BL022A

50-6000 MHz Wideband LNA Gain Block

Preliminary Datasheet

Device Features

- Low Noise Figure: NF = 1.1 @ 1900MHz
- High Linearity: OIP3 = 35.5 dBm @ 1900 MHz
- Output P1 dB = 22 dBm @ 1900 MHz
- Gain = 19 dB @ 1900 MHz
- Internally matched to 50 ohms
- Vdd: 5.0V
- Lead-free/RoHS-compliant SOT-89 SMT package



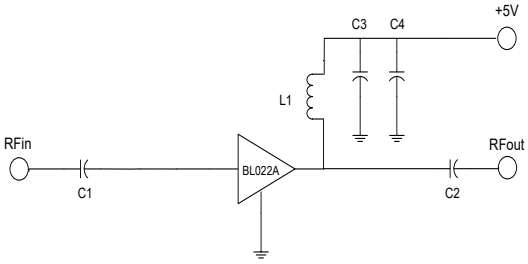
Product Description

The BL022A is a high performance, wideband, LNA GaAs E-pHEMT gain block that is ideal for applications demanding low noise and high linearity in a wideband of 50-6000 MHz. The BL022A is internally matched to 50 Ohms and requires no external matching components. It is available in RoHS-compliant, SOT-89 SMT package and has a Class 1A ESD rating (HBM) These devices are 100% DC and RF tested to assure quality and performance.

Applications

- Base station Infrastructure/RFID
- Commercial/Industrial

Applications Circuit



BOM	50~500MHz	0.7~1GHz	1.7~2.2GHz	2.5~3GHz	3.4~3.8GHz
C1	1nF	68pF	47pF	33pF	10pF
C2	1nF	68pF	47pF	33pF	22pF
C3	100pF	100pF	100pF	100pF	100pF
C4	1nF	1nF	1nF	1nF	1nF
L1	680nH	47nH	68nH	27nH	22nH

Typical Performance[1]

Parameter	Frequency						Unit
	70	900	1900	2140	2650	3500	MHz
Gain	26.0	23.0	19.0	18.5	17.5	16.0	dB
S11[2]	-7.5	-18.0	-24.0	-25.0	-13.5	-9.3	dB
S22	-16.0	-15.0	-11.0	-10.0	-11.0	-20.0	dB
OIP3[3]	39.5	36.5	35.5	35.0	34.0	31.5	dBm
P1dB	20.3	22.0	22.0	22.0	22.0	21.0	dBm
Noise Figure	1.20	1.10	1.10	1.25	1.50	1.10	dB

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

[2] S11 can be improved by a shunt capacitor. (refer to application circuits)

[3] OIP3 _ measured on two tones with a output power 5dBm/ tone , F2—F1 = 1 MHz.

	Min.	Typical	Max.	Unit
Bandwidth	50		6000	MHz
I_d @ (Vd = 5V)	55	70	85	mA
V_d		5.0		V
dG/dT		-0.009		dB/°C
R_{TH}		79.8		°C/W
Operating Case Temperature	-40		+105	°C

Absolute Maximum Ratings

Parameter	Rating	Unit
Storage Temperature	-55 to +155	°C
Junction Temperature	+220	°C
Operating Voltage	+7	V
Supply Current	190	mA
Input RF Power	24	dBm

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

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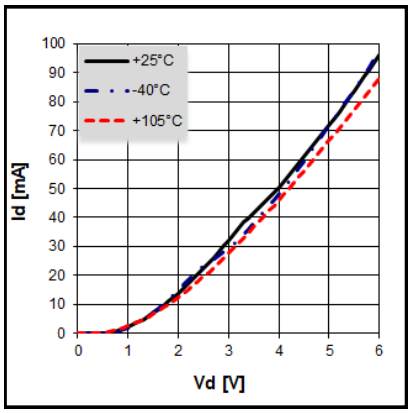
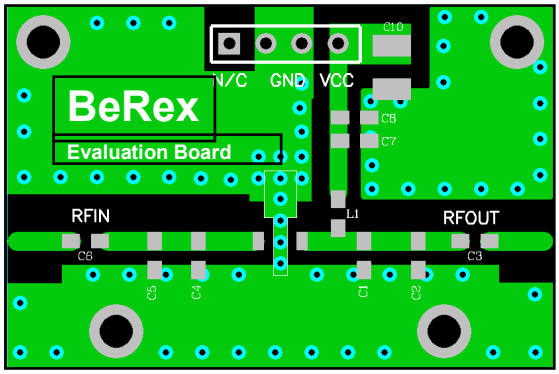
V-I Characteristics



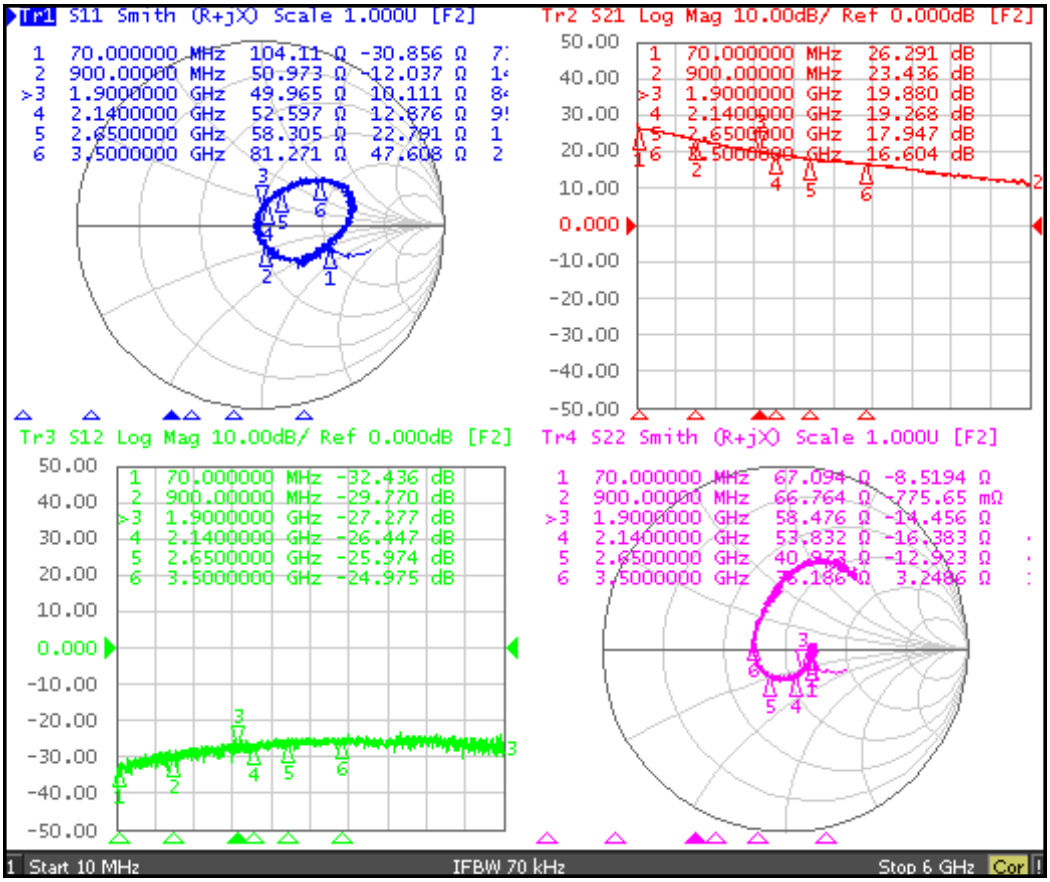
BeRex SOT89 Evaluation Board



*Dielectric constant _ 4.2 *31mil thick FR4 PCB

Typical Device Data

S-parameters (V_D=5V, I_D=70mA, T=25°C)



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S-Parameter

(Vdevice = 5.0V, I_d = 70mA, 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]
10	0.62	-13.07	24.68	173.99	0.01	40.63	0.36	-18.81
100	0.39	-19.38	20.55	167.42	0.02	11.98	0.15	-14.89
200	0.34	-26.97	19.95	160.72	0.03	21.38	0.12	-9.49
400	0.29	-43.26	18.63	145.13	0.02	11.52	0.14	-1.61
600	0.22	-57.90	17.05	130.96	0.03	11.67	0.14	1.52
800	0.14	-71.56	15.56	117.96	0.02	12.01	0.14	4.13
1000	0.09	-79.27	14.16	105.89	0.03	17.49	0.16	-1.25
1200	0.05	-116.50	13.04	95.26	0.04	14.81	0.14	-12.87
1400	0.02	150.79	11.83	83.84	0.03	4.80	0.16	-21.49
1600	0.04	110.36	10.96	75.50	0.04	13.55	0.15	-36.92
1800	0.08	89.48	10.09	66.73	0.04	3.27	0.16	-49.04
2000	0.11	79.67	9.68	57.99	0.04	4.73	0.16	-61.71
2200	0.15	69.28	9.20	48.99	0.04	-0.31	0.17	-81.59
2400	0.17	64.69	8.48	39.20	0.04	0.93	0.18	-92.49
2600	0.20	60.13	7.90	29.75	0.05	-3.44	0.19	-107.06
2800	0.23	58.65	7.46	20.49	0.05	-17.66	0.21	-115.71
3000	0.33	49.52	6.94	20.84	0.05	-10.28	0.25	-150.57
3200	0.35	41.46	7.09	8.48	0.05	-11.71	0.20	-165.05
3400	0.39	37.67	6.88	-0.52	0.05	-24.85	0.20	-179.12
3600	0.43	34.22	6.59	-9.46	0.05	-29.29	0.20	162.43
3800	0.46	29.41	6.33	-18.48	0.05	-35.19	0.20	145.37
4000	0.50	26.20	6.05	-26.42	0.05	-30.36	0.22	128.25
4200	0.51	20.46	5.72	-35.34	0.05	-44.00	0.25	114.89
4400	0.51	14.44	5.43	-44.47	0.05	-46.41	0.28	102.49
4600	0.51	12.35	5.06	-52.18	0.06	-44.22	0.32	93.02
4800	0.49	4.17	4.80	-62.77	0.05	-66.11	0.37	92.21
5000	0.46	-0.90	4.57	-70.45	0.05	-75.84	0.42	85.91
5200	0.41	-10.03	4.51	-79.65	0.05	-80.46	0.46	79.17
5400	0.38	-18.60	4.15	-88.91	0.05	-86.88	0.50	72.00
5600	0.35	-26.00	4.05	-98.98	0.04	-93.12	0.54	63.28
5800	0.33	-34.90	3.78	-110.97	0.04	-122.88	0.55	54.96
6000	0.32	-45.78	3.63	-115.93	0.04	-136.64	0.56	45.62

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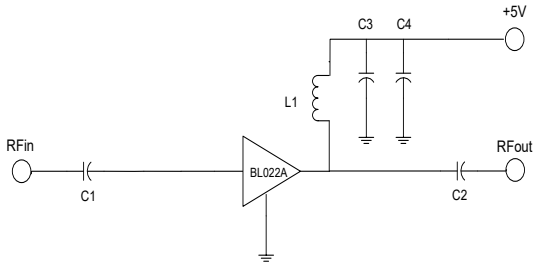
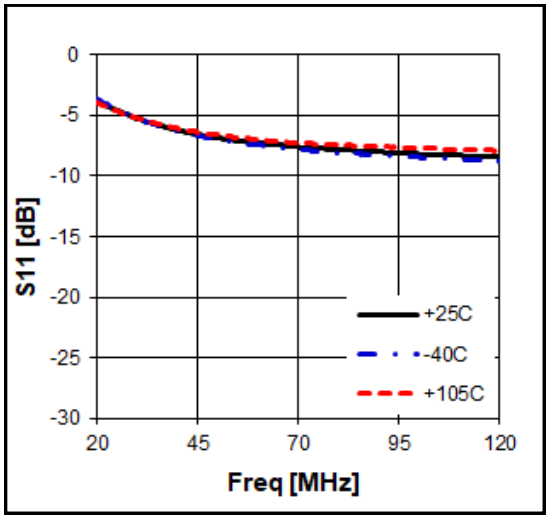
Preliminary Datasheet

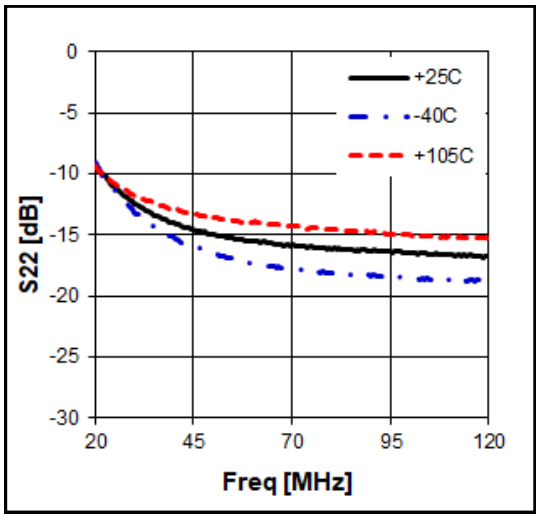
Application Circuit: 70 MHz

Schematic Diagram	BOM		Tolerance
	C1	1nF	± 5%
	C2	1nF	± 5%
	C3	100pF	± 5%
	C4	1nF	± 5%
	L1	680nH	± 5%

Typical Performance

V_d = 5V, I_d = 70mA





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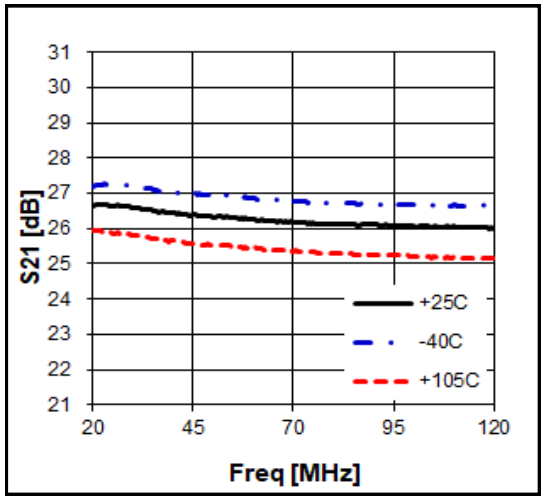
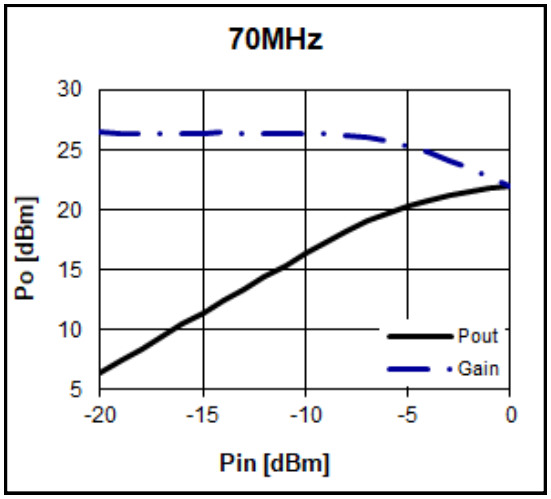
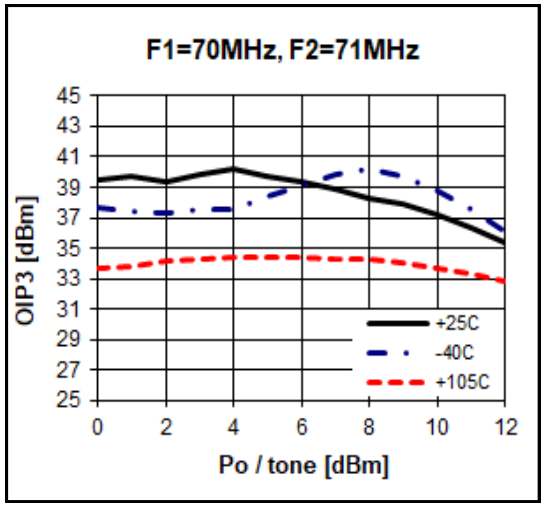
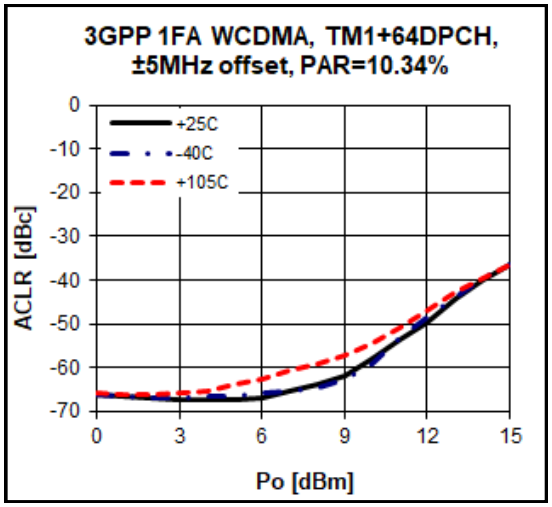
V_d = 5V, I_d = 70mA









Noise Figure Temperature Performance

(Vds = 5.0V, Ids = 70mA)

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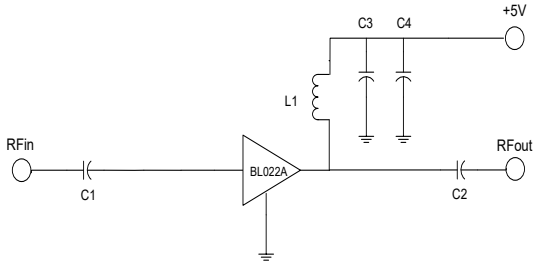
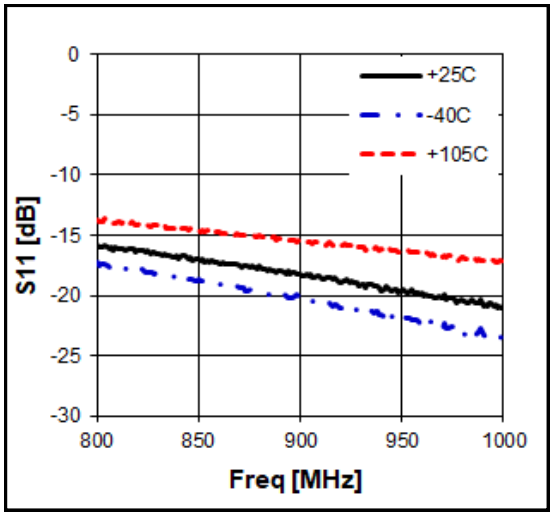
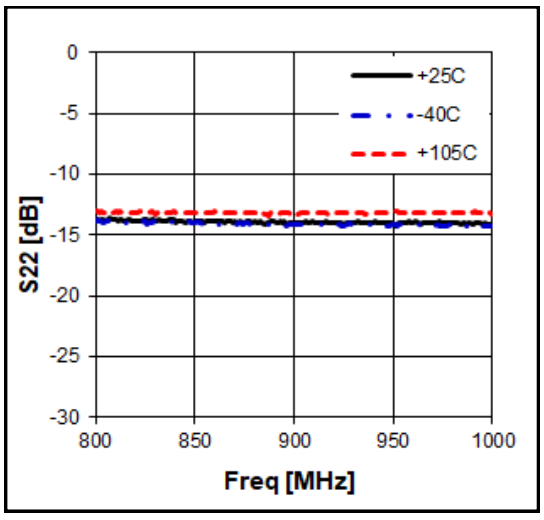
Application Circuit: 900 MHz

Schematic Diagram	BOM		Tolerance
	C1	68pF	± 5%
	C2	68pF	± 5%
	C3	100pF	±5%
	C4	1nF	±5%
	L1	47nH	±5%

Typical Performance

V_d = 5V, I_d = 70mA





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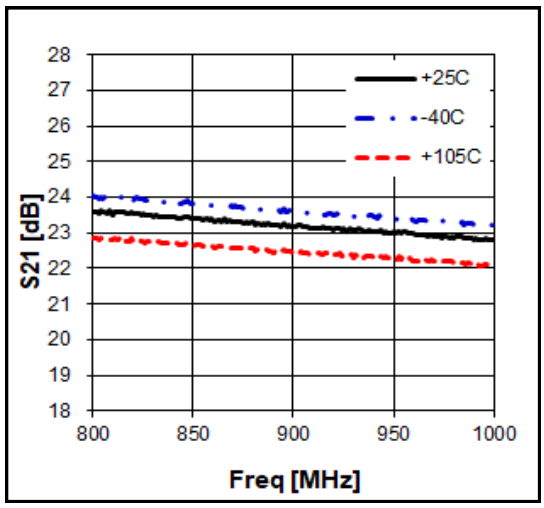
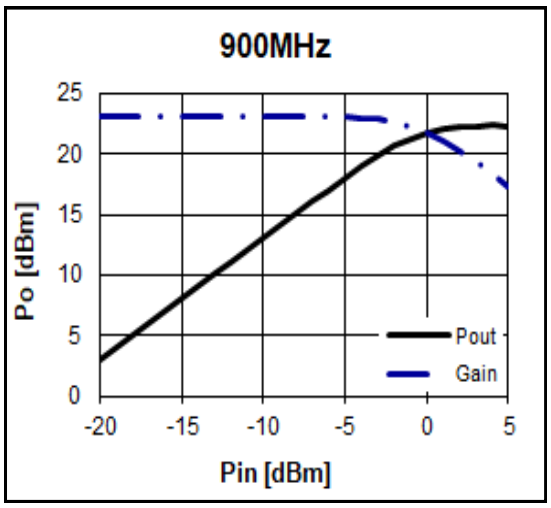
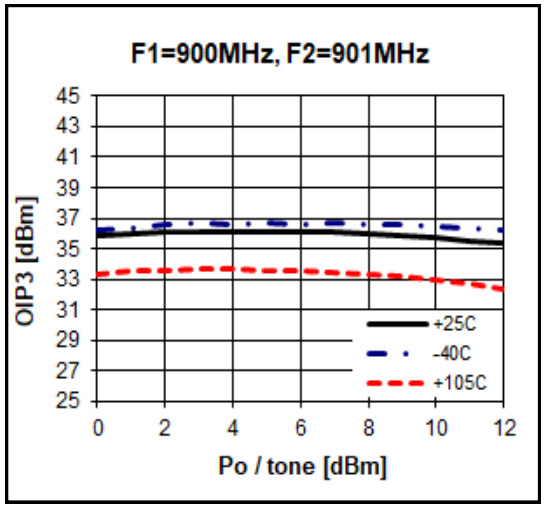
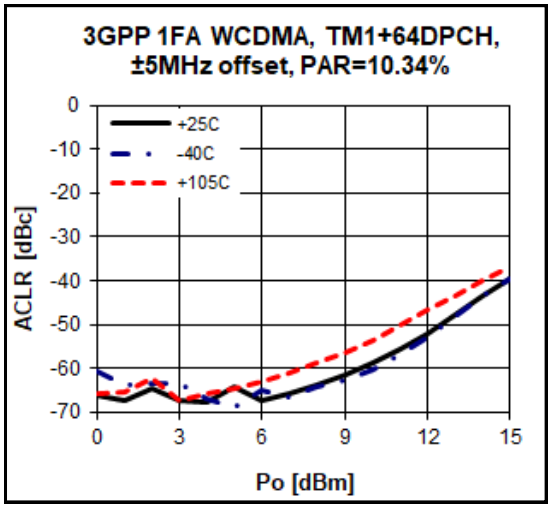
V_d = 5V, I_d = 70mA









Noise Figure Temperature Performance

(Vds = 5.0V, Ids = 70mA)

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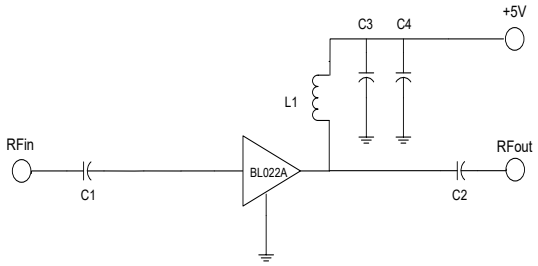
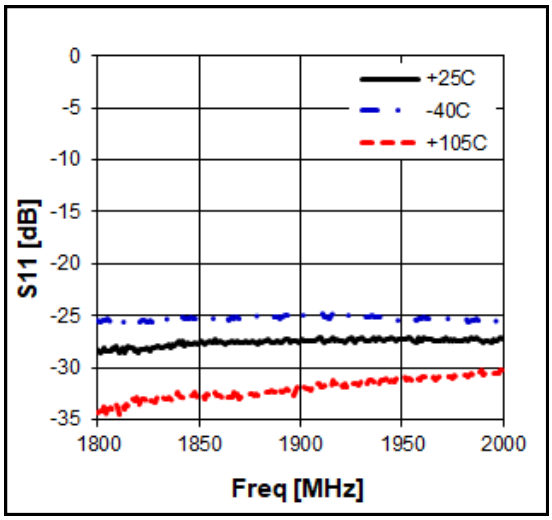
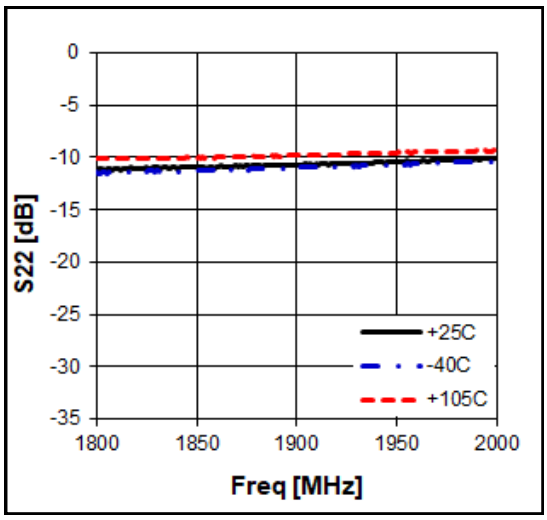
Application Circuit: 1900 MHz

Schematic Diagram	BOM		Tolerance
	C1	47pF	± 20%
	C2	47pF	± 5%
	C3	100pF	±5%
	C4	1nF	±5%
	L1	68nH	±5%

Typical Performance

V_d = 5V, I_d = 70mA





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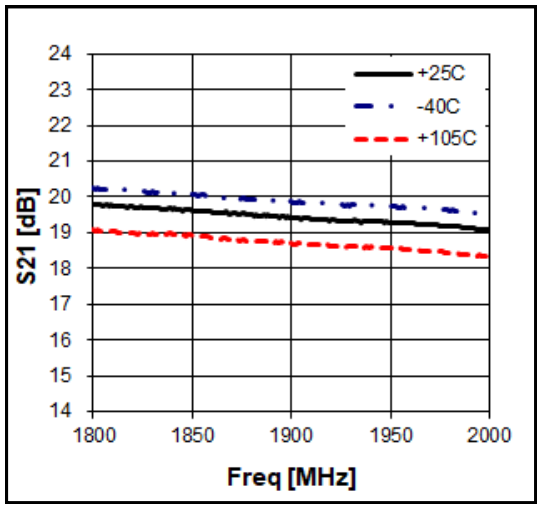
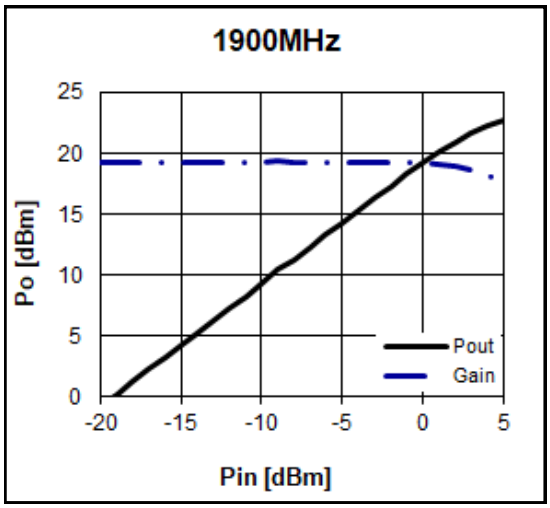
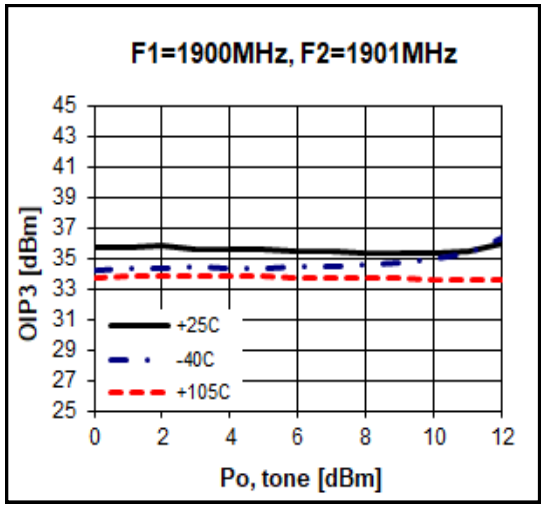
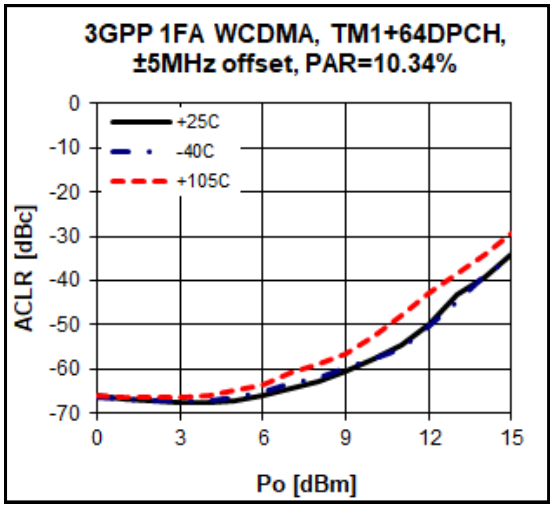
V_d = 5V, I_d = 70mA









Noise Figure Temperature Performance

(Vds = 5.0V, Ids = 70mA)

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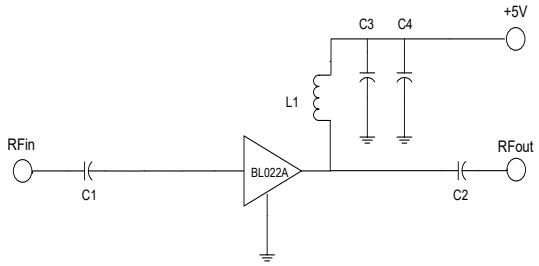
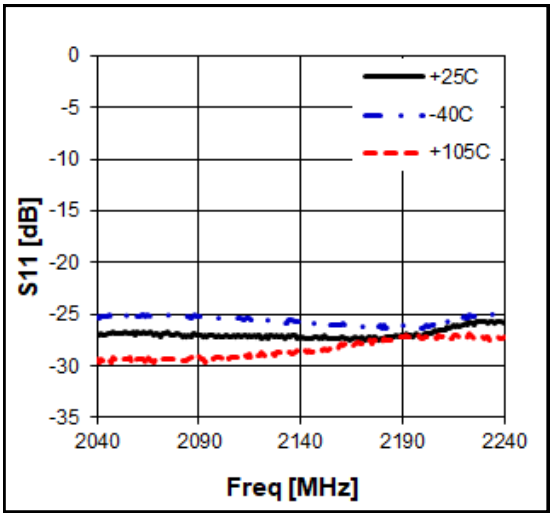
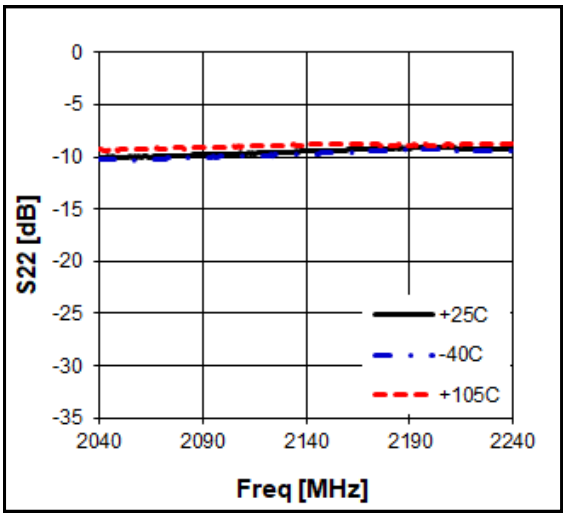
Application Circuit: 2140 MHz

Schematic Diagram	BOM		Tolerance
	C1	47pF	± 5%
	C2	47pF	± 5%
	C3	100pF	± 5%
	C4	1nF	± 5%
	L1	68nH	± 5%

Typical Performance

V_d = 5V, I_d = 70mA





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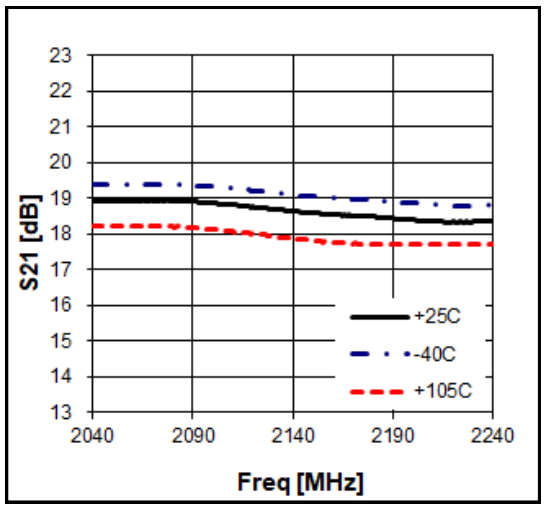
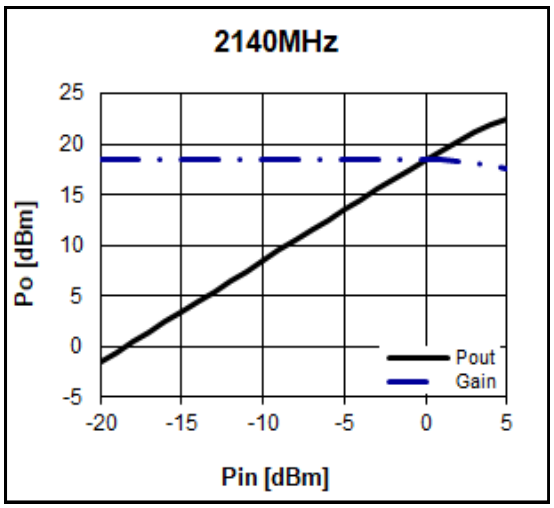
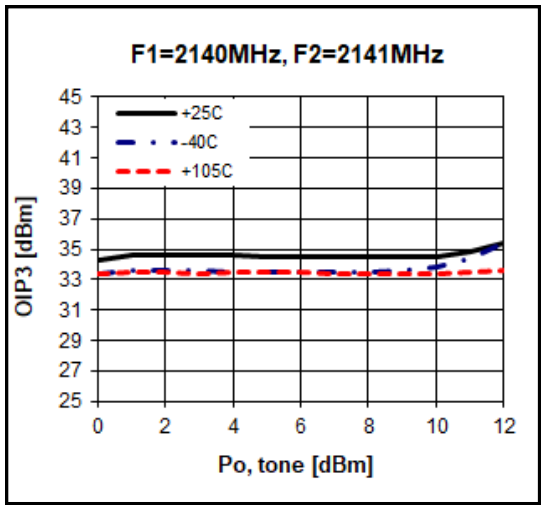
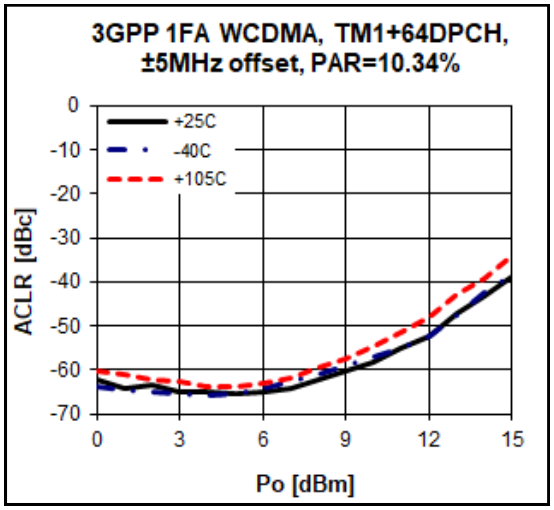
V_d = 5V, I_d = 70mA









Noise Figure Temperature Performance

(Vds = 5.0V, Ids = 70mA)

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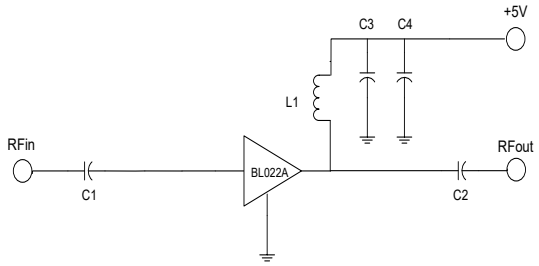
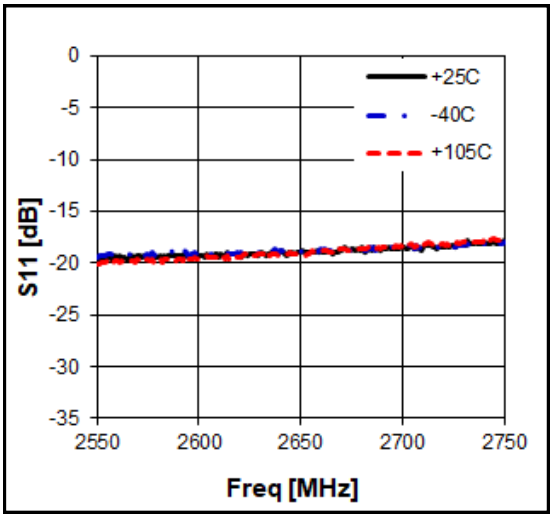
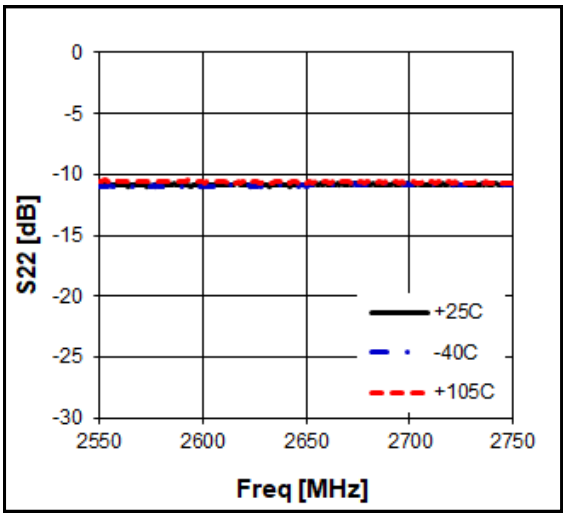
Application Circuit: 2650 MHz

Schematic Diagram	BOM		Tolerance
	C1	33pF	± 5%
	C2	33pF	± 5%
	C3	100pF	± 5%
	C4	1nF	± 5%
	L1	27nH	± 5%

Typical Performance

V_d = 5V, I_d = 70mA





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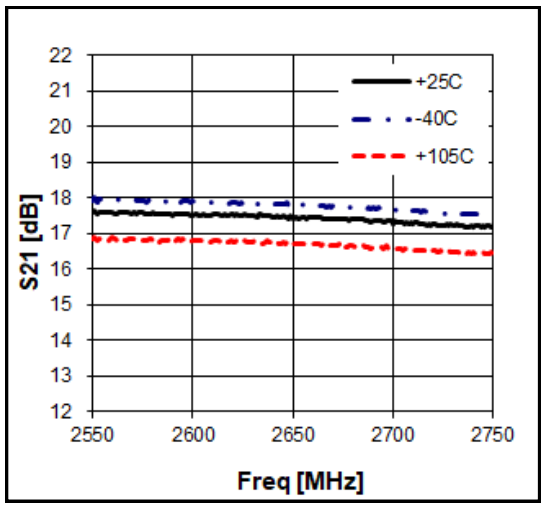
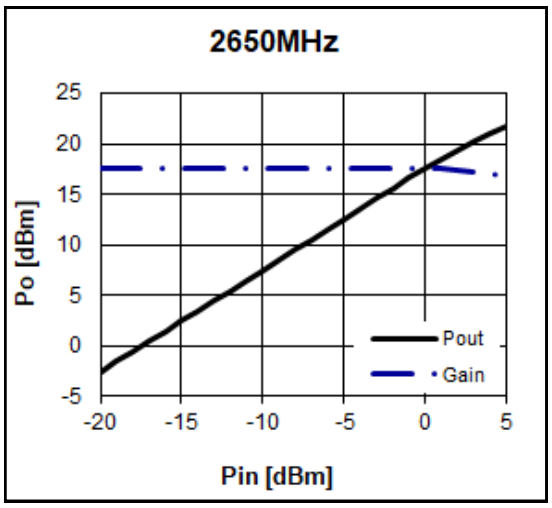
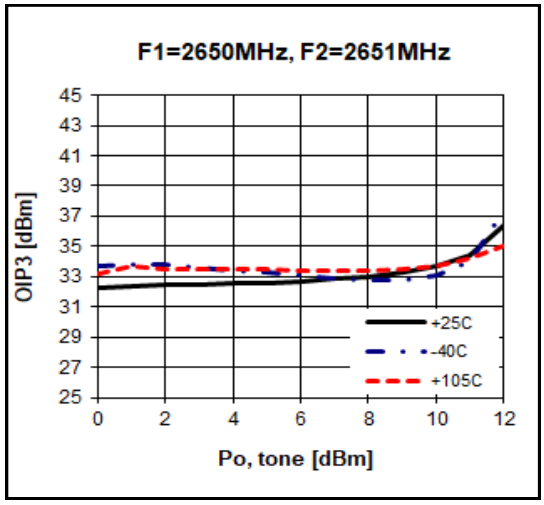
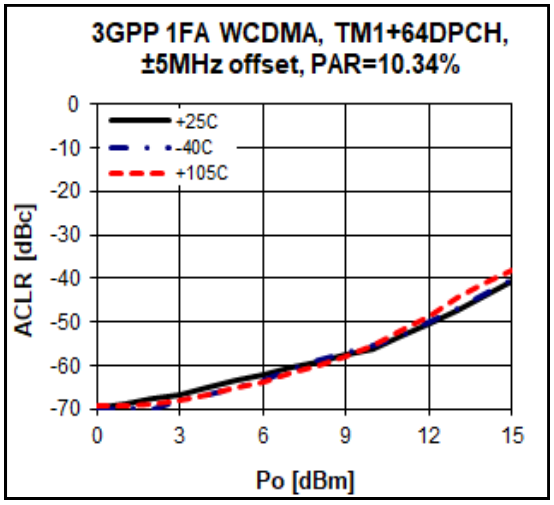
Preliminary Datasheet

V_d = 5V, I_d = 70mA









Noise Figure Temperature Performance

(Vds = 5.0V, Ids = 70mA)

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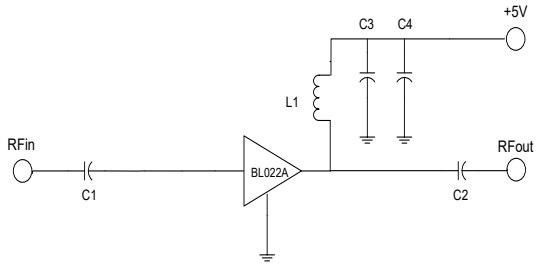
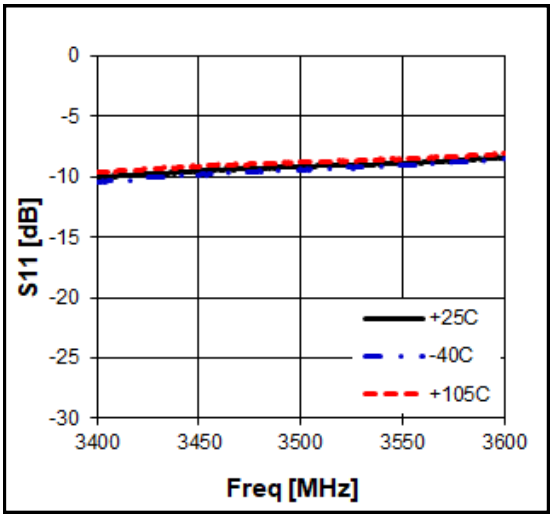
Preliminary Datasheet

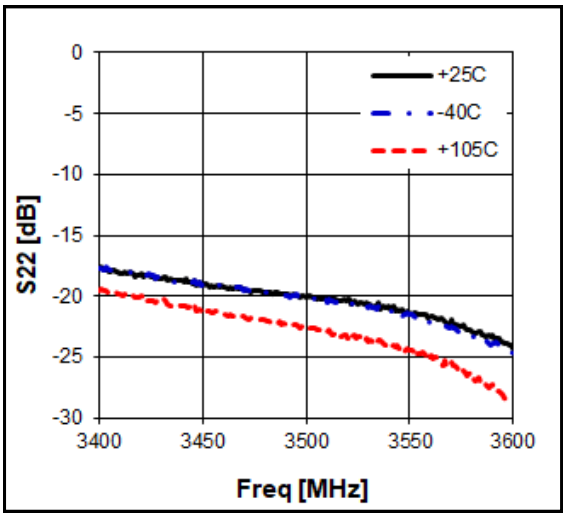
Application Circuit: 3500 MHz

Schematic Diagram	BOM		Tolerance
	C1	10pF	± 5%
	C2	22pF	± 5%
	C3	100pF	± 5%
	C4	1nF	± 5%
	L1	22nH	± 5%

Typical Performance

V_d = 5V, I_d = 70mA





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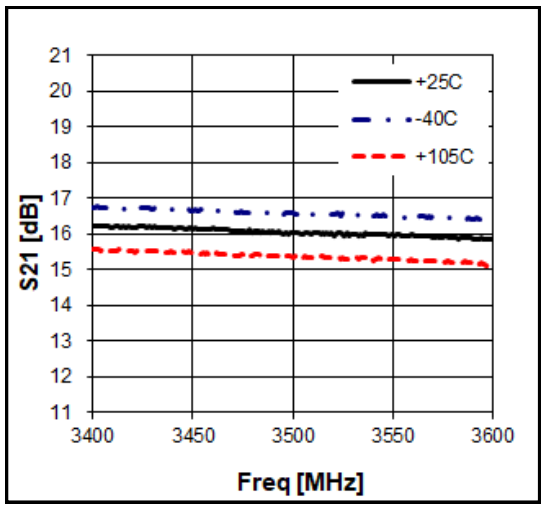
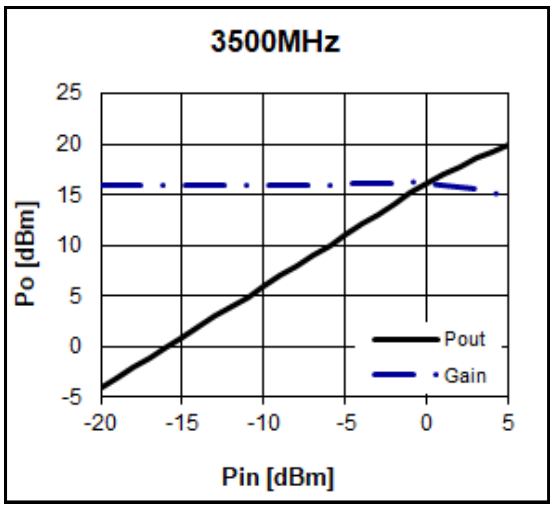
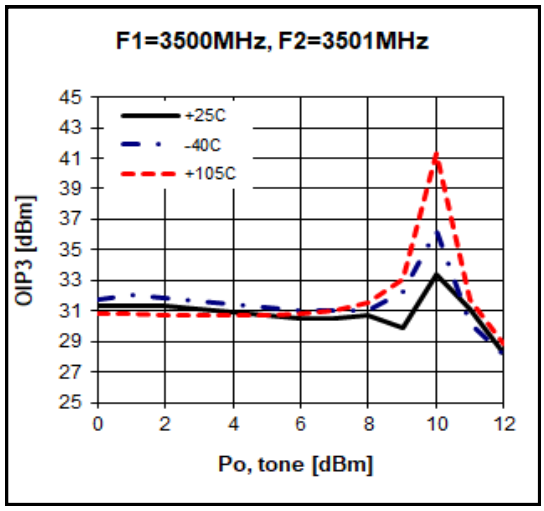
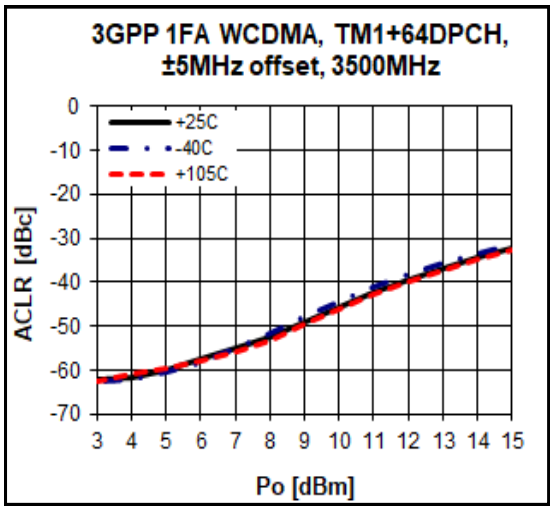
Preliminary Datasheet

V_d = 5V, I_d = 70mA









Noise Figure Temperature Performance

(Vds = 5.0V, Ids = 70mA)

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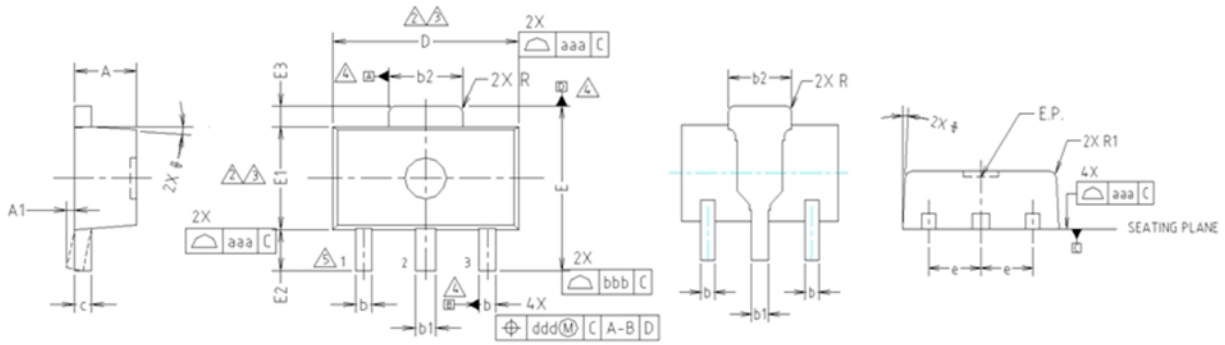
Preliminary Datasheet



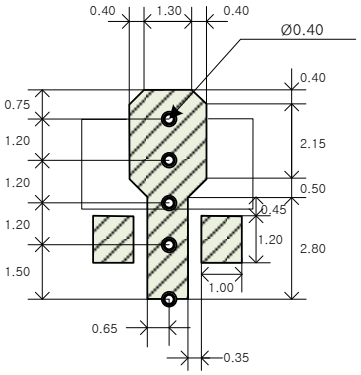
NOTE:

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 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.
4. DATUMS A, B AND D TO BE DETERMINED 0.18mm 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	

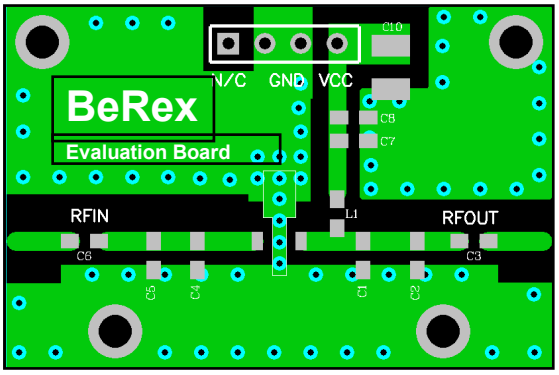
PCB Land Pattern



Note : All dimension _ millimeters

PCB lay out _ on BeRex website

PCB Mounting



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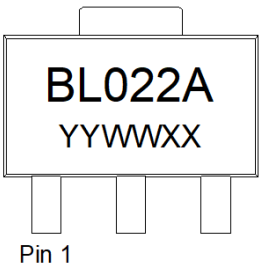
Preliminary Datasheet

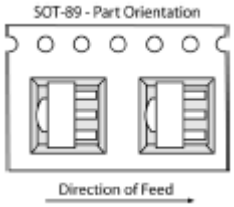
Package Marking



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 1A
Value:	**Passes <500V**
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114B
MSL Rating:	**Level 3 at +265°C convection reflow**
Standard:	JEDEC Standard J-STD-020

NATO CAGE code:

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

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