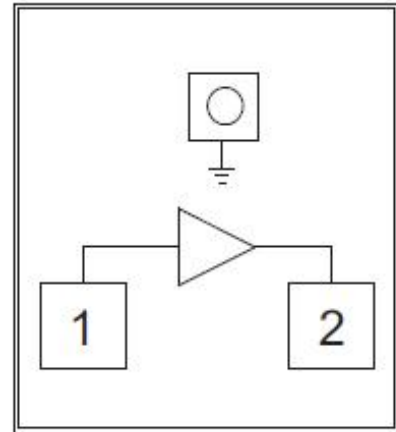


High Linearity, Low Noise Gain Block Chip, 0.6-5GHz

Performance characteristics

- Frequency range: 0.6 - 5.0 GHz
- Small signal gain: >20dB (full frequency band)
- Gain flatness : $\leq 2.0\text{dB}$ (1.5~3.6G, 3.5~ 5.0GHz)
- Noise figure: <0.9dB (full band)
- P-1dB: 18 dBm
- OIP3 : 34 dBm
- Support +3V ~ +5V operation
- Power, OIP3, current can be adjusted by external choking resistance
- ESD: 500V
- 50Ohm input/output
- Chip size: 0.83 x 0.93 x 0.1 mm

Functional Block Diagram



Use restriction parameter ¹

| | |
|-----------------------|----------------|
| Collector voltage | +7 V |
| Input power | +30dBm |
| Operating Current | 120mA |
| Operating temperature | -55 ~ + 125 °C |
| Storage temperature | -65 ~ +150°C |

【1】 Exceeding any of these maximum limits may cause permanent damage.

Electrical performance parameters (TA = +25°C, Vd = +5V, 50Ω system)

| Index | Test Conditions | Minimum | Typical Value | Maximum | Unit |
|--------------------|---------------------------------|---------|---------------|---------|------|
| Frequency Range | | 0.6 | - | 5 | GHz |
| Test frequency | | - | 2.6 | - | GHz |
| Small Signal Gain | | - | 21 | - | dB |
| Input return loss | | - | 15 | - | dB |
| Output return loss | | - | 15 | - | dB |
| Reverse Isolation | | - | 36 | - | dB |
| P-1 | | - | 18.5 | - | dBm |
| OIP3 | Pout = + 5 dBm/tone, Δf = 5 MHz | - | 34 | - | dBm |
| Noise Figure* | Not deembedded | - | 0.7 | - | dB |
| Switching speed | | - | 30 | - | ns |
| Shutdown control | On state | 0 | - | 0.8 | V |
| | Off state (Power down) | + 1.2 | - | VDD | V |
| Current | On state | - | 65 | - | mA |

| | | | | | |
|--|------------------------|---|---|---|----|
| | Off state (Power down) | - | 3 | - | mA |
|--|------------------------|---|---|---|----|

*The noise figure result does not deduct the input loss of the test DEMO board .

Electrical performance parameters

| Electrical performance parameters (TA = +25°C, Vd = +5V, 50Ω system) | | | | | | | | | | |
|---|---------------|------|------|------|------|------|------|------|------|------|
| Index | Typical Value | | | | | | | | | Unit |
| Test frequency | 0.7 | 0.9 | 1.9 | 2.6 | 3.0 | 3.6 | 4.0 | 4.5 | 5.0 | GHz |
| Small Signal Gain | 24.0 | 23.0 | 20.5 | 21.0 | 21.5 | 22.5 | 23.5 | 24.0 | 23.5 | dB |
| Input return loss | 11.0 | 13.0 | 16.5 | 15.0 | 14.0 | 12.5 | 11.5 | 10.5 | 10.5 | dB |
| Output return loss | 14.0 | 14.5 | 18.0 | 16.0 | 13.5 | 10.0 | 9.0 | 9.5 | 13.0 | dB |
| Noise Figure* | 0.6 | 0.6 | 0.6 | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 | 0.9 | dB |
| P-1 | 14.0 | 15.0 | 19.5 | 19.0 | 18.0 | 18.5 | 18.5 | 19.0 | 18.5 | dBm |
| OIP3** | 33.0 | 33.0 | 32.5 | 34.0 | 36.5 | 35.0 | 33.5 | 31.0 | 29.5 | dBm |
| Quiescent Current | 65 | | | | | | | | | mA |

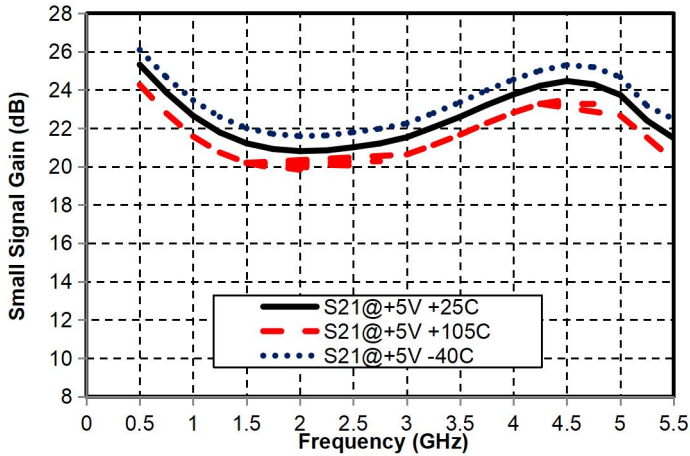
*The noise figure result does not deduct the input loss of the test DEMO board .

** Pout=+5dBm/tone, Δf = 5 MHz.

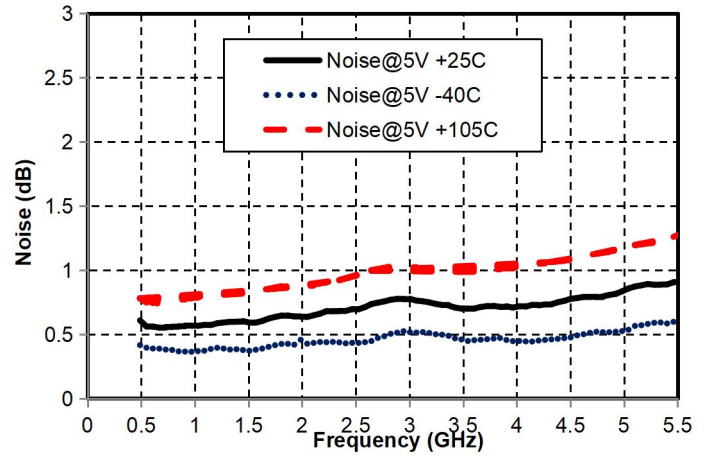
High Linearity, Low Noise Gain Block Chip, 0.6-5GHz

Main indicator testing curve

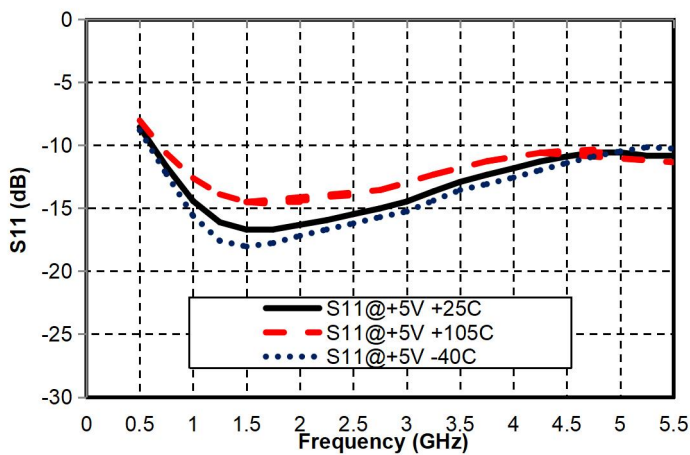
Small Signal Gain vs. Frequency



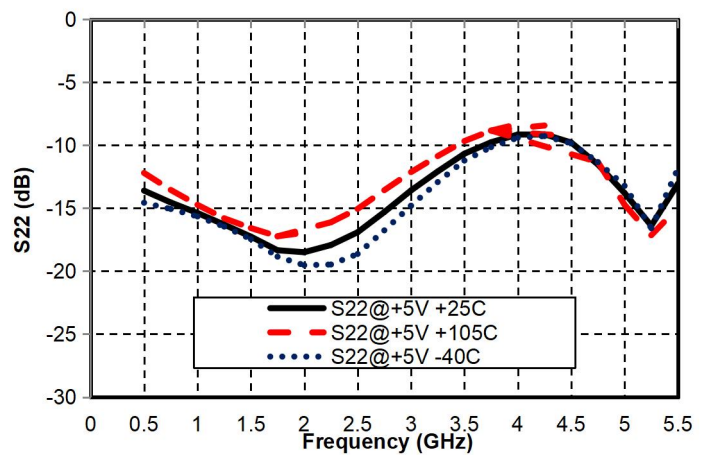
Noise Figure vs. Frequency



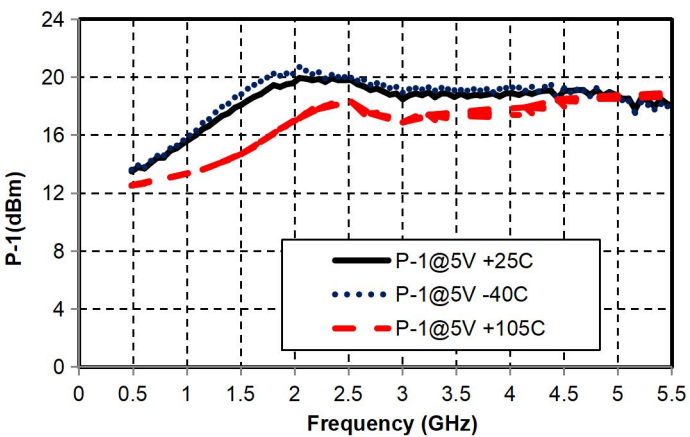
Input Return Loss vs. Frequency



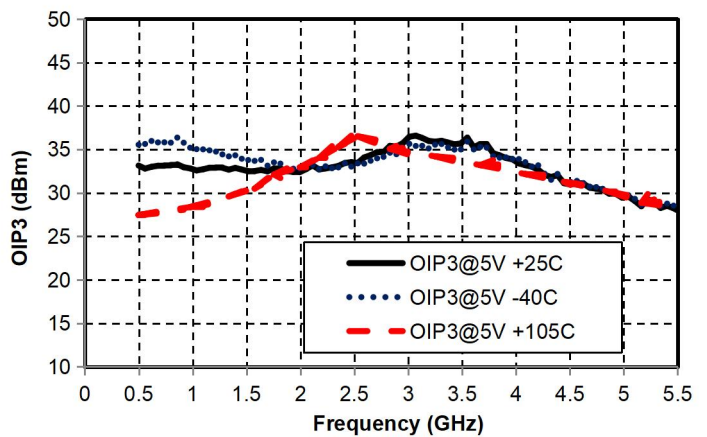
Output Return Loss vs. Frequency



P-1dB vs. Frequency



OIP3 vs. Frequency



Performance parameters

(The following table shows the +3.3V test results. The device can achieve different power, OIP3 and current by adjusting the Vbias port)

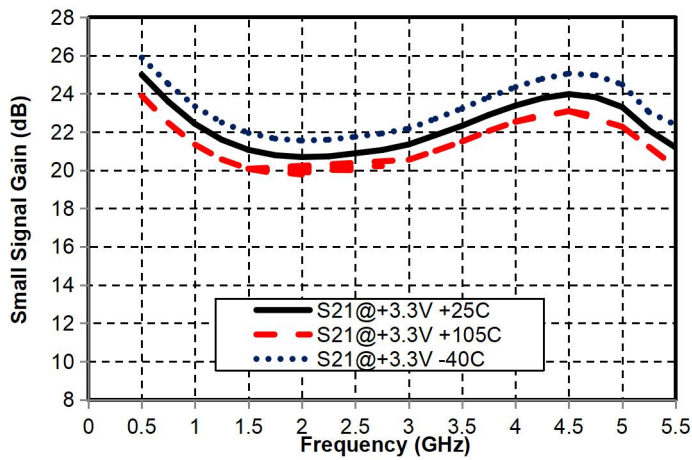
| Electrical performance parameters (TA =+25°C, Vd =+3.3V, 50Ω system) | | | | | | | | | | |
|---|---------------|------|------|------|------|------|------|------|------|------|
| Index | Typical Value | | | | | | | | | Unit |
| Test frequency | 0.7 | 0.9 | 1.9 | 2.6 | 3.0 | 3.6 | 4.0 | 4.5 | 5.0 | GHz |
| Small Signal Gain | 23.5 | 22.5 | 20.5 | 21.0 | 21.0 | 22.5 | 23.0 | 24.0 | 23.0 | dB |
| Input return loss | 10.5 | 13.5 | 17.0 | 15.0 | 14.0 | 12.0 | 10.5 | 10.0 | 9.5 | dB |
| Output return loss | 16.0 | 16.5 | 19.0 | 16.0 | 13.5 | 10.5 | 9.5 | 10.5 | 14.5 | dB |
| Noise Figure* | 0.5 | 0.5 | 0.5 | 0.6 | 0.7 | 0.6 | 0.6 | 0.7 | 0.8 | dB |
| P-1 | 9.5 | 10.5 | 17.0 | 17.5 | 17.0 | 17.0 | 17.0 | 16.5 | 15.5 | dBm |
| OIP3** | 15.0 | 19.5 | 35.5 | 41.5 | 39.0 | 38.5 | 36.0 | 33.0 | 31.0 | dBm |
| Quiescent Current | 65 | | | | | | | | | mA |

*The noise figure result does not deduct the input loss of the test DEMO board .

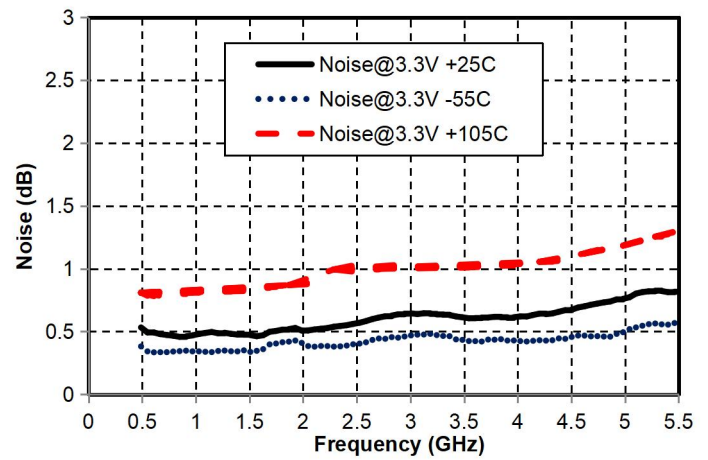
** Pout = +5dBm/tone, Δf = 5 MHz.

High Linearity Low Noise Gain Amplifier , 0.6-5GHz

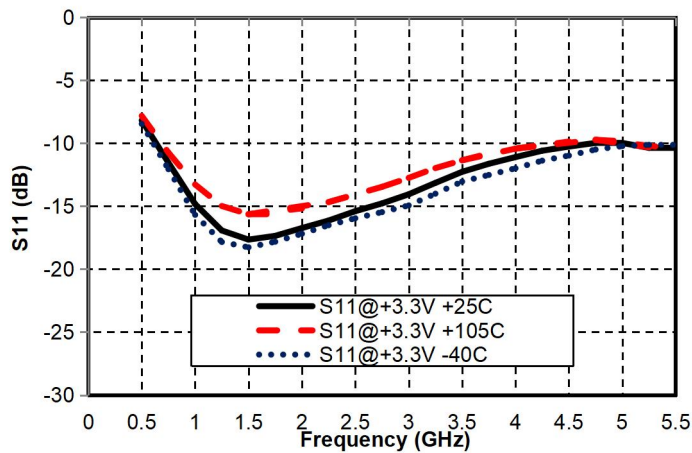
Small Signal Gain vs. Frequency



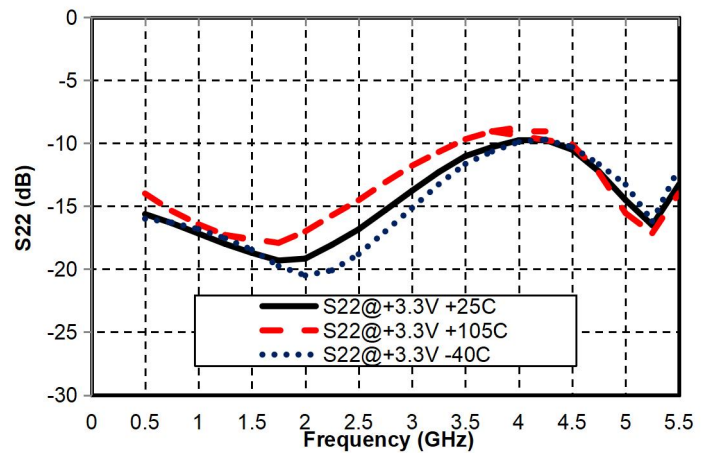
Noise Figure vs. Frequency



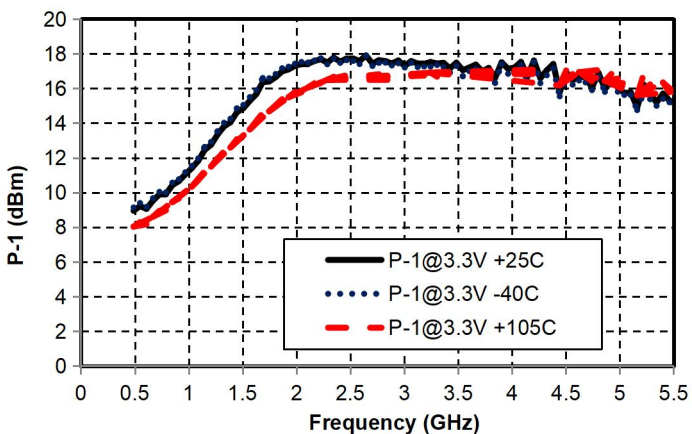
Input Return Loss vs. Frequency



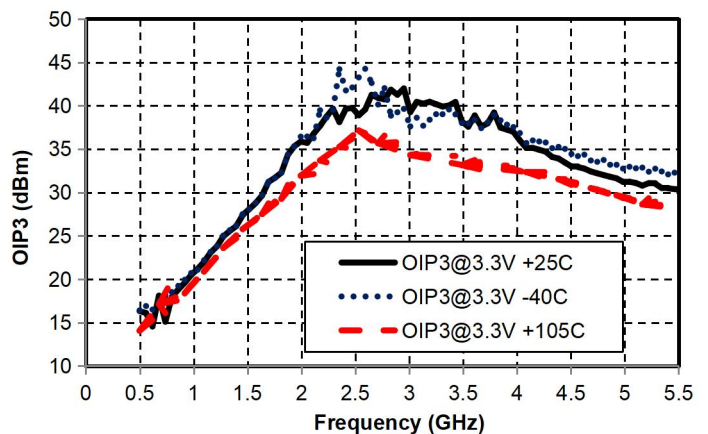
Output Return Loss vs. Frequency



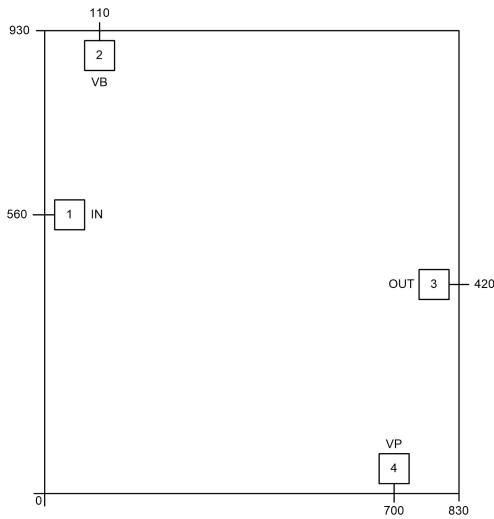
P-1dB vs. Frequency



OIP3 vs. Frequency



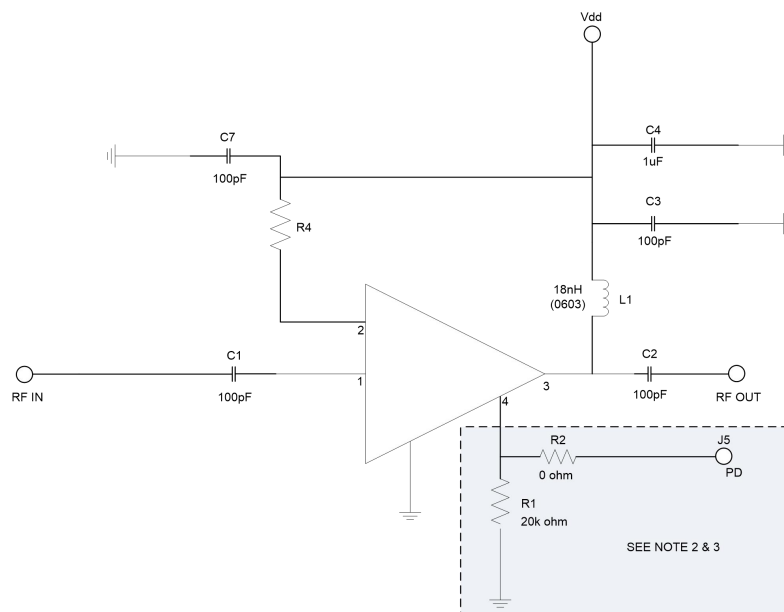
Recommended circuit diagram



All units in the figure are micrometers

| Bonding point number | Function Symbol | Functional Description |
|----------------------|-----------------|---|
| 1 | RFIN | RF input, external DC blocking capacitor is required. |
| 2 | VB | Power, OIP3, current tuning terminal. |
| 3 | RFOUT | RF output and chip DC bias, bias the circuit at the output end through an external choke inductor, and require an external DC blocking capacitor. |
| 4 | VP | Output power shutdown port. |
| Chip bottom | GND | The bottom of the chip needs to be well grounded to RF and DC. |

Recommended circuit diagram



Precautions:

- 1、 All components are of 0402 size unless stated on the schematic.
- 2、 TDD Applications: R1=20K Ω & R2=0 Ω
- 3、 For FDD Application : R1=20K 'OR' Pin 6 tied to ground.R2=DNP/Omitted .
- 4、 R4 sets the current draw. Can be changed for the desired bias point. See table below.

Ingredients list

| Raw Material | RC Inductance | Describe | Brand |
|----------------|---------------|------------------------------------|---------|
| R4 | 2.4K | Resistor , Chip, 0402, 5%, 1/16W | various |
| R1 | 20K | Resistor, chip, 0402, 5%, 1/16W | various |
| R2 | 0 Ω | Resistor, Chip, 0402, 5%, 1/16W | various |
| L1 | 18nH | Inductor, 0603, 5%, Ceramic | various |
| C4 | 1.0uF | Cap., Chip, 0402, 10%, 10V, X5R | various |
| C1, C2, C3, C7 | 100pF | Cap., Chip, 0402, 5%, 50V, NPO/COG | various |

R4 Resistor Values for Various ICQ settings (Vdd=5V)

| ICQ (mA) | 45 | 55 | 65 | 75 | 85 | 95 | 105 | 115 |
|----------|------|----|-------|----|----|----|-----|-----|
| R4 | 3.5K | -K | 2.2 K | -K | -K | -K | - | -K |

The device can adjust the output power and current by adjusting the external choke resistor. For example: R4=2.4K for IDD=65mA; R4=1.6K for IDD =80mA.