

Product Features

Operating Frequency: 500MHz~4.2GHz

Attenuation Step: 0.5dB

Gain Range: -10.3dB to 21.0dB

OIP3: 39.2dBm@500MHz

OP1dB: 19.4dBm@500MHz

Port Isolation: -26.7dB@500MHz

Noise Figure: 1.7dB@500MHz

VDD=5V, static current 144mA

Package: QFN24 (plastic seal)

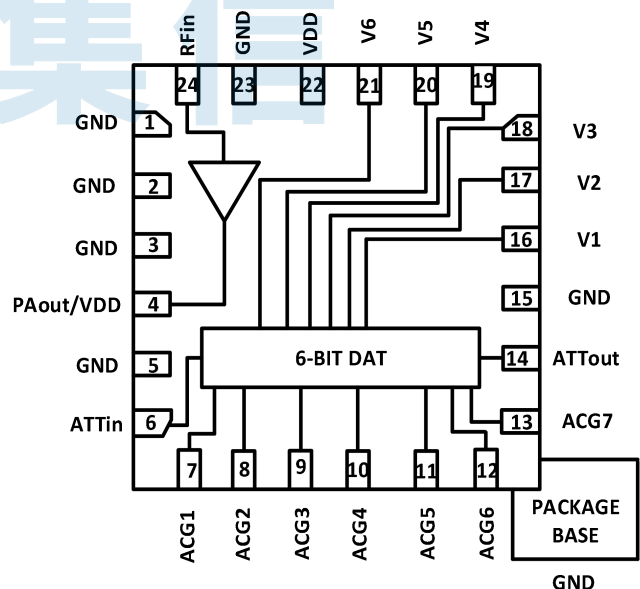
General Description

BR9606FP is a wide-band 6-bit parallel CNC VGA designed based on GaAs process, packaged in plastic leadless chip carrier. The product covers the frequency range of 500MHz to 4.2GHz, is powered by a +5V power supply, and the gain flatness in the band is ± 1 dB. The product uses 6-bit TTL/CMOS control signal to control the attenuation state, can achieve the minimum step of 0.5dB gain control, the attenuation bits are 0.5, 1, 2, 4, 8 and 16 dB, of which the minimum attenuation is 0.5dB, the total attenuation is 31.5dB, suitable for RF gain control circuit.

Ordering Information

Part Number	Packag	Description
BR9606FP	QFN24	500MHz ~ 4200MHz 6 bit Variable Gain Amplifier

Functional Block Diagram



Electrical Specifications

Parameters	Test Conditions	Min.	Typ.	Max.	Units
Gain (ref)	500MHz	-	21.0	-	dB
	2000MHz	-	20.0	-	dB
	4200MHz	-	18.1	-	dB
Input Return Loss	2000MHz	-	-11.9	-	dB
Output Return Loss	2000MHz	-	-21.5	-	dB
Reverse Isolation	2000MHz	-	-27.3	-	dB
Attenuation Accuracy: (reference insertion loss)	0.5dB ~ 31.5dB attenuation state	-0.39	-	+0.23	dB
Output Power for 1dB Compression	500MHz	-	19.4	-	dBm
	2000MHz	-	19.8	-	dBm
Output Third-Order Interception	500MHz	-	39.2	-	dBm
	2000MHz	-	36.1	-	dBm
Noise Figure	500MHz	-	1.7	-	dB
	2000MHz	-	1.9	-	dB
Switching Characteristic	200MHz, Attenuation 31.5dB test	-	100	-	ns
Trise (50% CTL-90% RF)			60		ns
Tfall (50% CTL-10% RF)			-		-
Operating Voltage	-	-	5	-	V
Static Working Current	-	-	144	-	mA
Test Conditions: VDD=+5V, I=144mA, OIP3 spacing=1MHz, Pout=5dBm/tone, TA=+25°C					

Absolute Maximum Ratings

Maximum Operating Voltage: +5.5V

Max RF input Power: 20dBm

Control Voltage Range: 0V ~ VDD

Recommended Operating Conditions

Power Supply Voltage: +5V

Switching Voltage: 0V ~ 0.8V (low)

2.7V ~ VDD (high level)

Operating Current: 144mA

Working Temperature: -55°C ~ +125°C

Storage Temperature: -65°C ~ +150°C

Note: Operation of the device outside the parameter ranges given absolute-maximum-ratings conditions may cause permanent damage, and. exposure to absolute-maximum-ratings conditions for extended periods will affect the reliability.

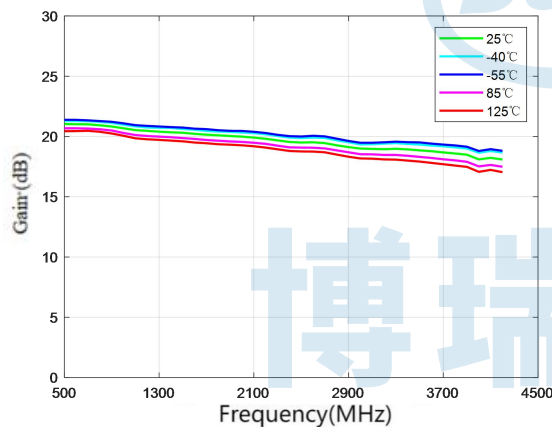
ESD WARNING**ELECTROSTATIC SENSITIVE DEVICE****OBSERVE HANDLING PRECAUTIONS**

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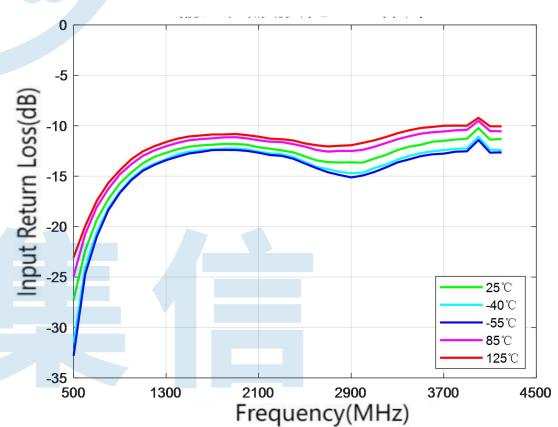
Typical Performance (EVB test results)

Parameters	Typ.											Units
Frequency	500	1000	1500	2000	2500	2600	3000	3500	3800	4000	4200	MHz
Gain (ref)	21.0	20.7	20.3	20.0	19.5	19.5	19.0	18.8	18.6	18.1	18.1	dB
Input Return Loss	-27.3	-14.6	-12.1	-11.9	-13.0	-13.4	-13.6	-11.9	-11.4	-10.2	-11.3	dB
Output Return Loss	-28.9	-26.2	-37.9	-21.5	-17.4	-17.5	-18.4	-22.2	-24.3	-25.7	-19.4	dB
Reverse Isolation	-26.7	-27.0	-27.2	-27.3	-27.5	-28.1	-27.0	-27.5	-27.4	-27.4	-26.7	dB
Output Power for 1dB Compression	19.4	19.7	20.1	19.8	20.0	20.1	19.8	19.0	19.1	18.5	17.9	dBm
Output Third-Order Interception	39.2	37.6	36.3	36.1	35.3	34.9	34.9	34.0	34.1	33.9	34.1	dBm
Noise Figure	1.7	1.7	1.9	1.9	2.0	2.3	2.2	2.4	2.6	2.6	2.6	dB

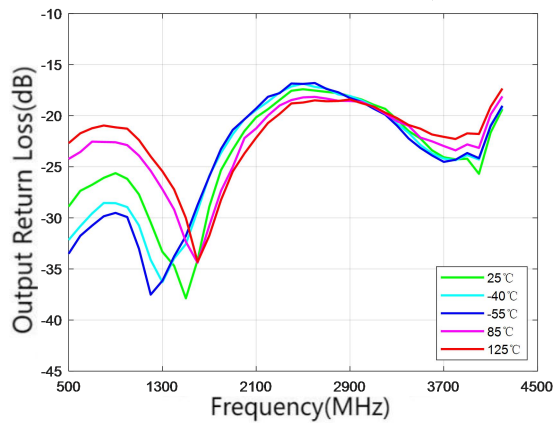
Test Conditions: Vdd=+5V, I=144mA; OIP3 spacing=1MHz, Pout=5dBm/1MHz, TA=+25°C



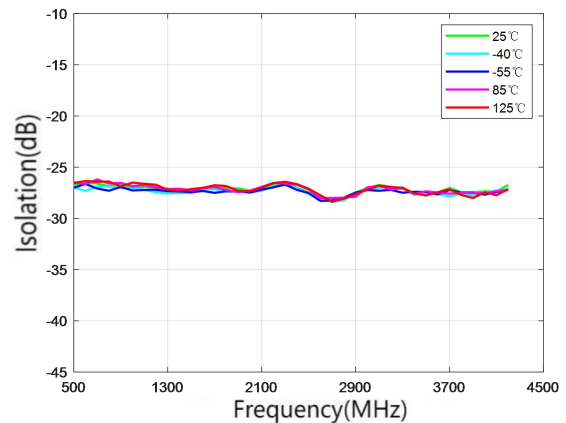
Gain



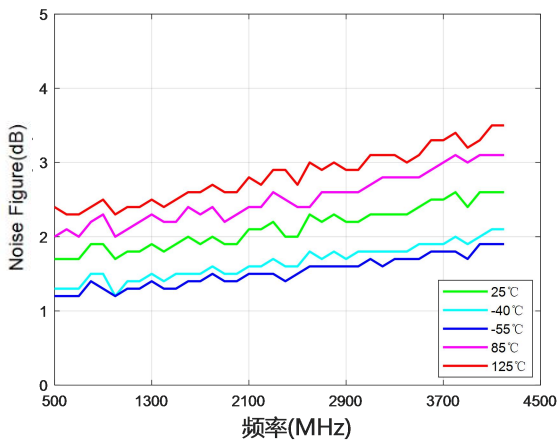
Input Return Loss



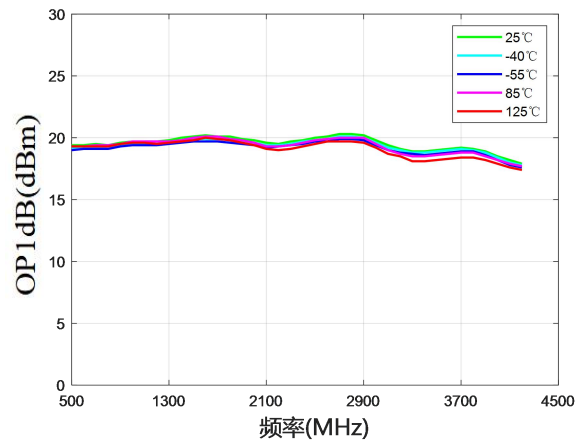
Output Return Loss



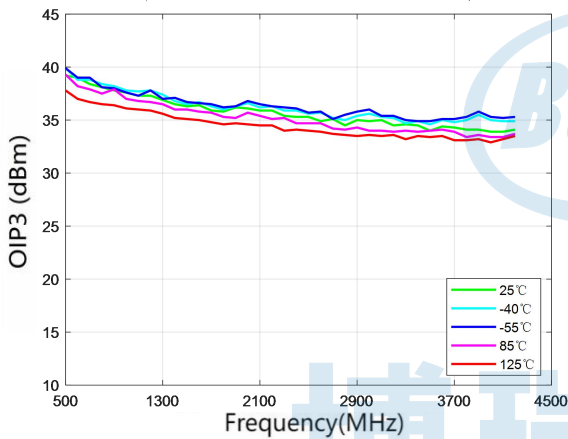
Reverse Isolation



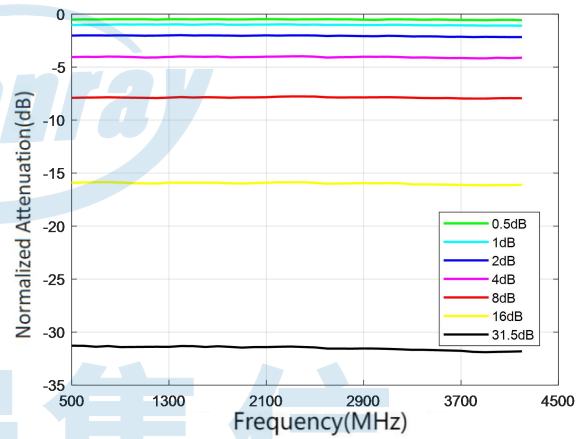
Noise Figure



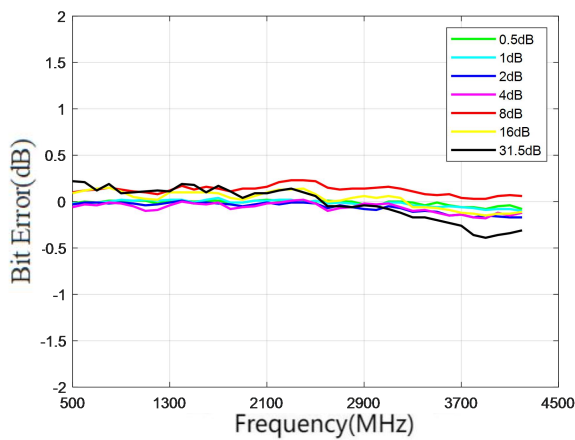
Output Power for 1dB Compression



Output Third-Order Interception

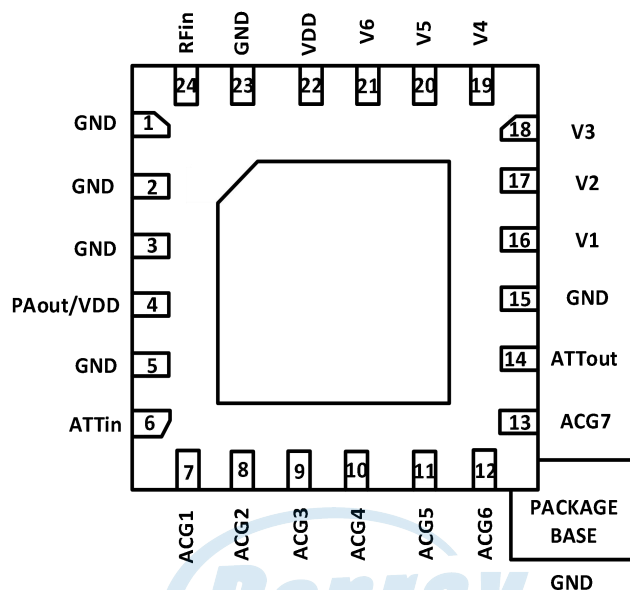


Normalized Attenuation



Bit Error

Pin Configuration and Description



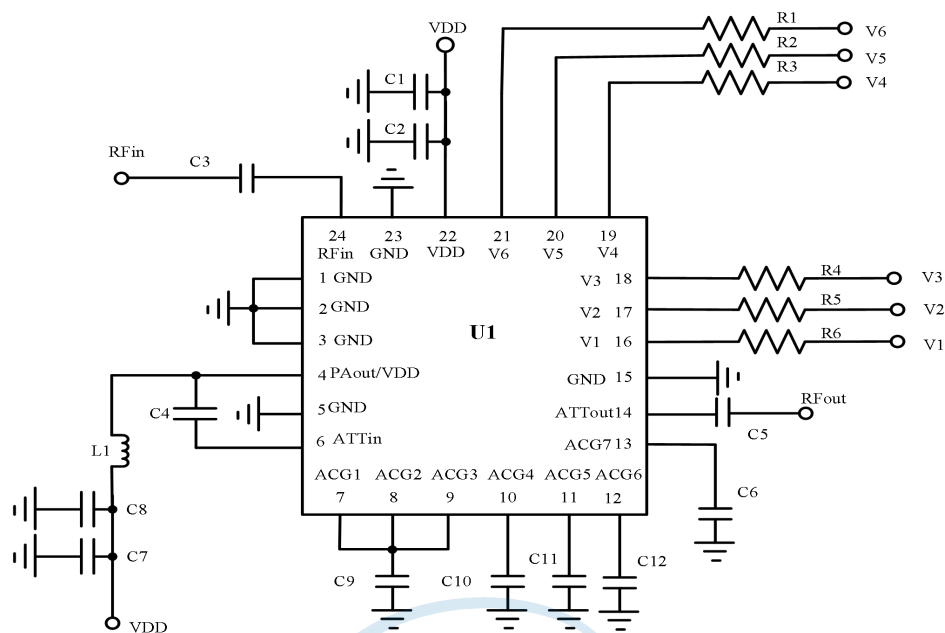
Pin Numbers	Pin Name	Description
1,2,3,5,15,23	GND	Ground pins; The pin and package substrate must be connected to the RF/DC ground;
24	RFin	RF signal input port, characteristic impedance of 50 ohms, the port needs to be connected with an external straight capacitor;
4	PAout/VDD	Amplifier output/chip power supply power port;
22	VDD	Chip power supply power port;
6	ATTin	Attenuator signal input port, this pin is DC coupled and needs to be matched to 50Ω;
14	ATTout	RF signal output port, the characteristic impedance is 50Ω, the port needs to be connected with an external straight capacitor;
7~13	ACG1 ~ ACG7	For low frequency and high frequency Application, it is recommended to connect an external ground capacitor, the capacitance value is determined by the lowest operating frequency, the capacitor position should be as close to the pin as possible;
16~21	V1 ~ V6	See the Control voltage Truth table for details;
-	EP	Grounded;

Control voltage truth value table

Control Voltage Input						Attenuated Sstate RF1/RF2
V1	V2	V3	V4	V5	V6	
16dB	8dB	4dB	2dB	1dB	0.5 dB	
1	1	1	1	1	1	Reference state insertion loss
1	1	1	1	1	0	0.5 dB
1	1	1	1	0	1	1 dB
1	1	1	0	1	1	2 dB
1	1	0	1	1	1	4 dB
1	0	1	1	1	1	8 dB
0	1	1	1	1	1	16 dB
0	0	0	0	0	0	31.5dB
Note: Any combination of the above attenuation states can provide a attenuation quantity approximately equal to the sum of the attenuation of the selected bits.						

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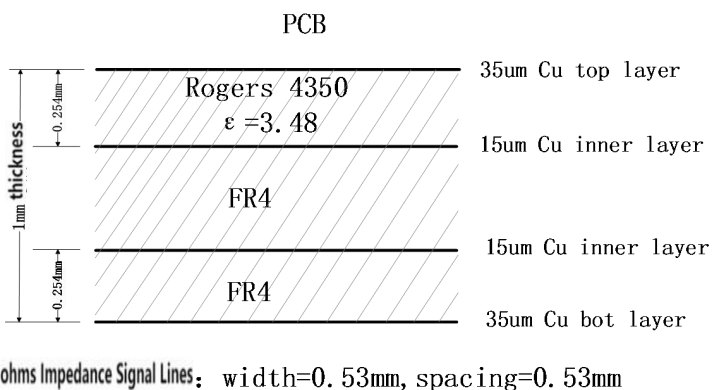
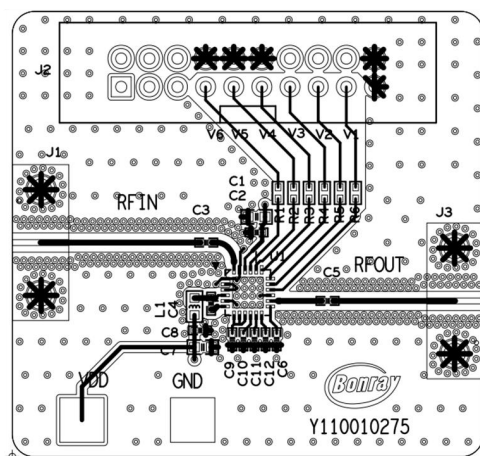
Typical Application Schematic



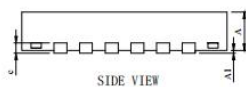
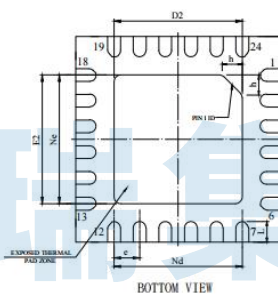
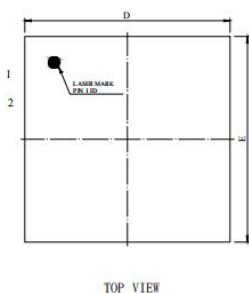
Bill of Material

Designator	Package	Description	Part Number
C3 ~ C5	0402	100pF	GRM1555C1H101JA01D
C2,C8	0402	1000pF	GRM1555C1H102JA01D
C7	0603	1uF	GCM188R71C105KA64D
C6,C9 ~ C12	0402	330pF	GRM1555C1H331JA01D
L1	0603	100nH	LQW18ANR10J00
R1~ R6	0402	100Ω	RC0402JR-07100RL
C1	0603	NC	/

PCB Evaluation Board



Package Dimensions (mm)



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.75	0.80	0.85
A1	0.01	0.02	0.05
b	0.20	0.25	0.30
c	0.270REF		
D	3.90	4.00	4.10
D2	2.60	2.70	2.80
e	0.50BSC		
Ne	2.50BSC		
Nd	2.50BSC		
E	3.90	4.00	4.10
E2	2.60	2.70	2.80
L	0.35	0.40	0.45
h	0.35	0.40	0.45