

Product Features

Frequency: 30MHz ~ 4.5GHz

Noise Figure: 0.9dB@2GHz

Gain: 22.3dB@2GHz

Output Third-Order Interception:

34.0dBm@2GHz

Output Power for 1dB Compression:

21.8dBm@2GHz

80mA@Vdd=5V(Normal Operation Mode)

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

34mA@Vdd=3.3V(Normal Operation Mode)

19mA@Vdd=3.3V(Low-power Operation

Mode)

Package: DFN8 (2mm×2mm)

Application

Repeaters/DAS

Mobile Infrastructure

LTE/WCDMA/CDMA/GSM

General Purpose Wireless

TDD or FDD Systems

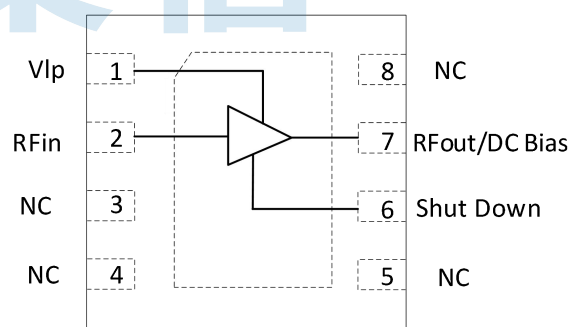
Ordering Information

Part Number	Package	Description
BR9394DAJ	DFN8	30MHz to 4.5GHz Low Noise Amplifier

General Description

The BR9394DAJ is a low noise amplifier with integrated Shutdown function, covering a frequency range from 30MHz to 4.5GHz. The amplifier is internally matched to 50 ohms, and only requires an external RF choke and blocking/bypass capacitors. The amplifier contains on-chip active bias network to ensure that the quiescent current is not affected by the threshold voltage and temperature. The amplifier is powered by a single-supply operation of +3.3V~+5V and a power down control capability integrated into the die for TDD applications. The product has the characteristics of low noise, high gain flatness and high linearity, making it suitable for applications with high linearity and low noise.

Functional Block Diagram



Typical Performance (+5V Supply voltage)

Parameters	Test Condition	Min.	Typ.	Max.	Units
Gain	2000MHz	-	22.3	-	dB
	4500MHz	-	21.7	-	
Input Return Loss	2000MHz	-	-21.5	-	dB
	4500MHz	-	-11.1	-	
Output Return Loss	2000MHz	-	-16.5	-	dB
	4500MHz	-	-11.6	-	
Reverse Isolation	2000MHz	-	-26.6	-	dB
	4500MHz	-	-30.9	-	
Output Power for 1dB Compression	2000MHz	-	21.8	-	dBm
	4500MHz	-	20.4	-	
Output Third-Order Interception	2000MHz	-	34.0	-	dBm
	4500MHz	-	36.0	-	
Noise Figure	2000MHz	-	0.9	-	dB
	4500MHz	-	1.2	-	
Supply Voltage	-	-	+5	-	V
Power Shutdown Voltage (pin 6)	ON state	0	-	0.6	V
	OFF state (Power down)	1.5	-	Vdd	
Supply Current	ON	-	80	-	mA
	OFF	-	5	-	
Switching Time	LNA ON to OFF	-	17.2	-	ns
	LNA OFF to ON	-	24.6	-	
Test conditions: Vdd=+5V, I=80mA, OIP3 spacing=1MHz, Pout=+5dBm/tone, TA=+25°C					

Absolute Maximum Ratings

Maximum Operating Voltage: +6V

Maximum Input Power: 27dBm

ESD Rating: Class 1B

Recommended Operating Conditions

Supply Voltage: +5V

Supply Current:

80mA@Vdd=5V (Normal Operation Mode)

Operating 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

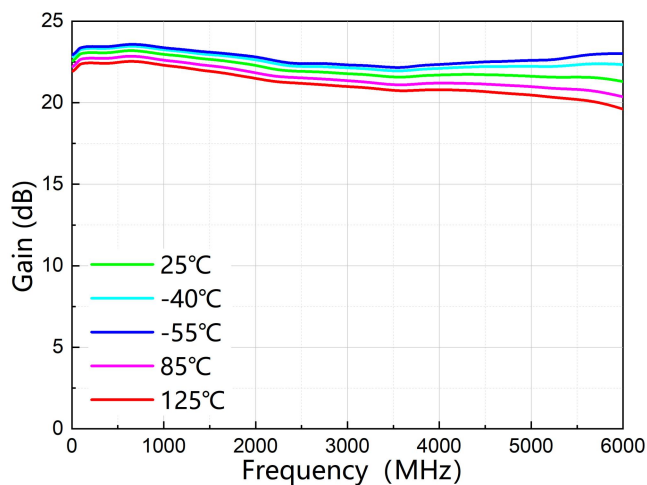
ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

博瑞集信

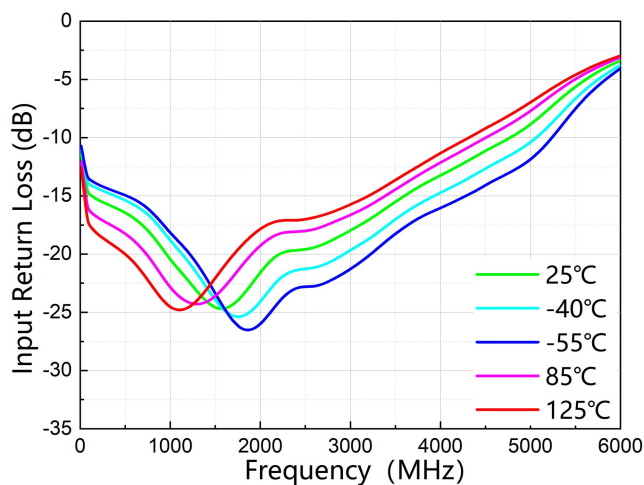


Parameters	Operation Mode	Typ.									Units
Frequency	-	30	1000	1400	2000	2400	3000	3400	4000	4500	MHz
Gain	5V	22.7	22.9	22.7	22.3	21.9	21.8	21.6	21.7	21.7	dB
	5V Low-power	22.1	22.1	21.9	21.4	21.0	20.8	20.8	20.7	20.5	
	3.3V	21.7	21.9	21.6	21.2	20.9	20.9	20.7	20.8	20.7	
	3.3V Low-power	20.3	20.0	19.8	19.2	18.8	18.8	18.8	18.8	18.4	
Input Return Loss	5V	-12.4	-20.5	-24.3	-21.5	-19.7	-18.0	-16.0	-13.2	-11.1	dB
	5V Low-power	-13.7	-27.9	-25.0	-17.3	-16.3	-15.7	-14.5	-12.5	-10.5	
	3.3V	-14.1	-26.9	-21.1	-16.2	-15.6	-14.9	-13.7	-11.1	-8.7	
	3.3V Low-power	-13.0	-16.1	-13.4	-10.8	-10.7	-10.4	-10.1	-8.7	-7.0	
Output Return Loss	5V	-11.0	-17.5	-19.6	-16.5	-15.7	-13.0	-12.6	-12.5	-11.6	dB
	5V Low-power	-14.0	-20.6	-21.2	-15.5	-14.5	-12.8	-12.6	-12.8	-11.9	
	3.3V	-13.7	-27.6	-26.3	-17.5	-16.8	-15.2	-15.1	-15.2	-14.0	
	3.3V Low-power	-19.4	-19.9	-16.2	-12.4	-12.2	-12.1	-12.7	-13.2	-12.0	
Output Power for 1dB Compression	5V	21.5	22.3	22.3	21.7	21.8	22.0	21.9	21.3	20.4	dBm
	5V Low-power	21.1	22.0	21.9	21.3	21.0	21.2	21.5	20.9	20.0	
	3.3V	17.5	20.0	20.1	19.5	19.1	18.8	18.2	16.7	15.4	
	3.3V Low-power	13.3	19.6	19.7	19.3	18.5	18.0	17.4	15.6	13.0	
Output Third-Order Interception	5V	35.2	35.1	34.8	34.0	34.2	35.1	34.4	36.1	36.0	dBm
	5V Low-power	33.7	32.1	31.2	31.0	31.6	31.9	32.9	33.2	31.3	
	3.3V	30.9	29.3	29.0	28.7	28.8	29.6	29.4	27.3	24.6	
	3.3V Low-power	26.9	25.3	24.5	23.9	24.9	26.0	25.4	23.5	20.4	
Noise Figure	5V	2.6	0.9	0.9	0.9	0.9	0.9	1.1	1.2	1.2	dB
	5V Low-power	2.7	0.8	0.8	0.9	0.9	1.0	1.1	1.2	1.2	
	3.3V	2.6	0.8	0.9	0.8	0.9	0.8	1.0	1.1	1.1	
	3.3V Low-power	2.5	0.9	0.9	0.9	1.0	1.0	1.1	1.3	1.3	
Supply Current	5V	80									mA
	5V Low-power	48									
	3.3V	34									
	3.3V Low-power	19									
Test Conditions: OIP3 spacing=1MHz, Pout=+5dBm/tone, TA=+25°C											

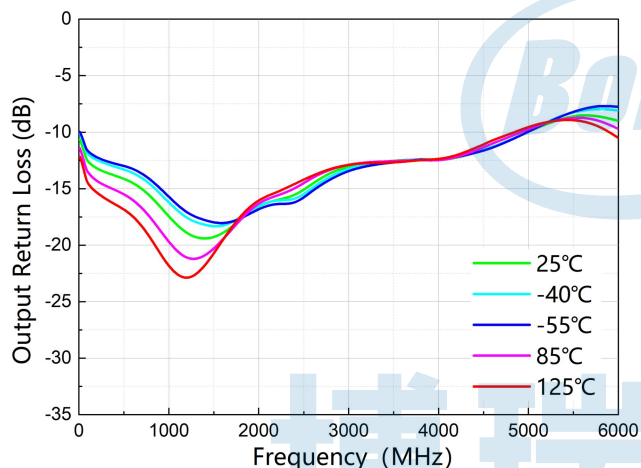
Typical Performance (EVB test results at +5V supply voltage in normal operation mode)



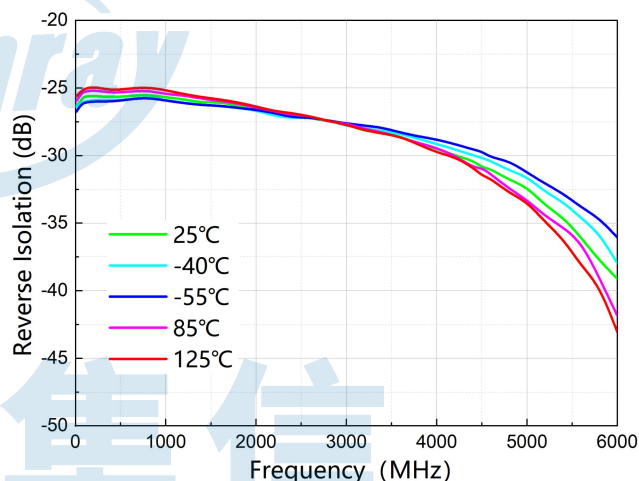
Gain vs. Freq



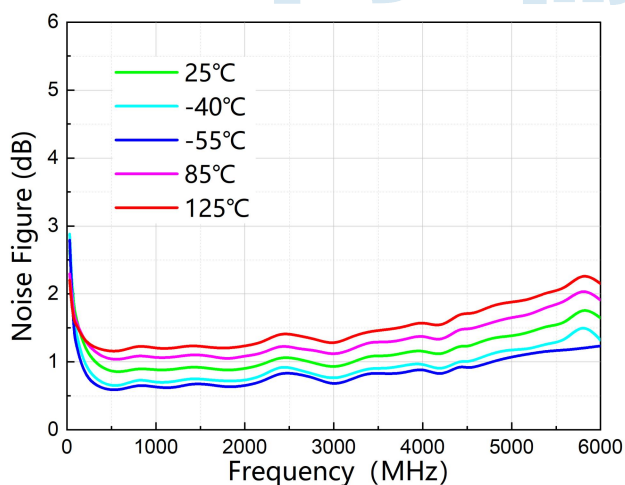
Input Return Loss vs. Freq



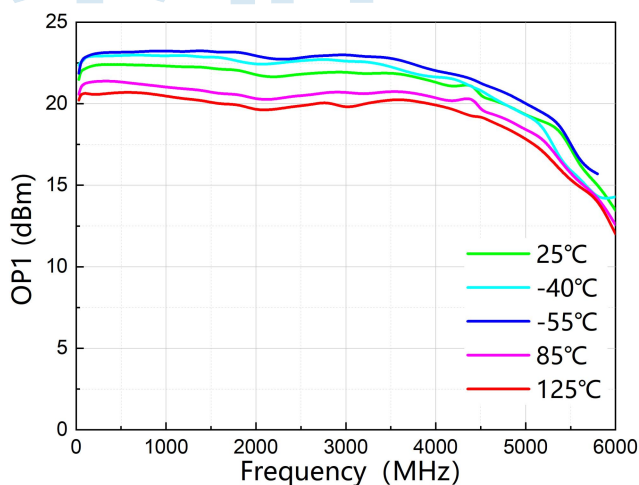
Output Return Loss vs. Freq



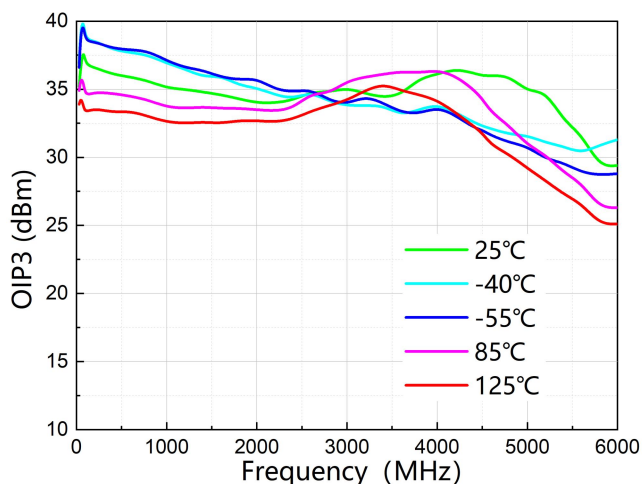
Reverse Isolation vs. Freq



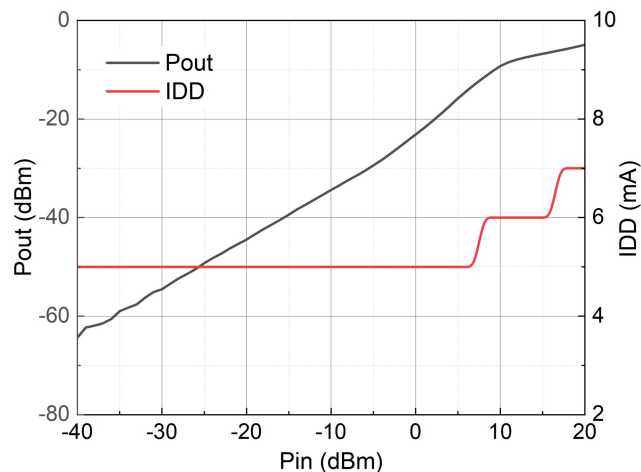
Noise Figure vs. Freq



Output Power for 1dB Compression vs. Freq

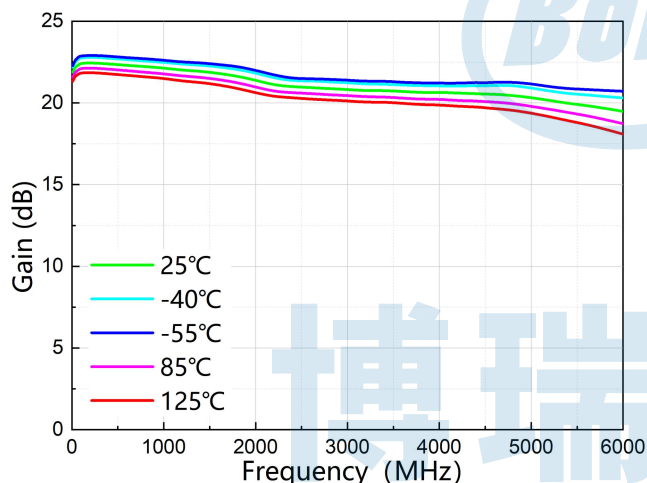


Output Third-Order Interception vs. Freq

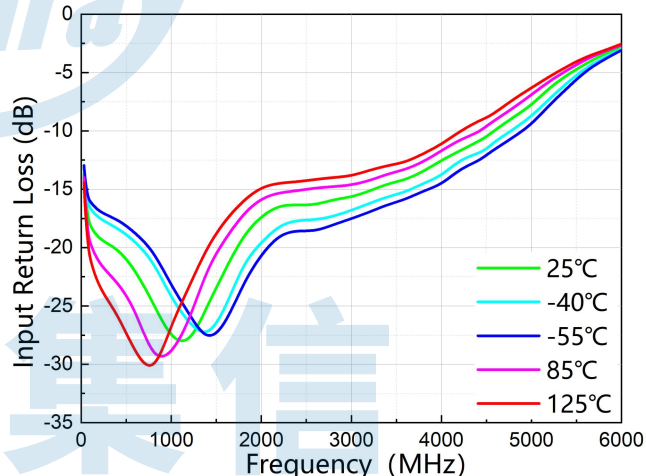


P_{out} and I_{DD} vs. P_{in}
(OFF State, 2GHz)

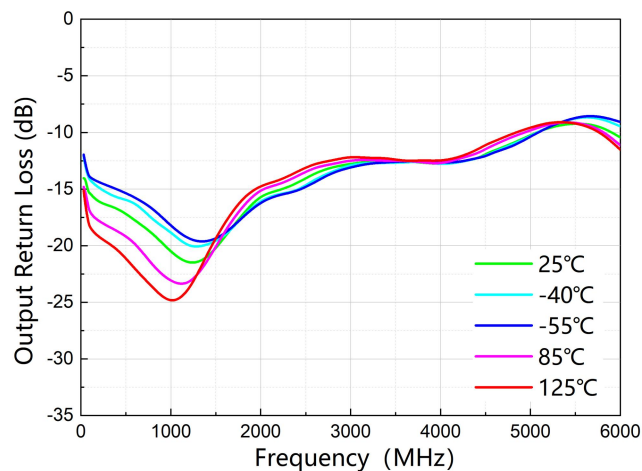
Typical Performance (EVB test results at +5V supply voltage in low-power operation mode)



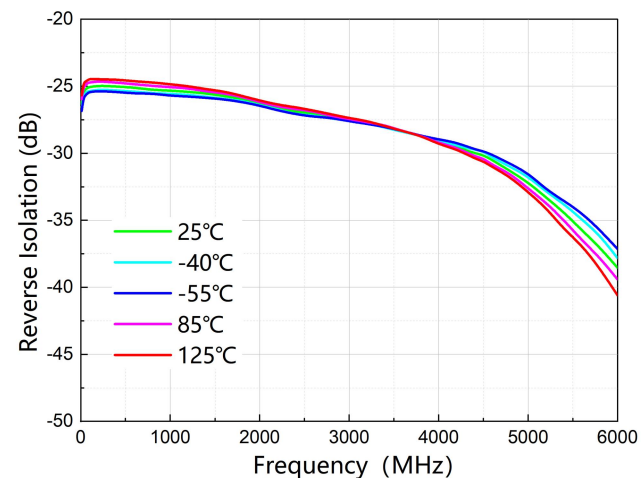
Gain vs. Freq



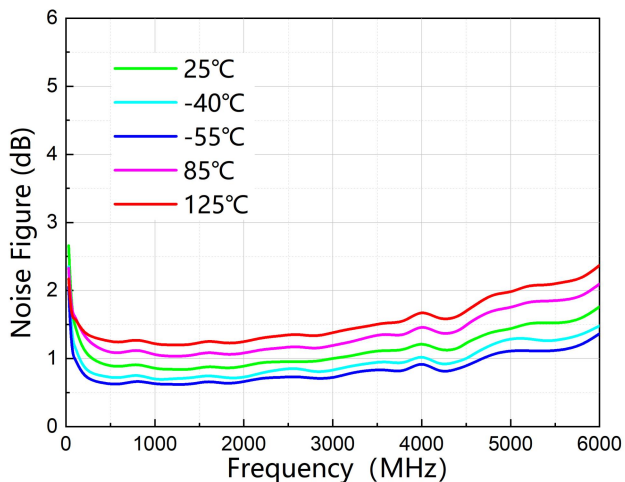
Input Return Loss vs. Freq



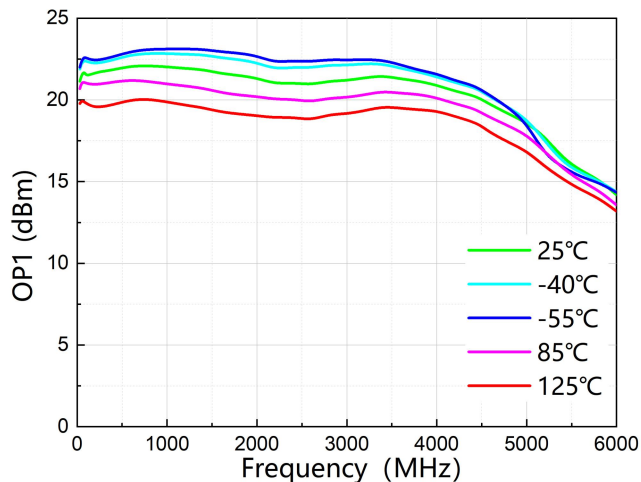
Output Return Loss vs. Freq



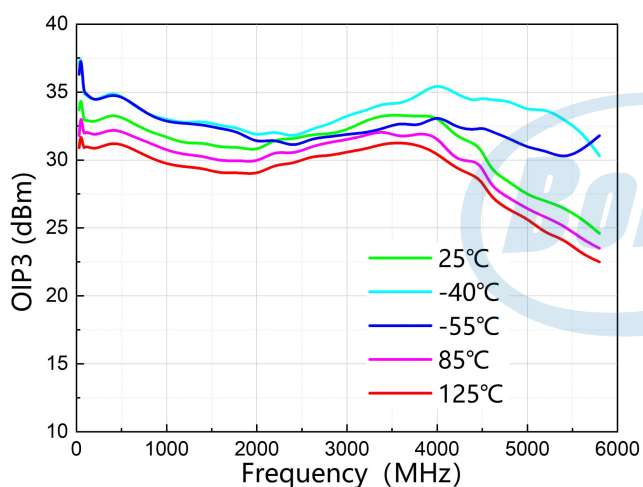
Reverse Isolation vs. Freq



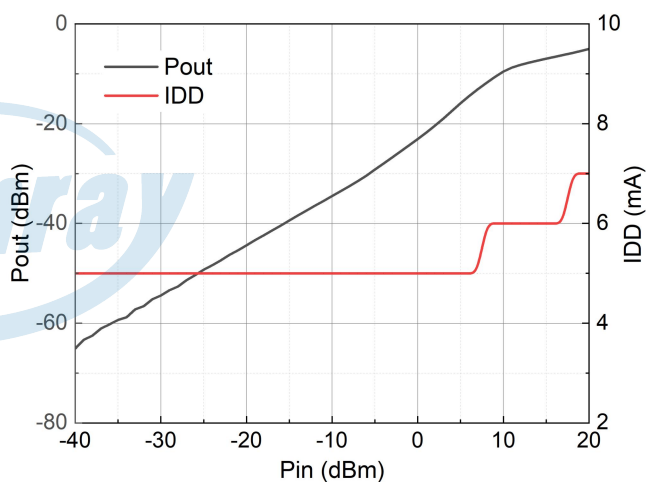
Noise Figure vs. Freq



Output Power for 1dB Compression vs. Freq

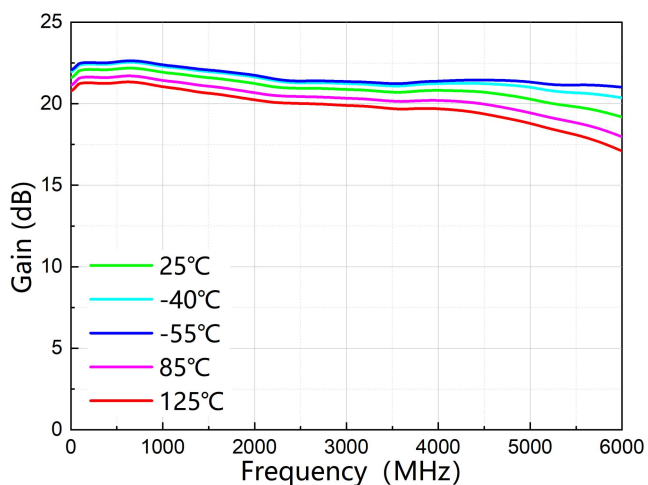


Output Third-Order Interception vs. Freq

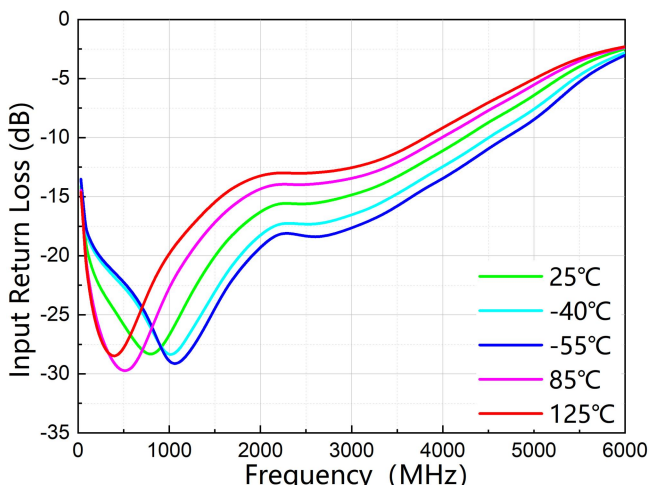


P_{out} and IDD vs. P_{in}
(OFF State, 2GHz)

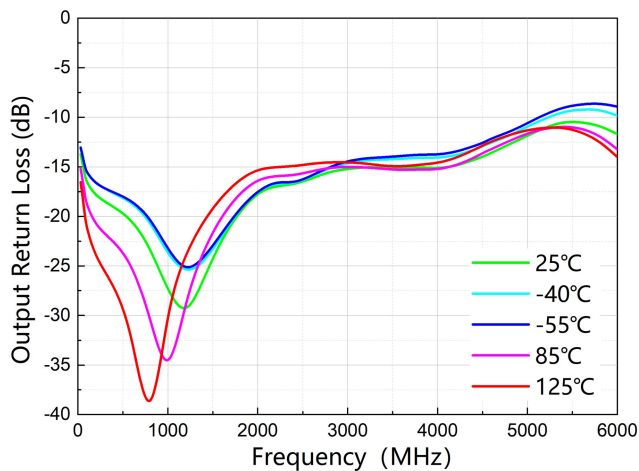
Typical Performance (EVB test results at +3.3V supply voltage in normal operation mode)



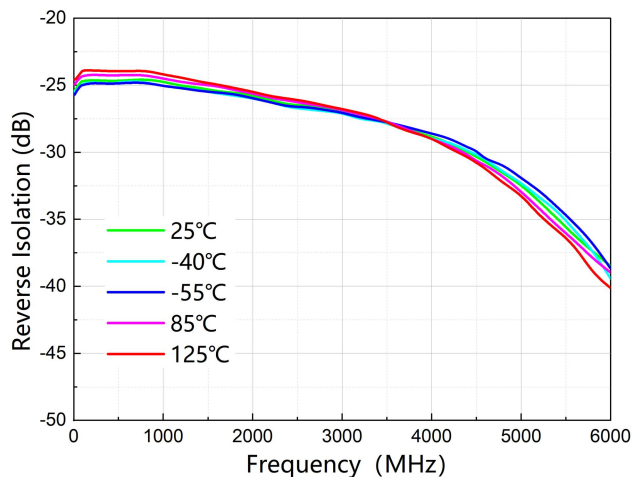
Gain vs. Freq



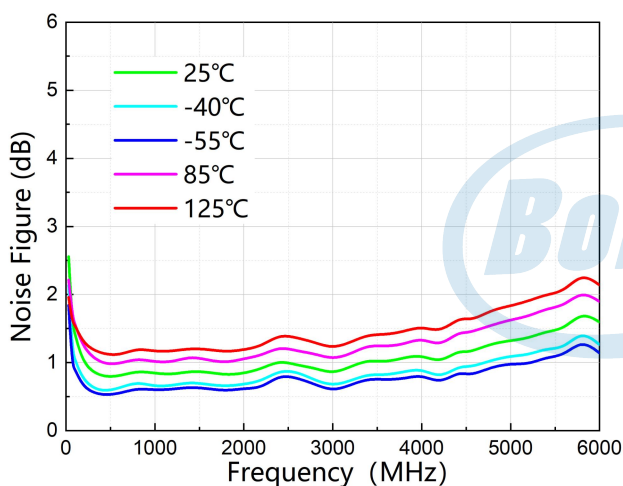
Input Return Loss vs. Freq



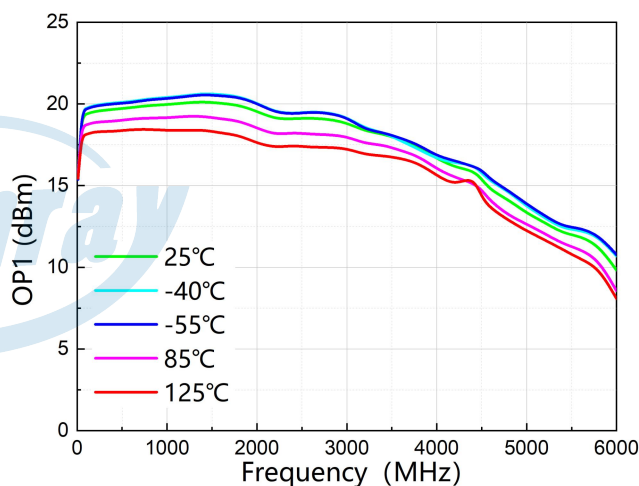
Output Return Loss vs. Freq



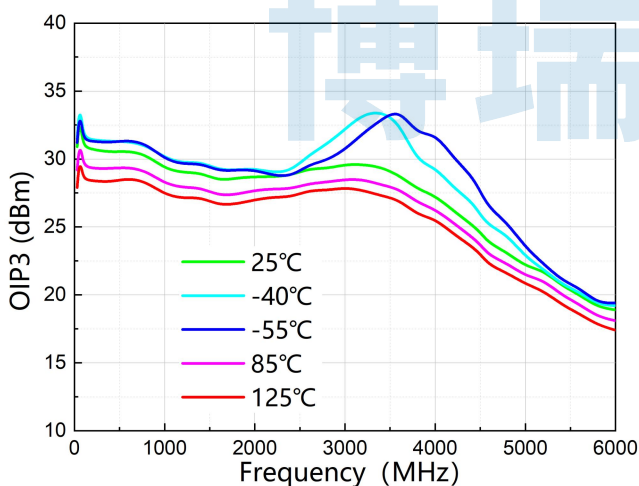
Reverse Isolation vs. Freq



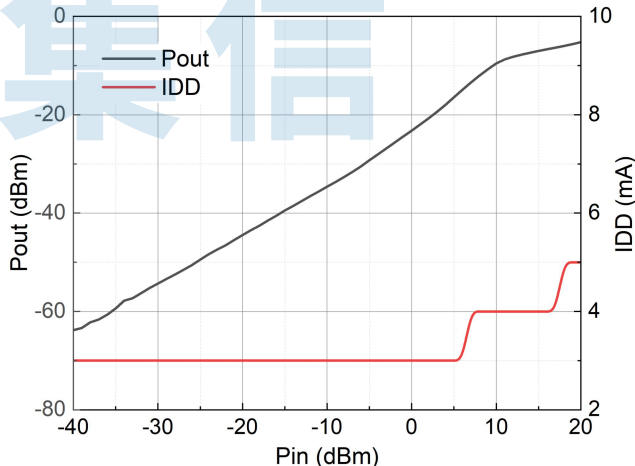
Noise Figure vs. Freq



Output Power for 1dB Compression vs. Freq

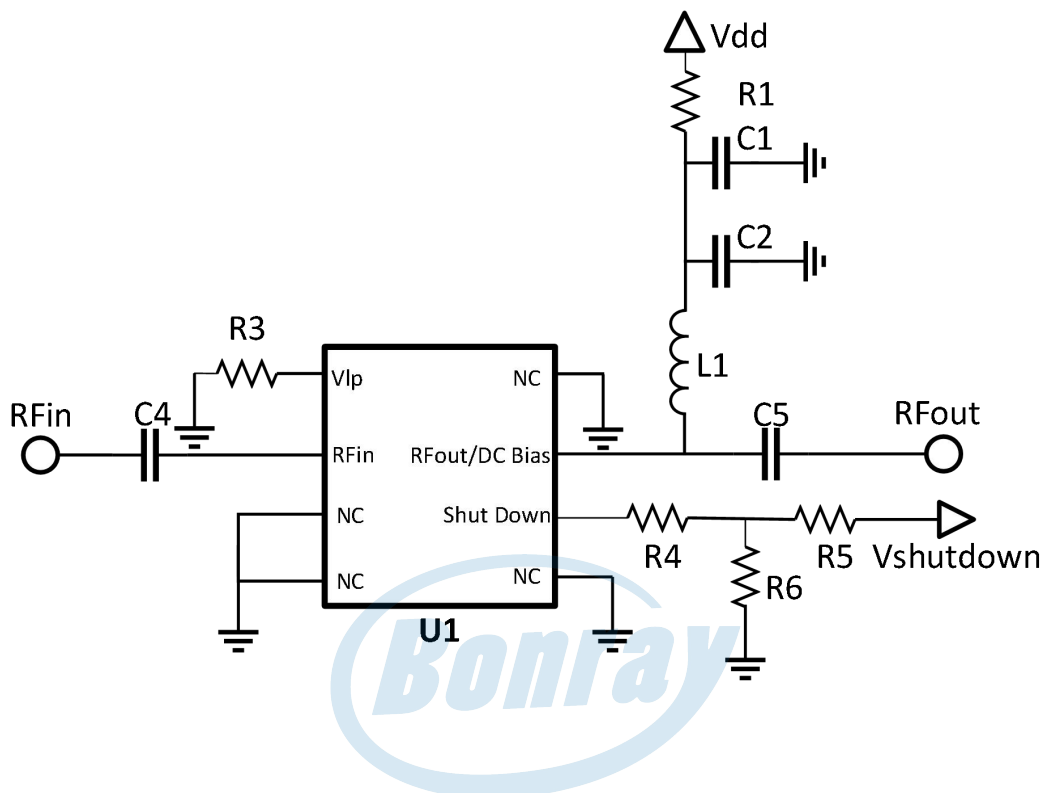


Output Third-Order Interception vs. Freq



P_{out} and I_{DD} vs. P_{in}
(OFF State, 2GHz)

Typical Application Schematic

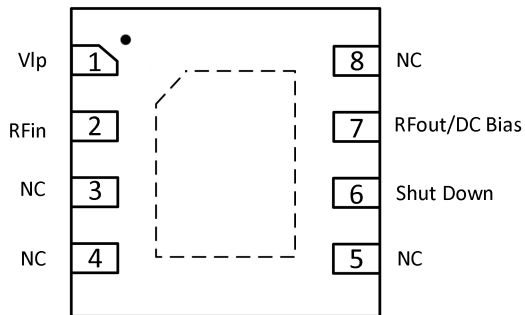


Bill of Material

Reference Designator	Package	Value	P/N
U1	DFN8	30MHz~4.5GHz Low noise amplifier	BR9394DAJ
L1	1008	1.1uH,±5%,1200mA	1008AF-112XJRB
C1	0603	1uF,16V,±10%	GRM188R61C105KA93D
C2	0402	50V,100pF,±5%	GRM1555C1H101JA01D
C4、C5	0402	50V,1nF,±5%	GRM1555C1H102JA01D
R1	0402	±1%,0Ω,1/16W	RC0402FR-070RL
R3 (Low-power operation mode)	0402	±5%,24Ω,1/16W	RC0402JR-0724RL
R3 (Normal operation mode)	/	Idle	/
R4	/	Solder short	/
R5	0402	±5%,1.8KΩ,1/16W	RC0402JR-071K8L
R6	0402	±0.1%,30KΩ,1/16W	RT0402BRE0730KL

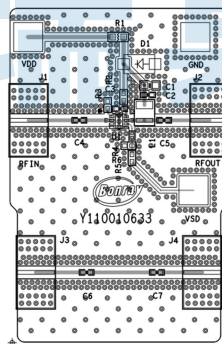
Note: Under normal operation, the R3 should be left floating. A 24 Ω resistor can be soldered at R3 to switch the device into low-power operation mode.

Pin Configuration and Description

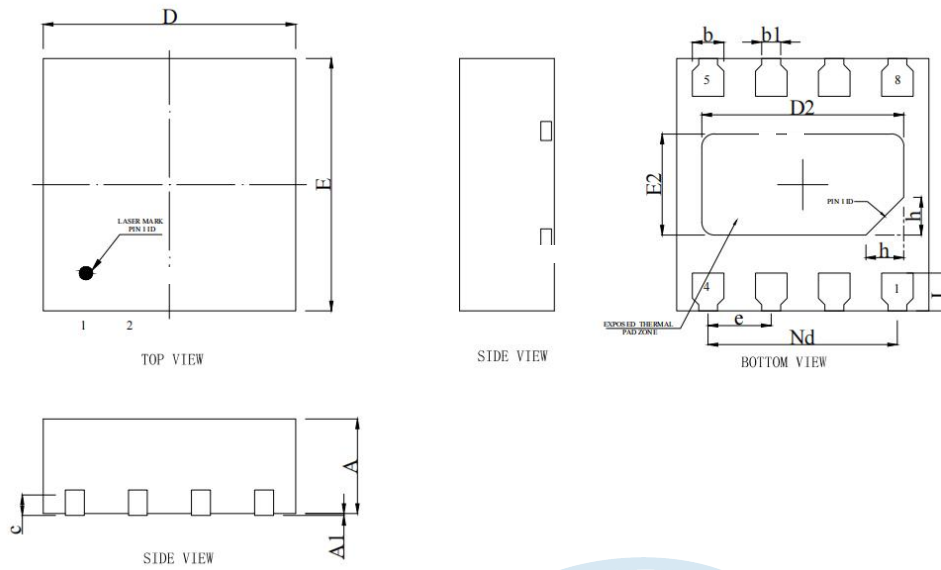


Pin Number	Pin Name	Description
2	RFin	RF input pin. A DC Block is required.
6	Shut Down	A high voltage $\geq 1.5V$ turns off the device. If the pin is pulled to ground or driven with a voltage $\leq 0.6V$, then the device will operate under LNA ON state.
7	RFout/DC Bias	RF output and DC bias pin. DC bias will also need to be injected through a RF bias choke/inductor for operation.
1	Vlp	Operation modes set pin. This pin is suspended in normal operation mode and grounded in low-power operation mode.
3,4,5,8	NC	No electrical connection. These pins should be connected to ground.
-	EP	Exposed pin. The exposed pad must be connected to RF/DC ground.

PCB Evaluation Board



Package Dimensions (mm)



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.20	0.25	0.30
b1	0.15REF		
c	0.203REF		
D	1.90	2.00	2.10
D2	1.50	1.60	1.70
e	0.508SC		
Ed	1.508SC		
E	1.90	2.00	2.10
E2	0.70	0.80	0.90
L	0.20	0.30	0.40
h	0.20	0.30	0.40



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