

0.5 – 1.5 GHz High Linearity LNA

Device Features

- Internally matched to 50 ohms
- Operated at 3.0V and 5.0V
- 37.5 dBm Output IP3 at 0dBm/tone at 700MHz
- 22.5dB Gain at 700MHz
- 21.1dBm P1dB at 700 MHz
- 0.40 dB NF at 700MHz on evaluation board
- Lead-free/Green/RoHS Compliant DFN8 2x2 Package



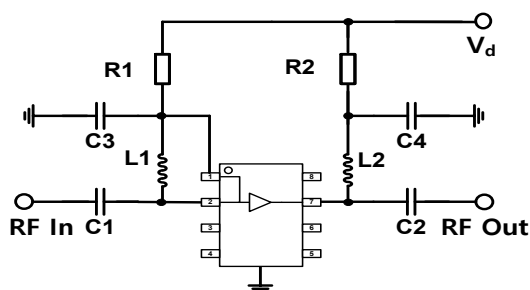
Product Description

BeRex's BLB01 is a high linearity LNA, based on GaAs material with E-pHEMT process and packaged in a RoHS-compliant DFN 8L 2x2mm² Surface mount package. It is designed for use where low noise and high linearity are required and features low noise and high OIP3 at Frequency range of 0.5~1.5GHz. It is internally matched to 50 Ohms without external matching components, with fast enable switching speed for TD-LTE application. All devices are 100% RF/DC tested and classified as HBM ESD Class 1C.

Applications

- Base station Infrastructure/RFID
- Commercial/Industrial/Military wireless system
- TDD or FDD LTE systems

Applications Circuit



* Refer to [page 13](#) for Enable application.

BOM	Value	Size	Vendor
C1,C4	100pF	0603	Samsung
C2,C3	12pF	0603	Samsung
R1	6.8Kohm	0603	Samsung
R2	0 ohm	0603	Samsung
L1	27nH	0603	Taiyo Yuden
L2	82nH	0603	Taiyo Yuden

Typical Performance¹

Parameter	Frequency					Unit
Vd = 5V	500	700	800	900	1500	MHz
Gain	24.5	22.5	21.7	21	17.5	dB
S11	-15.5	-12.3	-12.0	-11.7	-11.5	dB
S22	-8.7	-15.4	-19.3	-22.5	-15.8	dB
OIP3 ²	38.0	37.5	35.5	35.5	32.5	dBm
P1dB	21.2	21.1	21.2	20.9	19.3	dBm
Noise Figure	0.65	0.40	0.38	0.40	0.62	dB

Parameter	Frequency					Unit
Vd = 3V	500	700	800	900	1500	MHz
Gain	23.3	21.4	20.5	19.7	16.1	dB
S11	-18.3	-12.1	-11.0	-10.4	-9.3	dB
S22	-7.4	-12.9	-15.0	-16.5	-13.7	dB
OIP3 ²	31.0	30.5	29.5	28.5	27.0	dBm
P1dB	16.2	16.9	17.1	17.2	17.5	dBm
Noise Figure	0.62	0.39	0.37	0.38	0.60	dB

¹ Device performance _ measured on BeRex's evaluation board at 25°C, 50 Ω system.

² OIP3 _measured with two tones at an output power of 0 dBm/tone separated by 1 MHz.

	Min.	Typical	Max.	Unit
Bandwidth	500		1500	MHz
I _d @ (Vd = 5.0V)	56	66	76	mA
I _d @ (Vd = 3.0V)	23	27	31	
dG/dT		-0.008		dB/°C
R _{TH}		24.76		°C/W
Switching Time(T _{on})		140		ns
Switching Time(T _{off})		140		ns

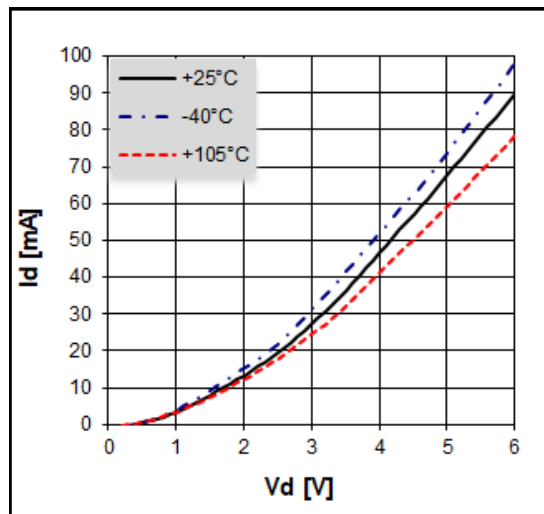
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Absolute Maximum Ratings

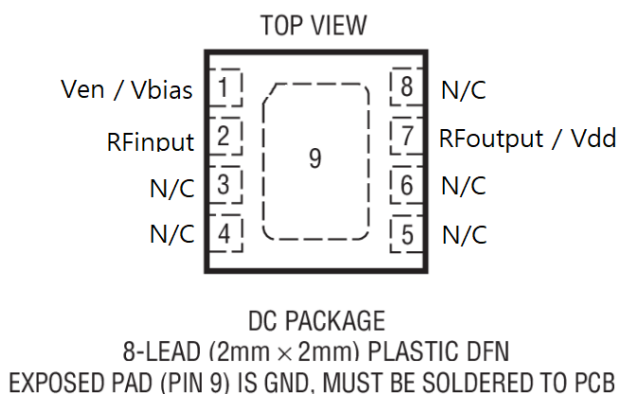
Parameter	Rating	Unit
Operating Case Temperature	-40 to +105	°C
Storage Temperature	-55 to +155	°C
Junction Temperature	+220	°C
Operating Voltage	+6	V
Supply Current	130	mA
Input RF Power	21	dBm

Operation of this device above any of these parameters may result in permanent damage.

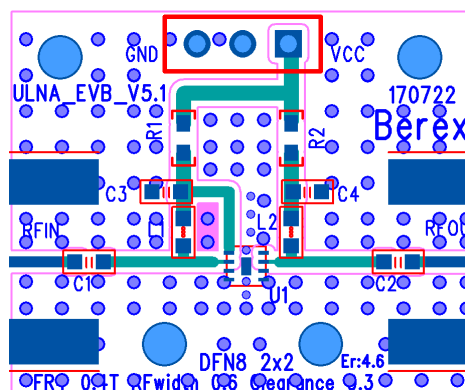
V-I Characteristics



Pin Configuration



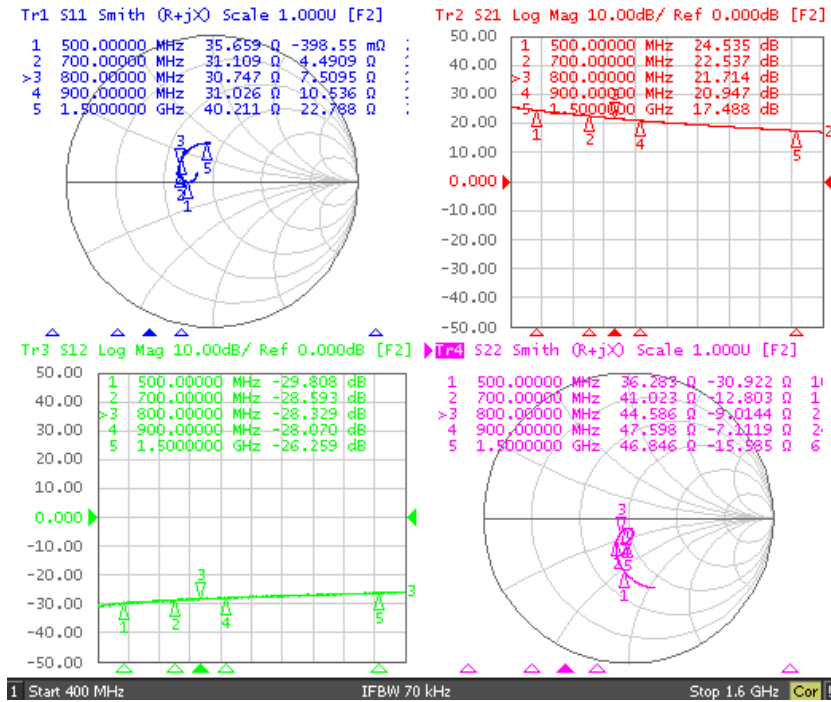
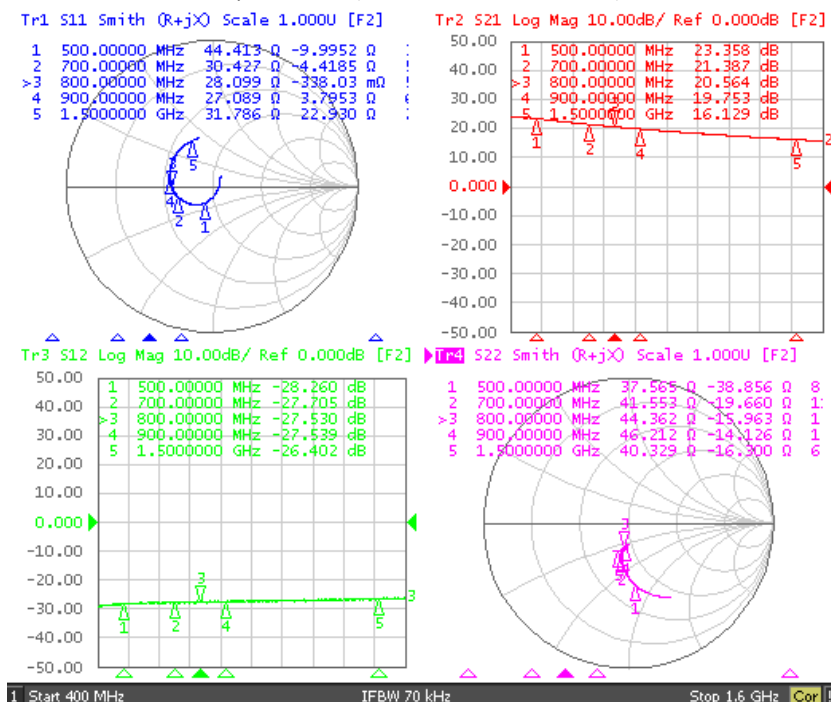
PCB Mounting



*Dielectric constant _ 4.2 *RF pattern width 24mil *16mil thick FR4 PCB

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Typical Device Data

S-parameters ($V_d=5.0V$, $I_d=66mA$, $T=25^\circ C$)S-parameters ($V_d=3.0V$, $I_d=27mA$, $T=25^\circ C$)

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S-Parameter

(Vd=5.0V, Id = 66mA, T = 25 °C, calibrated to device leads)

Freq [MHz]	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
500	0.23	-124.89	18.00	134.12	0.04	63.62	0.20	-119.48
600	0.29	-140.90	15.43	123.05	0.04	53.44	0.15	-142.56
700	0.30	-151.49	13.67	115.15	0.04	49.45	0.10	-161.73
800	0.31	-157.31	12.36	108.84	0.04	45.30	0.07	-177.33
900	0.30	-163.08	11.33	103.54	0.04	43.09	0.04	164.79
1000	0.29	-166.98	10.52	98.37	0.04	37.82	0.01	113.63
1100	0.28	-170.27	9.82	93.46	0.05	37.16	0.03	4.31
1200	0.27	-172.29	9.17	88.78	0.05	31.40	0.06	-13.23
1300	0.26	-173.09	8.66	84.16	0.05	31.93	0.09	-19.81
1400	0.24	-174.55	8.18	79.84	0.05	28.25	0.12	-25.54
1500	0.23	-174.85	7.78	75.66	0.05	26.86	0.15	-29.69

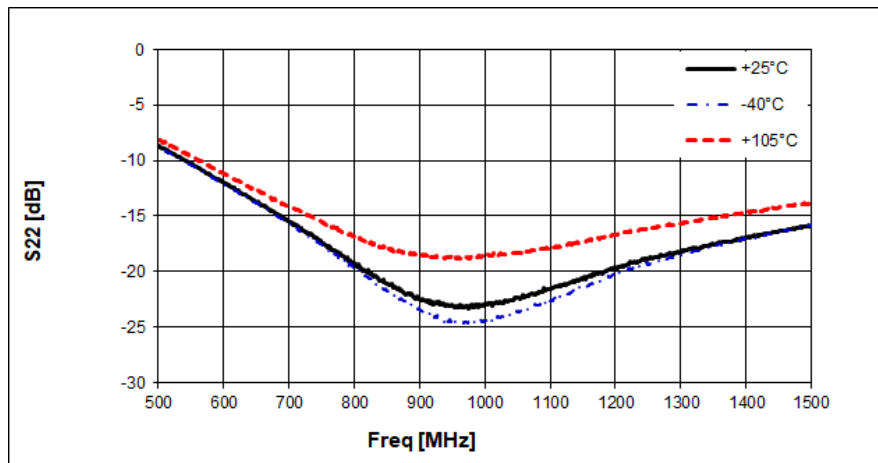
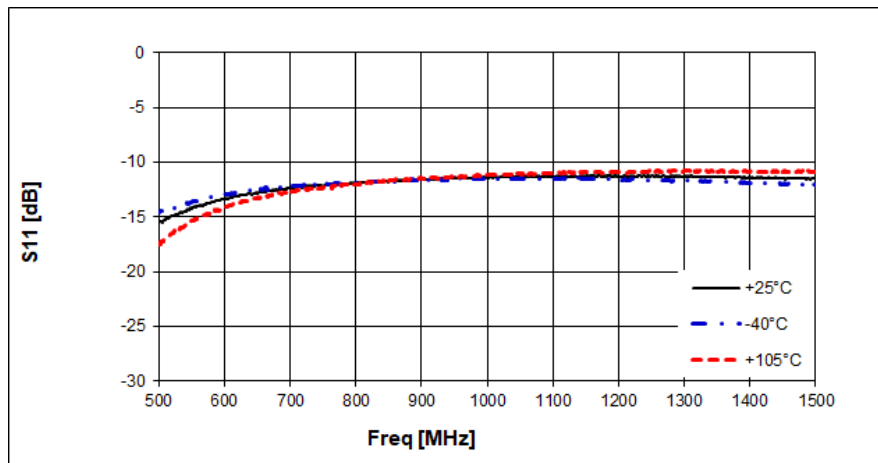
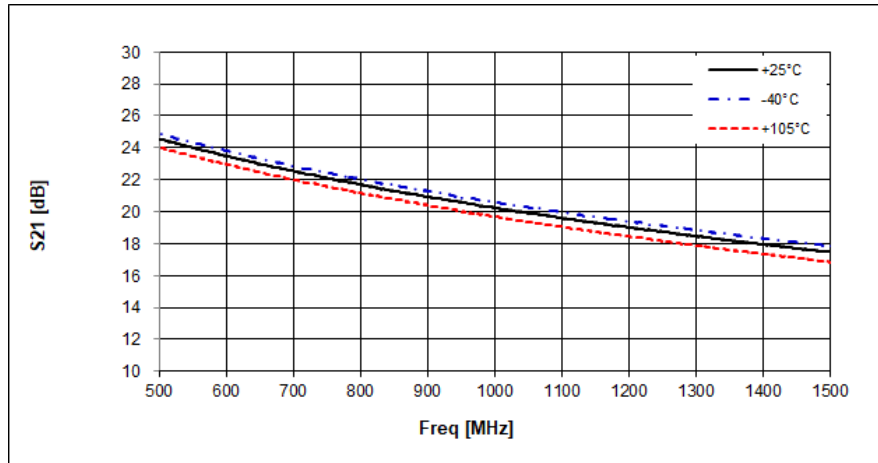
(Vd=3.0V, Id = 27mA, T = 25 °C, calibrated to device leads)

Freq [MHz]	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
500	0.26	-75.46	15.48	141.37	0.04	55.53	0.26	-88.42
600	0.31	-107.06	13.30	127.53	0.05	45.23	0.17	-102.44
700	0.34	-122.34	11.75	118.21	0.04	38.40	0.11	-104.33
800	0.35	-131.66	10.55	110.48	0.04	35.85	0.08	-95.78
900	0.35	-138.83	9.63	104.26	0.04	31.10	0.07	-76.19
1000	0.35	-143.86	8.88	98.67	0.05	28.25	0.08	-58.96
1100	0.35	-148.58	8.25	93.39	0.05	25.15	0.11	-50.97
1200	0.35	-151.32	7.70	88.38	0.05	24.09	0.13	-47.09
1300	0.35	-153.89	7.23	83.57	0.05	22.66	0.16	-47.34
1400	0.34	-156.28	6.81	78.98	0.05	22.68	0.19	-48.71
1500	0.34	-158.25	6.44	74.59	0.05	19.77	0.21	-49.29

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Device Performance

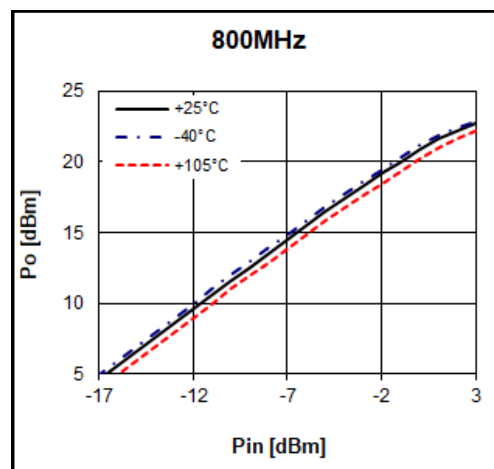
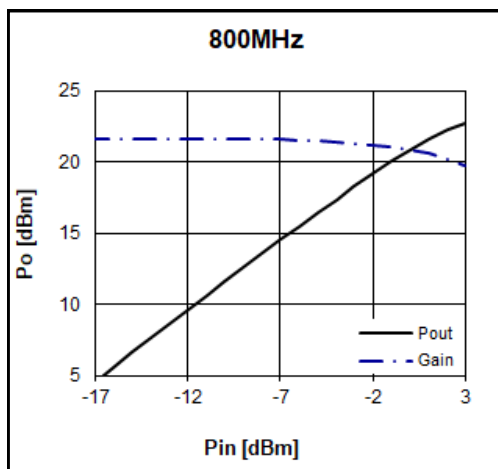
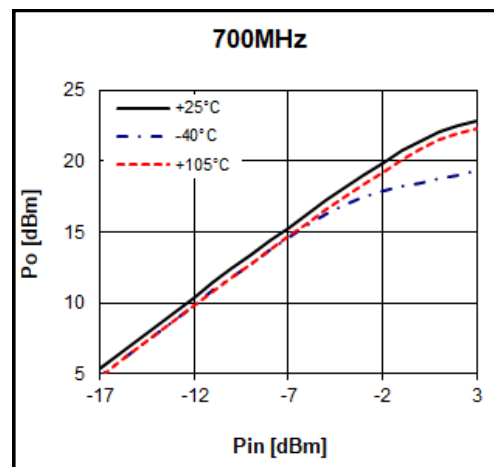
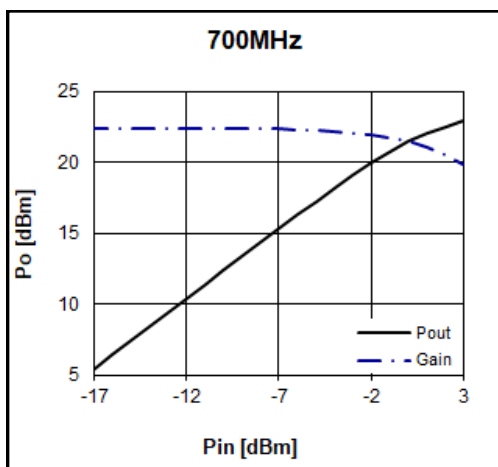
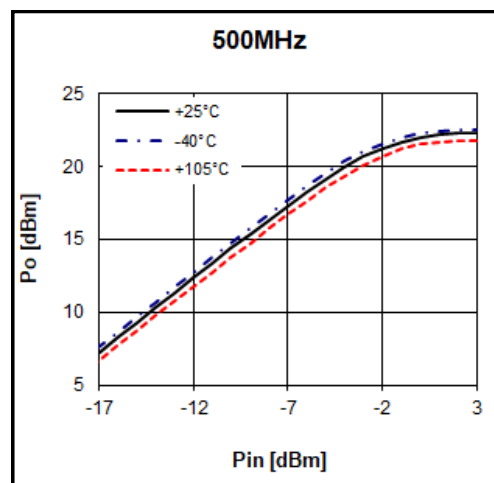
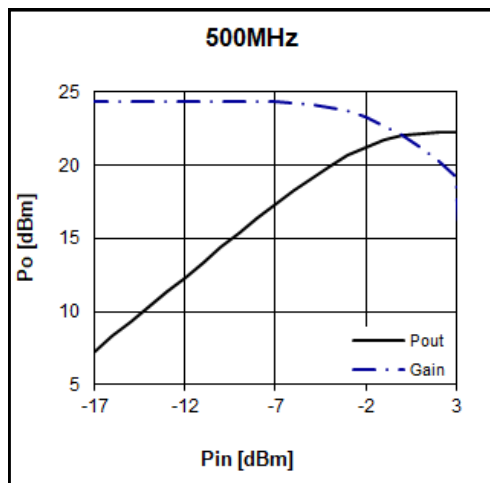
$V_d = 5.0V$, $I_d = 66mA$



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Device Performance

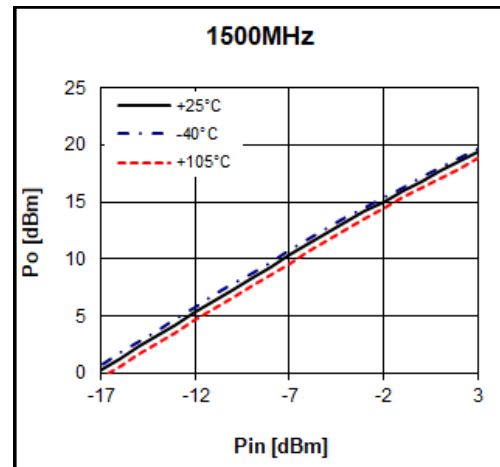
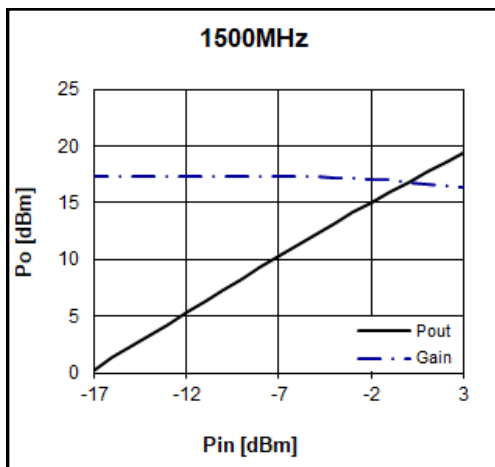
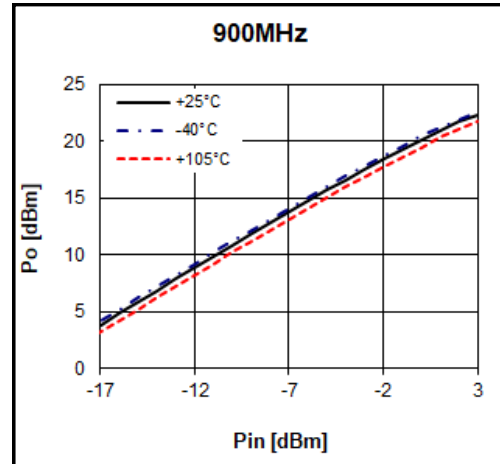
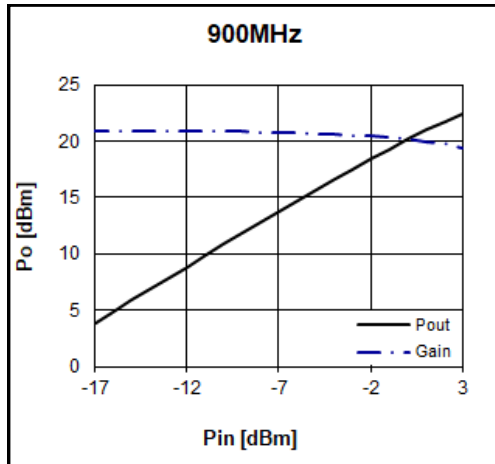
$V_d = 5.0V$, $I_d = 66mA$



0.5 – 1.5 GHz High Linearity LNA

Device Performance

$V_d = 5.0V$, $I_d = 66mA$



Noise Figure Temperature Performance

($V_{ds} = 5.0V$, $I_{ds} = 66mA$)

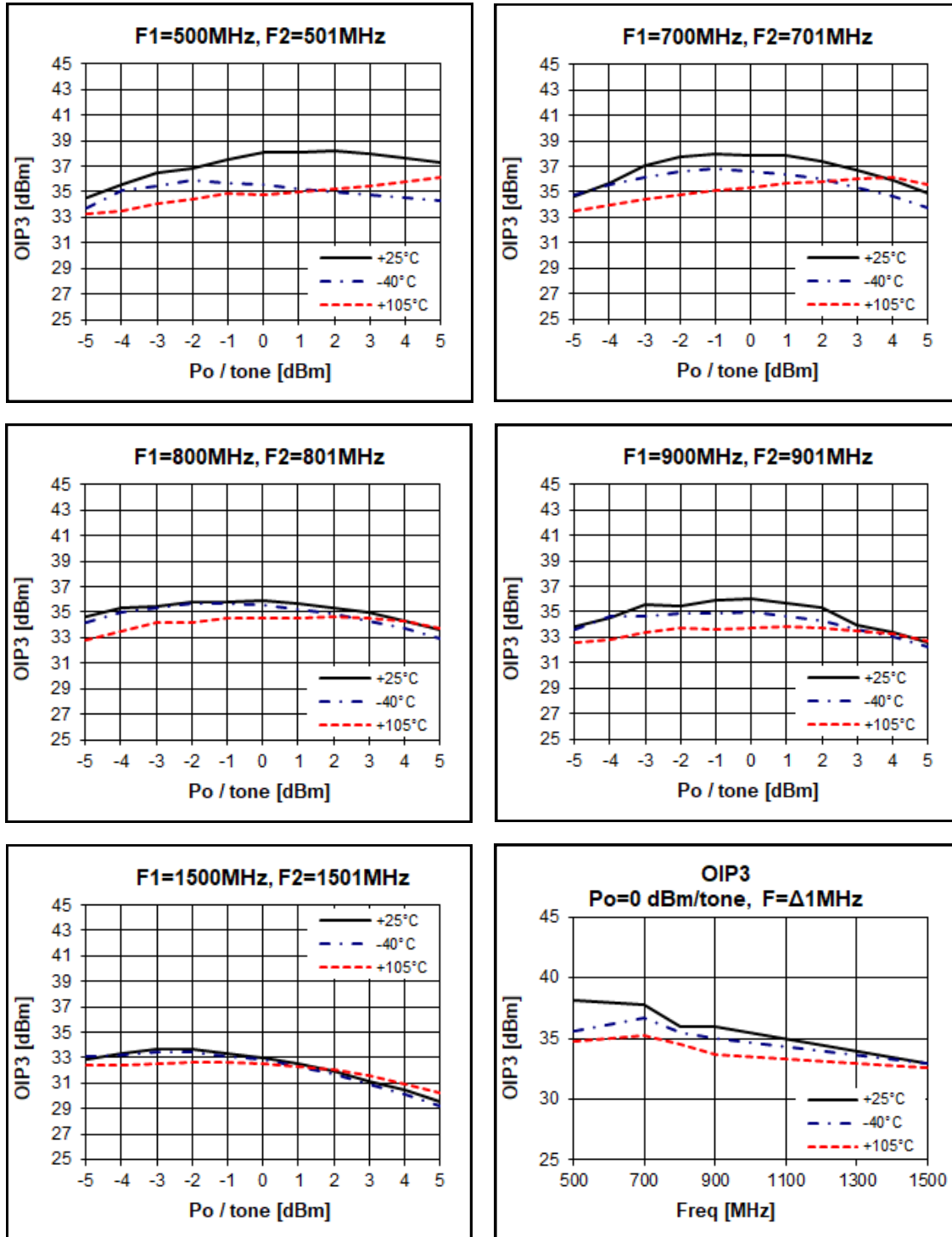
Freq	MHz	500	700	800	900	1500
Temp [°C]	-40	0.60	0.39	0.37	0.38	0.60
	+25	0.65	0.40	0.38	0.40	0.62
	+105	0.75	0.55	0.45	0.45	0.68

* N.F : Losses on input and output transmission lines on PCB are not de-embedded .

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Device Performance

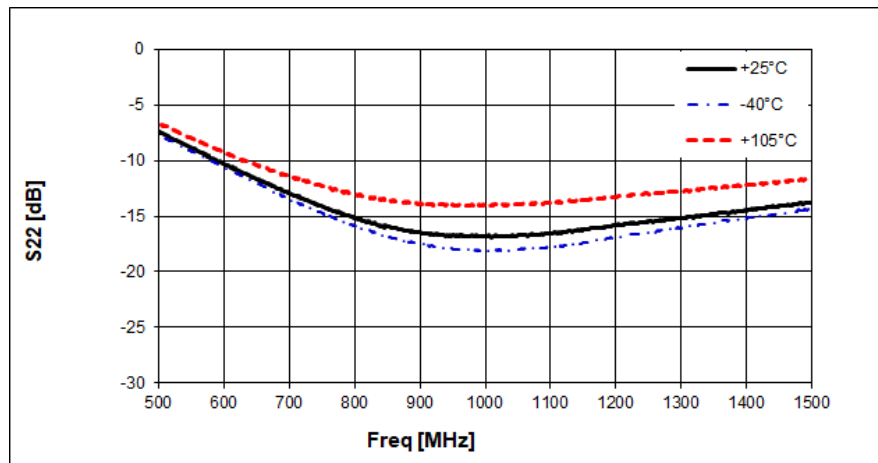
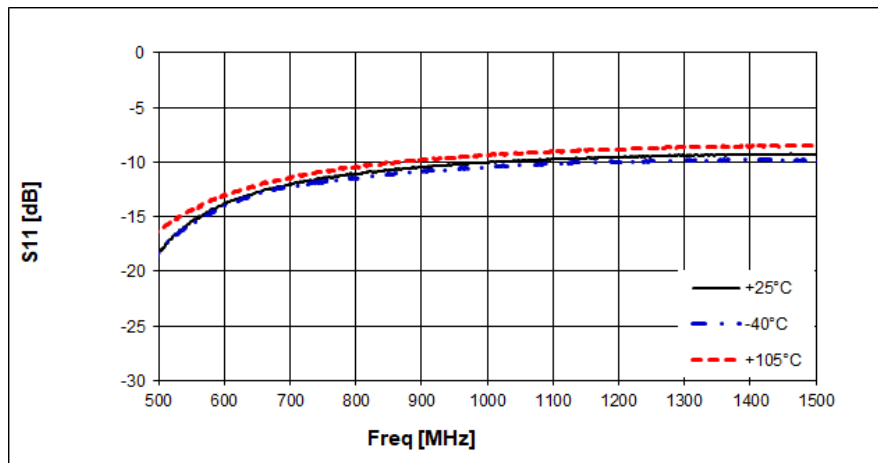
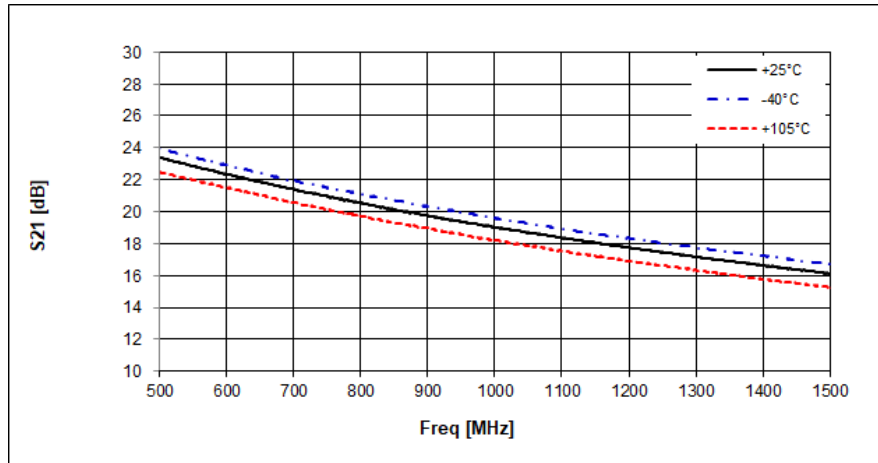
$V_d = 5.0V$, $I_d = 66mA$



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Device Performance

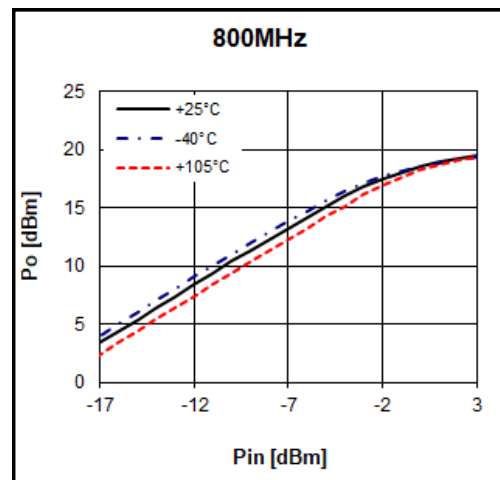
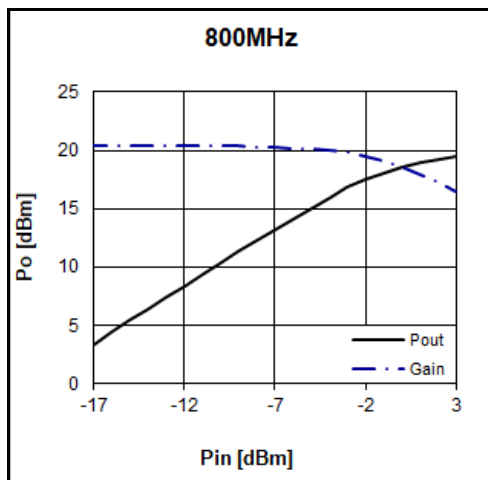
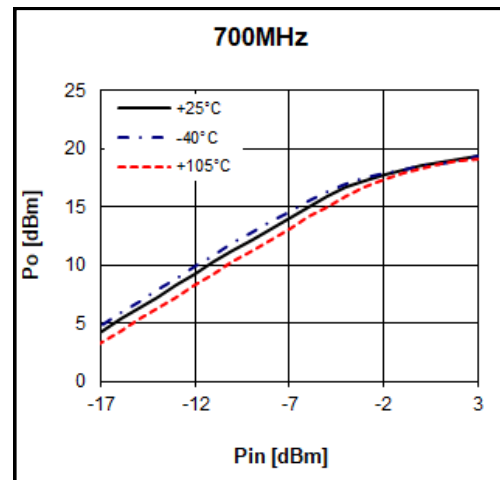
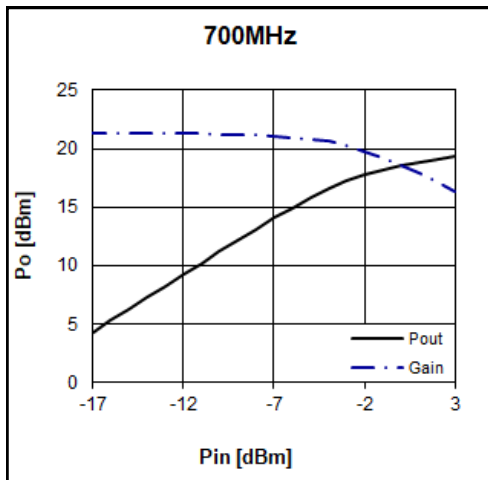
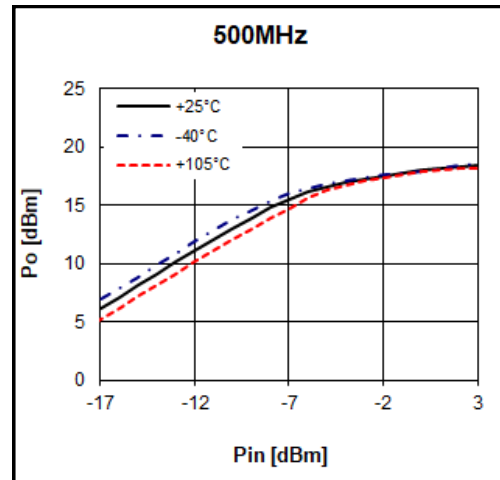
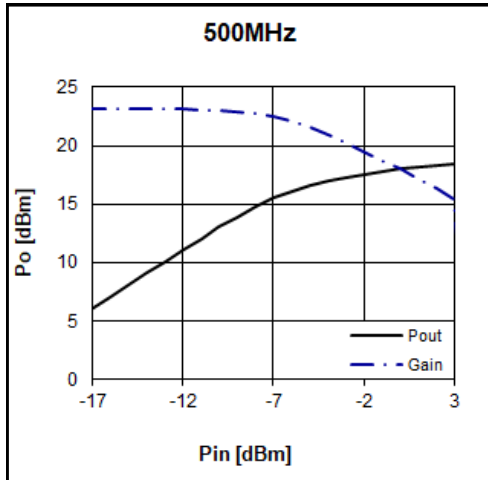
$V_d = 3.0V$, $I_d = 27mA$



0.5 – 1.5 GHz High Linearity LNA

Device Performance

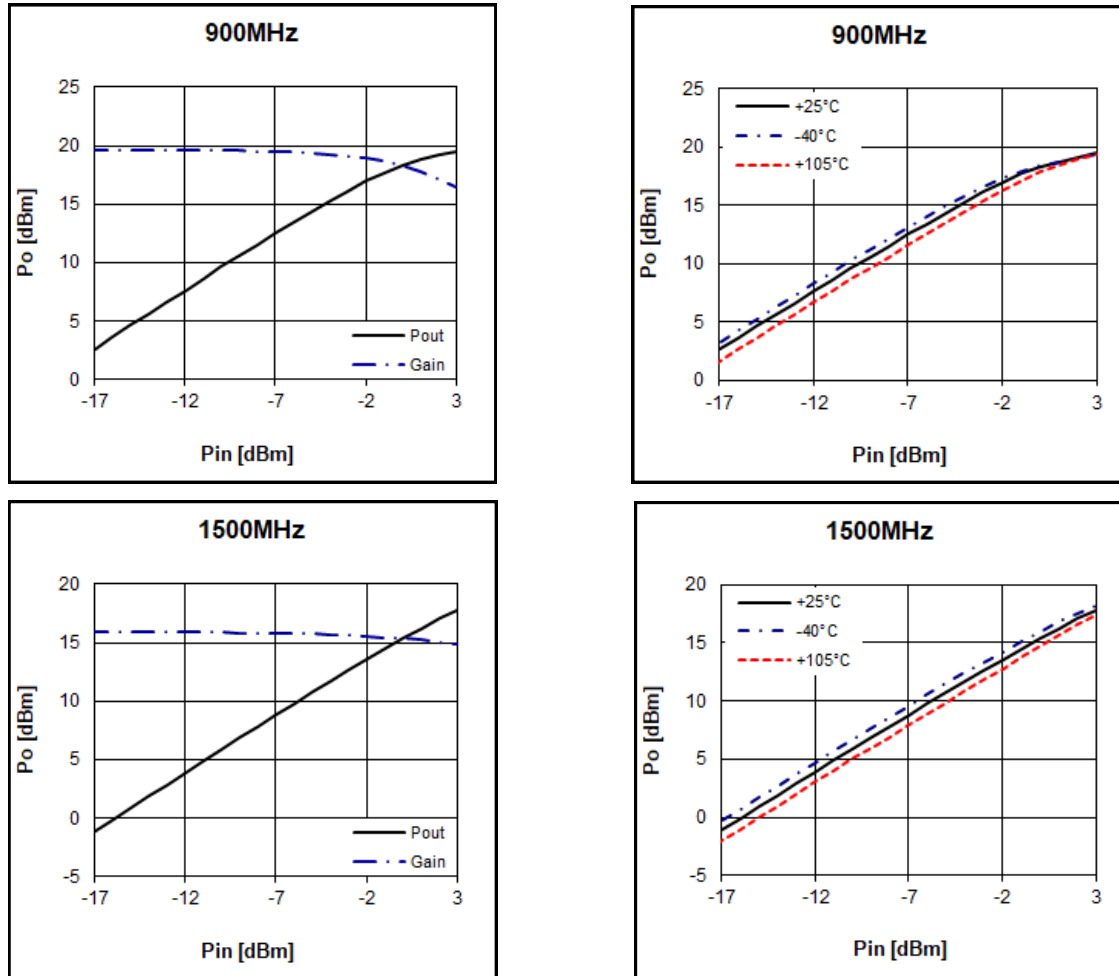
$V_d = 3.0V$, $I_d = 27mA$



0.5 – 1.5 GHz High Linearity LNA

Device Performance

$V_d = 3.0V$, $I_d = 27mA$



Noise Figure Temperature Performance

($V_{ds} = 3.0V$, $I_{ds} = 27mA$)

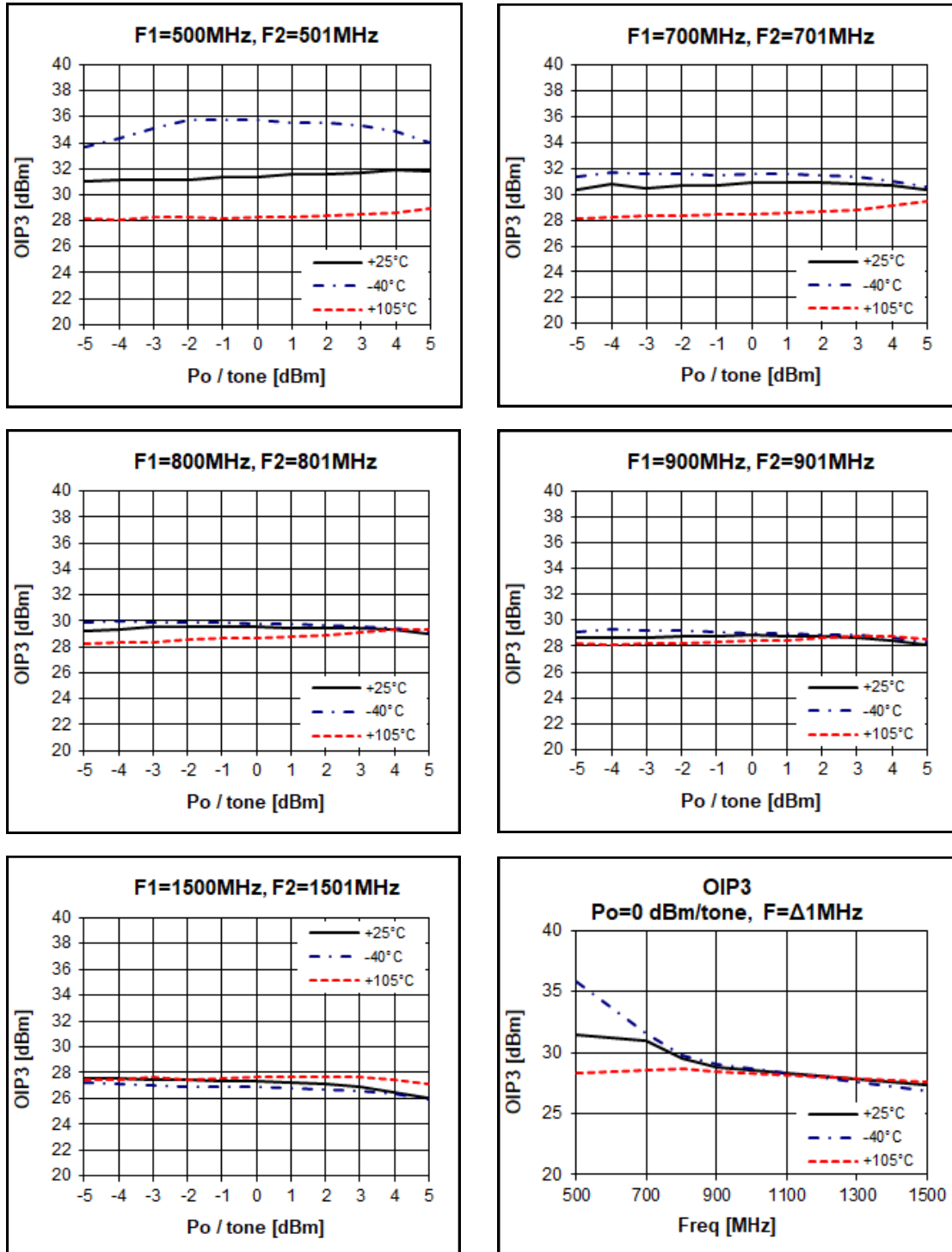
Freq	MHz	500	700	800	900	1500
Temp [°C]	-40	0.55	0.37	0.35	0.34	0.58
	+25	0.62	0.39	0.37	0.38	0.60
	+105	0.73	0.53	0.43	0.44	0.70

* N.F : Losses on input and output transmission lines on PCB are not de-embedded .

0.5 – 1.5 GHz High Linearity LNA

Device Performance

$V_d = 3.0V$, $I_d = 27mA$



0.5 – 1.5 GHz High Linearity LNA

Enable Application

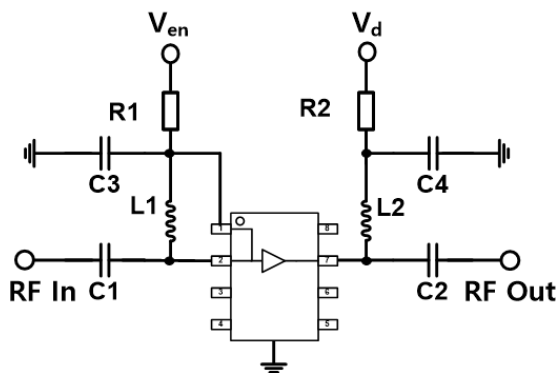
State function

V _d	V _{en}	State
5V	0V	Off
5V	5V	On

Switching Time

	Min.	Typical	Max.	Unit
Raising time (T _{on})		140		ns
Falling time (T _{off})		140		ns

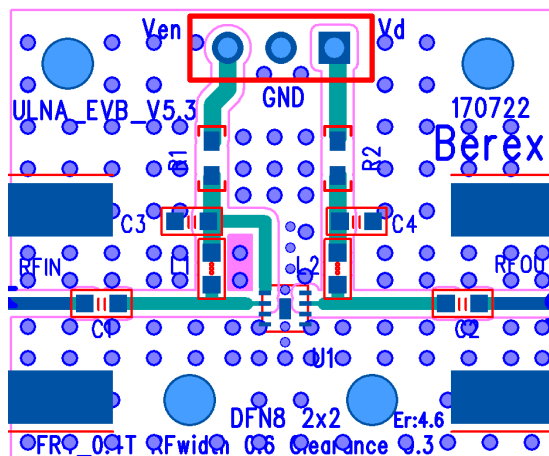
Application circuit



BOM

Component	Value	Size	Vendor
C1,C4	100pF	0603	Samsung
C2,C3	12pF	0603	Samsung
R1	6.8Kohm	0603	Samsung
R2	0 ohm	0603	Samsung
L1	27nH	0603	Taiyo Yuden
L2	82nH	0603	Taiyo Yuden

PCB Mounting for the application



Suggested PCB Land Pattern and PAD Layout

Technical drawing of a mechanical part with dimensions. The drawing shows a cross-section of a component with a central vertical slot and a horizontal slot. The overall width is 2.2000. The central vertical slot has a width of 1.9200. The horizontal slot has a depth of 0.5600. The top surface has a radius of R0.1500. The overall height is 2.2000. The distance from the top surface to the center of the horizontal slot is 0.9000. The distance from the center of the horizontal slot to the bottom surface is 1.0000. The distance from the left edge to the center of the horizontal slot is 0.2500. The distance from the center of the horizontal slot to the right edge is 1.1000. The distance from the center of the horizontal slot to the top surface is 0.2000. The distance from the center of the horizontal slot to the bottom surface is 0.5000.

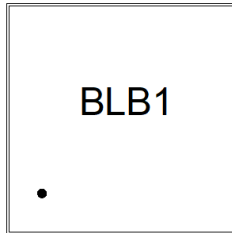
PCB lay out _ on BeRex website

SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.50	0.55	0.60	0.020	0.022	0.024
A3	0.150 REF			0.006 REF		
A1	0.00	0.02	0.05	0.000	0.001	0.002
b	0.15	0.20	0.25	0.006	0.008	0.010
D	1.90	2.00	2.10	0.075	0.079	0.083
D2	0.92	1.02	1.12	0.036	0.040	0.044
E	1.90	2.00	2.10	0.075	0.079	0.083
E2	0.46	0.56	0.66	0.018	0.022	0.026
e	0.50 BSC			0.020 BSC		
L	0.24	0.29	0.30	0.010	0.011	0.012

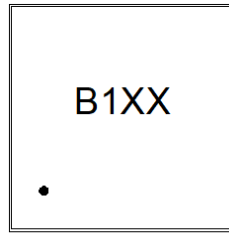
Rev. B

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Package Marking



Pin 1

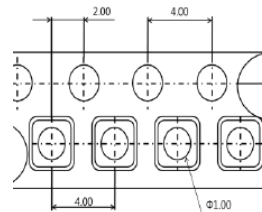


Pin 1

XX = Wafer No.

Tape & Reel

DFN8 2x2



Packaging information:

Tape Width (mm): 8

Reel Size (inches): 7

Device Cavity Pitch (mm): 4

Devices Per Reel: 3000

Lead plating finish

100% Tin Matte finish

(All BeRex products undergoes a 1 hour, 150 degree C, Anneal bake to eliminate thin whisker growth concerns.)

MSL / ESD Rating

ESD Rating:	Class 1C
Value:	Passes <2000V
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114B
MSL Rating:	Level 1 at +265°C convection reflow
Standard:	JEDEC Standard J-STD-020



Proper ESD procedures should be followed when handling this device.

NATO CAGE code:

2	N	9	6	F
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