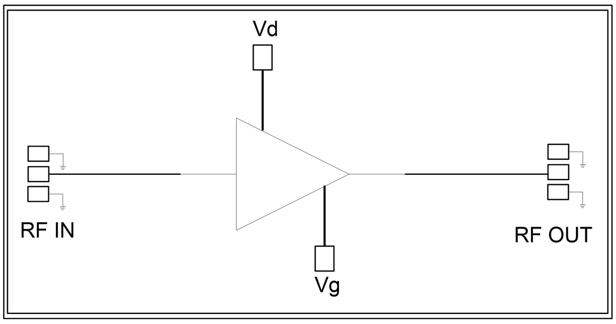
GPA-0020-23

GaAs MMIC Power Amplifier Chip, DC-20GHz

Performance characteristics

Frequency range: DC-20GHz
Small signal gain: 13 dB
Gain flatness: ≤±0.5 dB @DC- 20 GHz
Noise figure: ≤4dB
P-1dB: 22dBm
Psat: 2-3dBm
Power supply: +8 V/ 100mA
50Ohm input/output
100% on-wafer testing
Chip size: 2.94 x 1.35 x 0.1mm

Functional Block Diagram



Product Introduction

GPA-0020-23 is an ultra-wideband distributed amplifier chip based on pHEMT technology, with a frequency range of DC~20GHz, a small signal gain of 16dB, and a saturated output power of 23dBm. The chip through-hole metallization process ensures good grounding, and the back side is metallized, which is suitable for eutectic sintering or conductive adhesive bonding process.

Use restriction parameter [1]	
Maximum drain voltage	+14V
Maximum gate bias	-3V
Maximum input power	+20dBm
Operating temperature	-40 ~ + 70 °C
Storage temperature	-65 ~ +150°C

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

Electrical parameters (Ta=+25°C, Vd= +8 V, *Ids= 10 0mA)										
Index	Minimum	Typical Value	Maximum	Minimum	Typical Value	Maximum	Minimum	Typical Value	Maximum	Unit
Frequency Range	DC-6			6 - 12			12 - 20			GHz
Small Signal Gain		16			15.5			16		dB
Gain Flatness		±0.2			±0.1			± 0.2		dB
Noise Figure		3.5			2.0			2.5		dB

P-1dB		21.5			22			22		dBm
Psat		23			23.5			23		dBm
Input return loss		15			15			12		dB
Output return loss		20			16			13		dB
*By tuning the Vg terminal voltage from -2V to 0V, 100 mA is achieved, and the Vg terminal voltage is expected to be -0.9V .										

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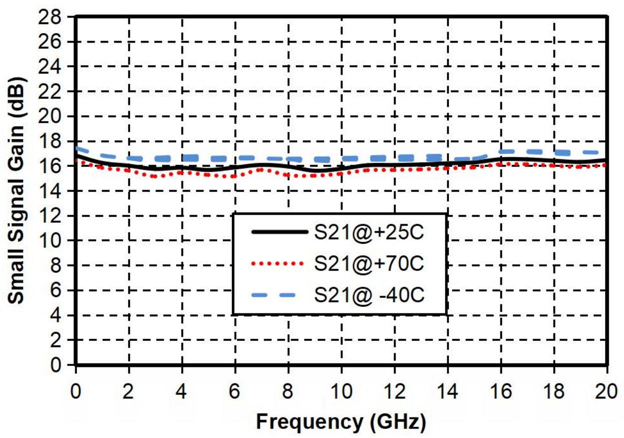
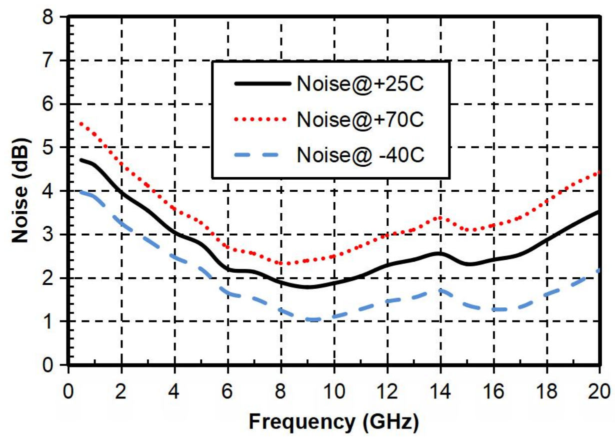
Main index test curve

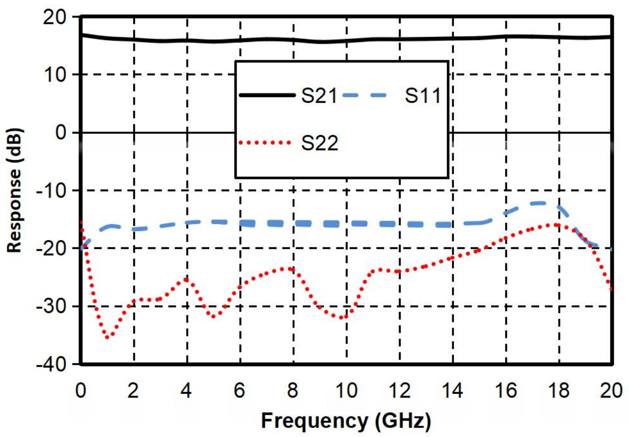
Gain vs. Temperature



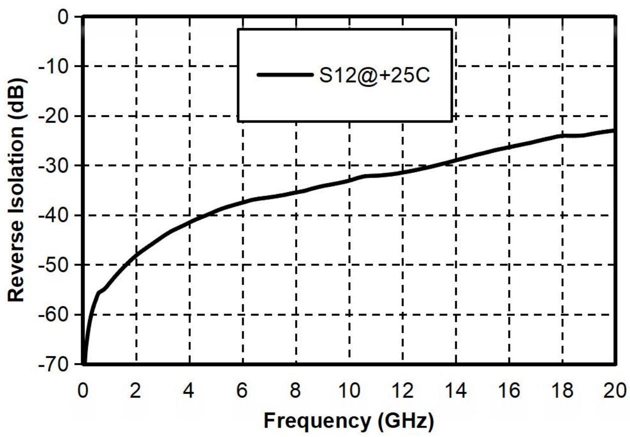
Noise Figure vs. Temperature



Gain & Input/Output Return Loss vs. Frequency

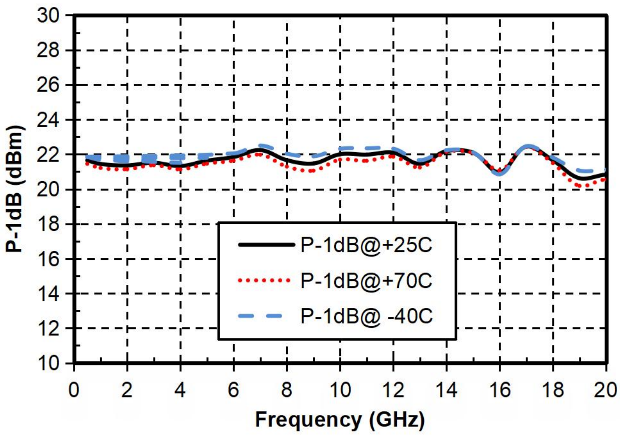


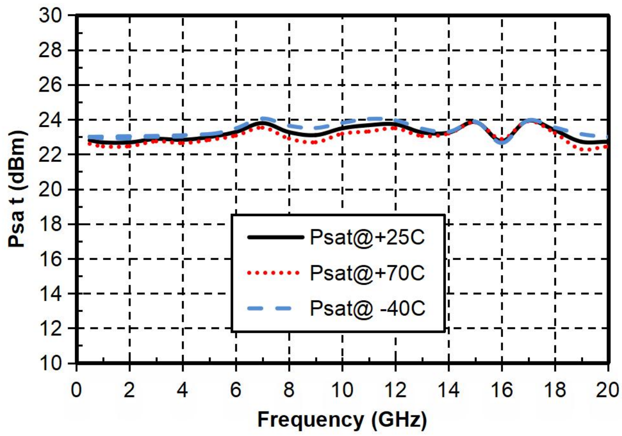
Reverse Isolation vs. Frequency



P-1dB vs. Temperature

Psat vs. Temperature





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Appearance structure [2]

【 2 】The units in the figure are all micrometers (dimensional tolerance: ± 50um .)

Bonding point definition		
Bonding point number	Function Symbol	Functional Description
1	RF IN	The signal input terminal is connected to a 50 ohm circuit, and a DC blocking capacitor needs to be added
2	RF OUT	The signal output terminal is connected to a 50 ohm circuit, and a DC blocking capacitor and an external DC bias network are required to provide drain current. Please refer to the following application circuit or contact the manufacturer*
3	Vg	Amplifier gate bias, requires external 100pF bypass capacitor
Chip bottom	GND	The bottom of the chip needs to be in good contact with the RF and DC grounds

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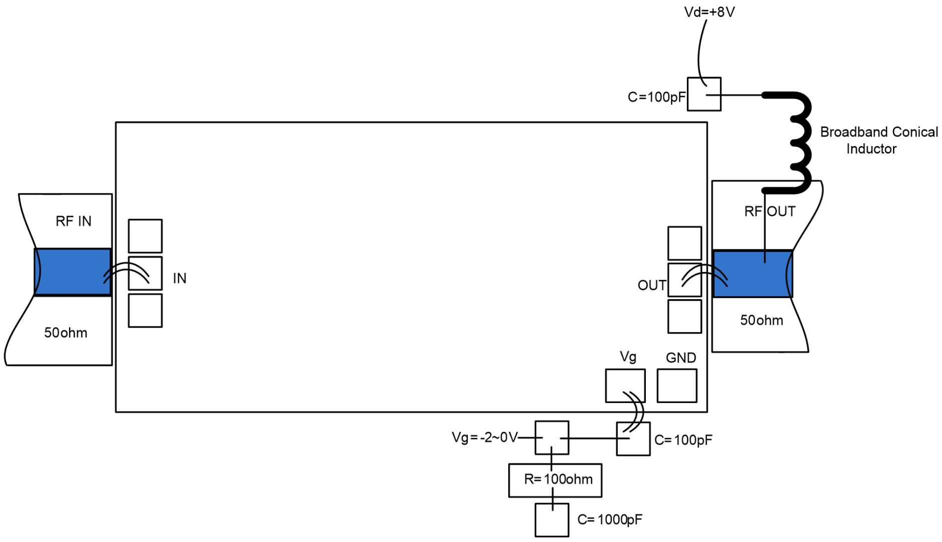
Application circuit structure

A broadband bias network (broadband conical inductor + broadband capacitor) that can withstand 700mA needs to be soldered to the RF OUT end. Recommended broadband conical inductor model: CC19T40K240G5-C, recommended broadband capacitor model: 550L104KT.

Recommended assembly diagram



- The conical end pin of the conical spiral inductor should be as close to the chip output port as possible.

Notice

- The chip should be stored in an anti-static container and in a nitrogen environment. It should be stored in an environment with a temperature of 10℃~30℃ and a relative humidity of less than 30%.
- Do not attempt to clean the bare die surface using wet chemical methods.
- Please strictly follow the ESD protection requirements to avoid static damage to the bare chip.
- General operation: Please use precision pointed tweezers to pick up bare chips. Avoid touching the chip surface with tools or fingers during operation.
- Rack mounting operation suggestions: Bare chip mounting can be done by AuSn solder eutectic sintering or conductive adhesive bonding. The mounting surface must be clean and flat.
- Sintering process: It is recommended to use AuSn solder sheets with a gold-tin ratio of 80/20. The working surface temperature reaches 255 ℃ and the tool (vacuum chuck) temperature reaches 265 ℃ . When the high-temperature mixed gas (nitrogen-hydrogen ratio of 90/10) is blown to the chip, the temperature at the top of the tool should be raised to 290 ℃ . Do not let the chip exceed 320 ℃ for more than 20 seconds. The friction time should not exceed 3 seconds.
- Bonding process: The amount of conductive glue dispensed should be as small as possible. After the chip is placed in the installation position, the conductive glue can be vaguely seen around it. For curing conditions, please follow the information provided by the conductive glue manufacturer.
- Bonding operation suggestions: Use Φ0.025mm (1mil) gold wire for both ball and wedge bonding.

Thermosonic bonding temperature is 150 ˚C . The pressure of the wedge bonding knife is 40~50gf for ball bonding and 18~22gf for wedge bonding. Use the smallest possible ultrasonic energy. The bonding starts at the pressure point on the chip and ends at the package (or substrate).