

Device Features

- NF = 0.91 dB @ 900MHz at RF connectors of Demo board
- Gain = 22.0 dB @ 900 MHz
- OIP3 = 36.0 dBm @ 900MHz
- Output P1 dB = 20.5 dBm @ 900 MHz
- 5V/75mA, MTTF > 100 Years, MSL 1, Class 1B
- RoHS2-compliant SOT-89 SMT package



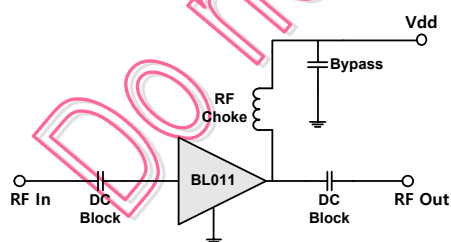
Product Description

BeRex's BL011 is a high performance LNA based on GaAs material with E-pHEMT process, packaged in a RoHS2-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 at wideband frequency. It requires a few external matching components. All devices are 100% RF/DC tested and classified as HBM ESD Class 1B.

Applications

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

Applications Circuit



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

Electrical Specifications

Device performance _ measured on a BeRex evaluation board at 25°C, Vd=5V, 50 Ω system.

Parameter	Conditions	Min	Typ	Max	Unit
Operational Frequency Range		5		4000	MHz
Test Frequency			900		MHz
Gain		20.5	22.0		dB
Input Return Loss			- 19.0		dB
Output Return Loss			- 15.0		dB
Output IP3	5 dBm / tone , Δf=1 MHz	30.5	33.5		dBm
Output P1dB		19.5	20.5		dBm
Noise Figure			0.91	1.11	dB

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

Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Bandwidth	5		4000	MHz
I _C @ (V _C = 5V)	60	75	90	mA
V _C	3.5	5.0	5.25	V
R _{TH}		43		°C/W
Operating Case Temperature	-40		+85	°C

Electrical specifications are measured at specified test conditions.

Specifications are not guaranteed over all recommended operating conditions.

Absolute Maximum Ratings

Parameter	Rating	Unit
Storage Temperature	-55 to +155	°C
Junction Temperature	+170	°C
Supply 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.

5-4000 MHz Wideband Low Noise Amplifier

Vd = 5V, Id = 75.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	22.0	17.0	17.0	15.5
S11	dB	- 19.0	- 24.0	- 24.0	- 19.5
S22	dB	- 15.0	- 15.5	- 21.5	- 16.0
P1	dBm	20.5	20.5	20.5	20.0
OIP3	dBm	33.5	36.0	35.5	38.0
NF	dB	0.91	1.13	1.17	1.30

Vd = 4.8V, Id = 70.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	21.8	17.0	16.9	15.5
S11	dB	- 18.8	- 24.5	- 23.2	- 19.5
S22	dB	- 15.3	- 16.5	- 23.1	- 16.9
P1	dBm	20.3	20.2	20.2	19.7
OIP3	dBm	33.4	35.5	36.0	37.0
NF	dB	0.91	1.13	1.17	1.30

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

Vd = 4.6V, Id = 65.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	21.8	17.0	16.8	15.5
S11	dB	- 18.3	- 24.7	- 22.6	- 19.6
S22	dB	- 15.6	- 17.4	- 24.8	- 18.1
P1	dBm	19.9	19.8	19.8	19.3
OIP3	dBm	32.9	35.0	36.0	36.0
NF	dB	0.91	1.13	1.17	1.30

Vd = 4.4V, Id = 59.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	21.7	17.0	16.7	15.5
S11	dB	- 17.5	- 24.9	- 21.8	- 19.5
S22	dB	- 15.8	- 18.4	- 26.6	- 19.3
P1	dBm	19.4	19.4	19.6	18.9
OIP3	dBm	32.4	34.5	36.0	35.0
NF	dB	0.91	1.13	1.17	1.30

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

Vd = 4.2V, Id = 53.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	21.6	17.0	16.6	15.4
S11	dB	- 16.8	- 24.9	- 21.1	- 19.5
S22	dB	- 15.9	- 19.4	- 27.7	- 21.0
P1	dBm	18.9	19.0	19.2	18.5
OIP3	dBm	31.5	33.5	35.0	34.0
NF	dB	0.91	1.13	1.17	1.30

Vd = 4.0V, Id = 46.0mA, Ta = 25°C

Freq	MHz	900	1900	2140	2450
S21	dB	21.5	17.0	16.5	15.3
S11	dB	- 15.9	- 24.9	- 20.4	- 19.4
S22	dB	- 15.8	- 20.5	- 27.6	- 22.8
P1	dBm	18.3	18.6	18.7	18.0
OIP3	dBm	30.5	33.0	34.0	33.0
NF	dB	0.91	1.13	1.17	1.30

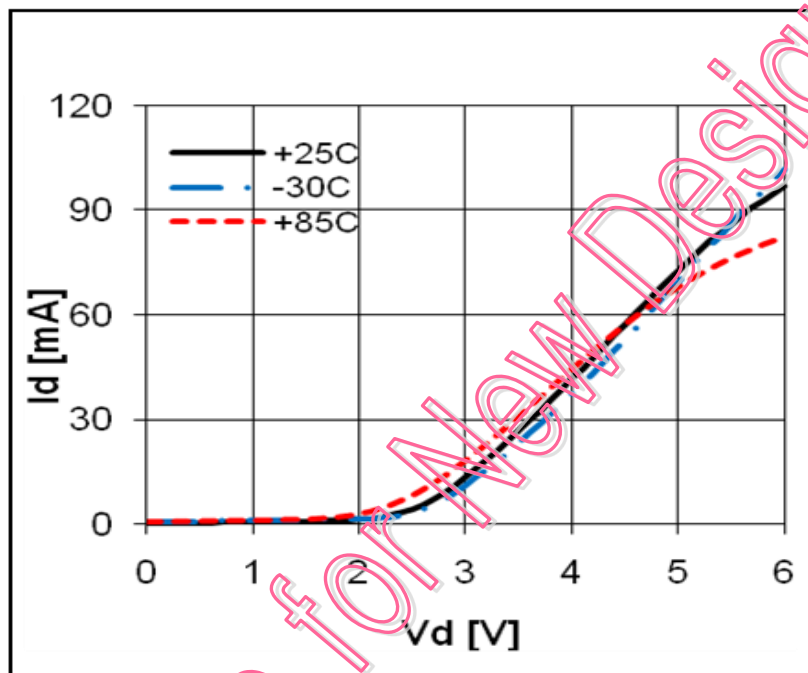
* NF : Losses on input and output transmission lines on PCB are not de-embedded.

Vd = 3.5V, Id = 34.0mA, Ta = 25°C

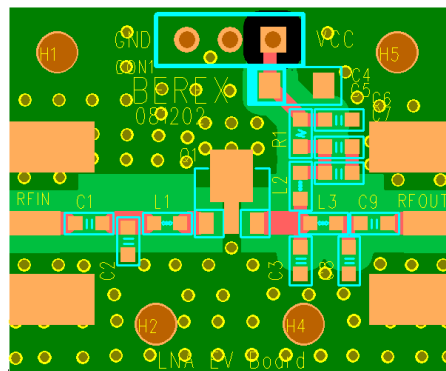
Freq	MHz	900	1900	2140	2450
S21	dB	21.0	16.7	16.1	15.0
S11	dB	- 13.1	- 23.6	- 18.5	- 19.3
S22	dB	- 14.2	- 21.9	- 22.5	- 27.7
P1	dBm	16.1	17.2	17.4	16.6
OIP3	dBm	26.0	29.5	30.5	30.0
NF	dB	0.91	1.13	1.17	1.30

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

V-I Characteristics



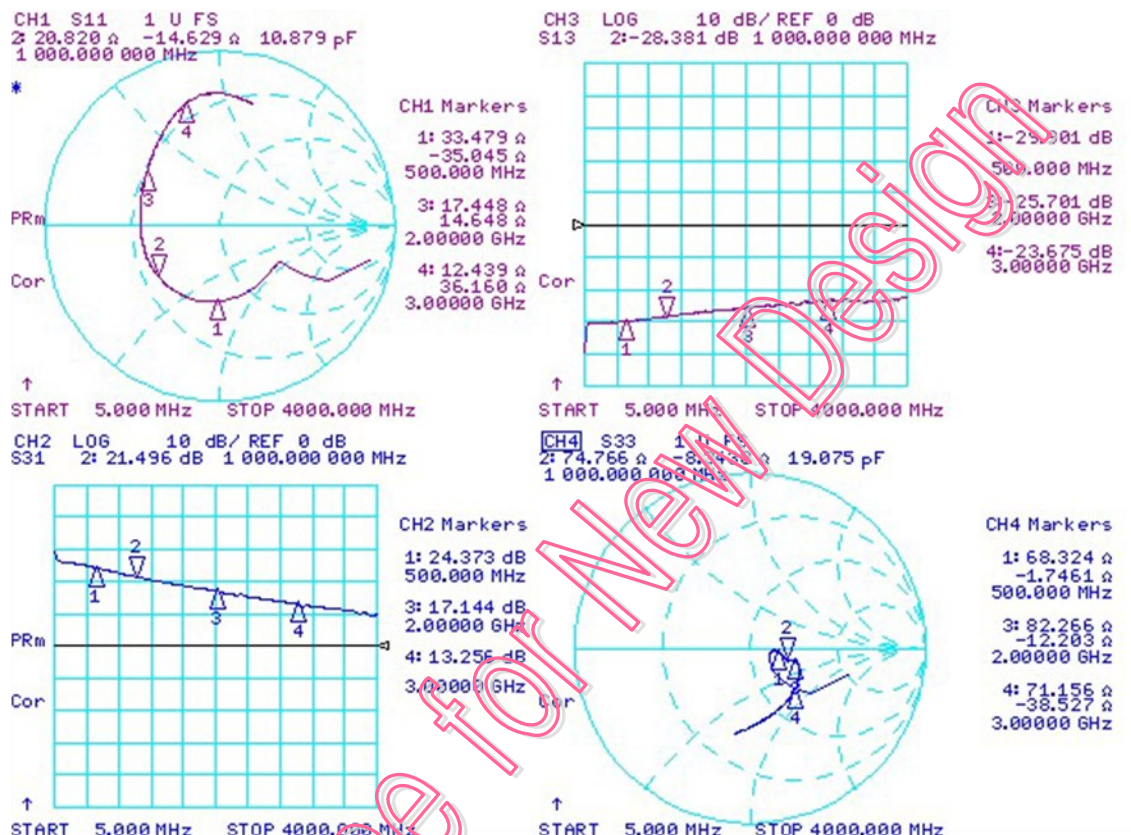
BeRex SOT89 Evaluation Board



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

Typical Device Data

S-parameters (Vd=5V, Id=75mA, T=25°C)

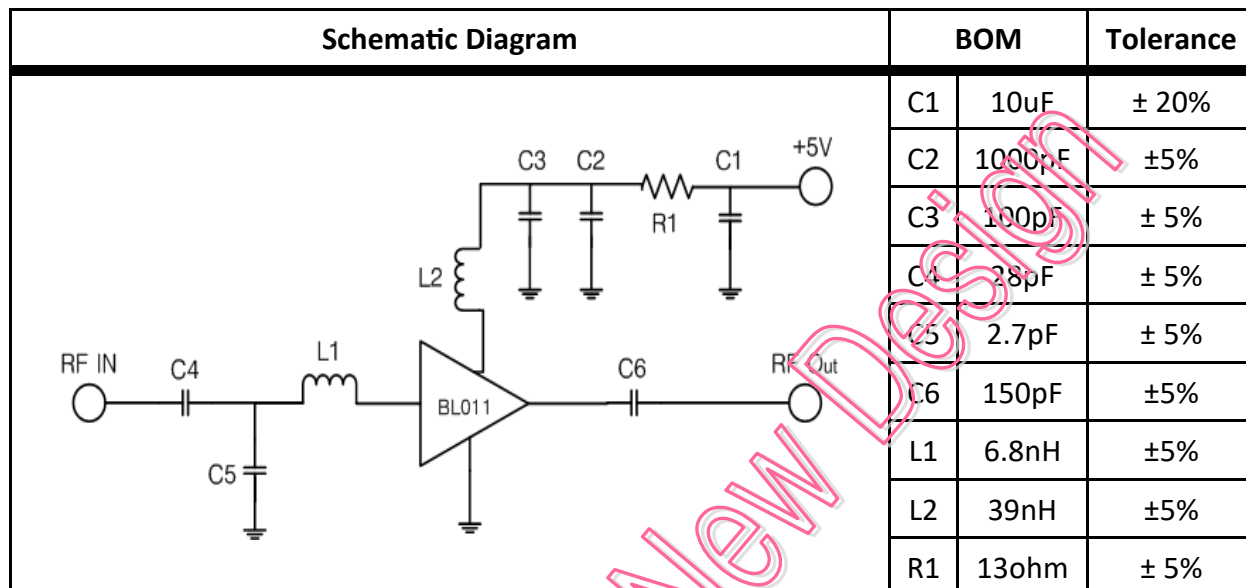


S-Parameter

(Vdevice = 5.0V, Icc = 75mA, T = 25 °C, calibrated to device leads)

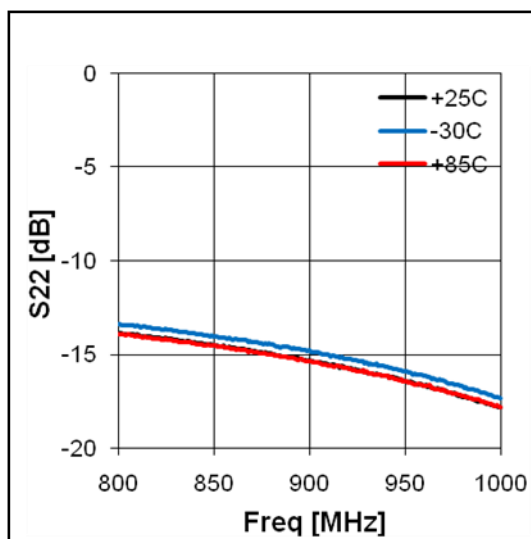
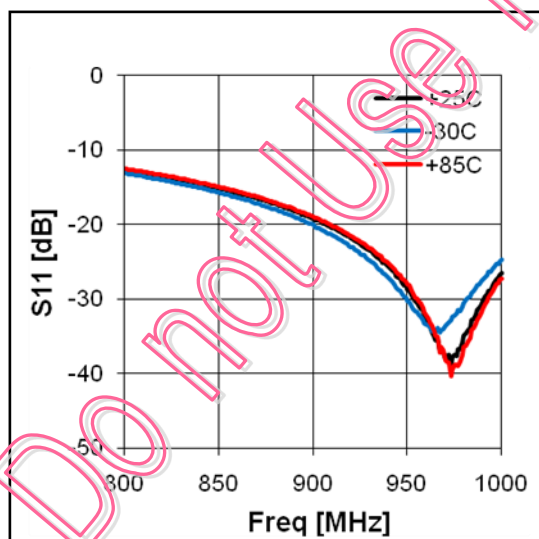
Freq [MHz]	S11 [Mag]	S11 [Ang]	S21 [Mag]	S21 [Ang]	S12 [Mag]	S12 [Ang]	S22 [Mag]	S22 [Ang]
100	0.594	-32.668	20.271	164.806	0.030	9.568	0.135	-29.347
500	0.431	-92.314	16.433	130.319	0.032	11.743	0.156	-6.174
1000	0.454	-141.505	11.810	98.232	0.039	16.118	0.206	-15.572
1500	0.455	178.736	8.990	73.537	0.046	12.886	0.229	-17.502
2000	0.518	143.413	7.118	54.527	0.051	7.508	0.255	-15.050
2500	0.631	120.153	5.709	34.979	0.056	0.061	0.303	-21.818
3000	0.723	105.634	4.566	19.308	0.066	-7.947	0.346	-42.248
3500	0.761	92.601	3.693	6.841	0.063	-20.854	0.403	-70.796
4000	0.772	74.726	3.014	-9.896	0.073	-31.161	0.499	-100.140

Application Circuit: 900 MHz

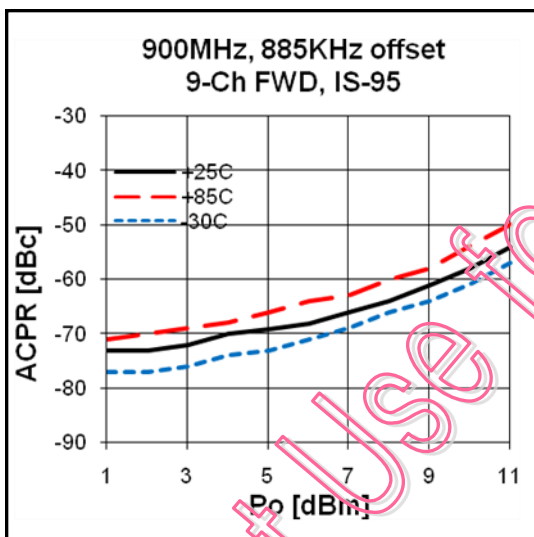
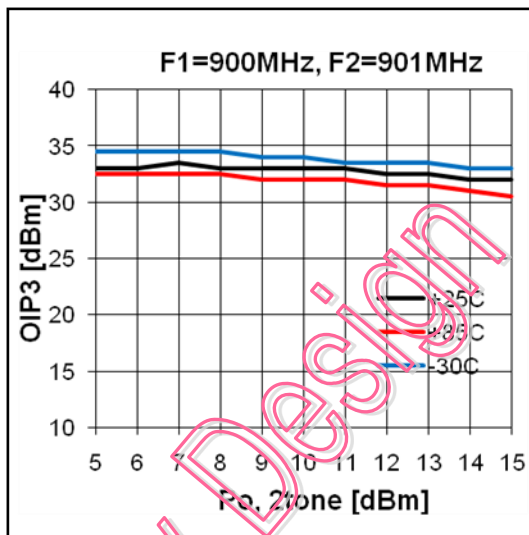
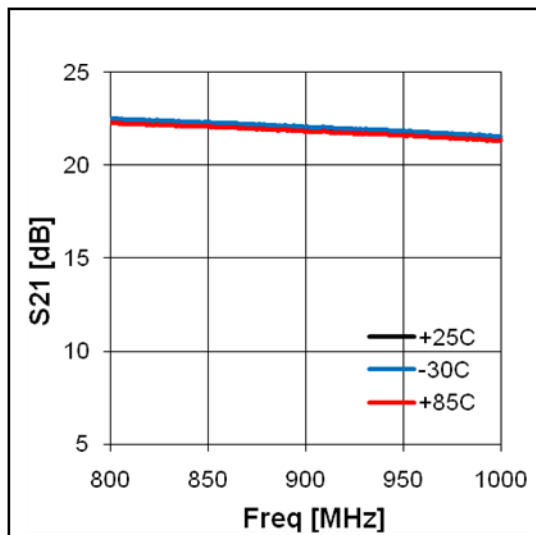


Typical Performance

(Vd=5V, Id=75mA, T=25°C)



5-4000 MHz Wideband Low Noise Amplifier



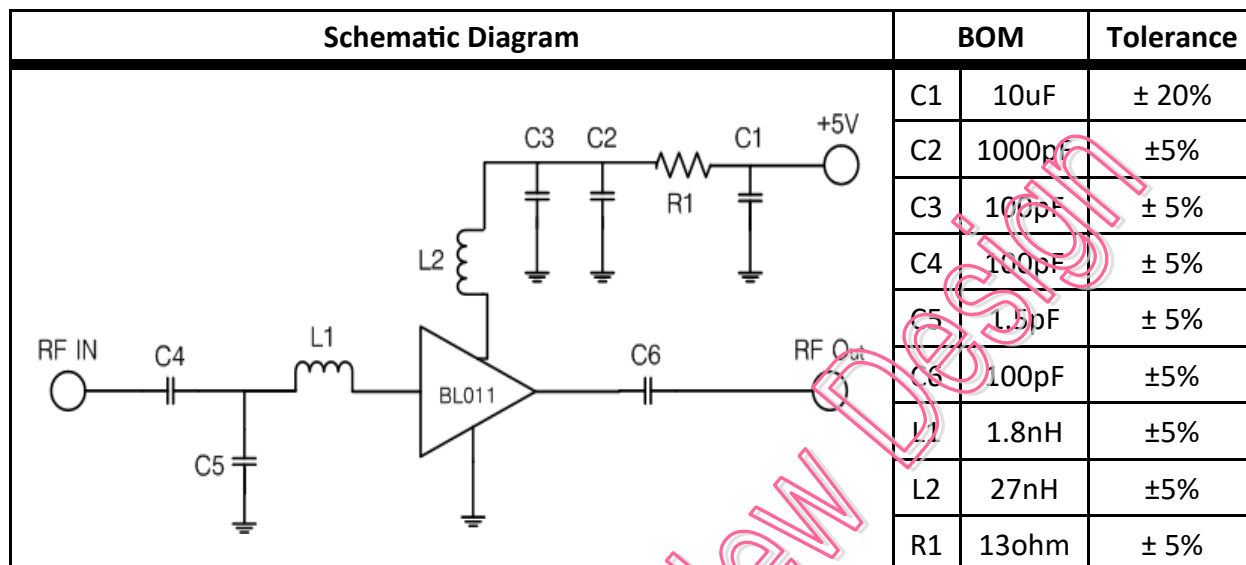
Noise Figure Temperature Performance

(Vd = 5.0V, Id = 75.0mA)

Freq	MHz	900	1900	2140	2450
Temp	-30	0.84	1.07	1.11	1.25
	25	0.91	1.13	1.17	1.30
	85	1.13	1.33	1.38	1.56

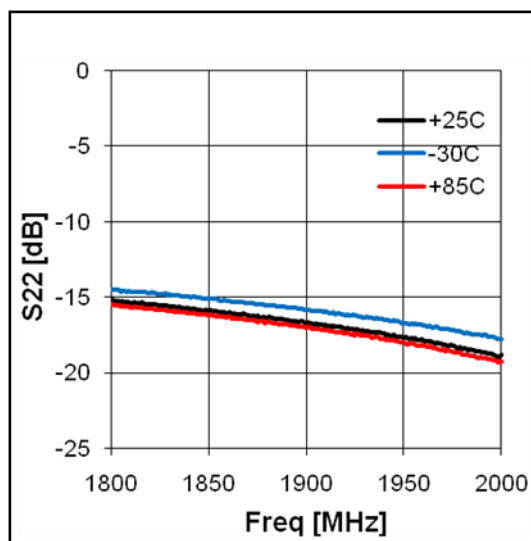
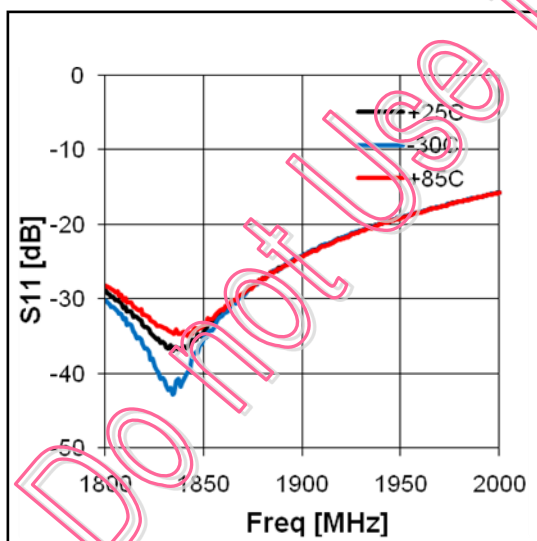
* NF : Losses on input and output transmission lines on PCB are not de-embedded.

Application Circuit: 1900 MHz

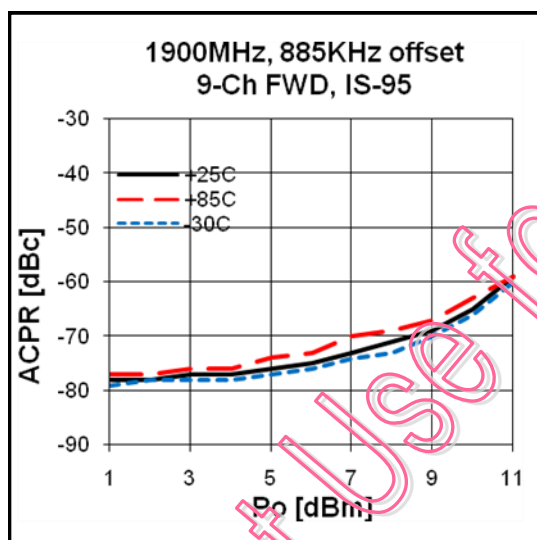
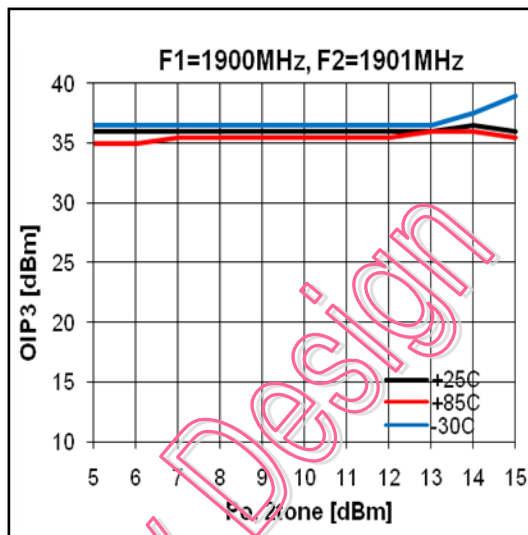
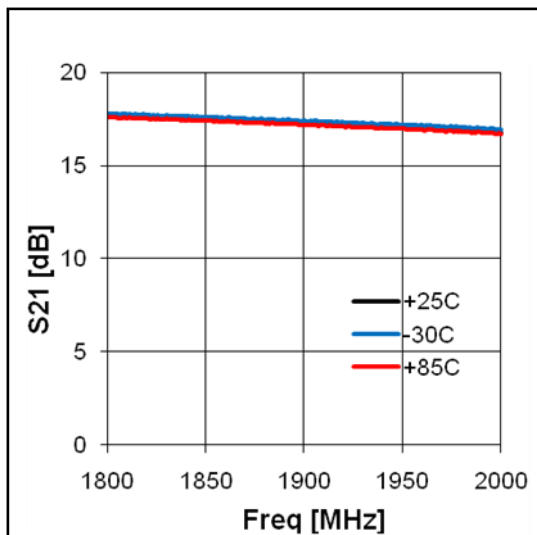


Typical Performance

(Vd=5V, Id=75mA, T=25°C)



5-4000 MHz Wideband Low Noise Amplifier



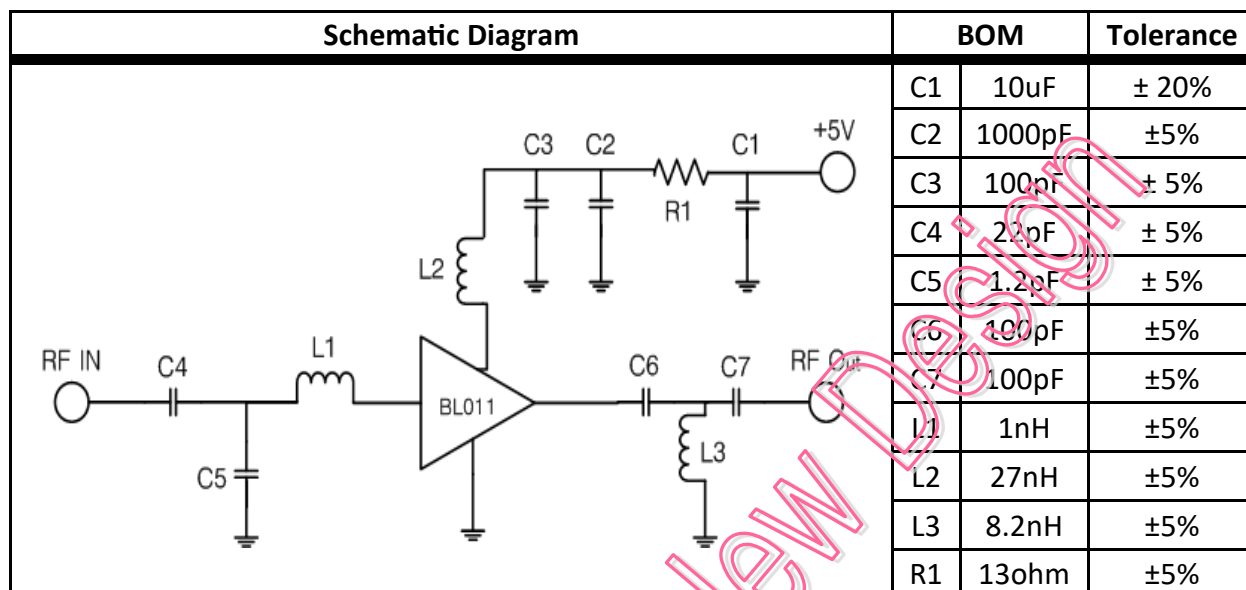
Noise Figure Temperature Performance

(Vd = 5.0V, Id = 75.0mA)

Freq	MHz	900	1900	2140	2450
Temp [°C]	-30	0.84	1.07	1.11	1.25
	25	0.91	1.13	1.17	1.30
	85	1.13	1.33	1.38	1.56

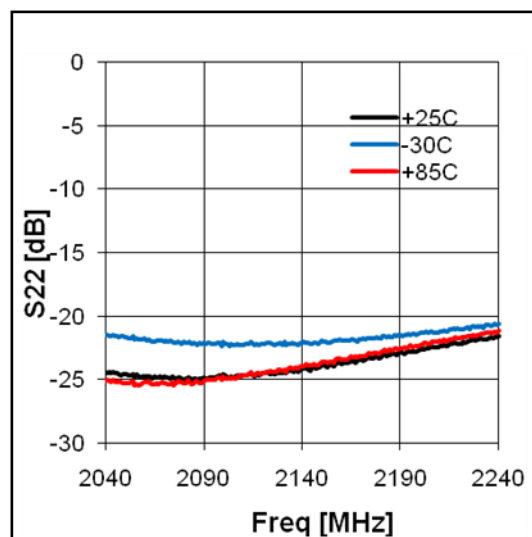
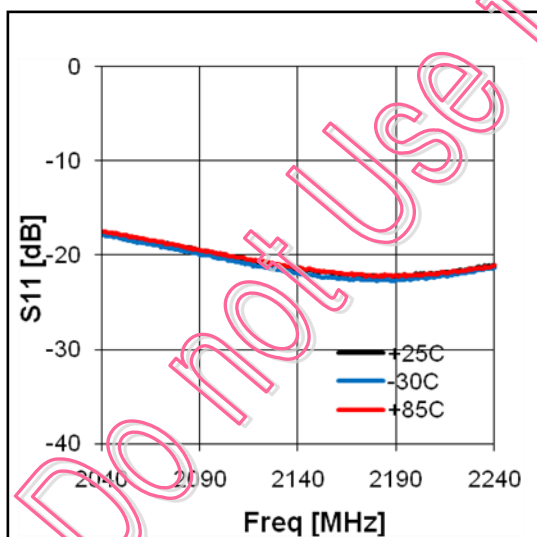
* NF : Losses on input and output transmission lines on PCB are not de-embedded.

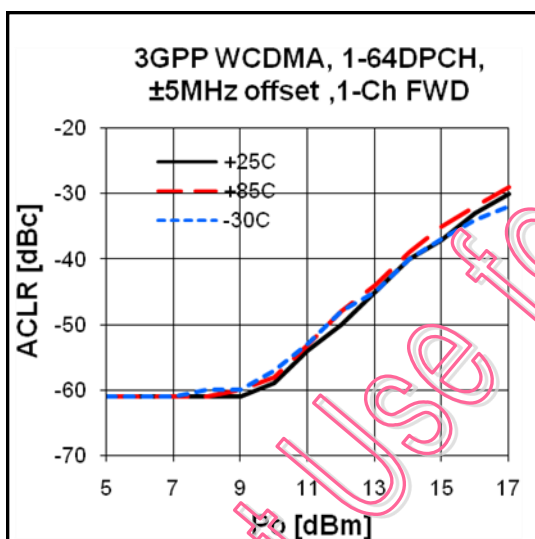
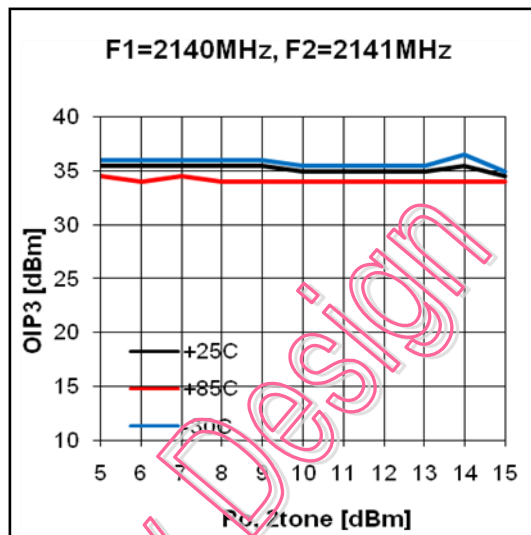
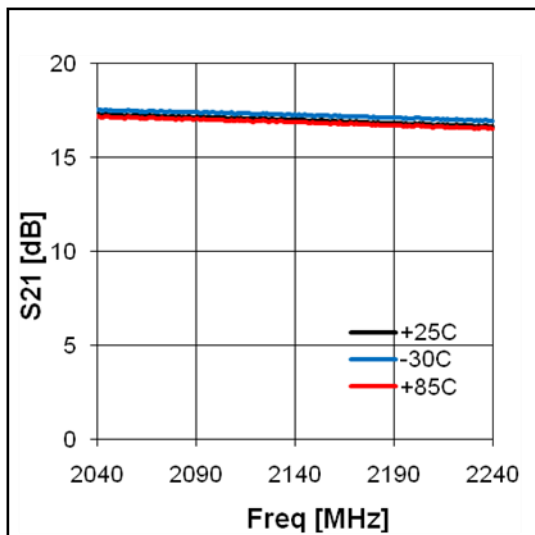
Application Circuit: 2140 MHz



Typical Performance

(Vd=5V, Id=75mA, T=25°C)





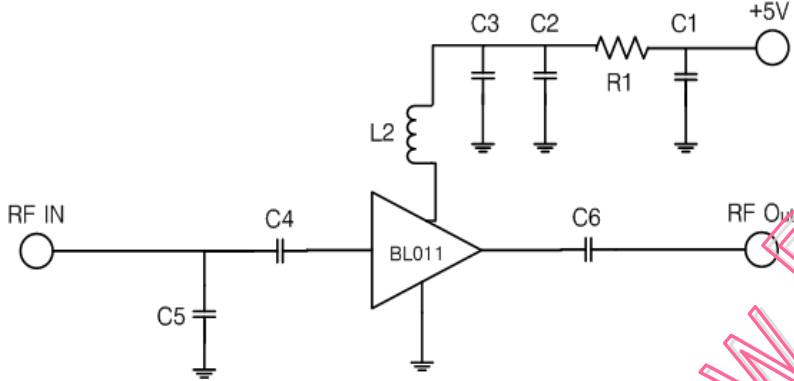
Noise Figure Temperature Performance

(Vd = 5.0V, Id = 75.0mA)

Freq	MHz	900	1900	2140	2450
Temp [°C]	-30	0.84	1.07	1.11	1.25
	25	0.91	1.13	1.17	1.30
	85	1.13	1.33	1.38	1.56

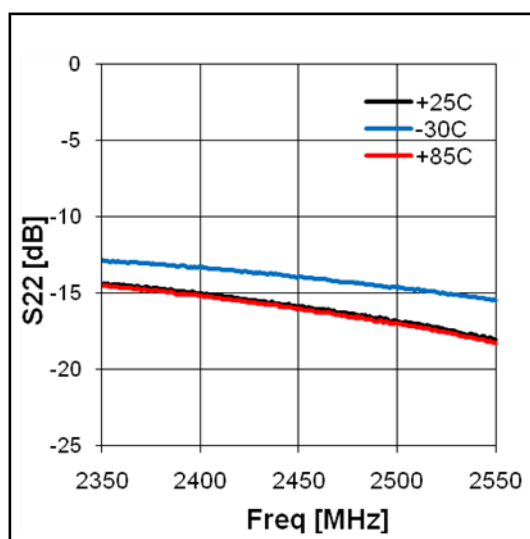
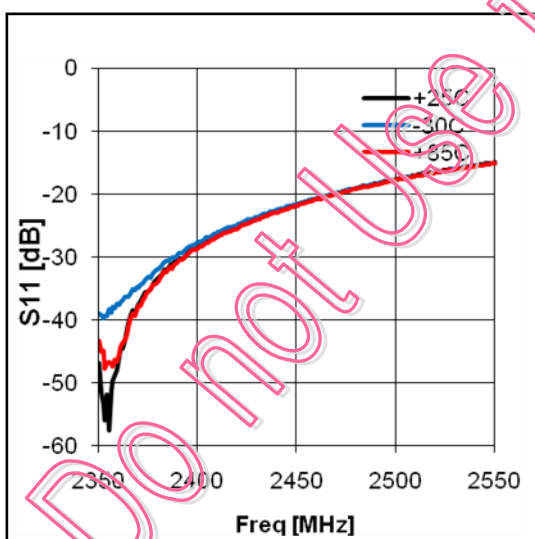
* NF : Losses on input and output transmission lines on PCB are not de-embedded.

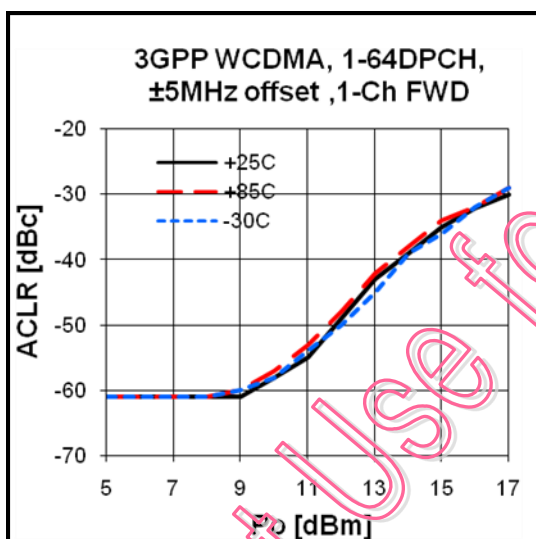
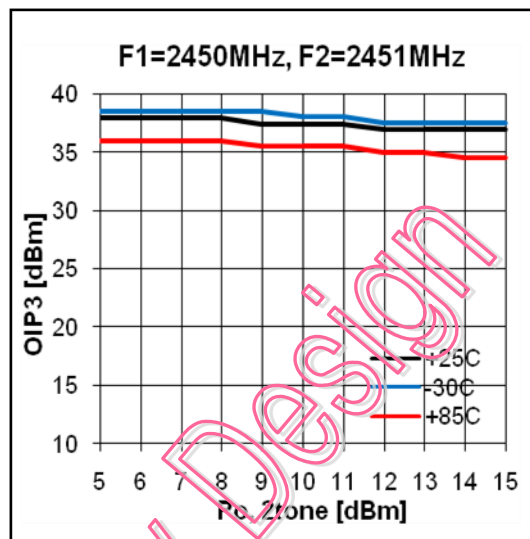
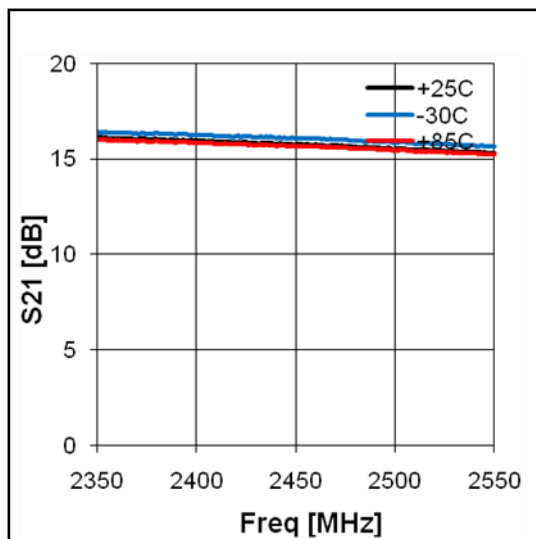
Application Circuit: 2450 MHz

Schematic Diagram	BOM		Tolerance
	C1	10uF	± 20%
	C2	1000pF	±5%
	C3	100pF	± 5%
	C4	39pF	± 5%
	C5	1.2pF	± 5%
	C6	100pF	±5%
	L1	22nH	±5%
	R1	13 ohm	±5%

Typical Performance

(Vd=5V, Id=75mA, T=25°C)





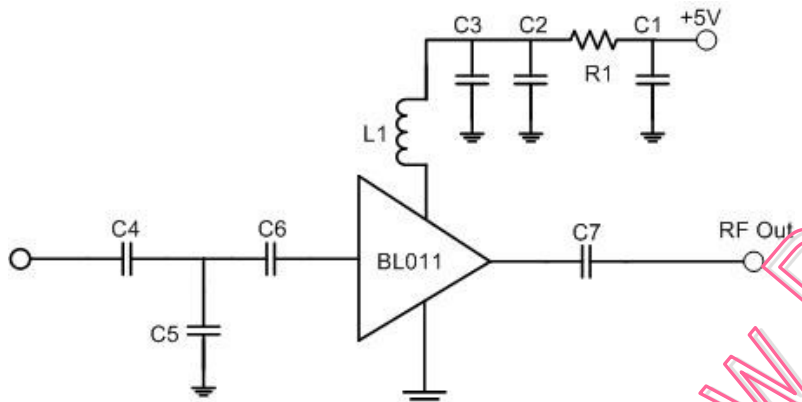
Noise Figure Temperature Performance

(Vd = 5.0V, Id = 75.0mA)

Freq	MHz	900	1900	2140	2450
Temp	-30	0.84	1.07	1.11	1.25
	25	0.91	1.13	1.17	1.30
	85	1.13	1.33	1.38	1.56

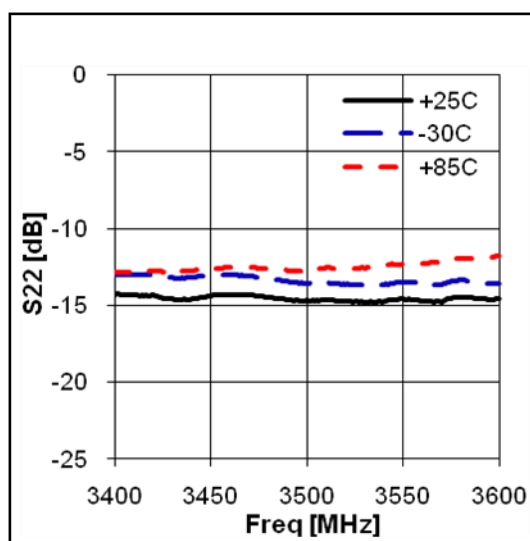
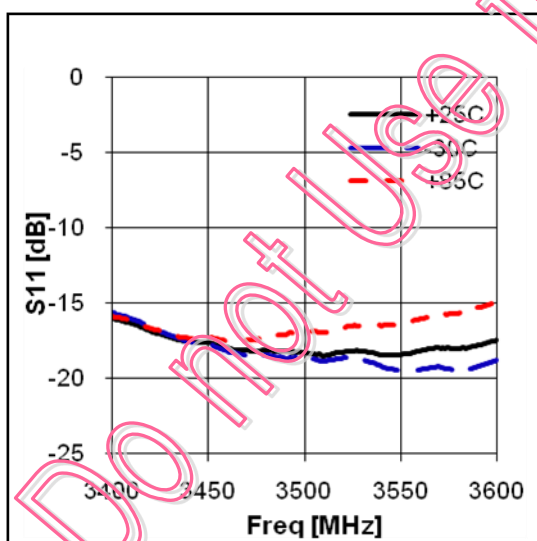
* NF : Losses on input and output transmission lines on PCB are not de-embedded.

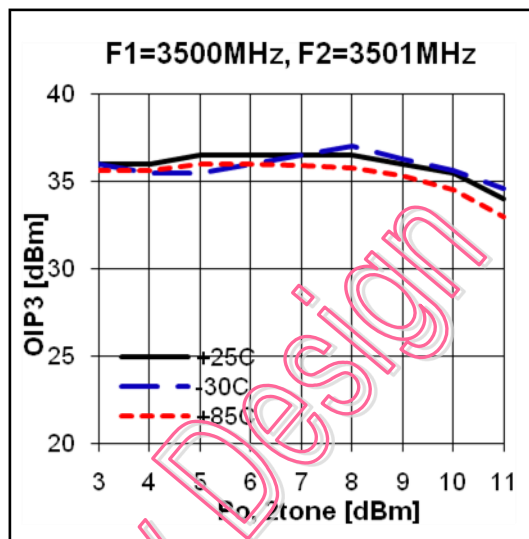
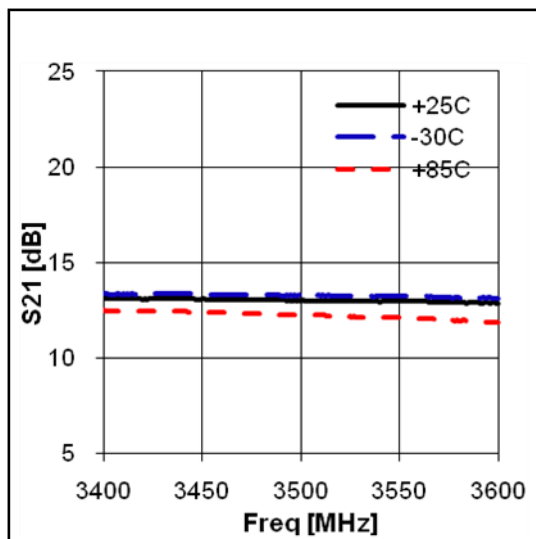
Application Circuit: 3500 MHz

Schematic Diagram	BOM		Tolerance
	C1	10uF	± 20%
	C2	1000nF	±5%
	C3	100pF	± 5%
	C4	100pF	± 5%
	C5	0.5pF	± 5%
	C6	1.2pF	±5%
	C7	100pF	±5%
	L1	8.2nH	±5%
	R1	13 ohm	±5%

Typical Performance

(Vd=5V, Id=75mA, T=25°C)





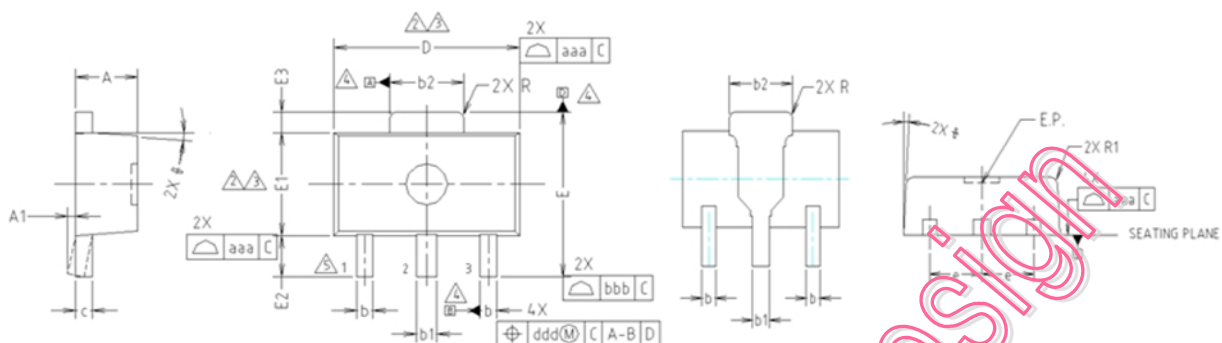
Noise Figure Temperature Performance

(Vd = 5.0V, Id = 75.0mA)

Freq	MHz	900	1900	2140	2450	3500
Temp [°C]	-30	0.84	1.07	1.11	1.25	1.32
	25	0.91	1.13	1.17	1.30	1.56
	85	1.13	1.33	1.38	1.56	1.71

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

Package Outline Dimension



NOTE:

1. DIMENSIONS IN MILLIMETERS.

△ 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.

△ DIMENSIONS D AND E1 ARE 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.

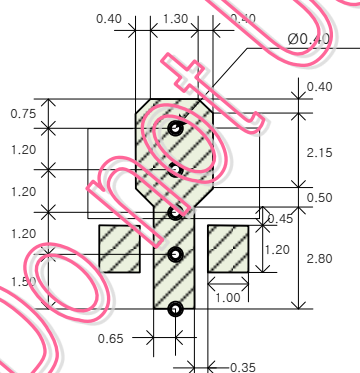
△ DATUMS A, B AND D TO BE DETERMINED 0.18mm FROM THE LEAD TIP.

△ TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	1.4	1.50	1.60	
A1	0.00		0.10	
b	0.30	0.42	0.48	
b1	0.40	0.52	0.58	
b2	1.19	1.82	1.87	
c	0.40	0.42	0.46	
c1	4.40	4.50	4.70	2,3
c2	3.70	4.00	4.30	
E	2.40	2.50	2.70	2,3
E1	0.80	1.00	1.20	
c3	0.40	0.50	0.60	
e	1.50 TYP.			
φ	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

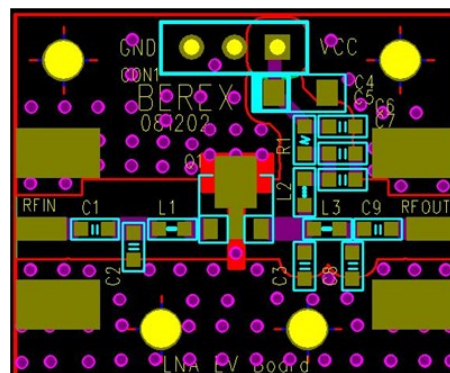
PCB Land Pattern



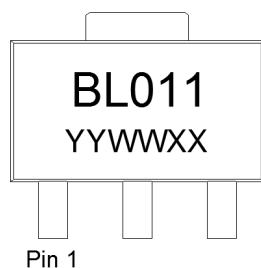
Note : All dimension _ millimeters

PCB lay out _ on BeRex website

PCB Mounting



Package Marking

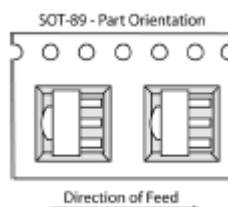


YY = Year, WW = Working Week,
XX = Wafer No.

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 1B
Value: Passes <100V
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

MSL Rating: Level 1 at +260°C convection reflow
Standard: JEDEC Standard J-STD-020



Proper ESD procedures should be followed when handling this device.

RoHS Compliance

This part is compliant with Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2011/65/EU as amended by Directive 2015/863/EU.

This product also is compliant with a concentration of the Substances of Very High Concern (SVHC) candidate list which are contained in a quantity of less than 0.1%(w/w) in each components of a product and/or its packaging placed on the European Community market by the BeRex and Suppliers.

NATO CAGE code:

2	N	9	6	F
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Do not Use for New Design