

Product Features

Operating Frequency: 5GHz~14GHz

Gain: 21.7dB@10GHz

Gain Flatness: ± 1 dB, Positive Gain Slope

Output Power for 1dB Compression:

17dBm@10GHz

Noise Figure: 1.25dB@8GHz

Output Third-Order Interception:

24.8dBm@10GHz

+3.3V/+5V Single Power Supply

Supply Current:

66mA @ Vdd=5V (Normal Operation Mode)

43mA @ Vdd=5V (Low-power Operation Mode)

37mA @ Vdd=3.3V (Normal Operation Mode)

Package: QFN16 (3mm×3mm)

General Description

The BR9376FDJ is a high-performance MMIC low noise amplifier designed using GaAs process which operates between 5GHz and 14GHz. The amplifier is powered by a single supply operation of +5V or +3.3V. At 10GHz, the amplifier typically provides a gain of 21.7dB, noise figure of 1.4dB, output P1dB of 17dBm in normal operation mode with +5V power supply. It has been internally matched to 50 ohms and AC coupled, thereby eliminating the need for external DC blocks and RF port matching. The product has the characteristics of high output P1dB, positive gain slope, low power consumption, high reliability and other features, which can be widely used in radar receiving and transmitting systems.

Application

Radar and Electronic Countermeasures

Military and Aerospace

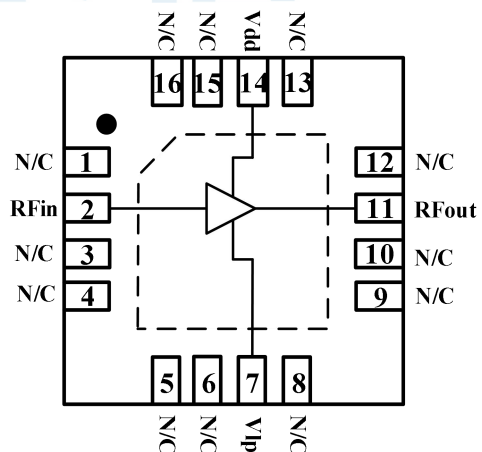
Navigation Equipment

Test Instrumentation

Ordering Information

Part Number	Package	Description
BR9376FDJ	QFN16	5GHz ~ 14GHz Low Noise Amplifier

Functional Block Diagram



Electrical Specifications

Parameter	Normal Mode with 5V (Typ.)	Low-Power Mode with 5V (Typ.)	Normal Mode with 3.3V (Typ.)	Units	Test Conditions
Gain	20	19.5	19.5	dB	5000MHz
	21.7	20.4	21	dB	10000MHz
	21.5	18.6	19.3	dB	14000MHz
Output Power for 1dB Compression	16.6	14.1	13.2	dBm	5000MHz
	17	14.1	12.3	dBm	10000MHz
	15.3	14.8	12.2	dBm	14000MHz
Output Third-Order Interception	27.9	24.7	24.9	dBm	5000MHz
	22.7	25.4	24.2	dBm	14000MHz
Noise Figure	1.45	1.32	1.21	dB	10000MHz
Input Return Loss	-15	-12.2	-13.4	dB	10000MHz
Output Return Loss	-17.8	-18.6	-17.5	dB	10000MHz
Reverse Isolation	-38	-38	-37	dB	10000MHz
Supply Voltage	+5	+5	+3.3	V	-
Supply Current	66	43	37	mA	-
Test Condition: OIP3 spacing=1MHz, Pout=5dBm/tone, TA=+25°C					

Absolute Maximum Ratings

Maximum Supply Voltage (Vdd): +6V

Maximum RF Input Power: +19dBm

Recommended Operating Conditions

Supply Voltage: +3.3V/+5V

Supply Current:

66mA @ Vdd=5V (Normal Operation Mode)

43mA @ Vdd=5V (Low-power Operation Mode)

37mA @ Vdd=3.3V (Normal Operation Mode)

Storage Temperature: -65°C ~ +150°C

Operating Temperature: -55°C ~ +125°C

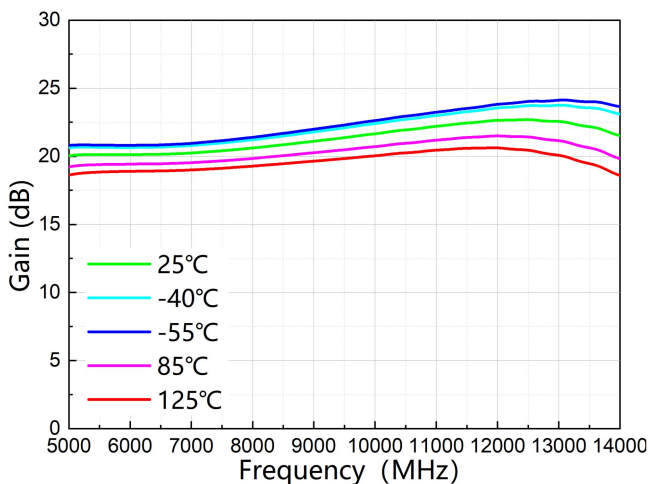
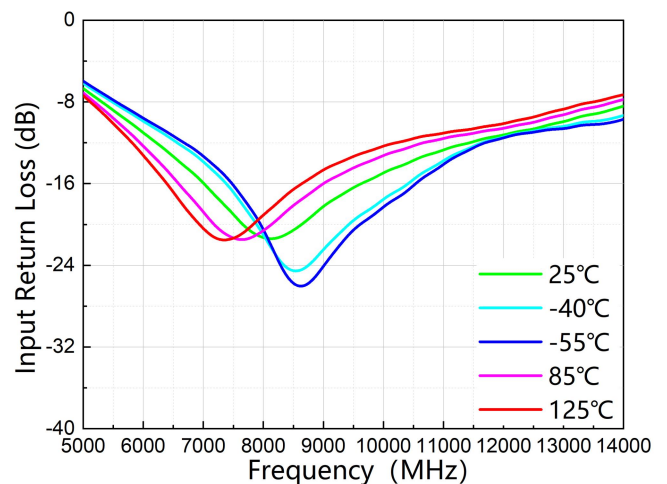
Note: Operation of the device outside the parameter ranges given absolute-maximum-ratings conditions may cause permanent damage, and. exposure to absolute-maximum-ratings conditions for extended periods will affect the reliability.

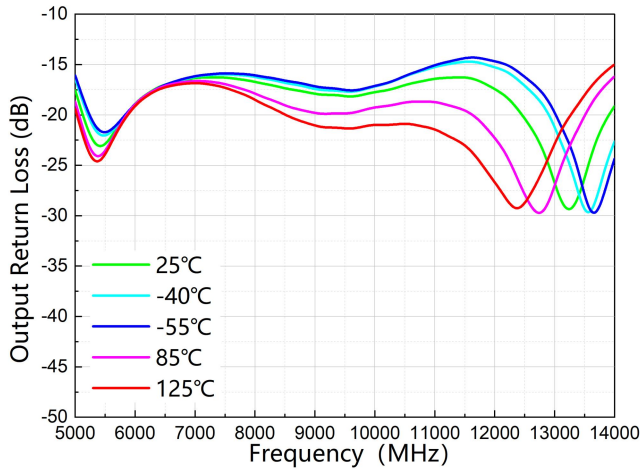
ESD Warnings

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

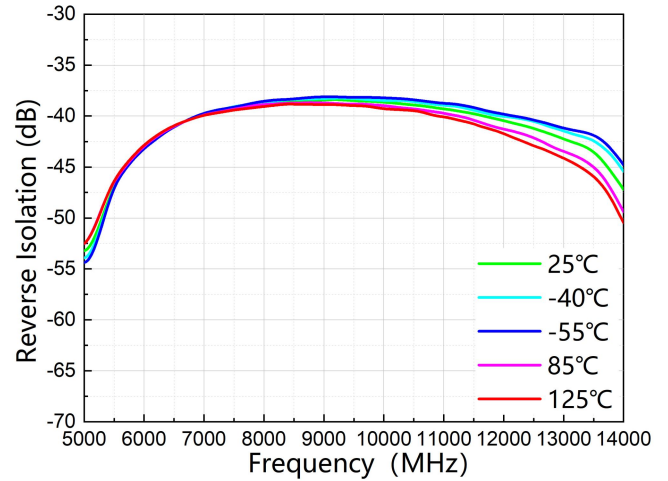
Typical Performance (EVB test results at +5V supply voltage in normal operation mode)

Parameter	Typ.									Units
Frequency	5000	6000	6500	7000	7500	8000	8500	9000	9500	MHz
Gain	20	20.1	20.2	20.2	20.4	20.6	20.8	21.1	21.3	dB
Input Return Loss	-6.7	-11	-13.3	-15.9	-19	-21.5	-21	-18.5	-16.6	dB
Output Return Loss	-17.5	-18.9	-17	-16.3	-16.3	-16.7	-17.2	-17.9	-18	dB
Reverse Isolation	-53.8	-43	-41.1	-39.8	-39.2	-38.8	-38.5	-38.4	-38.4	dB
Output Power for 1dB Compression	16.6	16.7	16.8	16.9	16.9	16.9	17	17	17.1	dBm
Output Third-Order Interception	27.9	26.9	26.4	26.1	25.9	25.7	25.8	25.5	25.3	dBm
Noise Figure	2.13	1.46	1.39	1.33	1.27	1.25	1.23	1.29	1.26	dB
Frequency	10000	10500	11000	11500	12000	12500	13000	13500	14000	MHz
Gain	21.7	21.9	22.2	22.4	22.6	22.7	22.6	22.2	21.5	dB
Input Return Loss	-15	-13.8	-12.6	-11.8	-11	-10.4	-9.7	-9	-8.4	dB
Output Return Loss	-17.8	-17.2	-16.4	-16.3	-17.4	-20.4	-26.7	-26.1	-19.2	dB
Reverse Isolation	-38.6	-38.8	-39.3	-39.7	-40.6	-41.2	-42.3	-43.4	-47.3	dB
Output Power for 1dB Compression	17	16.9	16.8	16.7	16.6	16.2	15.8	15.6	15.3	dBm
Output Third-Order Interception	24.8	24.5	24.	23.6	23.1	22.5	22.8	22.3	22.3	dBm
Noise Figure	1.45	1.49	1.52	1.62	1.67	1.72	1.8	1.94	2.13	dB
Test Conditions: Vdd=+5V, Idd=66mA; OIP3 spacing=1MHz, Pout=5dBm/tone; TA=+25°C										

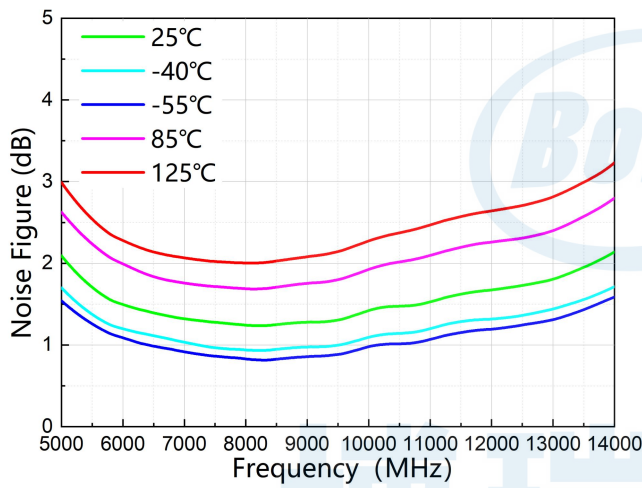

Gain vs. Freq

Input Return Loss vs. Freq



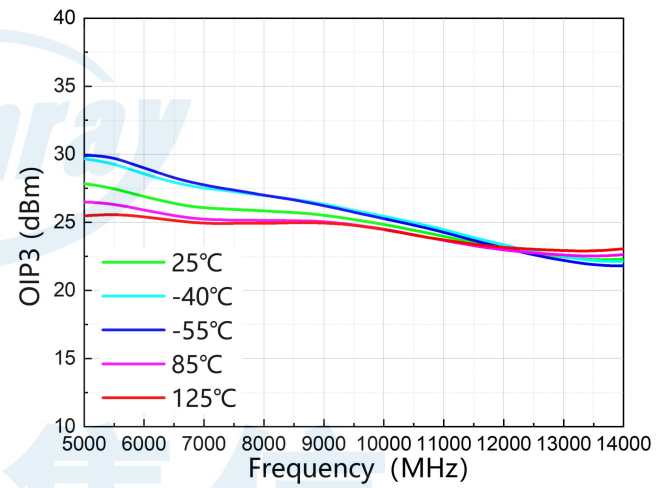
Output Return Loss vs. Freq



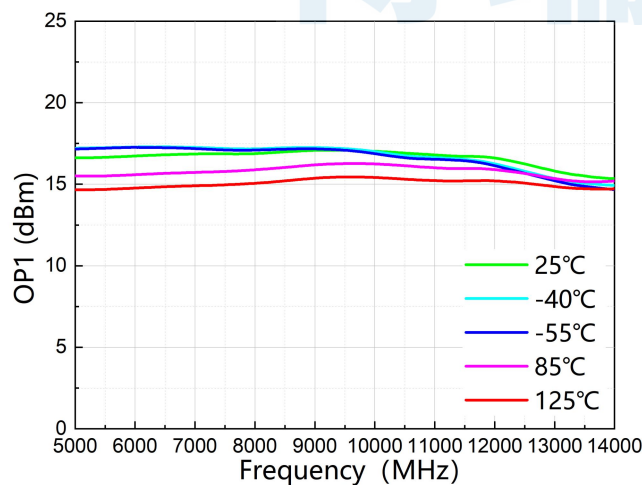
Reverse Isolation vs. Freq



Noise Figure vs. Freq



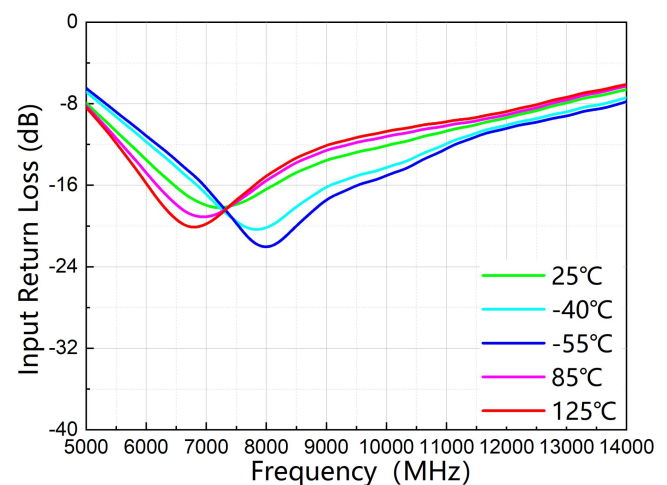
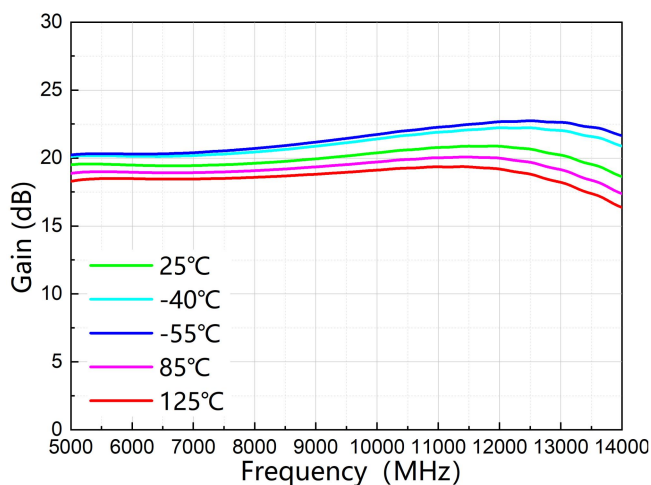
Output Third-Order Interception vs. Freq

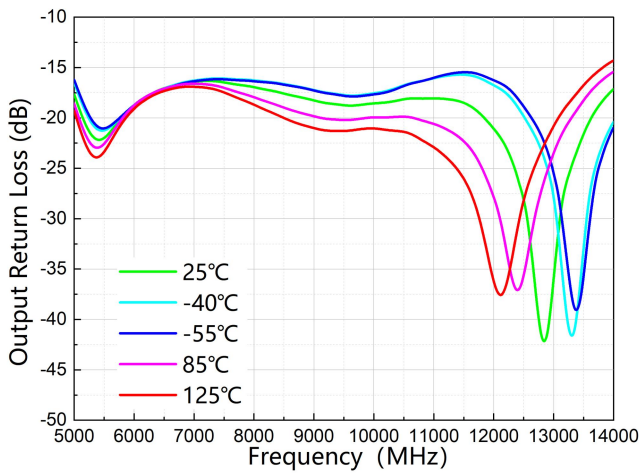


Output Power for 1dB Compression vs. Freq

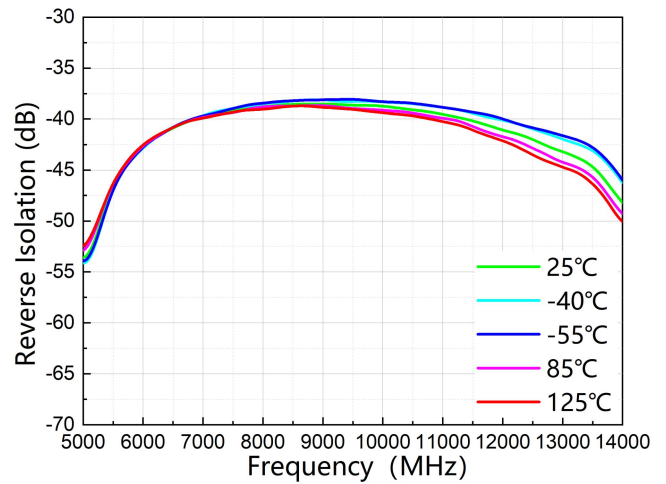
Typical Performance (EVB test results at +5V supply voltage in low-power operation mode)

Parameter	Typ.									Units
Frequency	5000	6000	6500	7000	7500	8000	8500	9000	9500	MHz
Gain	19.5	19.5	19.4	19.4	19.5	19.6	19.7	19.9	20.1	dB
Input Return Loss	-7.9	-13.4	-16.1	-18	-18	-16.6	-15.1	-13.7	-12.9	dB
Output Return Loss	-17.6	-18.7	-17	-16.4	-16.5	-16.9	-17.4	-18.3	-18.7	dB
Reverse Isolation	-54.5	-42.7	-40.9	-39.7	-39.2	-38.8	-38.6	-38.5	-38.6	dB
Output Power for 1dB Compression	14.4	14.8	14.7	14.6	14.1	14.3	14.2	14.2	14.1	dBm
Output Third-Order Interception	26.4	25.7	25.4	25	24.7	26.8	27	27.4	27.4	dBm
Noise figure	1.99	1.46	1.32	1.24	1.18	1.14	1.12	1.21	1.22	dB
Frequency	10000	10500	11000	11500	12000	12500	13000	13500	14000	MHz
Gain	20.4	20.6	20.8	20.9	20.9	20.7	20.2	19.5	18.6	dB
Input echo	-12.2	-11.5	-10.7	-10	-9.2	-8.5	-7.7	-7.1	-6.6	dB
Output echo	-18.6	-18.3	-18.1	-18.4	-21	-28.3	-35.5	-21.6	-17.1	dB
Reverse Isolation	-38.7	-39	-39.5	-40.1	-41	-42	-43.2	-44.7	-48.4	dB
Output Power for 1dB Compression	14.1	14	13.9	13.8	14.1	14.3	14.3	14.5	14.8	dBm
Output Third-Order Interception	27.3	26.7	27.1	26.2	25.8	25.7	25.5	25.4	25.4	dBm
Noise figure	1.32	1.36	1.38	1.46	1.5	1.54	1.6	1.7	1.87	dB
Test conditions: Vdd=+5V, Idd=43mA; OIP3 spacing=1MHz, Pout=5dBm/tone; TA=+25°C										

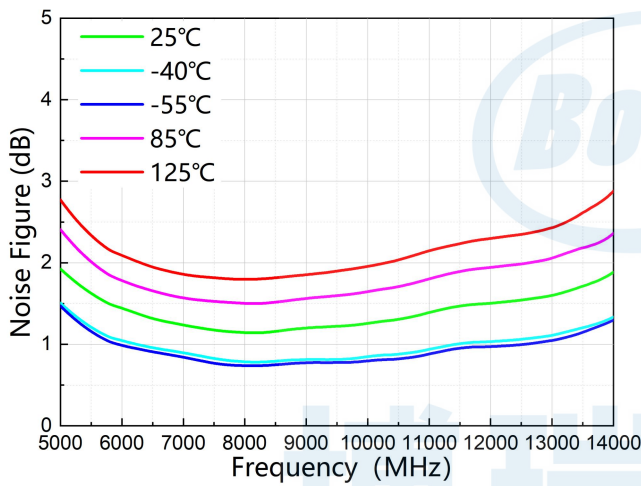




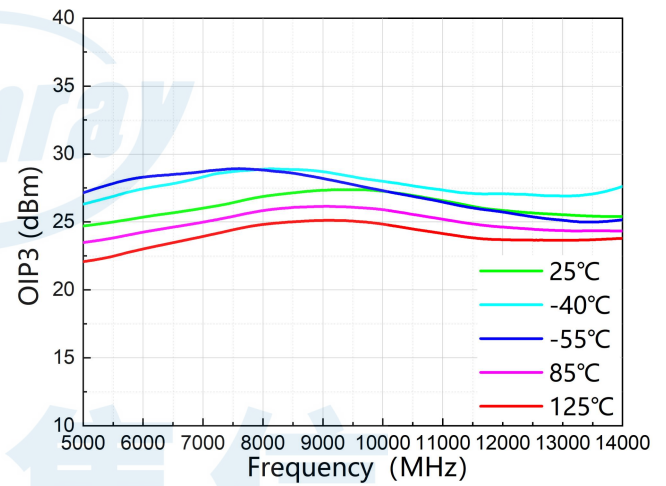
Output Return Loss vs. Freq



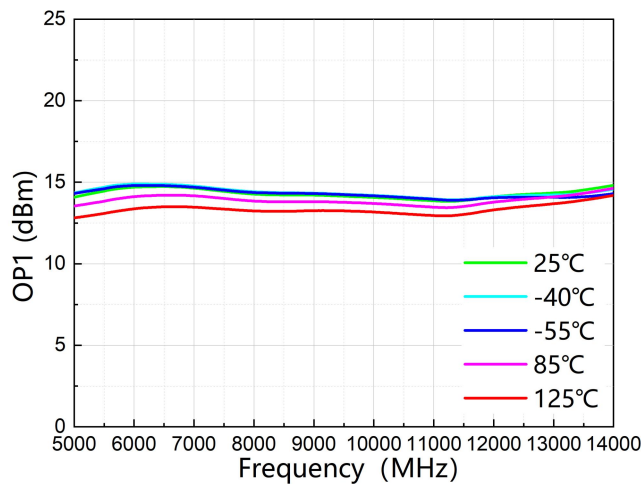
Reverse Isolation vs. Freq



Noise Figure vs. Freq



Output Third-Order Interception vs. Freq

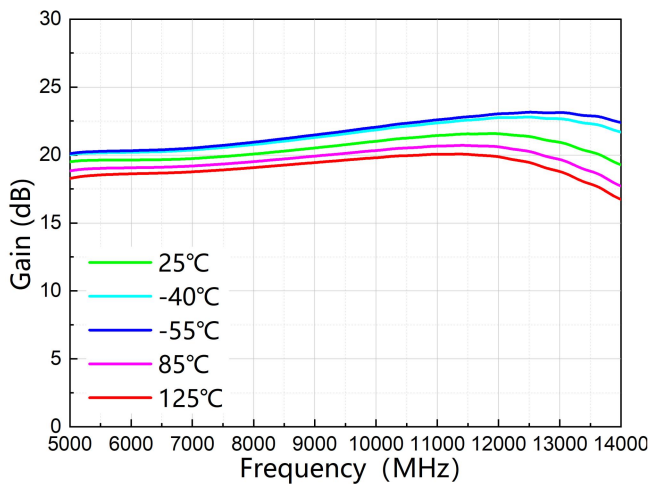


Output Power for 1dB Compression vs. Freq

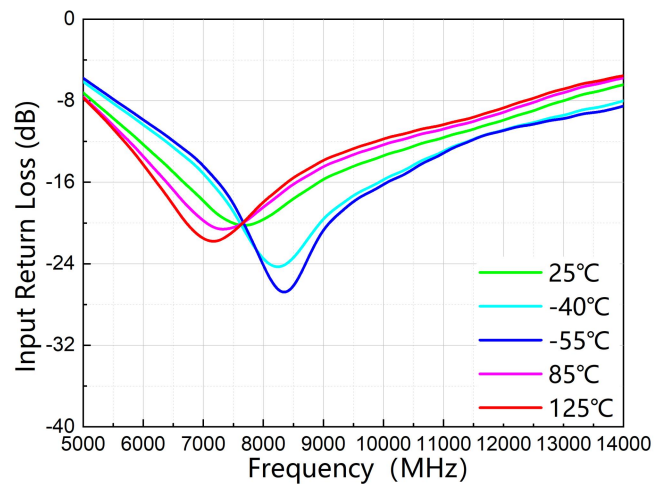
Typical Performance (EVB test results at +3.3V supply voltage in normal operation mode)

Parameter	Typ.									Units
Frequency	5000	6000	6500	7000	7500	8000	8500	9000	9500	MHz
Gain	19.5	19.6	19.7	19.7	19.9	20.1	20.2	20.5	20.7	dB
Input Return Loss	-7.2	-12.2	-15	-17.8	-20.2	-19.9	-18	-15.9	-14.6	dB
Output Return Loss	-17.6	-18.9	-17.3	-16.6	-16.5	-16.7	-17.1	-17.5	-17.7	dB
Reverse Isolation	-53.2	-42.1	-40.2	-39	-38.4	-37.9	-37.7	-37.7	-37.8	dB
Output Power for 1dB Compression	12.8	13.2	13.3	13.3	13.2	12.7	12.7	12.6	12.5	dBm
Output Third-Order Interception	25.5	25	25.2	25.1	24.9	25.6	25.8	26	25.9	dBm
Noise Figure	1.96	1.35	1.25	1.16	1.13	1.07	1.06	1.1	1.1	dB
Frequency	10000	10500	11000	11500	12000	12500	13000	13500	14000	MHz
Gain	21	21.2	21.4	21.5	21.6	21.3	20.9	20.2	19.3	dB
Input Return Loss	-13.5	-12.5	-11.6	-10.8	-9.7	-8.8	-7.8	-7	-6.4	dB
Output Return Loss	-17.5	-17.1	-16.5	-16.5	-17.9	-21.3	-29.1	-26.7	-19.9	dB
Reverse Isolation	-38	-38.1	-38.5	-38.9	-39.8	-40.8	-42.1	-43.2	-46.3	dB
Output Power for 1dB Compression	12.3	12.1	12	12	12.1	12	12	12.1	12.2	dBm
Output Third-Order Interception	25.5	25.2	24.7	24.5	24.1	24.1	23.9	23.8	24.2	dBm
Noise Figure	1.21	1.25	1.23	1.33	1.37	1.4	1.47	1.58	1.72	dB

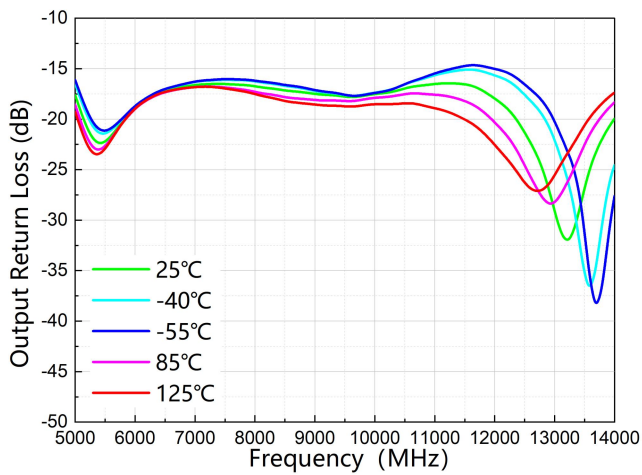
Test Conditions: Vdd=+3.3V, Idd=37mA; OIP3 spacing=1MHz, Pout=0dBm/tone; TA=+25°C



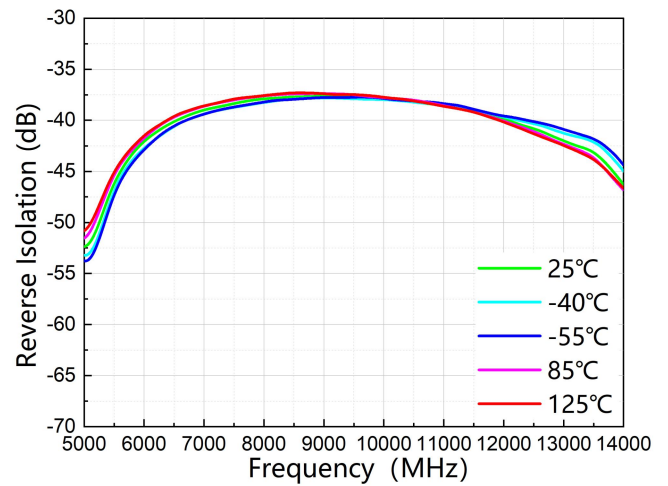
Gain vs. Freq



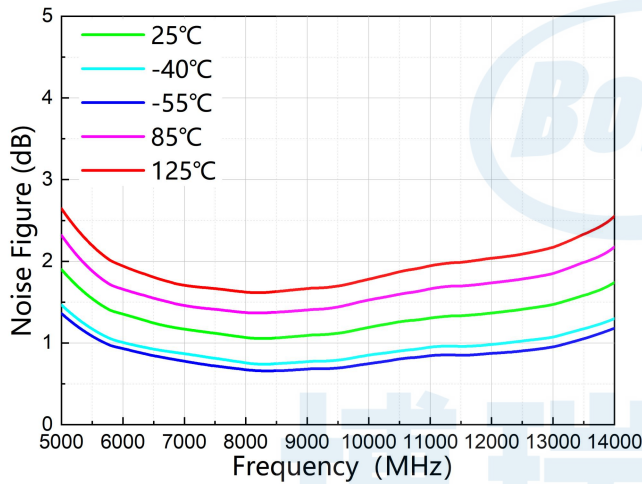
Input Return Loss vs. Freq



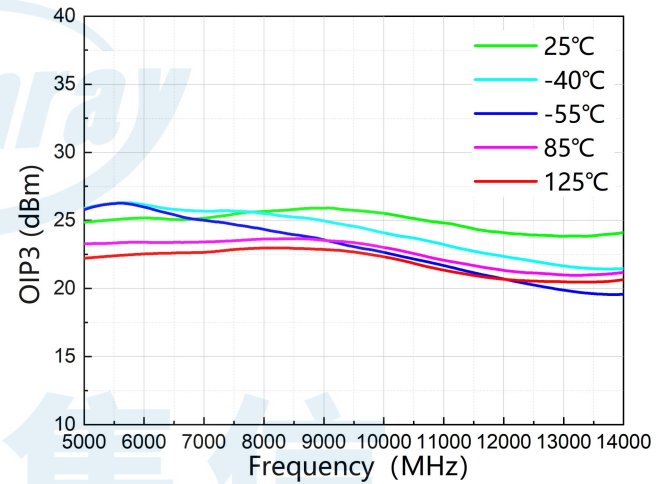
Output Return Loss vs. Freq



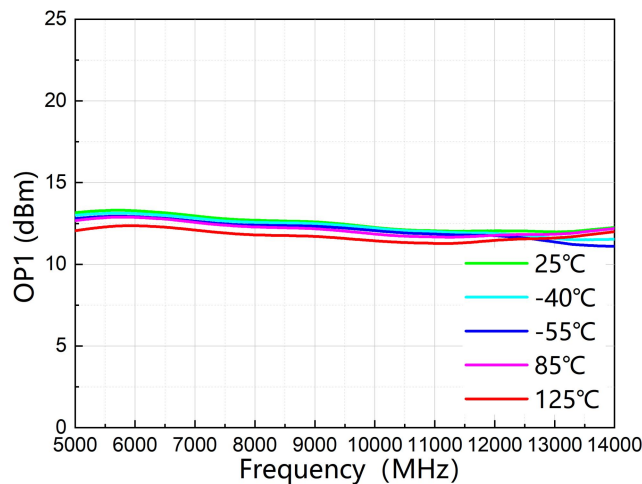
Reverse Isolation vs. Freq



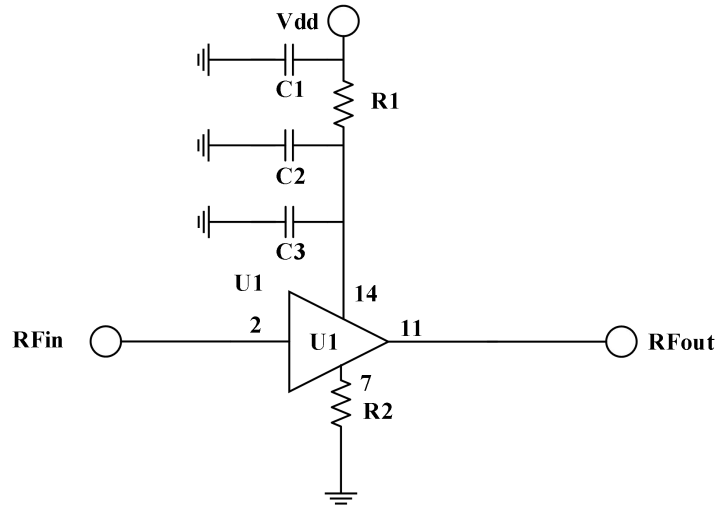
Noise Figure vs. Freq



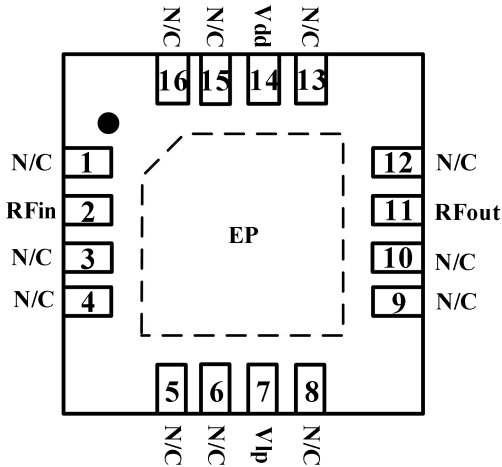
Output Third-Order Interception vs. Freq



Output Power for 1dB Compression vs. Freq

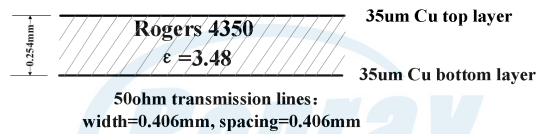
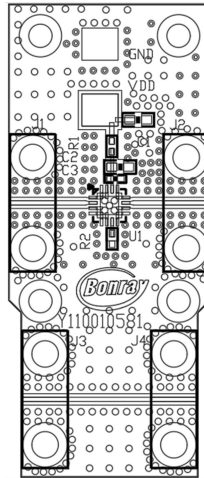
Typical Application Schematic

Bill of Material

Reference Designator	Package Size	Value	P/N
U1	QFN16	5GHz~14GHz Low Noise Amplifier	BR9376FDJ
C1	0603	1uF	GCM188R71C105KA64D
C2	0402	1nF	GCM155R71H102KA37D
C3	0402	100pF	GRM1555C1H101JA01D
R1	0402	0 Ω	RC0402FR-070RL
R2 (Normal operation mode)	/	Idle	/
R2 (Low-Power operation mode)	0402	0 Ω	RC0402FR-070RL

Pin Configuration and Description


Pin Number	Pin Name	Description
1,3 to 6,8 to 10,12,13,15,16	NC	No electrical connection; This pin and package substrate must be connected to RF/DC ground.
2	RFin	RF input pin. No external DC block is required.
7	Vlp	Operation modes setting pin; This pin is suspended in normal operation mode and grounded in low-power operation mode.
11	RFout	RF output pin. No external DC block is required.
14	Vdd	Power supply pin. External bypass capacitor is required.
-	EP	Exposed pins that must be connected to RF/DC ground.

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PCB Evaluation Board


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