BL051

5-4000 MHz Wideband Low Noise Amplifier

Device Features

- NF = 0.7 dB @ 900MHz at RF connectors of Demo board
- Gain = 19.0 dB @ 900 MHz
- OIP3 = 36.0 dBm @ 1900MHz, 2450MHz
- Output P1 dB = 21.0 dBm @ 900MHz, 22.0 dBm @2450MHz
- 5V/48mA, MTTF > 100 Years, MSL 1, Class 1A
- Lead-free/RoHS-compliant SOT-89 SMT package

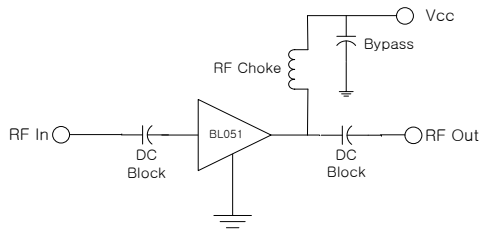
Product Description

BeRex's BL051 is a high performance LNA based on GaAs material with E-pHEMT process, packaged in a RoHS-compliant with SOT-89 surface mount package. It is designed for use where low noise and high linearity are required and features low noise and high OIP3 with ***low current*** at wideband frequency. It requires a few external matching components. All devices are 100% RF/DC tested and classified as HBM ESDS ***Class 1A***.

Applications

- Base station Infrastructure/RFID
- Commercial/Industrial/Military wireless system

Applications Circuit



*external matching circuit: refer to the page 5 to 13.

Typical Performance[1]

Parameter	Frequency					Unit
	900	1900	2140	2450	3500	MHz
Gain	19.0	14.0	13.0	12.0	9.8	dB
S11	-19.5	-22.0	-26.0	-23.5	-18.0	dB
S22	-26.0	-21.0	-17.5	-17.0	-15.0	dB
OIP3[2]	34.5	36.0	36.0	35.5	36.0	dBm
P1dB	21.0	21.5	21.5	22.0	21.0	dBm
Noise Figure	0.70	0.88	0.91	0.94	1.44	dB

[1] Device performance _ measured on a BeRex evaluation board at 25°C, 50 Ω system.

[2] OIP3 _ measured with two tones at an output of 5 dBm per tone separated by 1 MHz.

	Min.	Typical	Max.	Unit
Bandwidth	5		4000	MHz
I_C @ (Vc = 5V)	38	48	58	mA
V_C		5.0		V
R_{TH}		41		°C/W

Absolute Maximum Ratings

Parameter	Rating	Unit
Operating Case Temperature	-40 to +85	°C
Storage Temperature	-55 to +155	°C
Junction Temperature	+220	°C
Operating Voltage	+6.0	V
Supply Current	200	mA
Input RF Power	30	dBm

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

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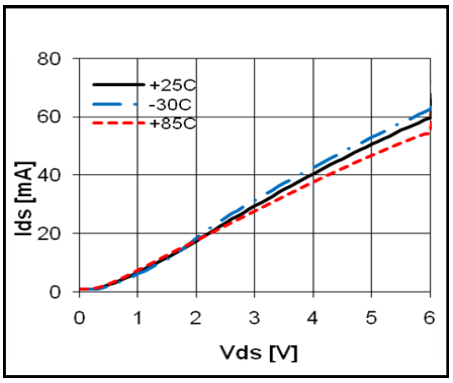
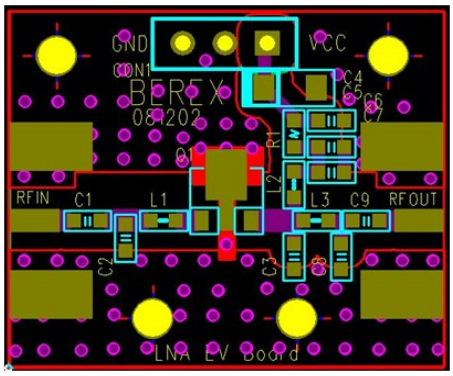
V-I Characteristics



BeRex SOT89 Evaluation Board



*Dielectric constant _ 4.2 *RF pattern width 52mil *31mil thick FR4 PCB

Typical Device Data

S-parameters (Vd=5V, Id=48mA, T=25°C)

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5-4000 MHz Wideband Low Noise Amplifier

S-Parameter

(Vdevice = 5.0V, Icc = 48mA, 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]
100	0.432	-23.546	18.428	162.342	0.032	12.662	0.230	-12.408
500	0.339	-64.094	12.907	122.963	0.038	31.883	0.316	-8.360
1000	0.245	-92.179	8.226	95.114	0.057	43.556	0.396	-32.581
1500	0.153	-112.501	6.008	74.810	0.080	42.095	0.401	-50.[illegible]
2000	0.083	-171.662	4.811	58.294	0.102	36.535	0.341	-[illegible].753
2500	0.150	128.339	3.906	44.067	0.125	29.791	0.261	-[illegible].248
3000	0.235	15.431	3.325	31.484	0.152	22.486	[illegible]	-98.979
3500	0.279	112.352	2.942	20.295	0.174	13.449	[illegible]	-125.159
4000	0.271	107.520	2.619	7.406	0.270	6.[illegible]	0.311	-146.330

Vd = 5V, Id = 48.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	19.0	14.0	13.0	12.0
S11	dB	- 19.5	- 22.0	- 26.0	- 28.5
S22	dB	- 26.0	- 21.0	- [illegible]	- 17.0
P1	dBm	21.5	21.[illegible]	21.6	22.0
OIP3	dBm	34.5	36.0	36.0	35.5
NF	dB	[illegible]	0.88	0.91	0.94

Vd = 4.8V, Id = 46.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	19.0	14.0	13.0	120.
S11	dB	- 19.0	- 21.5	- 22.5	- 23.0
S22	dB	- 27.5	- 22.0	- 18.0	- 17.0
P1	dBm	21.0	21.0	21.5	21.5
OIP3	dBm	34.0	35.8	36.0	35.0
NF	dB	0.71	0.88	0.9	0.94

Vd = 4.6V, Id = 44.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	19.0	14.0	13.0	12.0
S11	dB	- 19.0	- 11.0	- 25.0	- 22.5
S22	dB	- 28.5	- 22.5	- 18.5	- 17.5
P1	dBm	20.5	20.5	21.0	21.0
OIP3	dBm	34.0	35.5	35.5	34.5
NF	dB	0.70	0.88	0.89	0.95

Vd = 4.4V, Id = 42.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	18.9	13.9	13.0	11.9
S11	dB	- 18.7	- 20.7	- 24.1	- 22.4
S22	dB	- 29.8	- 23.8	- 19.3	- 17.9
P1	dBm	20.0	20.3	20.7	20.8
OIP3	dBm	33.3	35.0	35.1	34.4
NF	dB	0.70	0.87	0.90	0.93

BL051

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Vd = 4.2V, Id = 40.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	19.0	14.0	13.0	12.0
S11	dB	- 18.5	- 20.0	- 23.5	- 21.5
S22	dB	- 28.5	- 24.5	- 20.0	- 18.5
P1	dBm	19.5	20.0	20.0	20.5
OIP3	dBm	35.0	35.5	34.0	35.0
NF	dB	0.70	0.87	0.90	0.93

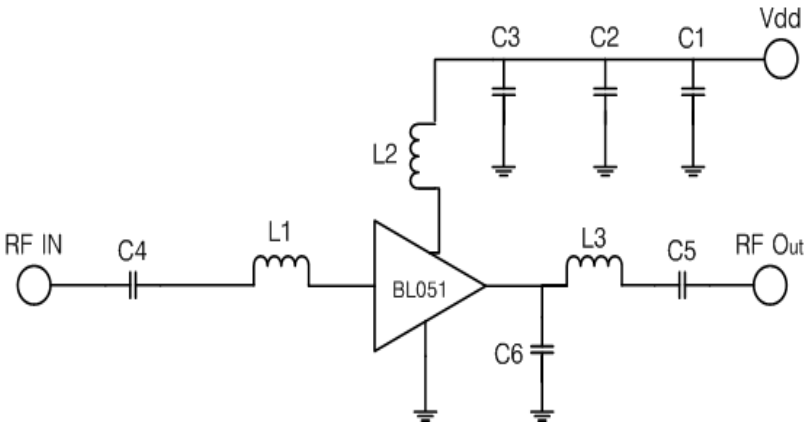
Vd = 4.0V, Id = 38.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	19.0	14.0	13.0	12.5
S11	dB	- 18.5	- 20.0	- 23.0	- 21.0
S22	dB	- 28.0	- 26.0	- 21.0	- 18.5
P1	dBm	19.0	19.5	20.0	20.0
OIP3	dBm	32.5	34.0	34.0	33.4
NF	dB	0.70	0.87	0.89	0.93

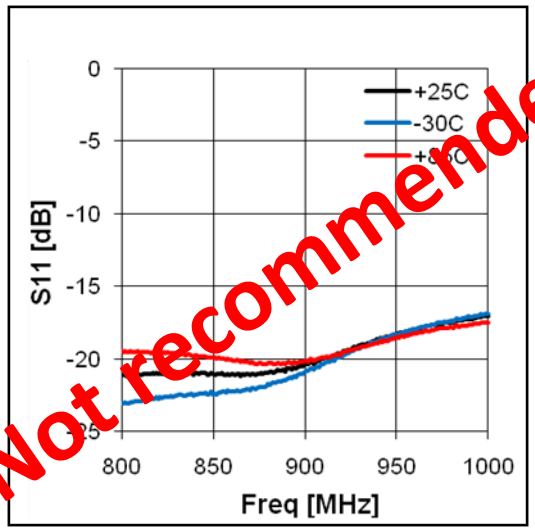
Vd = 3.5V, Id = 33.0mA, Ta = 25°C

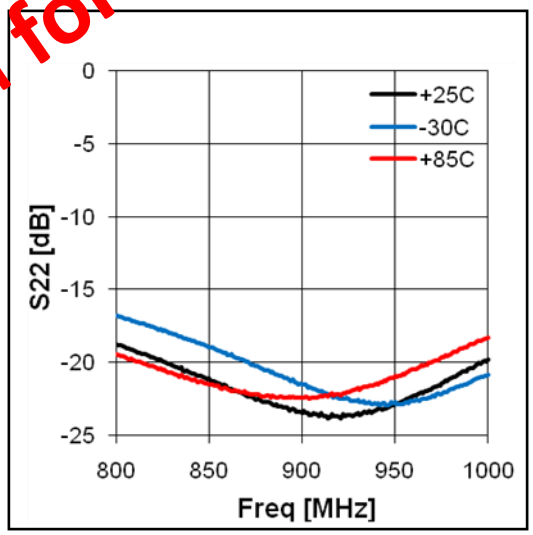
Freq	MHz	900	1900	2140	2450
S21	dB	18.5	13.5	12.5	11.5
S11	dB	- 18.0	- 18.5	- 21.5	- 20.0
S22	dB	- 24.5	- 31.0	- 23.5	- 9.5
P1	dBm	18.5	18.5	19.0	19.0
OIP3	dBm	30.5	32.5	32.5	31.5
NF	dB	0.70	0.86	0.90	0.93

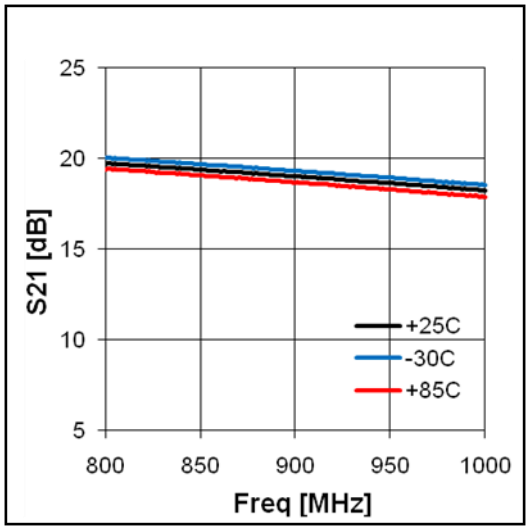
Application Circuit: 900 MHz

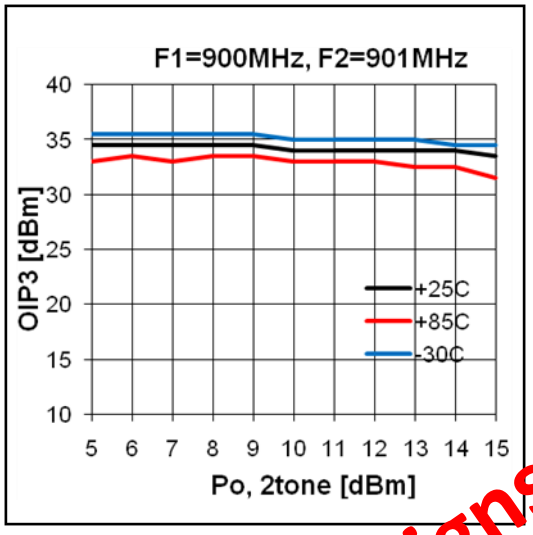
Schematic Diagram	BOM		Tolerance
	C1	10uF	± 20%
	C2	1000pF	± 5%
	C3	100pF	±5%
	C4	100pF	±5%
	C5	100pF	±5%
	C6	1pF	± 5%
	L1	3.9nH	±5%
	L2	6.8nH	±5%
	L3	6.8nH	±5%

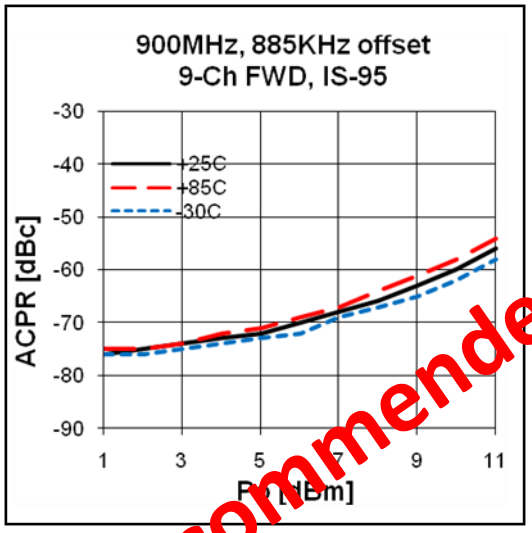
Typical Performance









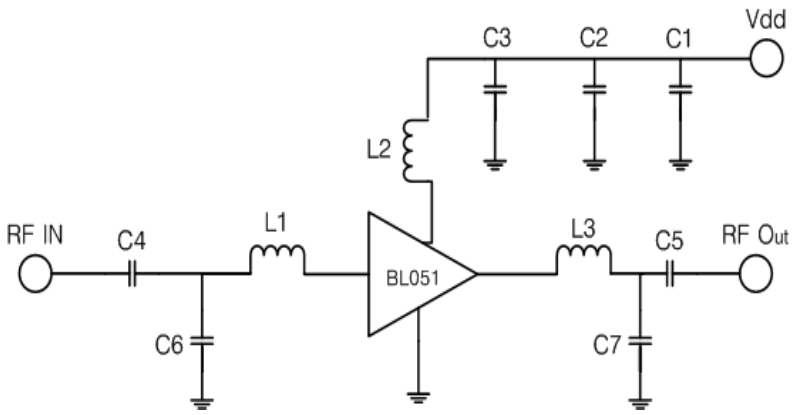


Noise Figure Temperature Performance

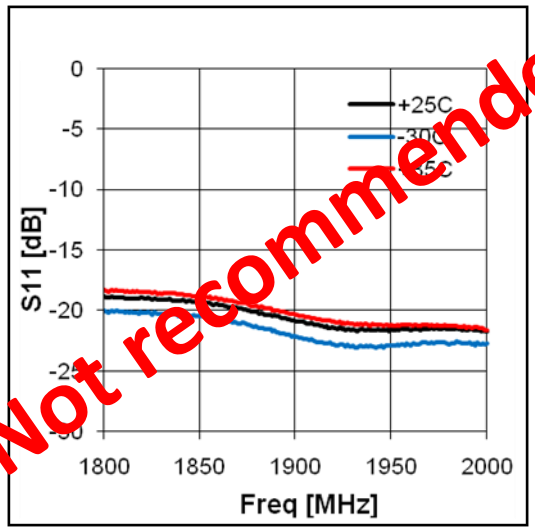
(Vds = 5.0V, Ids = 48.0mA)

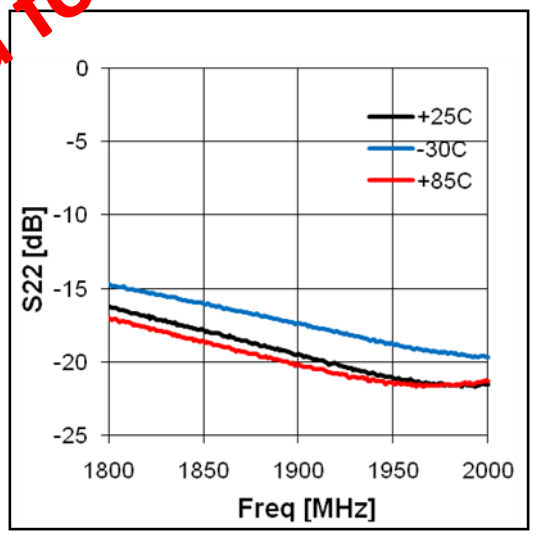
Freq	MHz	900	1900	2140	2450
Temp [°C]	-30	0.65	0.80	0.83	0.87
	25	0.70	0.88	0.91	0.94
	85	0.83	1.03	1.06	1.10

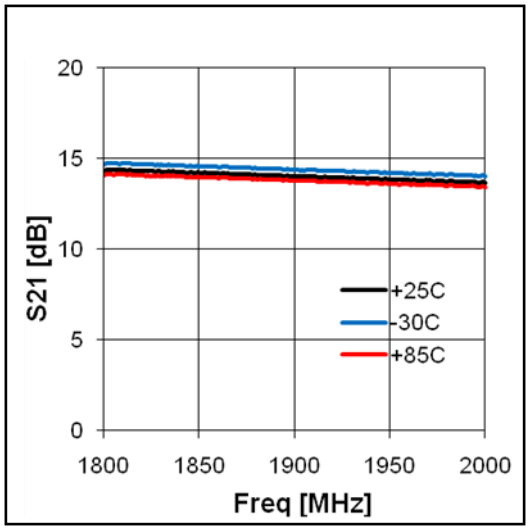
Application Circuit: 1900 MHz

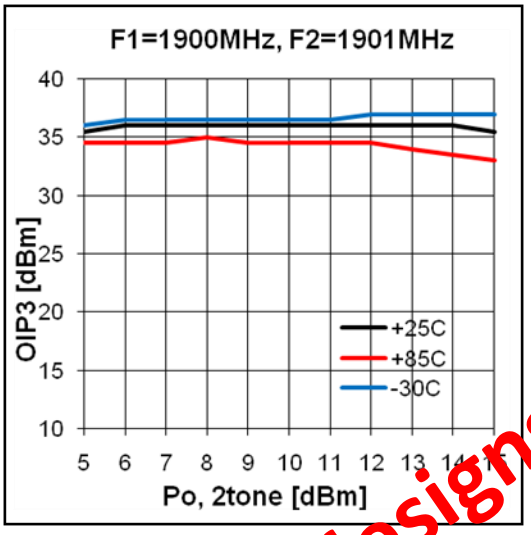
Schematic Diagram	BOM		Tolerance
	C1	10uF	± 20%
	C2	1000pF	± 5%
	C3	100pF	±5%
	C4	22pF	± 5%
	C5	22pF	± 5%
	C6	0.5pF	± 5%
	C7	0.75pF	±5%
	L1	1.5nH	±5%
	L2	5.6nH	±5%
	L3	4.7nH	±5%

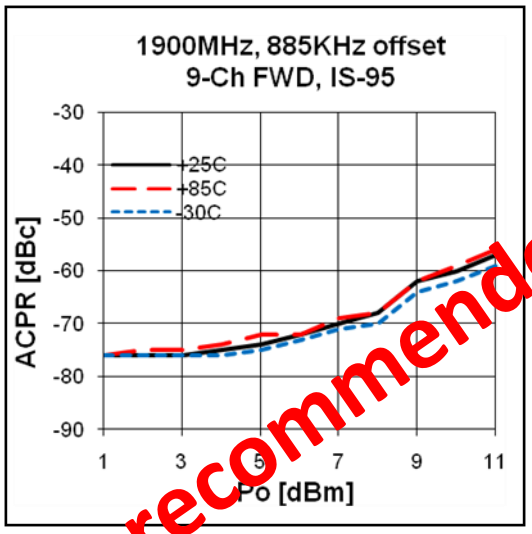
Typical Performance









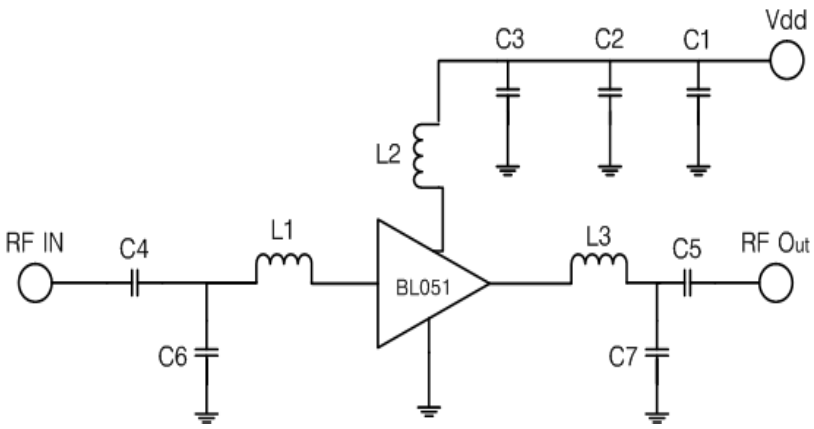


Noise Figure Temperature Performance

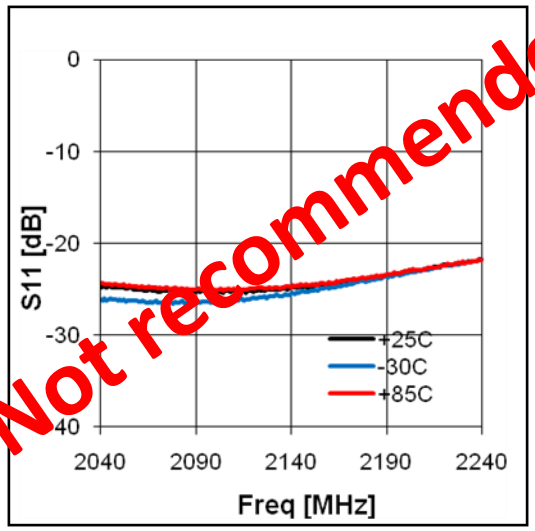
(Vds = 5.0V, Ids = 48.0mA)

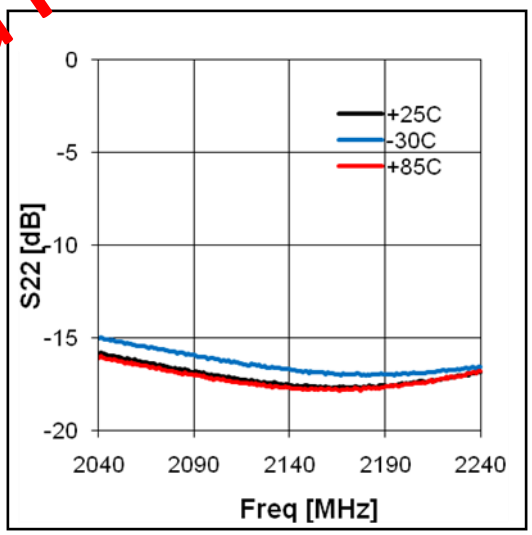
Freq	MHz	900	1900	2140	2450
Temp [°C]	-30	0.65	0.80	0.83	0.87
	25	0.70	0.88	0.91	0.94
	85	0.83	1.03	1.06	1.10

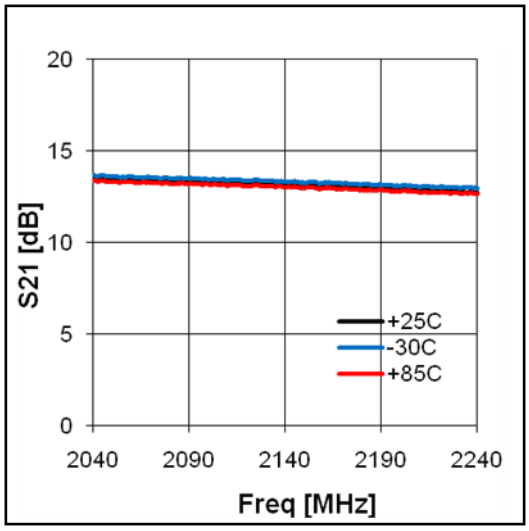
Application Circuit: 2140 MHz

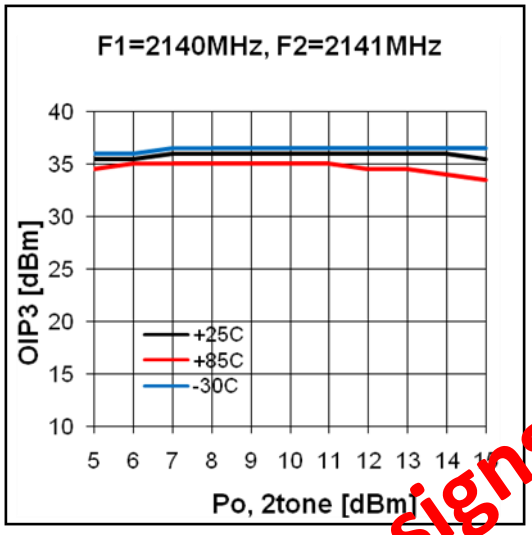
Schematic Diagram	BOM		Tolerance
	C1	10uF	± 20%
	C2	1000pF	± 5%
	C3	100pF	±5%
	C4	22pF	± 5%
	C5	22pF	± 5%
	C6	0.5pF	± 5%
	C7	0.75pF	±5%
	L1	1.5nH	±5%
	L2	6nH	±5%
	L3	3.9nH	±5%

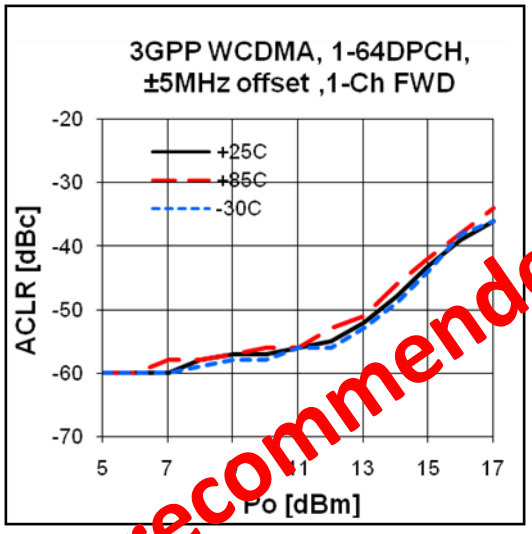
Typical Performance









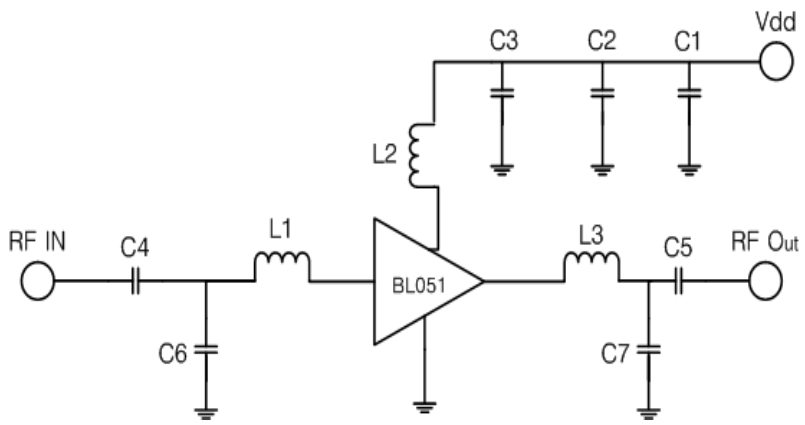


Noise Figure Temperature Performance

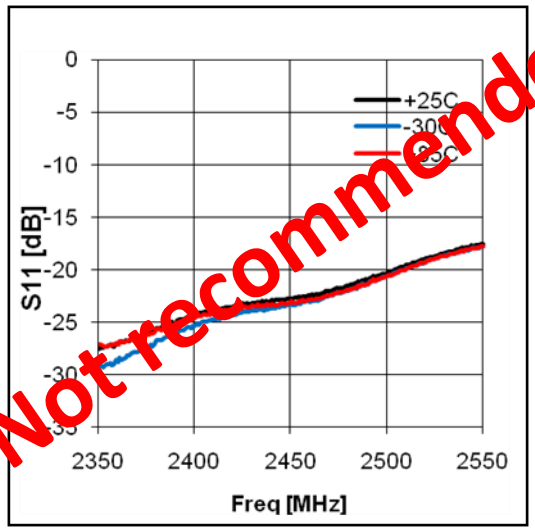
(Vds = 5.0V, Ids = 48.0mA)

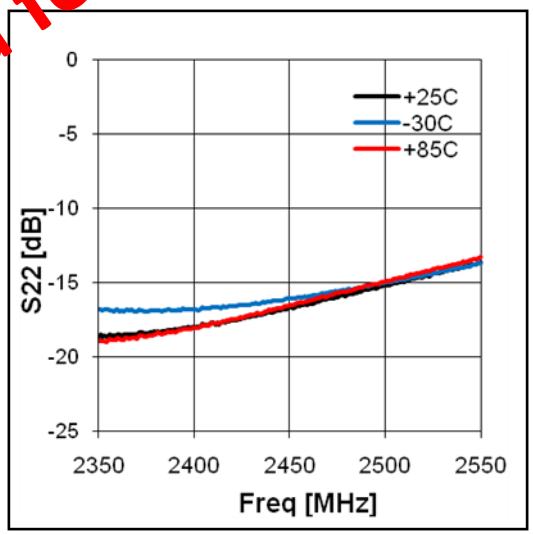
Freq	MHz	900	1900	2140	2450
Temp [°C]	-30	0.65	0.80	0.83	0.87
	25	0.70	0.88	0.91	0.94
	85	0.83	1.03	1.06	1.10

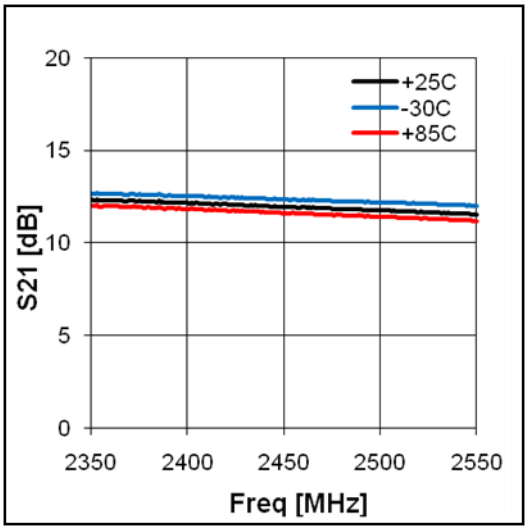
Application Circuit: 2450 MHz

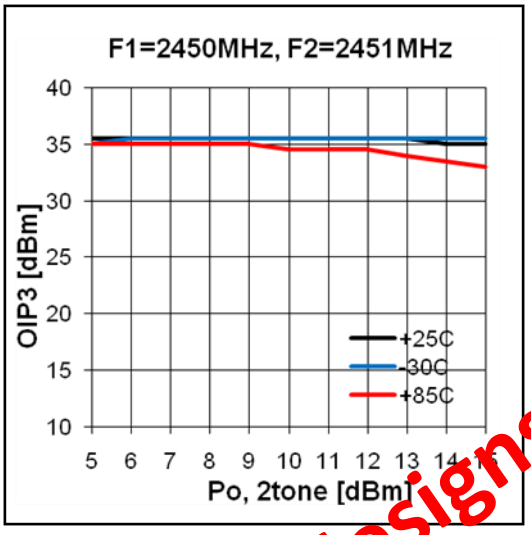
Schematic Diagram	BOM		Tolerance
	C1	10uF	± 20%
	C2	1000pF	± 5%
	C3	100pF	±5%
	C4	22pF	± 5%
	C5	22pF	± 5%
	C6	0.5pF	± 5%
	C7	0.75pF	±5%
	L1	1nH	±5%
	L2	1.2nH	±5%
	L3	3.3nH	±5%

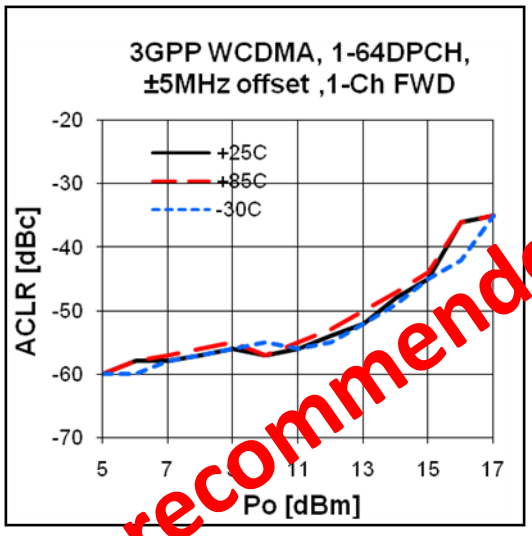
Typical Performance











Noise Figure Temperature Performance

(Vds = 5.0V, Ids = 48.0mA)

Freq	MHz	900	1900	2140	2450
Temp [°C]	-30	0.65	0.80	0.83	0.87
	25	0.70	0.88	0.91	0.94
	85	0.83	1.03	1.06	1.10

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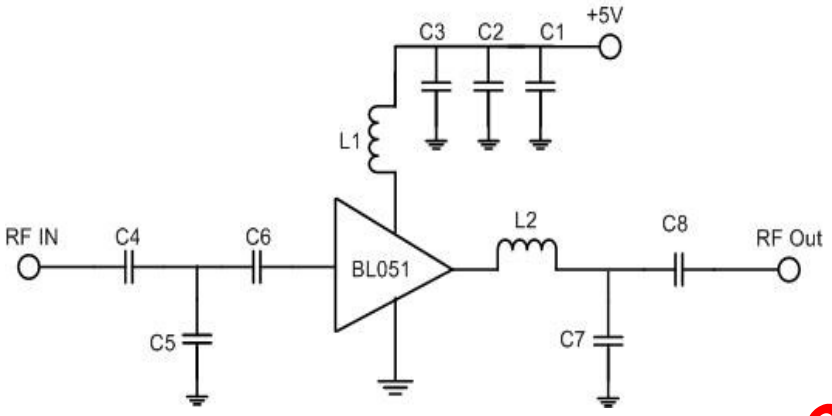
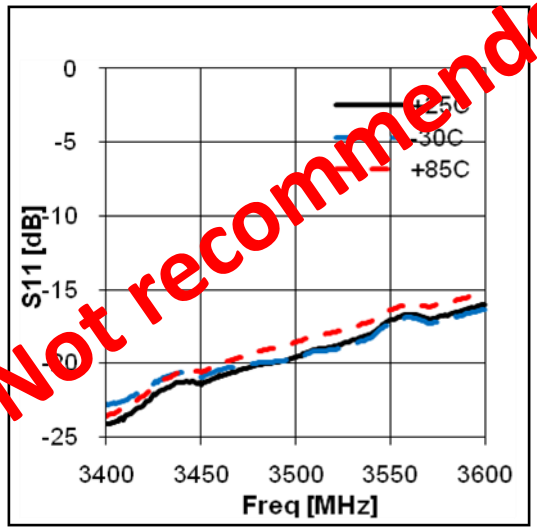
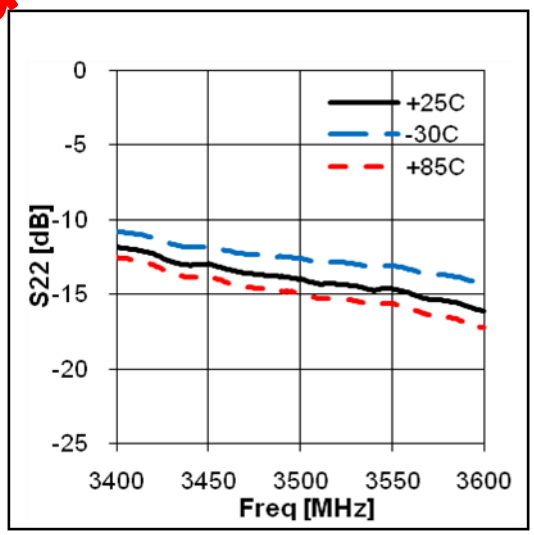
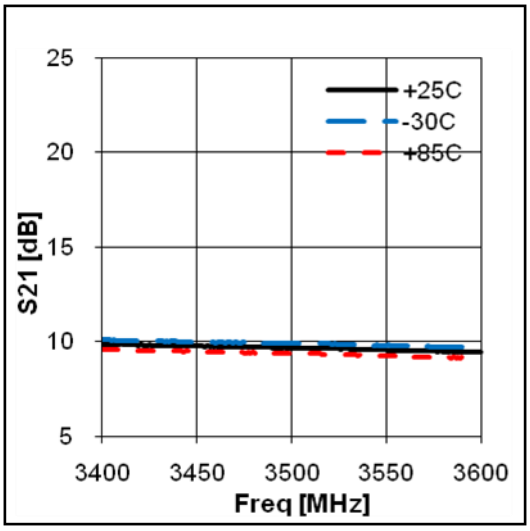
Application Circuit: 3500 MHz

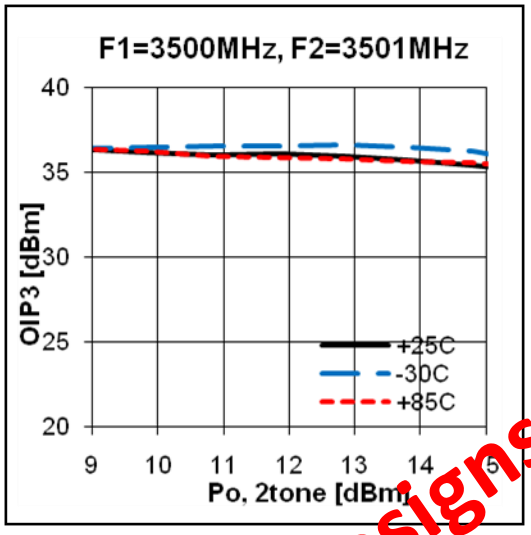
Schematic Diagram	BOM		Tolerance
	C1	10uF	± 20%
	C2	1000pF	± 5%
	C3	100pF	±5%
	C4	18pF	± 5%
	C5	0.5pF	± 5%
	C6	4.7pF	± 5%
	C7	0.5pF	±5%
	C8	8pF	±5%
	L1	33nH	±5%
	L2	1.8nH	±5%

Typical Performance









Noise Figure Temperature Performance

(Vds = 5.0V, Ids = 48.0mA)

Freq	MHz	900	1900	2140	2450	3500
Temp [°C]	-30	0.65	0.80	0.83	0.87	1.32
	25	0.70	0.88	0.91	0.94	1.45
	85	0.78	1.03	1.06	1.10	1.60

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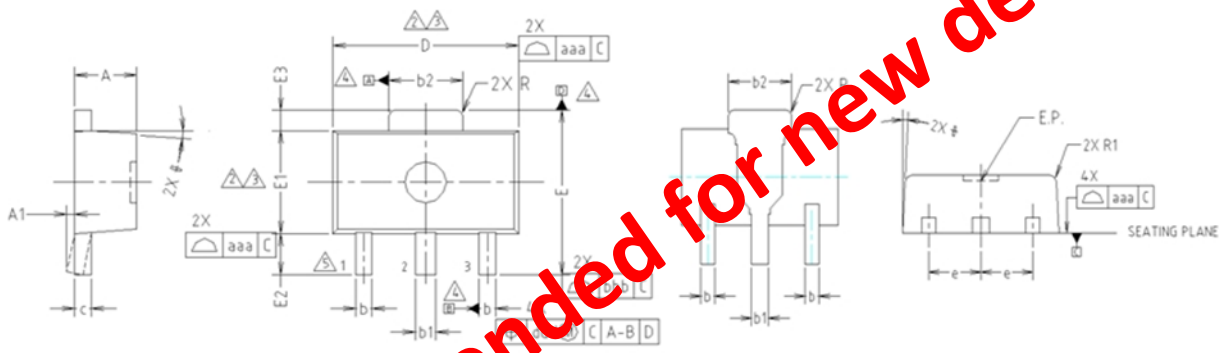
5-4000 MHz Wideband Low Noise Amplifier

Package Outline Dimension



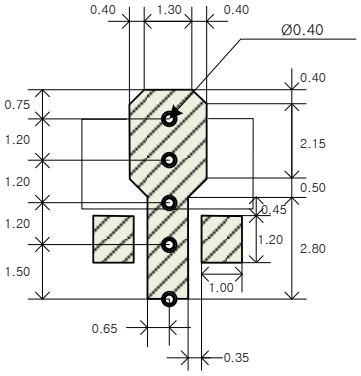
NOTE:
1. DIMENSIONS IN MILLIMETERS.
2. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.5mm PER END. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.5mm PER SIDE.
3. DIMENSIONS D AND E ARE TO BE DETERMINED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
4. DIMENSIONS A, B AND D TO BE DETERMINED 0.10mm FROM THE LEAD TIP.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

SYMBOL	MILLIMETERS MINIMUM	NOMINAL	MAXIMUM	NOTE
A	1.40	1.50	1.60	
A1	0.00	–	0.10	
b	0.38	0.42	0.48	
b1	0.48	0.52	0.58	
b2	1.79	1.82	1.87	
c	0.40	0.42	0.46	
D	4.40	4.50	4.70	2,3
E	3.70	4.00	4.30	
E1	2.40	2.50	2.70	2,3
E2	0.80	1.00	1.20	
E3	0.40	0.50	0.60	
e		1.50 TYP.		
θ		4° TYP.		
R		0.15 TYP.		
R1	–	–	0.20	

SYMBOL	TOLERANCES OF FORM AND POSITION	NOTE
aaa	0.15	
bbb	0.20	
ccc	0.10	
ddd	0.10	

Suggested PCB Land Pattern and PAD Layout

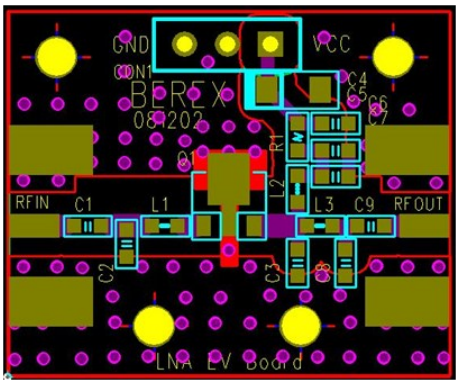
PCB Land Pattern



Note : All dimension _ millimeters

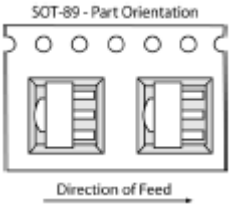
PCB lay out _ on BeRex website

PCB Mounting



Tape & Reel

SOT89



Packaging information:

Tape Width (mm): 12

Reel Size (inches): 7

Device Cavity Pitch (mm): 8

Devices Per Reel: 1000

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 1A
Value:	**Passes <500V**
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

NATO CAGE code:

2	**N**	**9**	**6**	**F**