

Product Features

Frequency: 600MHz ~ 4.2GHz

Noise Figure: 0.55dB@1.8GHz

Gain: 20.8dB@1.8GHz

Output Third-Order Interception:

35.5dBm@1.8GHz

Output Power for 1dB Compression:

19.1dBm@1.8GHz

Bias adjustable for linearity optimization

Integrated shutdown control pin

+3V~+5V Single Power Supply

67mA@Vdd=+5V

Package: DFN8 (2mm×2mm)

Application

Repeaters/DAS

Mobile Infrastructure

LTE/WCDMA/CDMA/GSM

General Purpose Wireless

TDD or FDD Systems

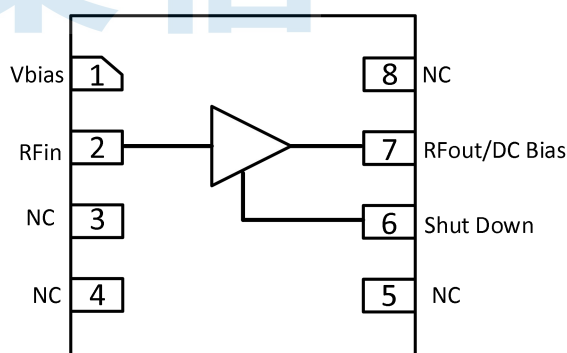
Ordering Information

Part Number	Package	Description
BR9511DA	DFN8	600MHz to 4.2GHz Low Noise Amplifier

General Description

BR9511DA is a high-performance MMIC low noise amplifier. Covering a frequency range of 600MHz~4.2GHz, the amplifier is internally matched to 50 ohms, and only requires an external RF choke and blocking/bypass capacitors. The amplifier is powered by a single-supply operation of +3V~+5V and on-chip active bias network ensures that the quiescent current is not affected by temperature. The amplifier is bias adjustable and requires minimal external components to operate, and a power down control capability integrated into the die for TDD applications. The amplifier provides high stability, high linearity, low noise figure, which can be applied in the system of high dynamic range.

Functional Block Diagram



Electrical Specifications

Parameter	Test Condition	Min.	Typ.	Max.	Units
Gain	1GHz	-	22.5	-	dB
	2.5GHz	-	20.7	-	
Output Power for 1dB Compression	1GHz	-	17.1	-	dBm
	2.5GHz	-	19.1	-	
Output Third-Order Interception	1GHz	-	34.4	-	dBm
	2.5GHz	-	33.3	-	
Noise Figure	1GHz	-	0.57	-	dB
	2.5GHz	-	0.70	-	
Input Return Loss	1GHz	-	-12.6	-	dB
	2.5GHz	-	-16.8	-	
Output Return Loss	1GHz	-	-23.5	-	dB
	2.5GHz	-	-12.9	-	
Reverse Isolation	1GHz	-	-33.0	-	dB
	2.5GHz	-	-33.4	-	
Operating Voltage	-	-	+5	-	V
Power Shutdown Voltage (pin 6)	ON state	0	-	0.6	V
	OFF state (Power down)	1.5	-	V _{DD}	
Static Supply Current	ON state	-	67	-	mA
	OFF state (Power down)	-	5	-	
Switching Time	LNA ON to OFF	-	24	-	ns
	LNA OFF to ON	-	25	-	

Test Conditions: V_{dd}=+5V, I=67mA, OIP3 spacing=1MHz, P_{out}=5dBm/tone, T_A=+25°C

Absolute Maximum Ratings

Maximum Operating Voltage: +7V

Maximum input Power (LNA-ON): 24dBm

Maximum input Power (LNA-OFF): 24dBm

Recommended Operating Conditions

Supply Voltage: +5V

Supply Current: 67mA

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 Warnings



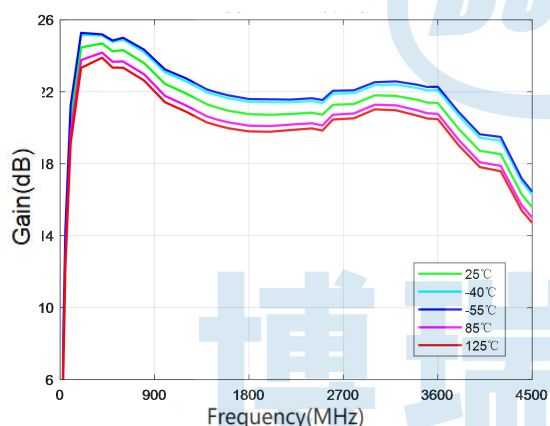
ELECTROSTATIC SENSITIVE DEVICE

OBSERVE HANDLING PRECAUTIONS

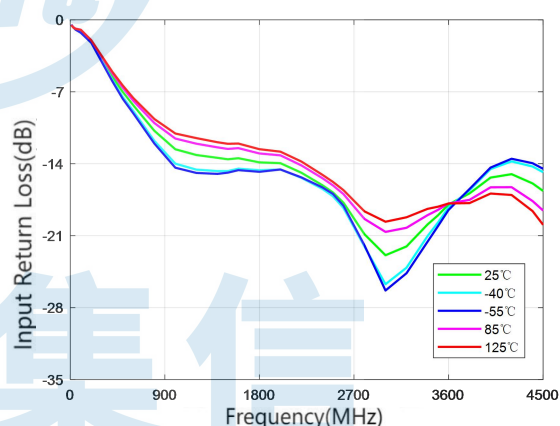
ESD Rating: Class 1B

Typical Performance (EVB test results at +5V supply voltage)

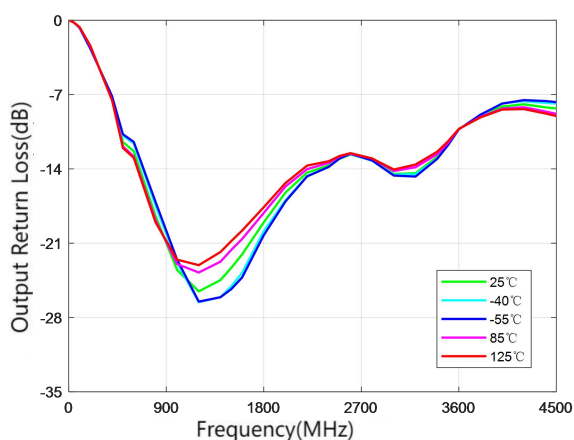
Parameters	Typ.														Units
Frequency	600	800	1000	1200	1500	1800	2000	2200	2800	3000	3500	3800	4000	4200	MHz
Gain	24.3	23.5	22.5	21.9	21.1	20.8	20.7	20.7	21.4	21.8	21.4	20.0	18.8	18.4	dB
Input Return Loss	-8.3	-10.8	-12.6	-13.2	-13.6	-13.8	-14.1	-15.0	-20.9	-23.0	-19.1	-16.8	-15.3	-15.0	dB
Output Return Loss	-12.3	-18.4	-23.5	-25.4	-23.3	-19.0	-16.2	-14.4	-13.2	-14.4	-11.6	-9.0	-8.1	-7.9	dB
Reverse Isolation	-34.2	-33.4	-32.7	-32.5	-32.6	-32.9	-32.9	-33.0	-33.3	-33.7	-34.6	-35.6	-36.5	-36.9	dB
Output Power for 1dB Compression	14.9	16.0	17.1	18.4	19.4	19.1	19.8	19.4	19.0	18.7	17.8	17.1	17.7	17.9	dBm
Output Third-Order Interception	31.7	33.4	34.4	34.2	34.9	35.5	35.2	34.8	33.5	33.2	31.6	29.2	30.6	29.6	dBm
Noise Figure	0.55	0.62	0.57	0.59	0.63	0.55	0.58	0.63	0.66	0.66	0.71	0.66	0.69	0.98	dB
Test Conditions: Vdd=+5V, I=67mA, OIP3 spacing=1MHz, Pout=5dBm/tone, TA=+25°C															



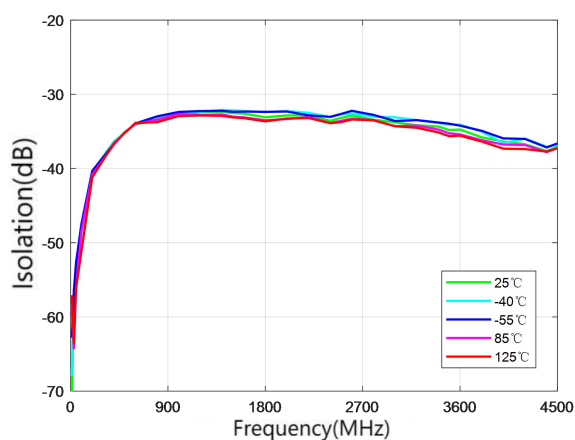
Gain vs. Freq



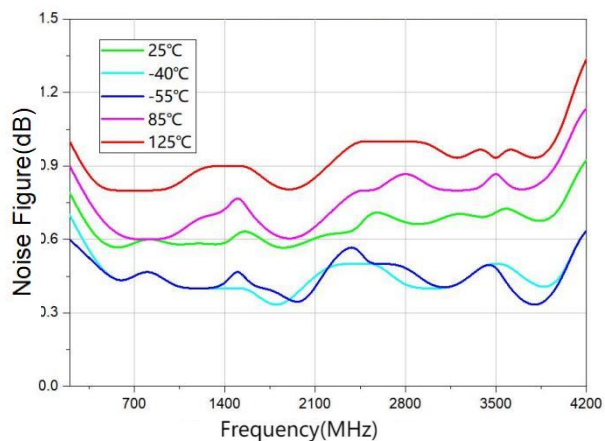
Input Return Loss vs. Freq



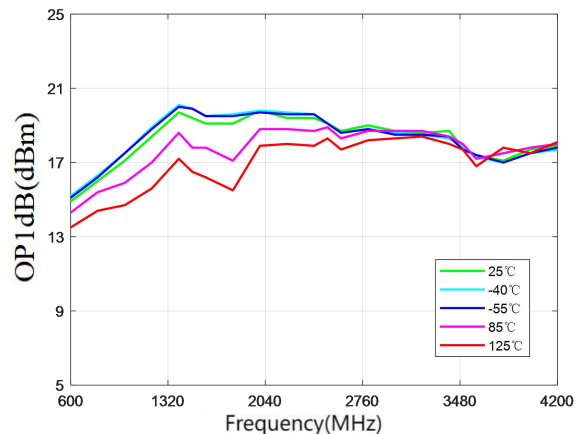
Output Return Loss vs. Freq



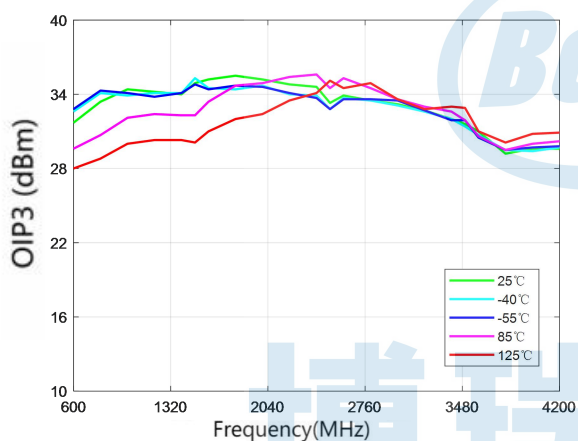
Reverse Isolation



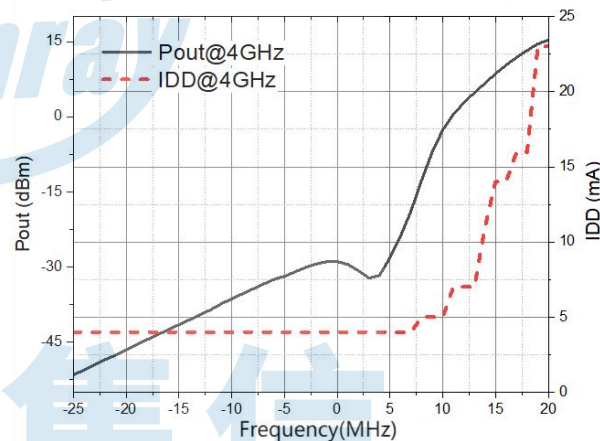
Noise Figure vs. Freq



Output Power for 1dB Compression vs. Freq



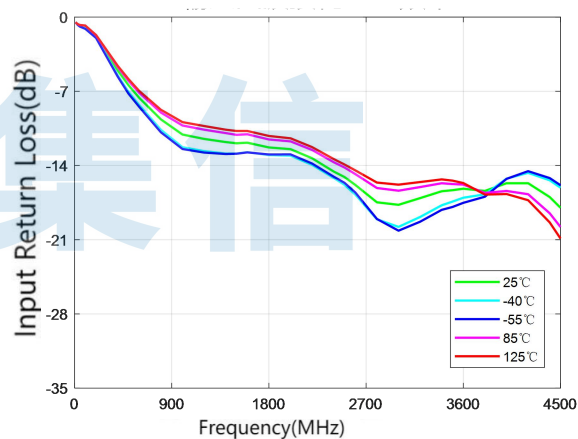
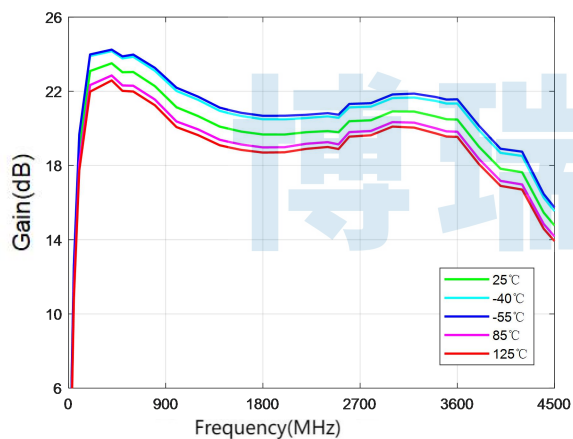
Output Third-Order Interception vs. Freq

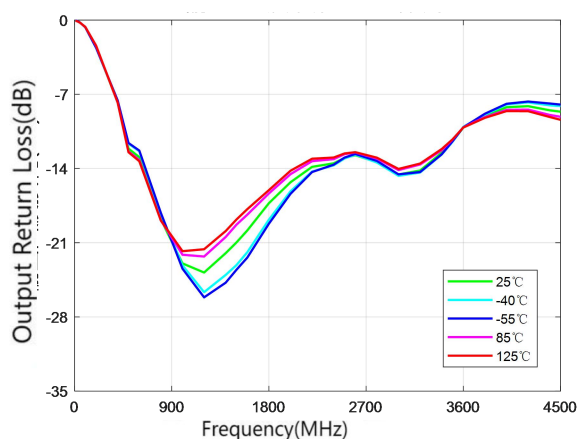


P_{out}, I_{DD} vs. P_{in}

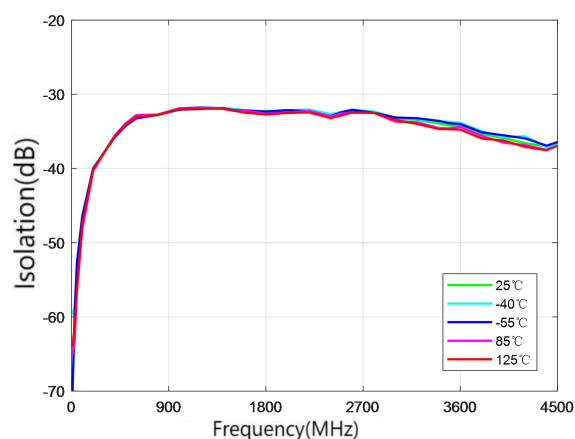
Typical Performance (EVB test results at +3.3V supply voltage)

Parameters	Typ.														Units
Frequency	600	800	1000	1200	1500	1800	2000	2200	2800	3000	3500	3800	4000	4200	MHz
Gain	23.0	22.2	21.2	20.7	20.0	19.7	19.7	19.8	20.5	20.9	20.5	19.1	17.9	17.5	dB
Input Return Loss	-7.6	-9.7	-11.0	-11.5	-11.9	-12.2	-12.5	-13.4	-17.5	-17.8	-16.4	-16.4	-15.7	-15.7	dB
Output Return Loss	-13.0	-18.7	-23.0	-23.8	-21.0	-17.4	-15.3	-13.9	-13.4	-14.5	-11.4	-9.1	-8.3	-8.1	dB
Reverse Isolation	-33.3	-32.6	-31.9	-31.9	-32.1	-32.4	-32.3	-32.3	-32.6	-33.2	-34.2	-35.3	-35.9	-36.5	dB
Output Power for 1dB Compression	10.3	11.4	12.6	14.2	15.8	14.8	17.0	16.5	15.8	15.6	15.0	14.2	14.8	15.1	dBm
Output Third-Order Interception	20.7	22.4	24.4	27.0	27.9	29.8	30.0	31.0	33.0	32.8	33.0	31.3	33.5	33.8	dBm
Noise Figure	0.54	0.65	0.63	0.66	0.68	0.58	0.57	0.68	0.76	0.73	0.76	0.67	0.74	1.05	dB
Test Conditions: Vdd=+3.3V, I=41mA, OIP3 spacing=1MHz, Pout=5dBm/tone, TA=+25°C															

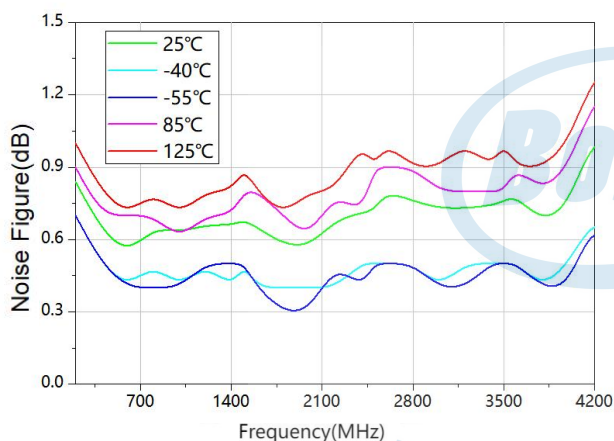




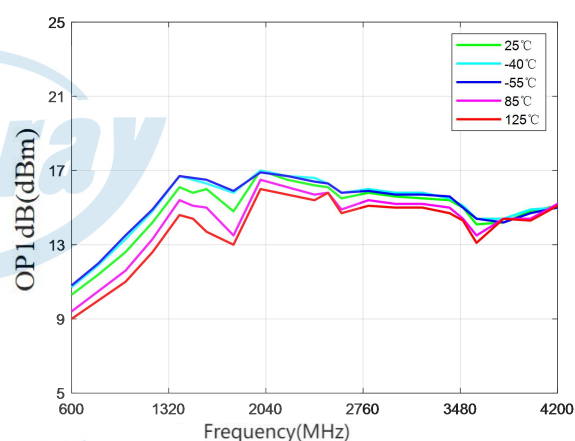
Output Return Loss vs. Freq



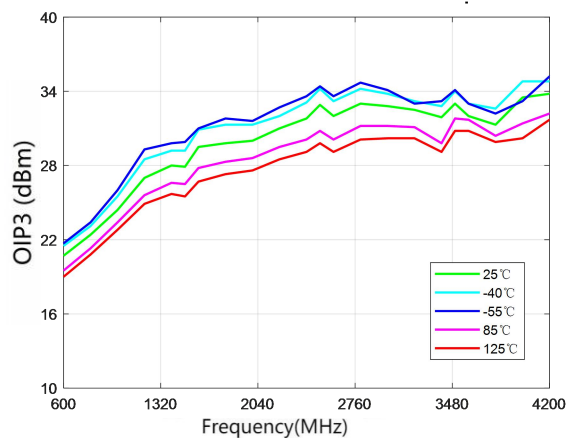
Reverse Isolation vs. Freq



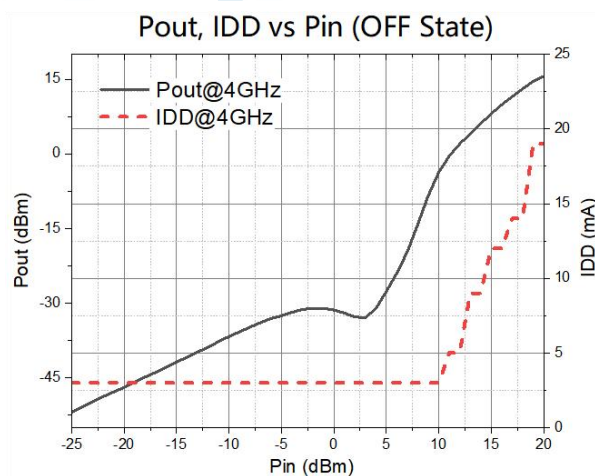
Noise Figure vs. Freq



Output Power for 1dB Compression vs. Freq

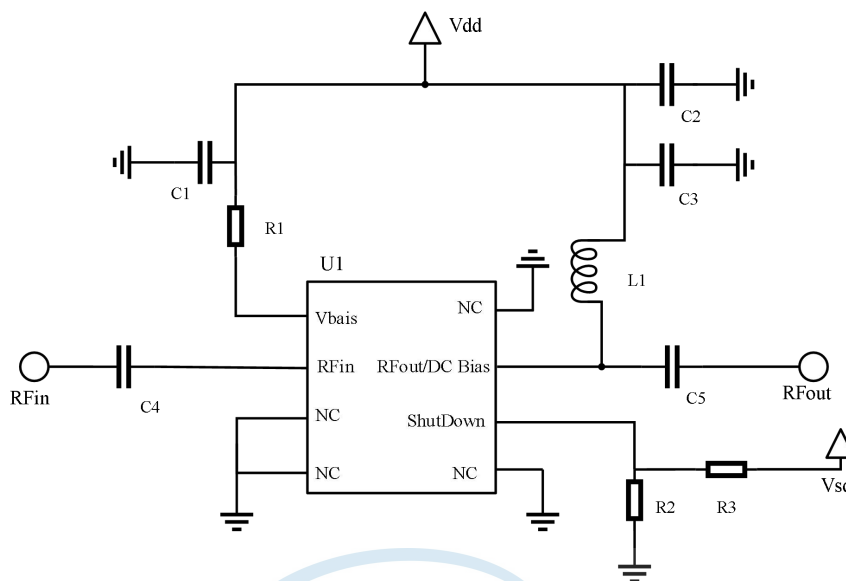


Output Third-Order Interception vs. Freq



P_{out} , I_{DD} vs. P_{in}

Typical Application Schematic



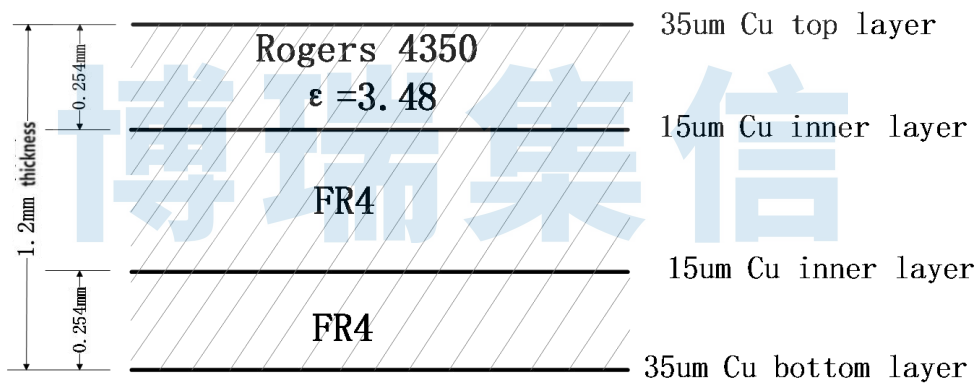
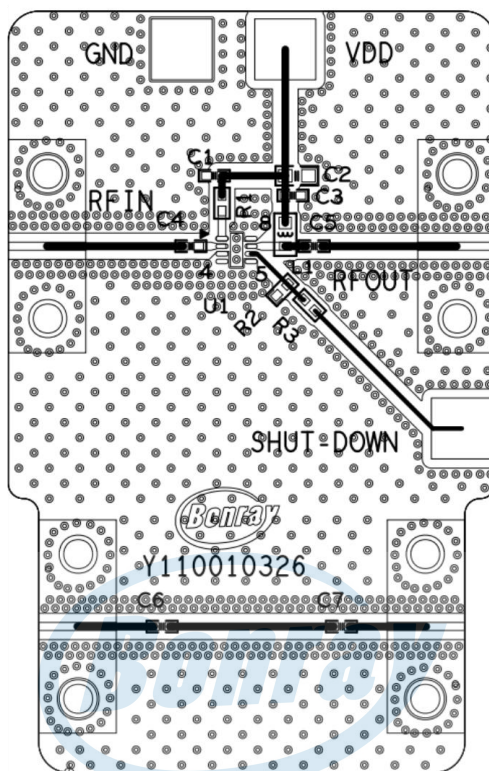
Bill of Material

Reference Designator	Package	Value	P/N
U1	DFN8	Low noise amplifier	BR9511DA
L1	0603	18nH	LQW18AN18NJ00
C2	0402	1uF	GRM155C81E105ME11D
C1, C3, C4, C5	0402	100pF	GRM1555C1H101JA01D
R1	0402	3.6kΩ	RC0402JR-073K6L
R2	0402	20kΩ	RC0402JR-0720KL
R3	0402	0Ω	RC0402FR-070RL

R1 Resistor Values for Various I_{DD} Settings

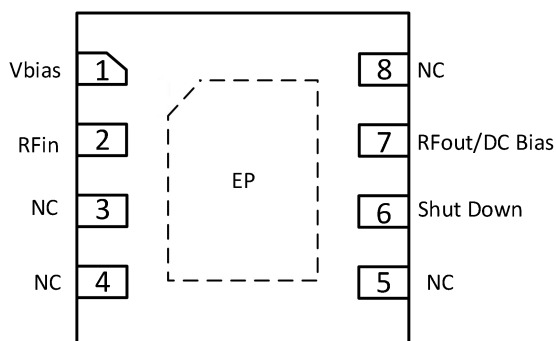
Parameter	Value								Units
I _{DD}	45	55	65	75	85	95	105	115	mA
R1	6.2	4.7	3.6	3.0	2.4	2.0	1.6	1.3	KΩ
Test Conditions: V _{dd} =+5V, T _A =+25°C									

PCB Evaluation Board



50 ohms Impedance Signal Lines: width=0.53mm, spacing=0.53mm

Pin Configuration and Description



Pin Number	Pin Name	Description
1	Vbias	Sets I_{DD} for the device.
2	RFin	RF input pin. A DC Block is required.
3,4,5,8	NC	No electrical connection. These pins and package substrate must be connected to RF/DC ground.
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.
-	EP	Exposed pin. The exposed pad must be connected to RF/DC ground.

Package Dimensions (mm)

