2~4 GHz Low Noise Amplifier Chip

AS3105AA-A

Datasheet

V1.0

Table of Contents

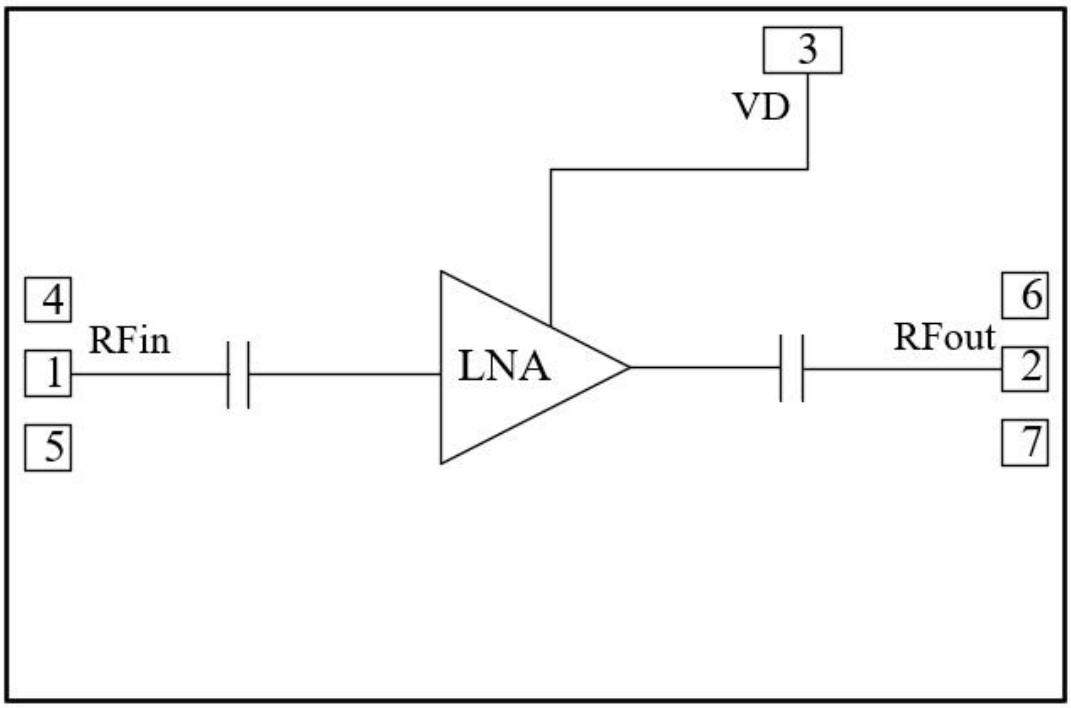
1. Product Features

- Frequency Range: 2~4 GHz
- Small Signal Gain: 33.5 dB
- Noise Figure: 0.4 dB (typical)
- Output P1dB: 21 dBm
- Bias Condition: VDD = 5.0 V, IDQ = 109 mA
- Chip Size: 1.50 mm × 1.20 mm × 0.10 mm

2. Functional Overview

This chip is a low noise amplifier operating from 2 to 4 GHz. It operates from a single +5.0 V supply. At a bias current of 109 mA, it provides a gain of 33.5 dB, output P1dB of 21 dBm, and a typical noise figure of 0.4 dB. The chip features 50 Ω port impedance and is grounded through the backside metal.

3. Block Diagram



4. Typical Applications

Suitable for communications, radar and other applications.

5. Electrical Parameters

5.1 RF Characteristics

Unless otherwise specified, all electrical characteristics are measured under conditions: VD = 5.0 V, IDQ = 109 mA, small-signal Pin = -40 dBm, TA = +25 ° C, 50 Ω system, continuous wave.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks (Conditions)
Frequency Range	RF Range	2		4	GHz	
Input Return Loss	IRL		20		dB	
Output Return Loss	ORL		15		dB	
Small Signal Gain	Gain					
2 GHz			32.5		dB	
3 GHz			33.5		dB	
4 GHz			33.5		dB	
Gain Flatness	△G		±0.5		dB	@2~4GHz
Reverse Isolation	Isolation		43		dB	
Noise Figure	NF					
2 GHz			0.3		dB	
3 GHz			0.3		dB	
4 GHz			0.4		dB	
Gain Variation vs Temperature						
2 GHz			±0.8		dB	
3 GHz			±0.8		dB	-55℃, +25℃, +125℃
4 GHz			±0.8		dB	
Output 1 dB Compression Point	OP1dB					
2 GHz			21		dBm	
3 GHz			21		dBm	
4 GHz			21		dBm	

5.2 DC Characteristics

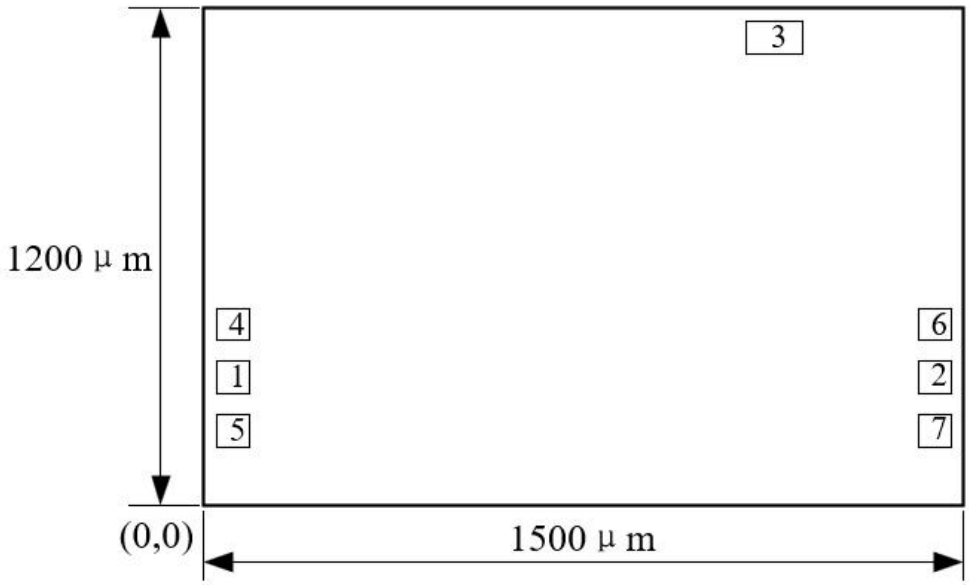
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks (Conditions)
Drain Voltage	VD		5.0		V	
Operating Current	ID					
-55℃			107		mA	
+25℃			109		mA	
+85℃			108		mA	
+125℃			106		mA	

6. Absolute Maximum Ratings

All voltages are referenced to GND.

Parameter	数值
Drain Voltage VD	TBD
HBM ESD Rating	TBD
CDM ESD Rating	TBD
Max. Input Power (CW, 50 Ω, TA = 25 ℃)	TBD
Thermal Resistance Rth	TBD
Channel Temperature TCH	175℃
Mounting Temperature (20 s,N_2 protection)Storage Temperature	320℃
Operating Temperature	-65℃～+150℃
	-55℃～+125℃

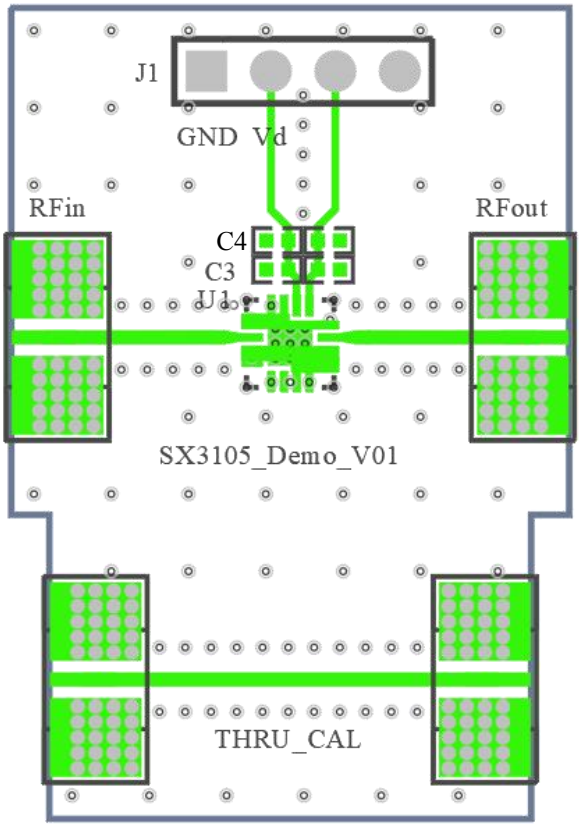
7. Package Dimensions



8. Pin Definitions

No.	Symbol	Attribute	PAD Size (μm)	PAD Position (μm)		Function Description
				X	Y	
1	RFin	Input	100×90	107.5	406	RF Signal Input Port
2	RFout	Output	100×90	1390.4	406	RF Signal Output Port
3	VD	Power	180×100	1058.2	1091.3	Drain Supply 5.0 V
4	GND	Ground	100×90	107.5	556	Ground
5	GND	Ground	100×90	107.5	256	Ground
6	GND	Ground	100×90	1390.4	556	Ground
7	GND	Ground	100×90	1390.4	256	Ground

9. Evaluation Demo Information



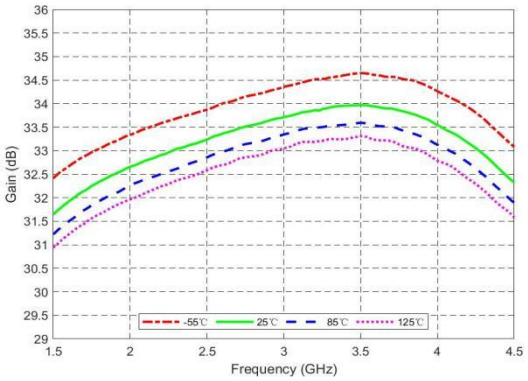
Pin	Description
RFin、RFout	RF signal input and output ports
J1	Drain supply +5.0 V
C3	0402C, 100 pF capacitor
C4	0402C, 1 μF capacitor

10. Test Curves

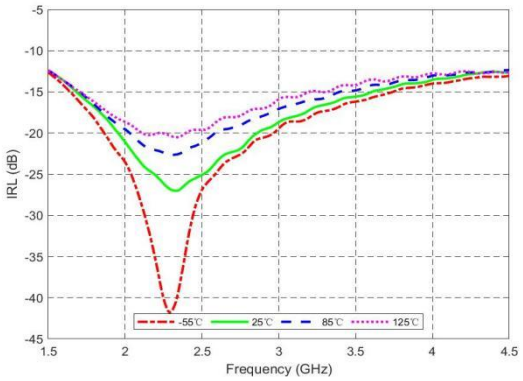
10.1 Small Signal

Test conditions (unless otherwise specified): VD = 5.0 V, IDQ = 109 mA, Pin = -40 dBm, TA = +25 ° C, 50 Ω system, continuous wave.

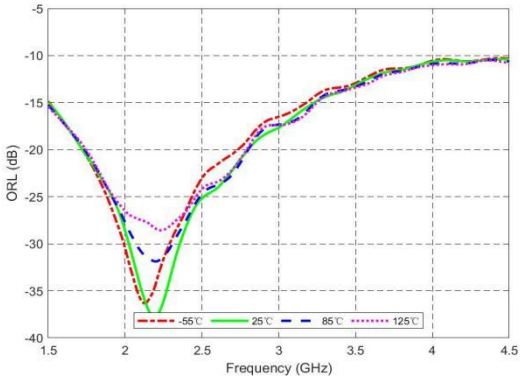
小信号增益 vs 频率 vs 温度



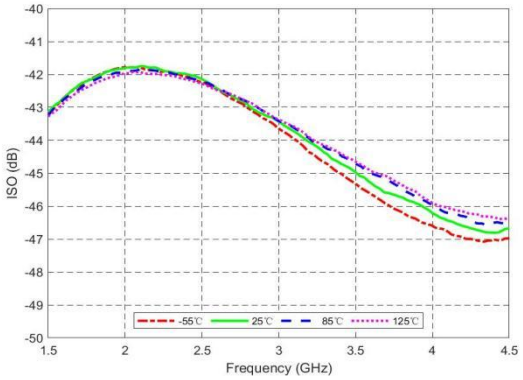
输入回波损耗 vs 频率 vs 温度



输出回波损耗 vs 频率 vs 温度



反向隔离度 vs 频率 vs 温度

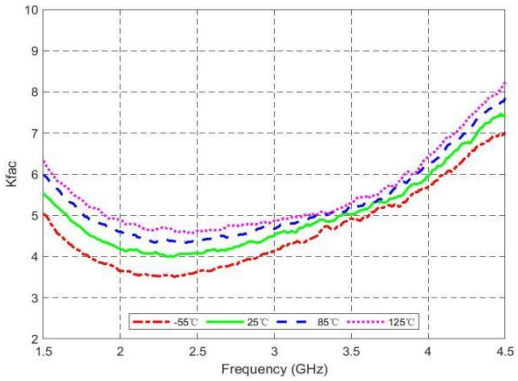


测试曲线

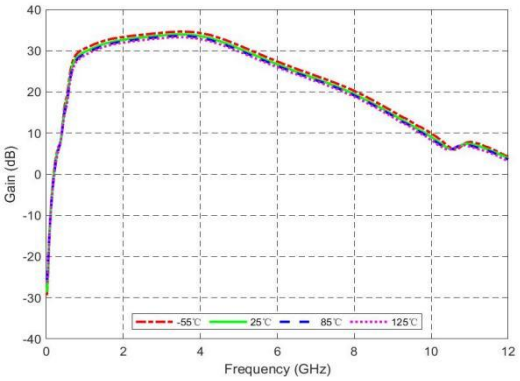
小信号

测试条件，除非特别说明：VD = 5.0V，IDQ = 109mA，Pin = -40dBm，T_A = +25℃，50Ω系统，连续波。

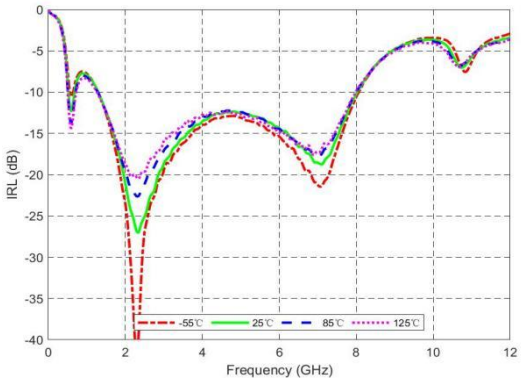
K 值 vs 频率 vs 温度



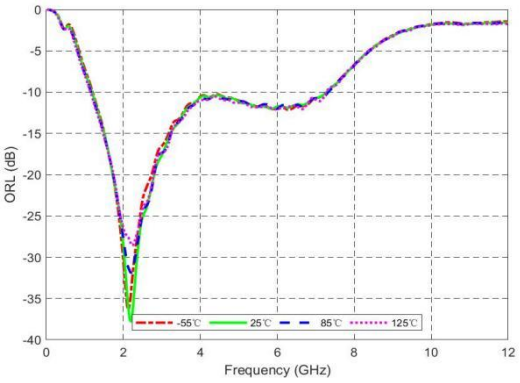
宽带小信号增益 vs 频率 vs 温度



宽带输入回波损耗 vs 频率 vs 温度



宽带输出回波损耗 vs 频率 vs 温度

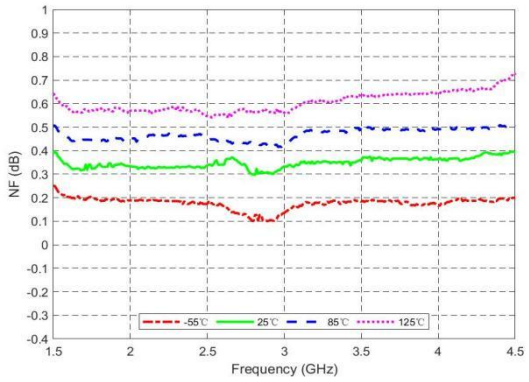


测试曲线

10.2 Noise Figure

Test conditions (unless otherwise specified): VD = 5.0 V, IDQ = 109 mA, Pin = -40 dBm, TA = +25 ° C, 50 Ω system, continuous wave.

噪声系数 vs 频率 vs 温度

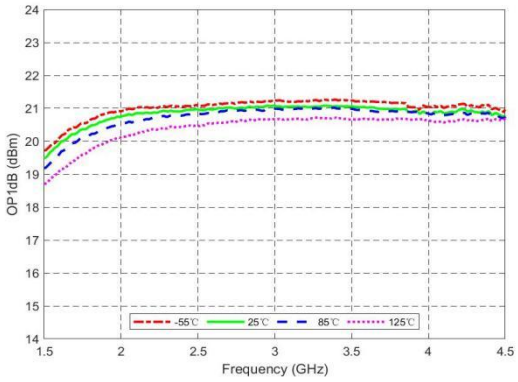


Noise Figure vs Frequency vs Temperature

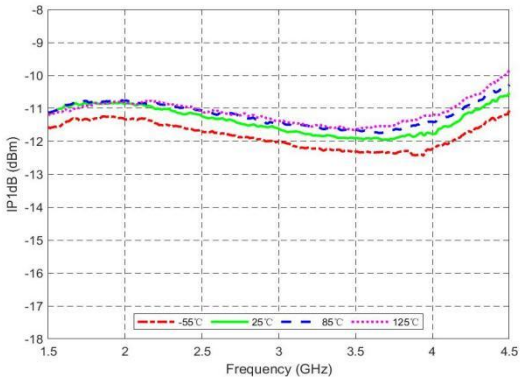
10.3 Large Signal

Test conditions (unless otherwise specified): VD = 5.0 V, IDQ = 109 mA, TA = +25 ° C, 50 Ω system, continuous wave.

OP1dB vs Frequency vs Temperature

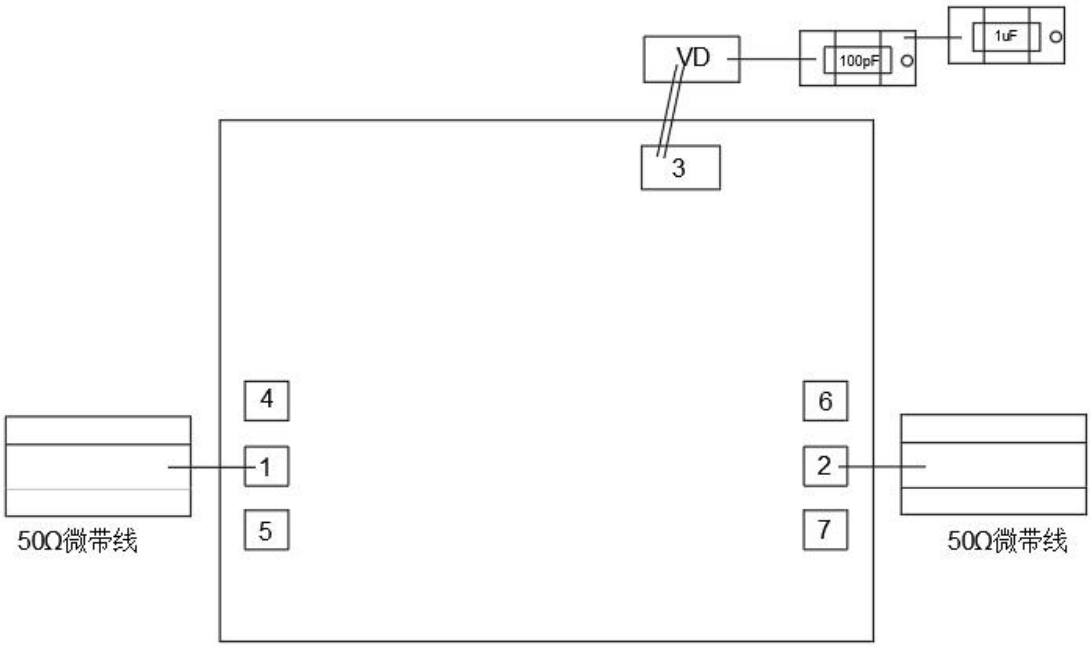


IP1dB vs Frequency vs Temperature



11. Application Information

11.1 Recommended Application Circuit



Note: Gold wire length at RF input: 650 μm, RF output: 500 μm, drain voltage: 600 μm.

11.2 Operating Instructions

Power-on Sequence
1.Set current limit ID to 200 mA.
2.Set VD = +5.0 V and turn on; IDQ ≈ 109 mA.
3.Apply RF signal.
Power-off Sequence
1.Remove RF signal.
2.Set VD to 0 V.
3.Turn off VD.

11.3 Operating Protection Conditions

	ESD (Electrostatic Discharge) sensitive device. Charged devices and printed circuit boards can discharge without detection. Although this product includes ESD protection circuits, high-energy ESD may cause device damage. Therefore, proper ESD precautions must be taken to avoid performance degradation or functional failure.

11.4 Operating Precautions

Chip Storage:

Chips must be stored in ESD-protective containers and under nitrogen atmosphere.

Cleaning:

Bare chips must be handled in a clean environment. Liquid cleaning agents are prohibited for chip cleaning.

ESD Protection:

Strictly follow ESD protection requirements to avoid electrostatic damage.

General Handling:

Use vacuum pick-up or precision sharp tweezers to handle chips. Avoid tool or finger contact with the chip surface.

Assembly:

Chip mounting can use Au80Sn20 eutectic solder or conductive adhesive. The mounting surface must be clean and flat.

1)**Eutectic Sintering**: Typically uses Au80Sn20 solder in inert (N) atmosphere. Manual sintering: 290 ℃~300 ℃, ≤ 30 s. Automatic equipment: max. 320 ℃.

2)**Adhesive Bonding**: Minimize conductive adhesive volume; visible adhesive around chip after placement. Follow curing specs from adhesive supplier.

Bonding: Φ25 μm gold wire recommended for ball or wedge bonding. Hot plate: ~150 ℃. Ball bonding force: 40~50 gf; wedge bonding: 18~22 gf. Bonding starts from chip pad to package/substrate. Package traces near I/O ports: 70 μm~150 μm. RF port wire length ≤ 300 μm.