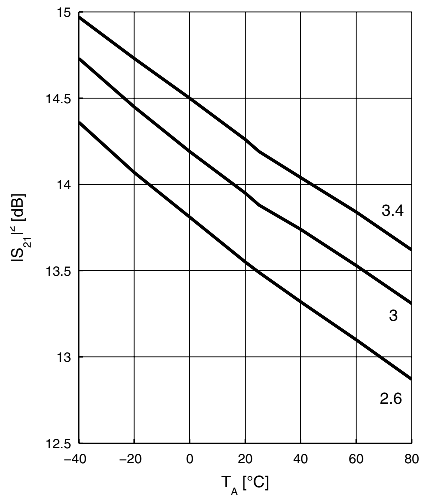
Device Current I_{tot-on} = f(T_A, V_{CC})
V_{CC} = parameter in V



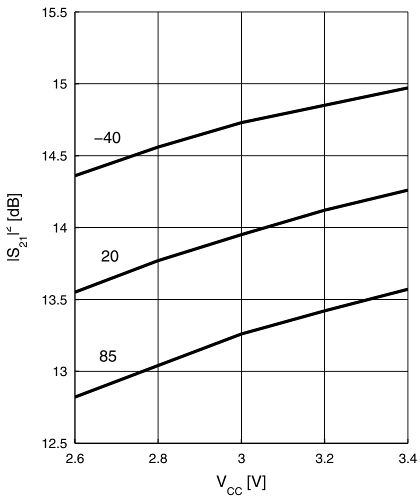
Device Current $I_{tot-on} = f(V_{CC}, T_A)$
T_A = parameter in °C



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



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



4 Package Information

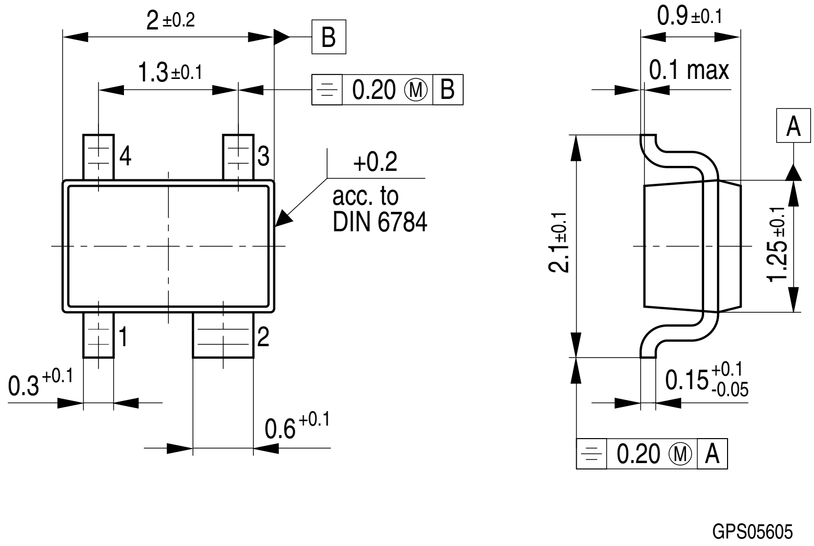


Figure 4 Package Outline SOT343

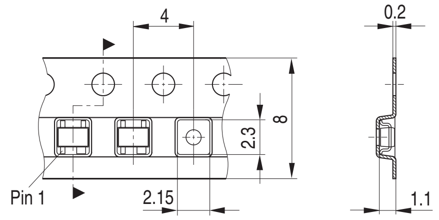


Figure 5 Tape for SOT343