

Product Features

Operating Frequency: 8GHz ~ 12GHz

Gain: 25.2dB@10GHz

Noise Figure: 1.65dB@10GHz

Output Third-Order Interception:

27.8dBm@10GHz

Output Power for 1dB Compression:

16.0dBm@10GHz

+3.3V/+5V Single Power Supply

Supply Current:

73mA @ Vdd=5V (Normal Operation Mode)

48mA @ Vdd=5V (Low-power Operation Mode)

41mA @ Vdd=3.3V (Normal Operation Mode)

Chip Size: 1100um x 850um x 100um

General Description

The BR9377LDZ is a MMIC low noise amplifier designed using GaAs process which operates between 8GHz and 12GHz. The amplifier is powered by a single-supply operation of +5V or +3.3V. At 10GHz, the amplifier typically provides a gain of 25.2dB, noise figure of 1.65dB, output IP3 of 27.8dBm, and output P1dB of 16dBm 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 amplifier is ideal for integration into Multi-Chip-Modules (MCMs) due to its small size.

Application

Radar and Electronic Countermeasures

Military and Aerospace

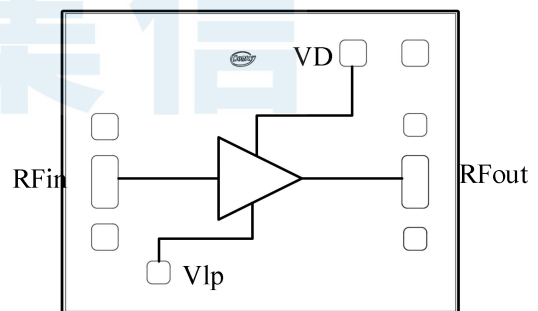
Navigation Equipment

Test Instrumentation

Ordering Information

Part Number	Package	Description
BR9377LDZ	Die	8GHz ~ 12GHz 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	24.9	25.1	24.5	dB	8000MHz
	25.2	25.0	24.7	dB	10000MHz
	25.7	25.2	24.7	dB	12000MHz
Output Power for 1dB Compression	15.1	16.3	15.3	dBm	8000MHz
	16.3	18.0	15.4	dBm	12000MHz
Output Third-Order Interception	27.8	26.2	27.2	dBm	8000MHz
	27.7	24.4	27.2	dBm	12000MHz
Noise Figure	1.65	1.68	1.32	dB	10000MHz
Input Return	-13.2	-15.9	-10.5	dB	10000MHz
Output Return	-15.9	-20.7	-10.1	dB	10000MHz
Reverse Isolation	-38.2	-40.4	-40.5	dB	10000MHz
Operating Voltage	+5	+5	+3.3	V	-
Static Supply Current	73	48	41	mA	-
Test Condition: OIP3 spacing=1MHz, Pout=5dBm/tone, TA=+25°C					

Absolute Maximum Ratings

Maximum Operating Voltage (Vdd): +6V

Maximum RF input Power: +20dBm

Recommended Operating Conditions

Supply Voltage: +5V/+3.3V

Supply Current:

73mA @ Vdd=5V (Normal Operation Mode)

48mA @ Vdd=5V (Low-power Operation Mode)

41mA @ 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.

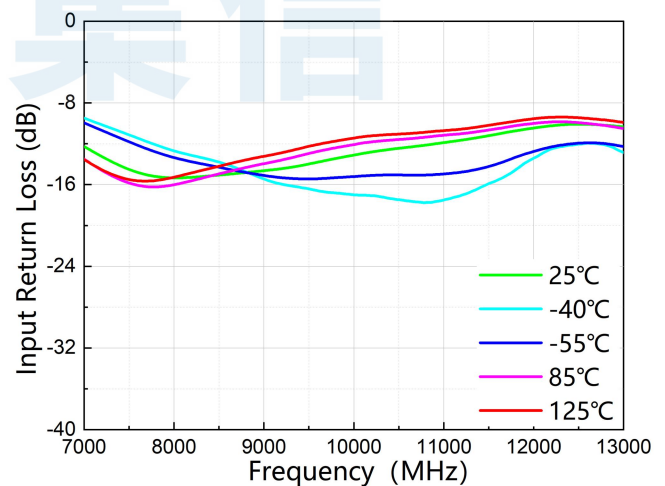
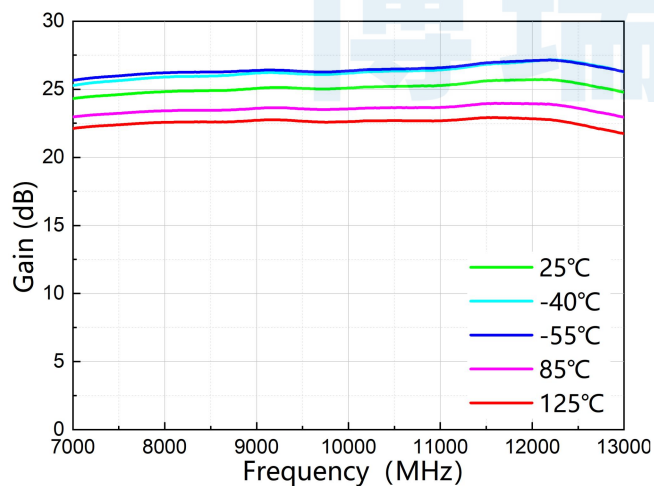
ESD WARNING

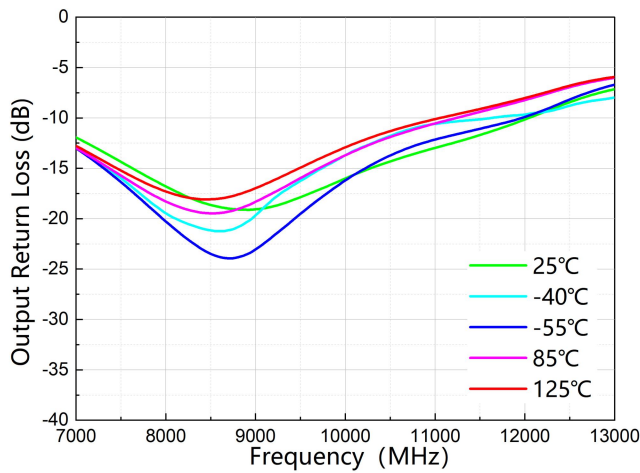
ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

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

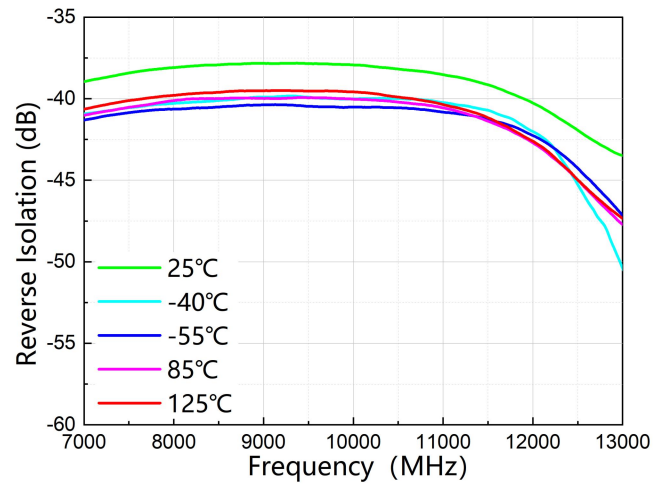
Parameter	Typ.									Units
Frequency	8000	8500	9000	9500	10000	10500	11000	11500	12000	MHz
Gain	24.9	24.9	25.1	25.1	25.2	25.2	25.3	25.7	25.7	dB
Input Return Loss	-15.5	-14.9	-14.7	-13.9	-13.2	-12.4	-11.9	-11.2	-10.5	dB
Output Return Loss	-16.8	-18.7	-19.0	-17.7	-15.9	-14.3	-12.9	-11.5	-10.1	dB
Reverse Isolation	-37.9	-38.0	-38.0	-37.8	-38.2	-38.1	-38.3	-39.2	-40.3	dB
Output Power for 1dB Compression	15.1	15.4	15.5	15.8	16.0	16.0	16.3	16.4	16.3	dBm
Output Third-Order Interception	27.8	28.0	27.9	27.9	27.8	27.7	27.8	27.9	27.7	dBm
Noise Figure	1.62	1.57	1.82	1.74	1.65	1.65	1.84	2.07	1.94	dB

Test Conditions: Vdd=+5V, Idd=73mA, OIP3 spacing=1MHz/Tone, Pout=5dBm/tone, TA=+25°C

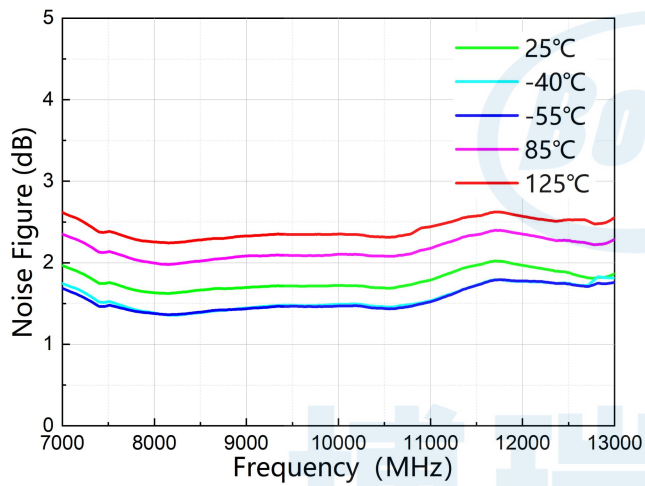




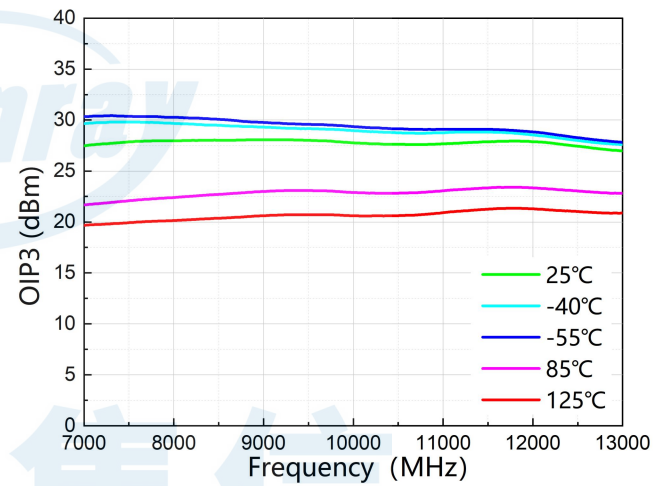
Output Return Loss vs. Freq



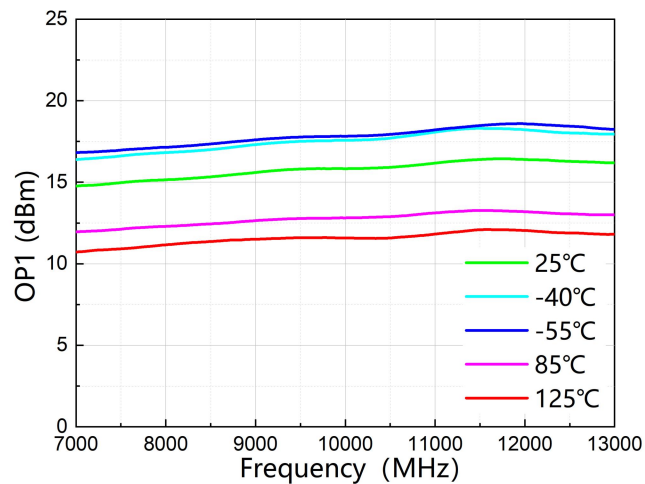
Reverse Isolation vs. Freq



Noise Figure vs. Freq



Output Third-Order Interception vs. Freq

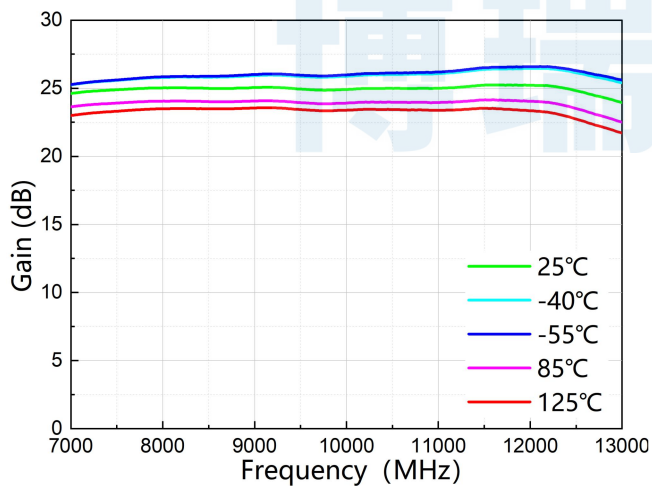


Output Power for 1dB Compression vs. Freq

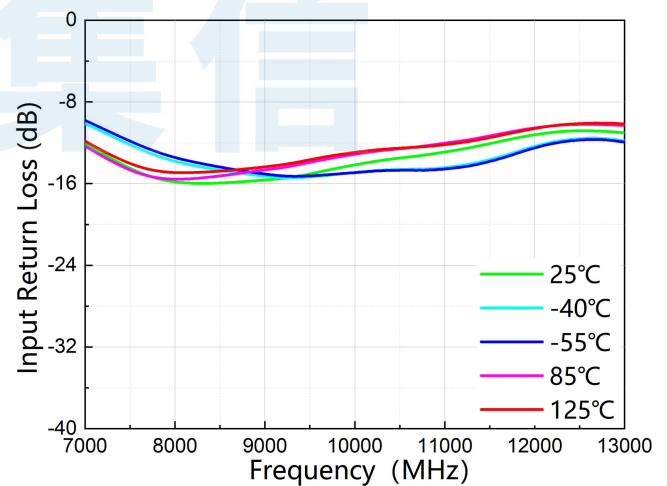
Typical Performance (Probe test results at +5V supply voltage in low-power operation mode)

Parameter	Typ.									Units
Frequency	8000	8500	9000	9500	10000	10500	11000	11500	12000	MHz
Gain	25.1	24.9	25.1	25.0	25.0	25.0	25.1	25.4	25.2	dB
Input Return Loss	-15.9	-15.9	-15.6	-15.1	-14.2	-13.5	-12.9	-12.1	-11.2	dB
Output Return Loss	-20.7	-22.8	-20.8	-17.7	-15.0	-13.0	-11.7	-10.5	-9.3	dB
Reverse isolation	-40.4	-40.2	-40.3	-40.3	-39.9	-40.7	-41.3	-41.6	-43.1	dB
Output Power for 1dB Compression	16.3	16.6	16.7	16.9	17.3	17.3	17.6	17.9	18.0	dBm
Output Third-Order Interception	26.2	26.1	26.0	25.8	25.5	25.3	25.2	24.7	24.4	dBm
Noise Figure	1.37	1.48	1.46	1.73	1.68	1.53	1.37	1.73	1.84	dB

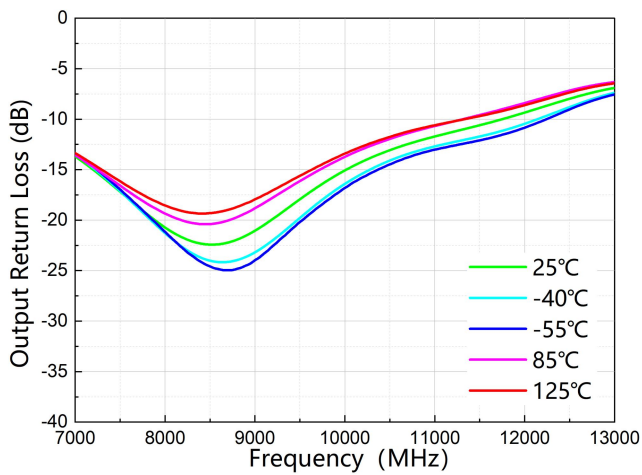
Test Conditions: Vdd=+5V, Idd=48mA, OIP3 spacing=1MHz/Tone, Pout=5dBm/tone, TA=+25°C



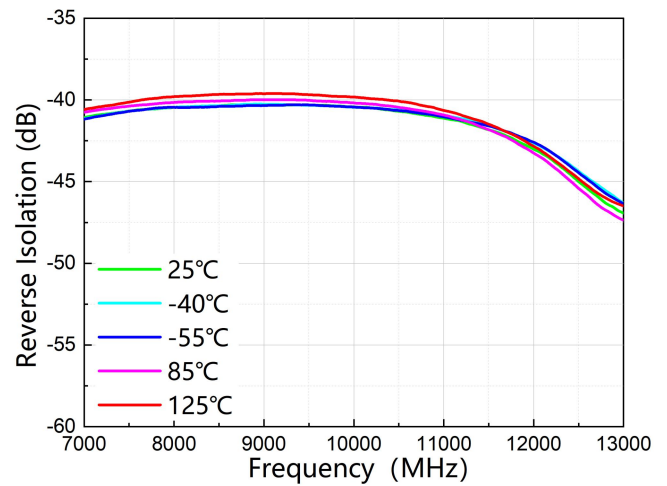
Gain vs. Freq



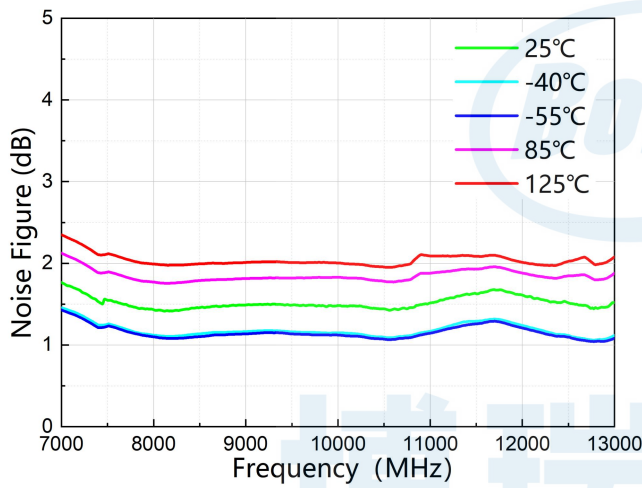
Input Return Loss vs. Freq



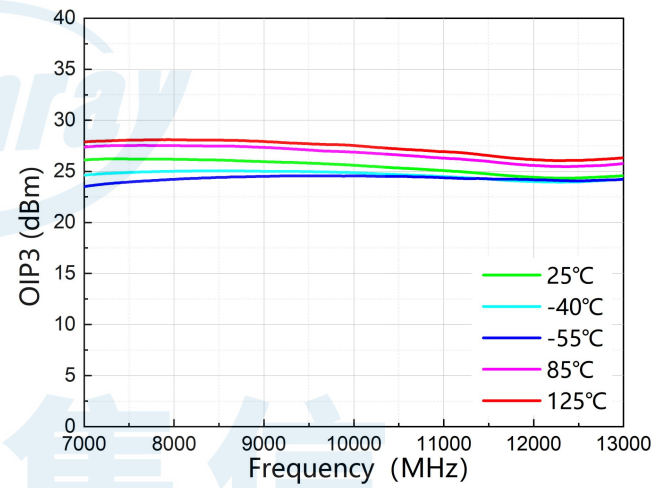
Output Return Loss vs. Freq



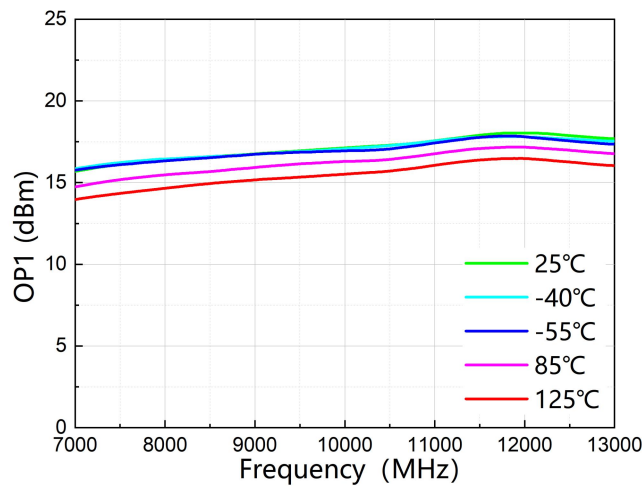
Reverse Isolation vs. Freq



Noise Figure vs. Freq



Output Third-Order Interception vs. Freq

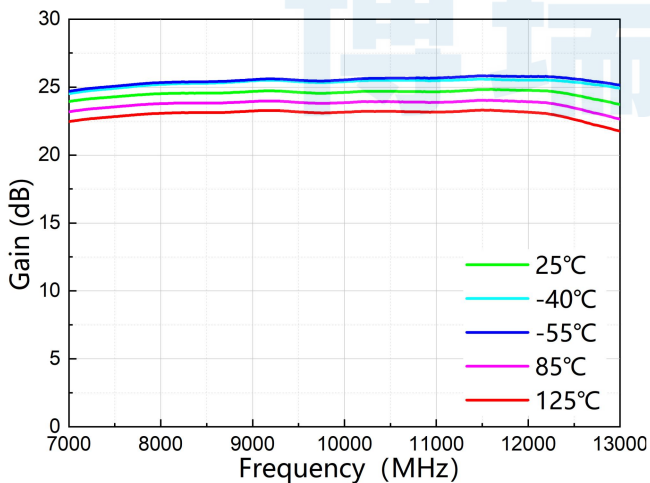


Output Power for 1dB Compression vs. Freq

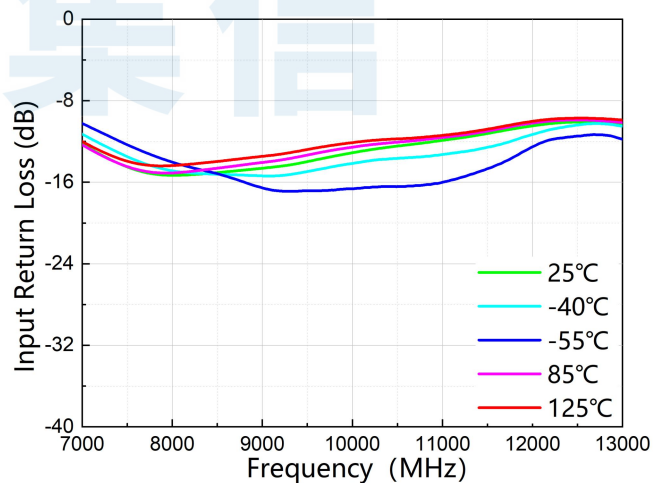
Typical Performance (Probe test results at +3.3V supply voltage in normal operation mode)

Parameter	Typ.									Units
Frequency	8000	8500	9000	9500	10000	10500	11000	11500	12000	MHz
Gain	24.6	24.5	24.7	24.7	24.7	24.6	24.7	24.9	24.8	dB
Input return loss	-15.4	-14.9	-14.7	-13.9	-13.2	-12.4	-11.9	-11.2	-10.5	dB
Output return loss	-16.8	-18.8	-19.0	-17.7	-15.9	-14.3	-12.9	-11.5	-10.1	dB
Reverse isolation	-37.9	-38.1	-38.1	-37.8	-38.2	-38.3	-38.6	-39.5	-40.5	dB
Output Power for 1dB Compression	14.6	14.8	14.9	15.2	15.4	15.4	15.6	15.5	15.4	dBm
Output Third-Order Interception	26.5	27.0	26.9	27.2	27.2	27.2	27.5	27.3	27.2	dBm
Noise Figure	1.32	1.29	1.49	1.44	1.32	1.24	1.47	1.66	1.40	dB

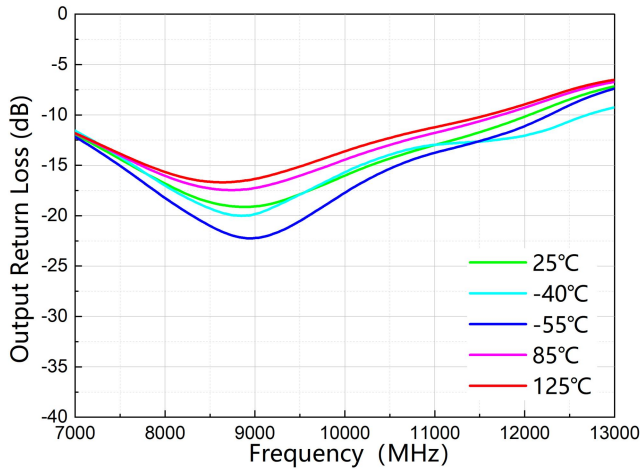
Test conditions: Vdd=+3.3V, Idd=41mA, OIP3 spacing=1MHz/Tone, Pout=5dBm/tone, TA=+25°C



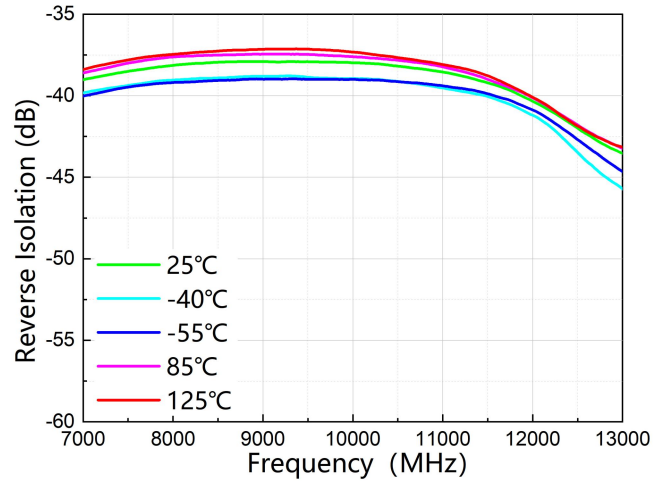
Gain vs. Freq



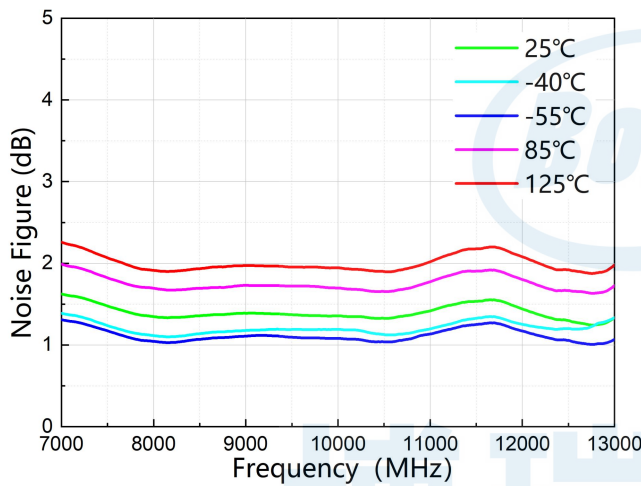
Input Return Loss vs. Freq



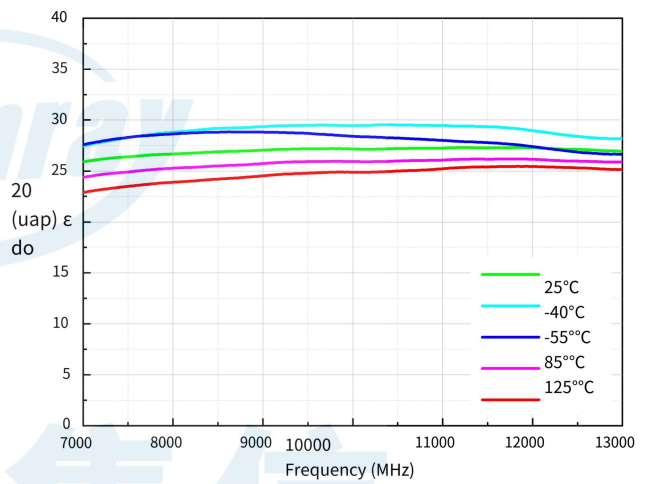
Output Return Loss vs. Freq



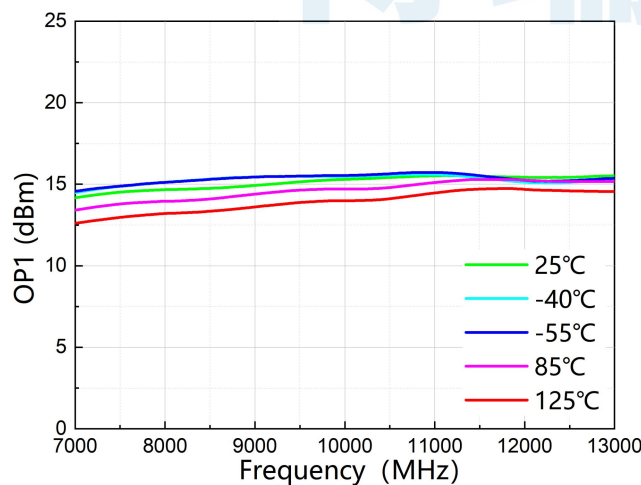
Reverse Isolation vs. Freq



Noise Figure vs. Freq

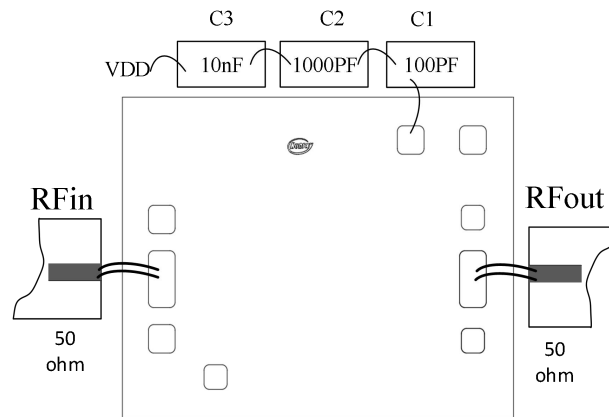


Output Third-Order Interception vs. Freq

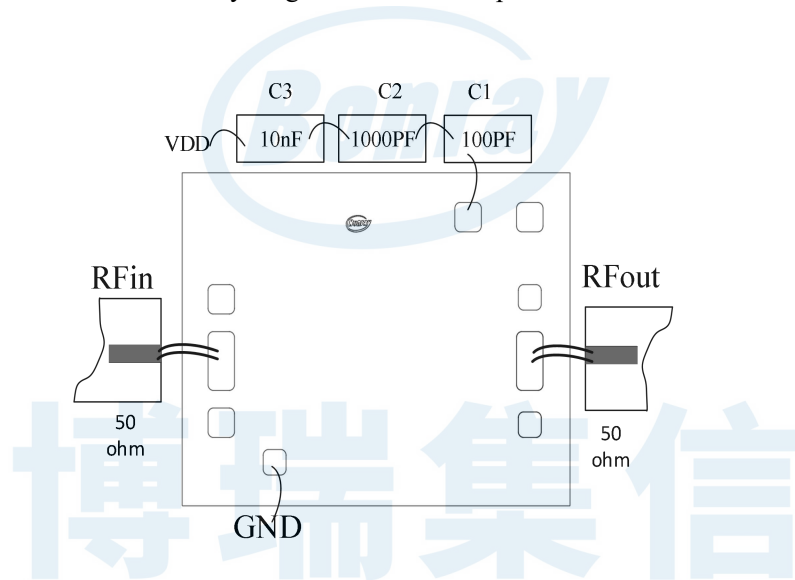


Output Power for 1dB Compression vs. Freq

Assembly Diagram



Assembly diagram for normal Operation Mode



Assembly diagram for low-power Operation Mode

Note: Chip capacitors as close as possible to power supply pad.

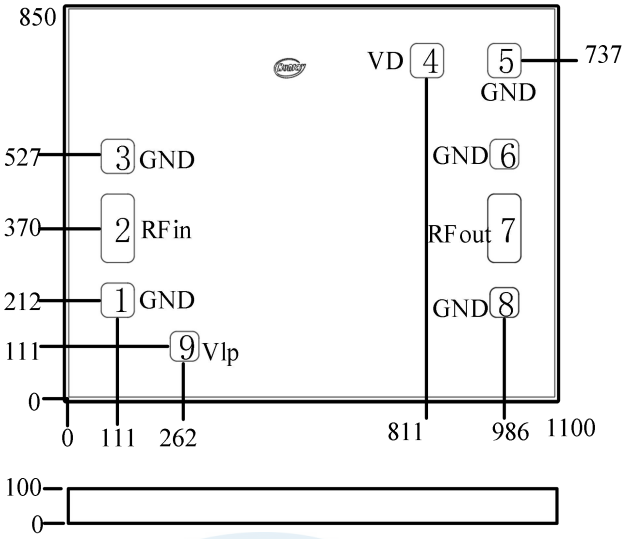
Bill of Material

Reference Designator	Package Size	Value	P/N
U1	Naked Die	8GHz~12GHz low noise amplifier	BR9377LDZ
C1	Chip Capacitor	100pF	SG201N101MSTW
C2	Chip Capacitor	1000pF	CT91202X102M100TW
C3	Chip Capacitor	10nF	CT91-20-2X-103-M-50-C-W

Handling Precautions:

1. **Storage:** All bare dies are placed in ESD protective containers, and then sealed in an ESD protective bag for shipment. Once the sealed ESD protective bag has been opened, all die should be stored in a dry nitrogen environment.
2. **Cleanliness:** Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.
3. **Electrostatic protection:** Follow ESD precautions to protect against ESD strikes.
4. **Transients:** Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pickup.
5. **General Handling:** Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers. The surface of the chip should not be touched with vacuum collet, tweezers, or fingers.
6. **Mouning:** The chip is back-metallized and can be die mounted with electrically conductive epoxy. The mounting surface should be clean and flat.
7. **Conductive epoxy Die Attach:** Apply conductive epoxy to the mounting surface so that the overflow of conductive epoxy on all four sides should not be less than 75%, and the height of conductive epoxy climbing on all four sides should not exceed the surface of the chip. Cure conductive epoxy per the manufacturer's schedule.
8. **Die bonding process unless otherwise noted:** Ball or wedge bond with 0.025mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 °C is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. **The length of all bonds should be as short as possible and the arc height as low as possible.**
9. **Die bonding void rate:** not more than 10%.
10. Please contact customer service if you have any problem.

Mechanical Information (Units: μm)



Notes:

1. Backside and bond pad metal: Gold;
2. Backside is RF and DC ground;
3. Pads size: RFin $75\mu\text{m} \times 150\mu\text{m}$, RFout $75\mu\text{m} \times 150\mu\text{m}$, Vlp $65\mu\text{m} \times 65\mu\text{m}$, VD $75\mu\text{m} \times 75\mu\text{m}$;
4. Cannot be bonded on the hole.

Pad Description

Press Point Number	Function Symbol	Function Description
2	RFin	RF Input. No external DC block is required.
9	Vlp	Sets operation modes, and see assembly for required operation mode
7	RFout	RF Output. No external DC block is required.
4	VD	Power Supply. See assembly for required external components.
1,3,5,6,8	GND	Connected to die bottom through hole
Die Bottom	GND	Die bottom must be well grounded to RF/DC