

Device Features

- Gain = 14.8 dB @ 900MHz
- OIP3 = 40.8 dBm @ 900 MHz
- Output P1 dB = 22.2 dBm @ 900 MHz
- N.F = 1.95dB @ 900 MHz
- Internally matched to 50 ohms
- Green/RoHS2 Compliant DFN 8L 2x2 Package



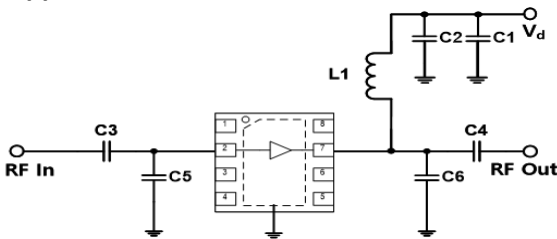
Product Description

The BBA31 is a BroadBand, GaAs E-pHEMT Amplifier that is ideal for applications demanding high linearity and gain flatness in a bandwidth of 50-5000 MHz. The BBA31 is internally matched to 50 Ohms and requires no external matching components. It is available in RoHS2-compliant DFN 8L 2x2 mm² Surface mount package. These devices are 100% DC and RF tested to assure quality and performance.

Applications

- Repeaters
- Mobile Infrastructure
- Defense/Aerospace
- LTE / WCDMA / EDGE / CDMA
- General Purpose Wireless
- IF amplifier, RF driver amplifier

Applications Circuit



BOM@GHz	0.05~1.5	0.5~3.0	3.0~5.0
C1	1uF	1uF	1uF
C2	100pF	100pF	100pF
C3	2.2nF	100pF	22pF
C4	2.2nF	100pF	22pF
L1	1uH	22nH	1.0nH
C5	-	-	0.5pF
C6	-	-	0.75pF

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		50		5000	MHz
Test Frequency			900		MHz
Gain		13.7	14.8		dB
Input Return Loss			-14.9		dB
Output Return Loss			-13.0		dB
Output IP3	5 dBm / tone , Δf=1 MHz	37.8	40.8		dBm
Output P1dB		21.2	22.2		dBm
LTE 20M ACLR*		11.9	12.9		dBm
Noise Figure			1.95	2.15	dB

*ACLR Channel Power measured at -50dBc.

- LTE set-up: 3GPP LTE, FDD E-TM3.1, 20MHz BW, ±20MHz offset, PAR 9.75 at 0.01% Prob.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Bandwidth	50		5000	MHz
I _d @ (V _d = 5V)	80	100	120	mA
V _d	4.75	5.0	5.25	V
dG/dT		-0.003		dB/°C
R _{TH}		40.1		°C/W
Operating Case Temperature	-40		+105	°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	+7	V
Supply Current	190	mA
Input RF Power	20	dBm

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

Typical Performance (Vd=5V, Id=100mA, T=25°C)

Parameter	Frequency								Unit
	100	900	1800	2140	2650	3500	4500	MHz	
Gain	15.0	14.8	14.8	14.6	14.5	14.5	15.5	dB	
S11	-19.0	-14.9	-21.7	-21.0	-12.2	-13.1	-13.3	dB	
S22	-17.8	-13.0	-24.0	-21.7	-11.8	-12.1	-14.1	dB	
OIP3	40.1	40.8	39.2	37.9	36.8	37.4	30.5	dBm	
P1dB	21.8	22.2	21.8	20.8	20.1	20.9	16.9	dBm	
LTE 20M ACLR*	13.4	12.9	11.8	11.1	10.5	-	-	dBm	
5G NR ACLR*	-	-	-	-	-	10.6	5.7	dBm	
Noise Figure	1.8	1.9	2.1	2.3	2.3	2.4	3.7	dB	

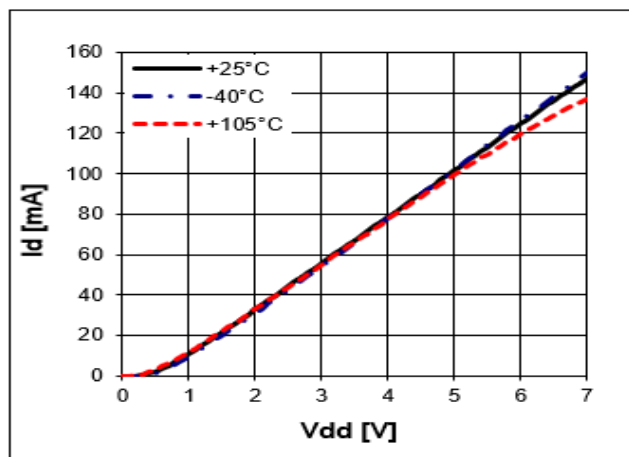
*ACLR Channel Power measured at -50dBc.

- LTE set-up: 3GPP LTE, FDD E-TM3.1, 20MHz BW, ±20MHz offset, PAR 9.75 at 0.01% Prob.

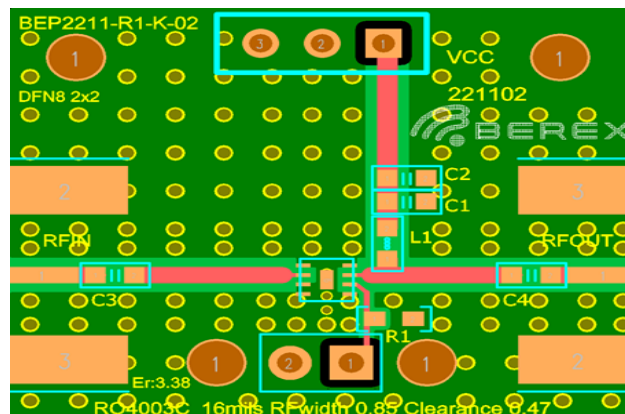
- 5G set-up: 3GPP 5G NR, 100MHz BW, ±100MHz offset, PAR 9.5 at 0.01% Prob.

- See "Application Note" on page 1 for 3.5 GHz & 4.5 GHz tuning points

V-I Characteristics

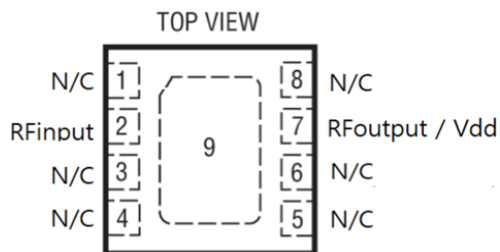


Evaluation Board



*Dielectric constant _ 3.38 *RF pattern width 0.85T *16mil thick

Pin Configuration



DC PACKAGE
8-LEAD (2mm × 2mm) PLASTIC DFN
EXPOSED PAD (PIN 9) IS GND, MUST BE SOLDERED TO PCB

Pin No.	Name	Description
2	RFin	RFin pin.
7	RFout	RFout / V _{dd} pin. Supply
1,3,4, 5,6,8	NC	No internal connection to die. May be connected to ground.
9	Backside Paddle	Exposed Pad is RF/DC ground, must be soldered to PCB.

Wideband Performance (V_d=5V, I_d=100mA, T=25°C)

Parameter	Frequency						Unit
	50	100	250	500	900	1500	
Gain	15.3	15.0	14.9	14.9	14.8	14.4	dB
S11	-14.2	-19.0	-21.6	18.8	-24.3	-26.4	dB
S22	-18.7	-17.8	-17.6	-15.9	-19.0	-17.5	dB
OIP3	36.8	40.0	40.7	40.7	39.2	37.7	dBm
P1dB	21.7	21.8	21.9	22.0	21.9	21.2	dBm
LTE 20M ACLR*	-	13.4	13.5	13.4	12.9	11.9	dBm
Noise Figure	1.7	1.8	2.1	2.0	1.9	2.1	dB

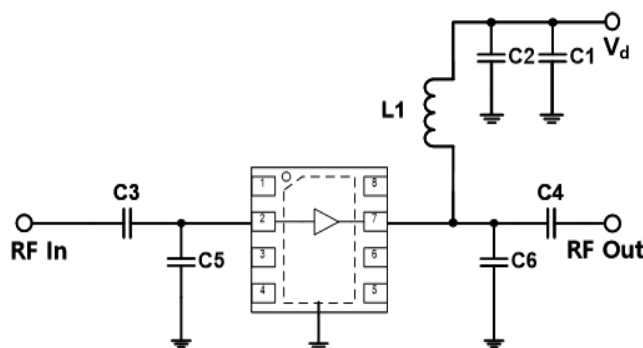
Parameter	Frequency						Unit
	500	900	1800	2140	2650	3500	
Gain	14.4	14.8	14.8	14.6	14.5	13.6	dB
S11	-12.2	-14.9	-21.7	-21.0	-12.2	-7.1	dB
S22	-10.0	-13.0	-24.0	-21.7	-11.8	-6.3	dB
OIP3	39.3	40.8	39.2	37.9	36.8	35.0	dBm
P1dB	21.4	22.2	21.8	20.8	20.1	19.3	dBm
LTE 20M ACLR*	12.7	12.8	11.8	11.1	10.5	-	dBm
5G NR ACLR*	-	-	-	-	-	9.5	dBm
Noise Figure	1.9	1.9	2.1	2.3	2.3	2.7	dB

Parameter	Frequency			Unit
	3500	4500	5000	
Gain	14.5	15.5	13.5	dB
S11	-13.1	-13.3	-5.0	dB
S22	-12.1	-14.1	-6.0	dB
OIP3	37.4	30.5	26.7	dBm
P1dB	20.9	16.9	12.2	dBm
5G NR ACLR*	10.6	5.7	1.6	dBm
Noise Figure	2.4	3.7	4.9	dB

*ACLR Channel Power measured at -50dBc.

- LTE set-up: 3GPP LTE, FDD E-TM3.1, 20MHz BW, ±20MHz offset, PAR 9.75 at 0.01% Prob.

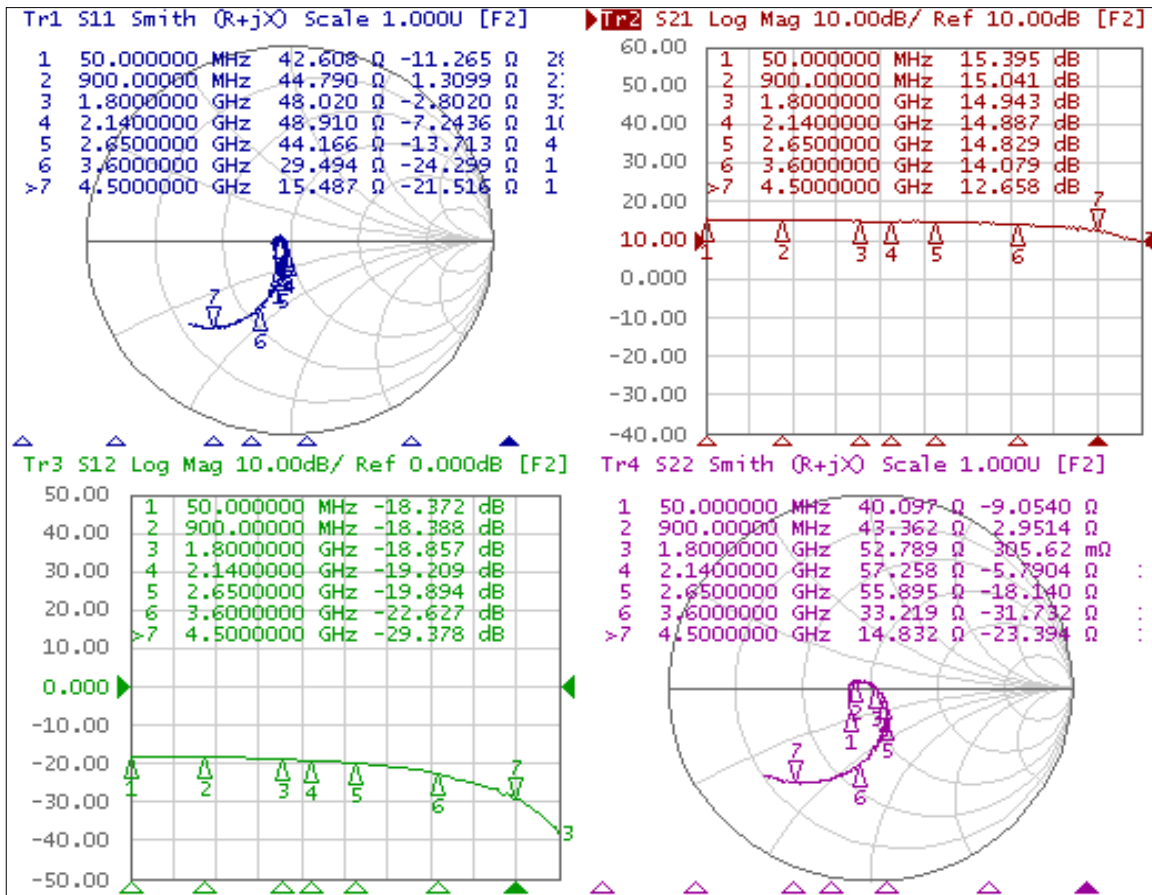
- 5G set-up: 3GPP 5G NR, 100MHz BW, ±100MHz offset, PAR 9.5 at 0.01% Prob.



BOM@GHz	0.03~1.5	0.5~3.5	3.5~5.0	Remark
C1	1uF	1uF	1uF	0603
C2	100pF	100pF	100pF	0603
C3	2.2nF	100pF	22pF	0603
C4	2.2nF	100pF	22pF	0603
L1	1uH	22nH	1.0nH	0603
C5	-	-	0.5pF	0603
C6	-	-	0.75pF	0603

Typical Device Data

S-parameters ($V_d=5V, I_d=100mA, T=25^\circ C$)



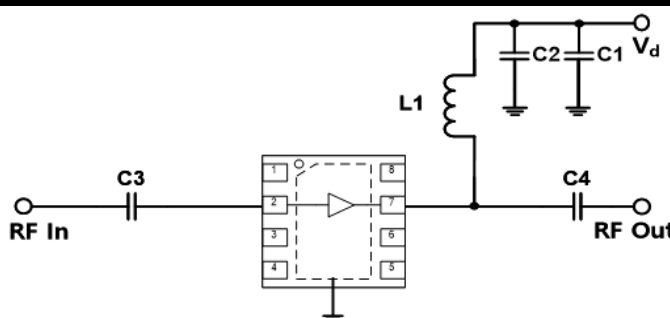
S-Parameter

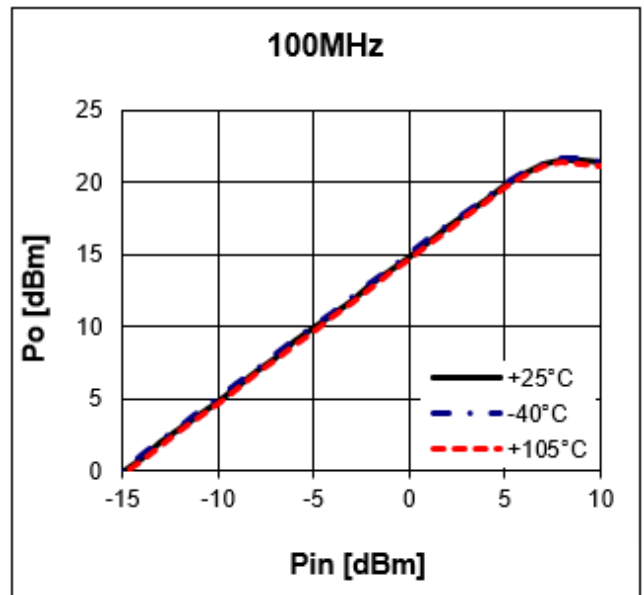
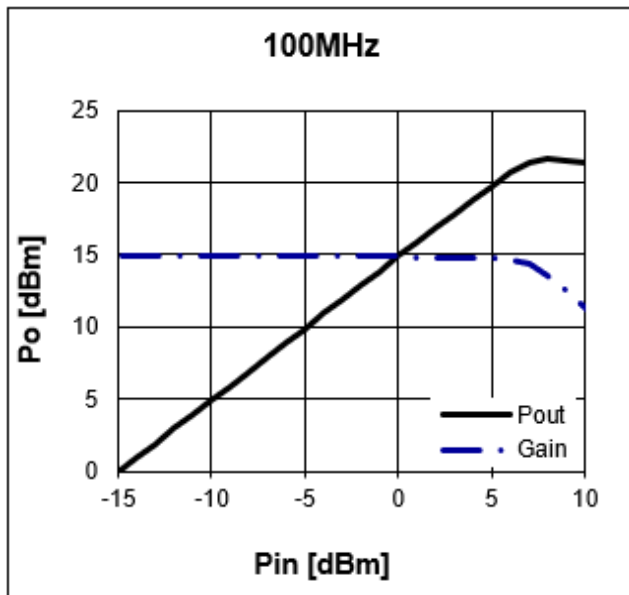
($V_{device} = 5.0V, I_d = 100mA, T = 25^\circ C$, calibrated to device leads)

Freq [MHz]	S11 [Mag]	S11 [Ang]	S21 [Mag]	S21 [Ang]	S12 [Mag]	S12 [Ang]	S22 [Mag]	S22 [Ang]
200	0.07	-162.53	5.64	170.31	0.12	-2.12	0.10	-169.33
400	0.07	-179.30	5.60	165.26	0.12	-6.70	0.10	-172.86
900	0.05	-164.84	5.65	149.22	0.12	-15.13	0.07	-154.10
1900	0.04	-113.24	5.55	113.70	0.11	-36.58	0.04	-22.19
2100	0.07	-104.17	5.56	106.90	0.11	-38.70	0.05	-23.69
2800	0.18	-103.99	5.46	79.80	0.09	-57.97	0.20	-68.02
3600	0.38	-113.07	5.06	46.96	0.07	-82.97	0.40	-96.90
4400	0.56	-126.90	4.34	9.32	0.04	-106.34	0.58	-123.38
5000	0.65	-139.13	3.01	-14.23	0.01	-143.90	0.69	-139.08

Preliminary Datasheet

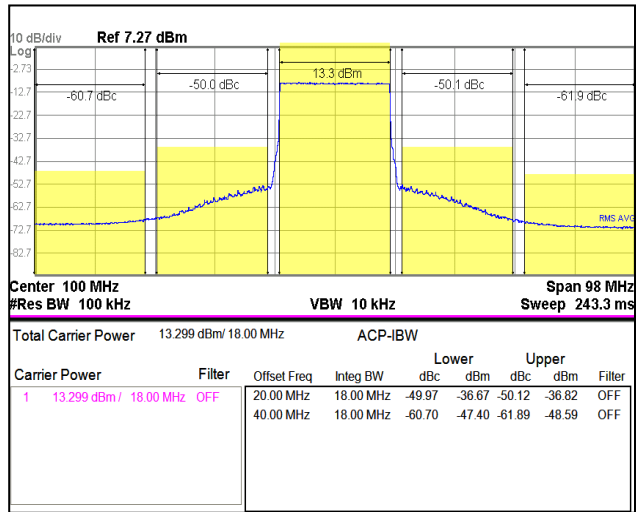
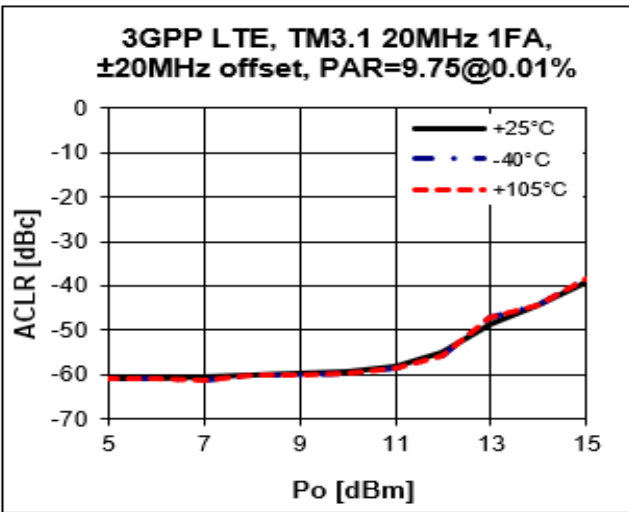
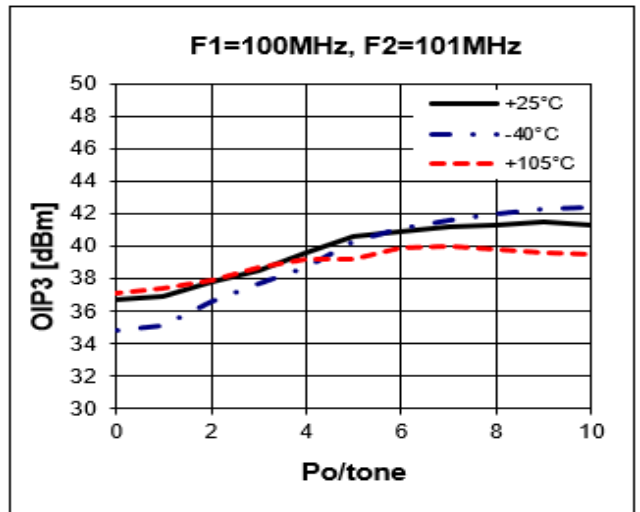
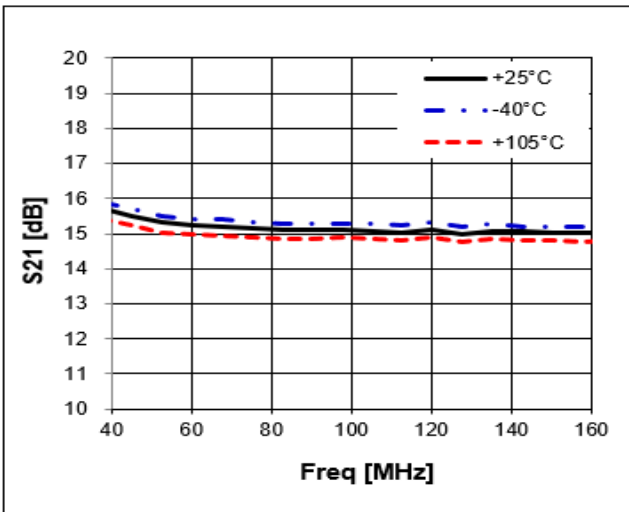
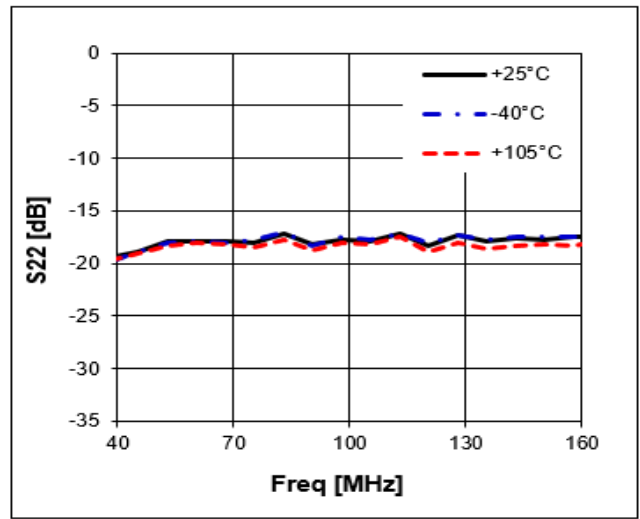
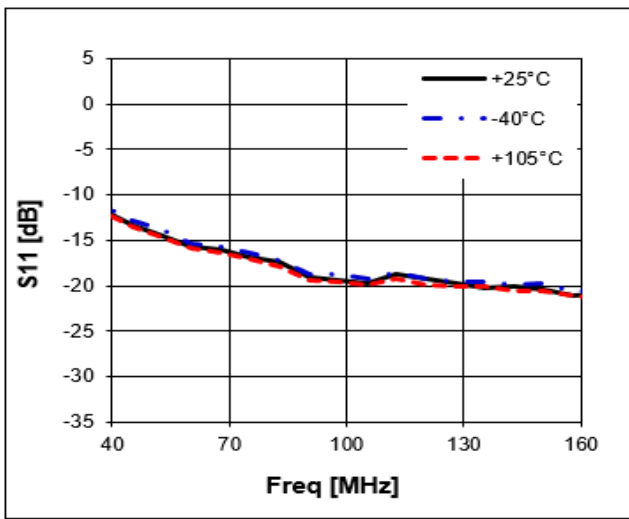
Application Circuit: 100 MHz

Schematic Diagram	BOM		Size
	C1	1uF	0603
	C2	100F	0603
	C3	2.2nF	0603
	C4	2.2nF	0603
	L1	1uH	0603
	U1	BBA31	DFN 2x2

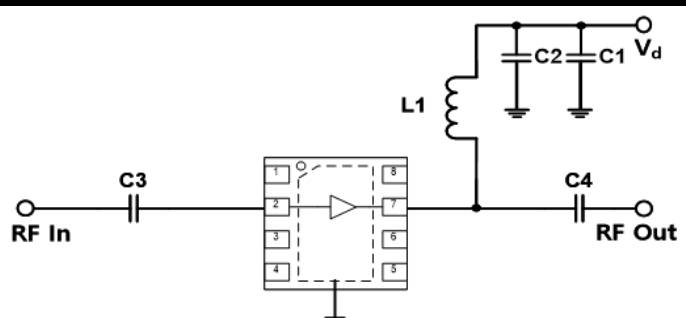
Typical Performance
 (Vd=5V, Id=100mA, T=25°C)


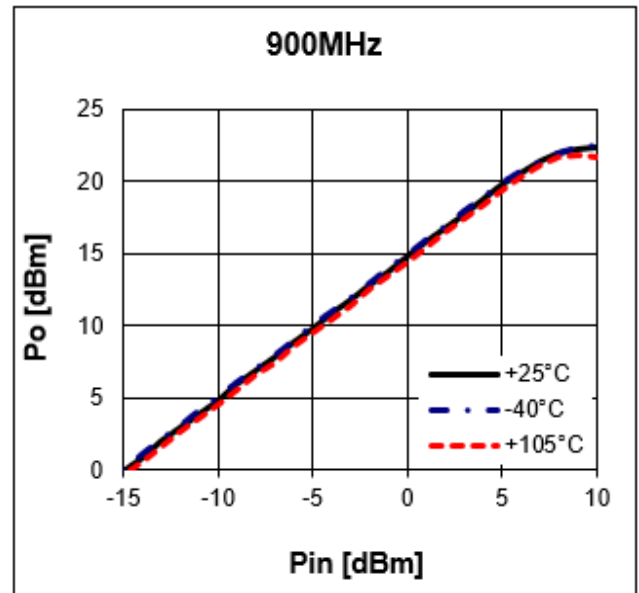
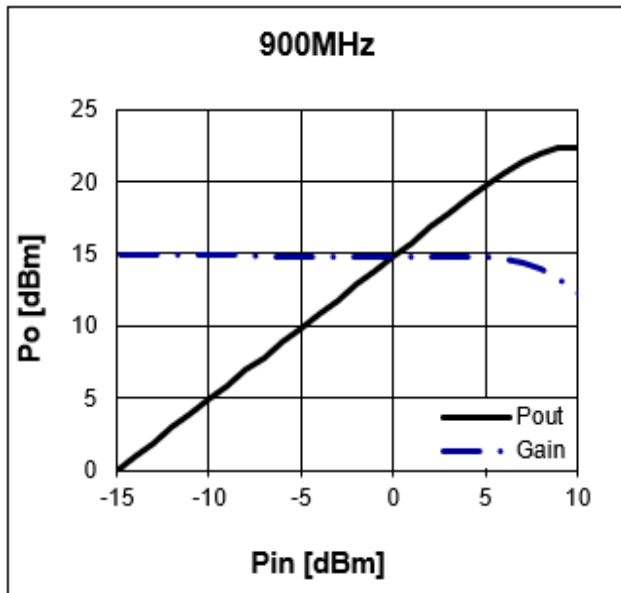
50-5000 MHz Flat Gain BroadBand AMP

Preliminary Datasheet



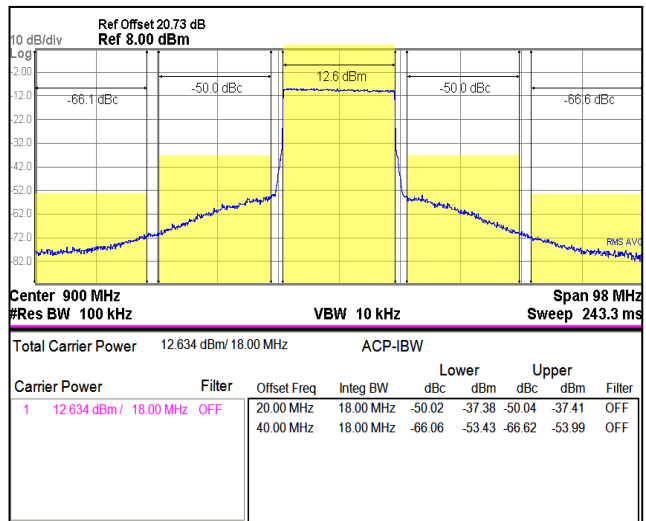
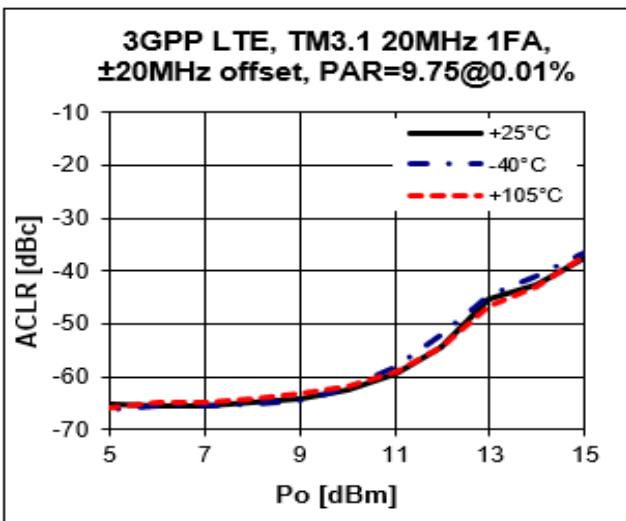
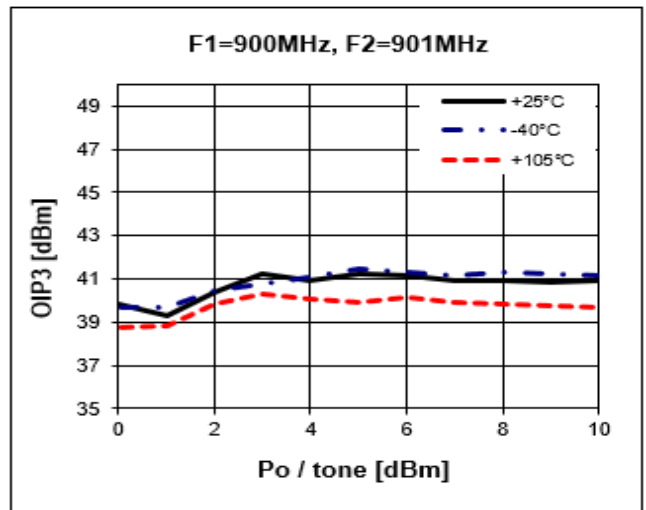
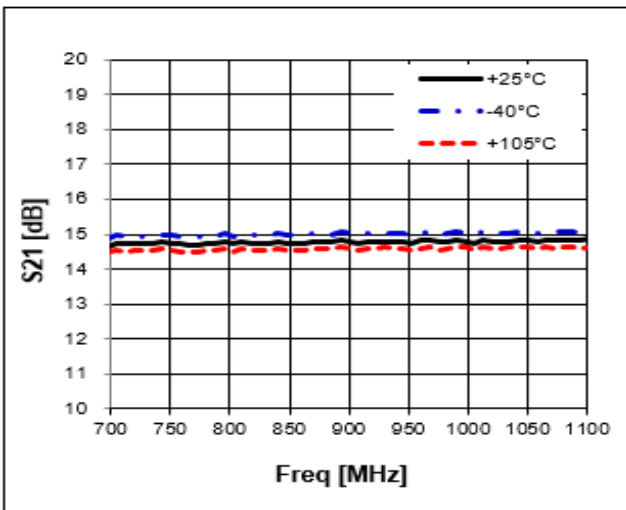
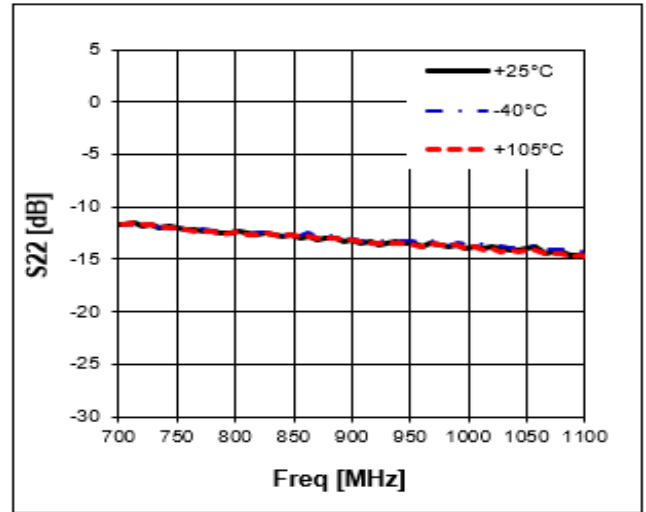
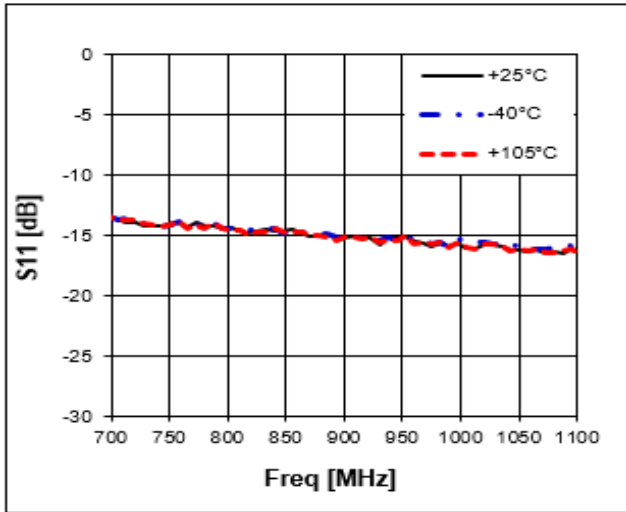
Application Circuit: 900 MHz

Schematic Diagram	BOM		Size
	C1	1uF	0603
	C2	100F	0603
	C3	100F	0603
	C4	100F	0603
	L1	1uH	0603
	U1	BBA31	DFN 2x2

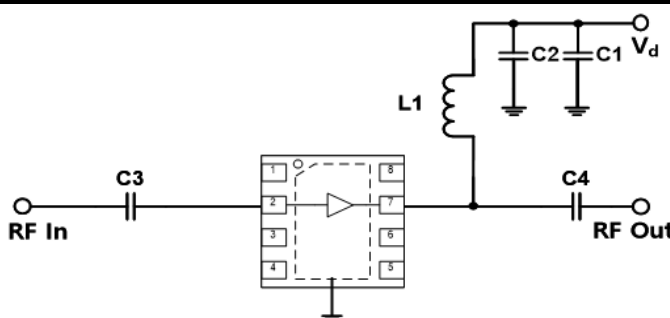
Typical Performance
 (Vd=5V, Id=100mA, T=25°C)


50-5000 MHz Flat Gain BroadBand AMP

Preliminary Datasheet

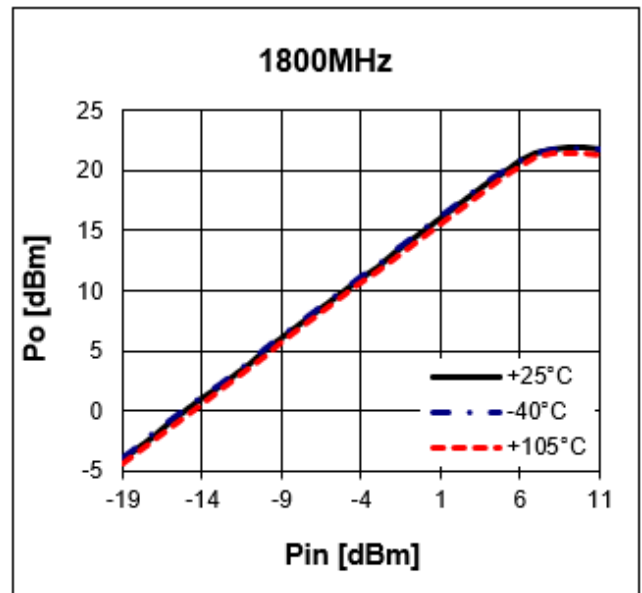
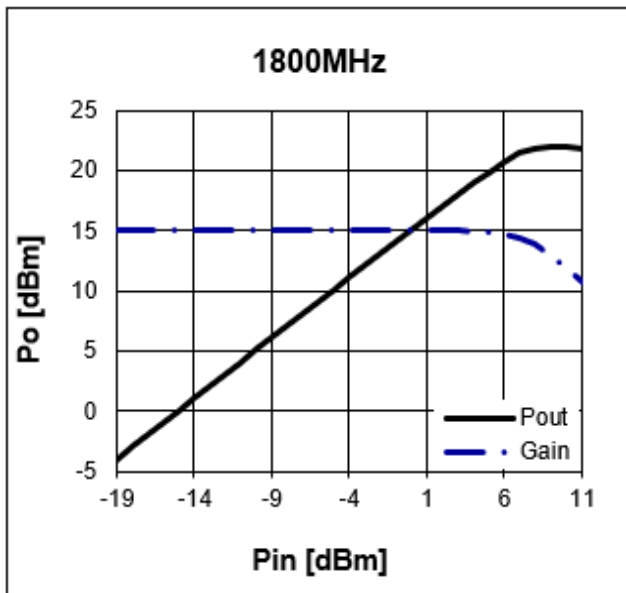


Application Circuit: 1800 MHz

Schematic Diagram	BOM		Size
	C1	1uF	0603
	C2	100F	0603
	C3	100F	0603
	C4	100F	0603
	L1	1uH	0603
	U1	BBA31	DFN 2x2

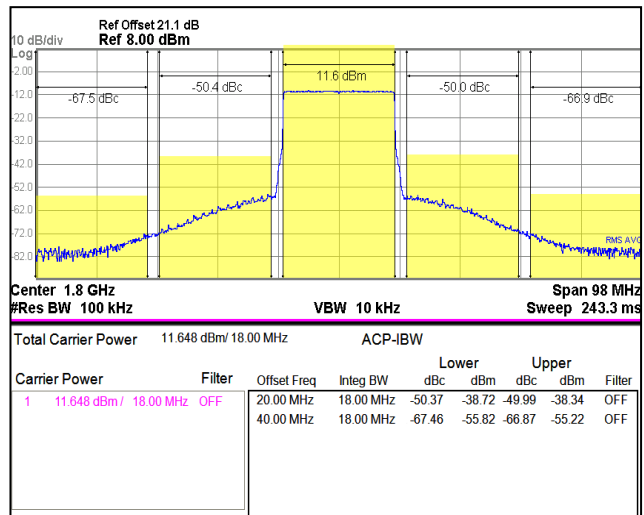
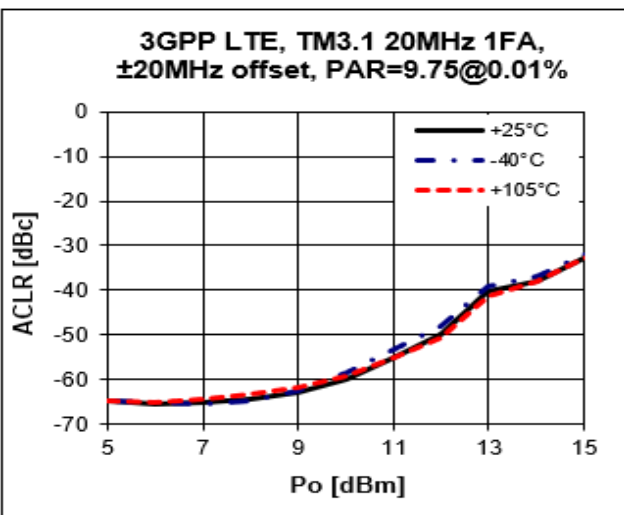
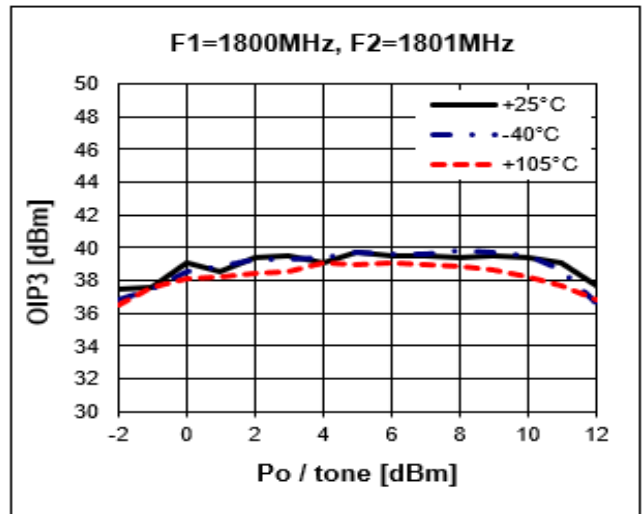
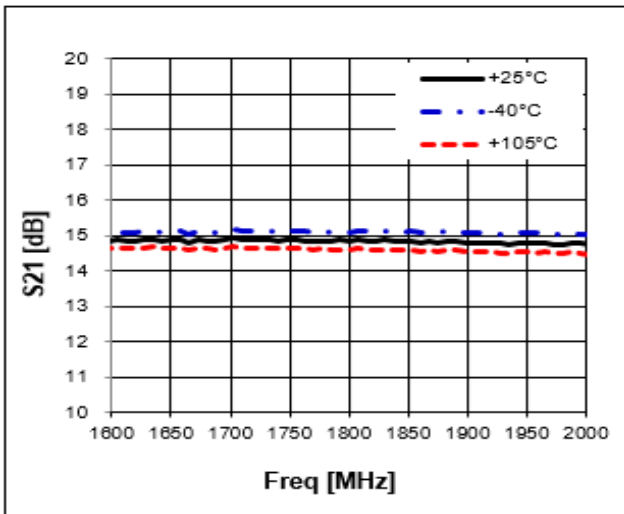
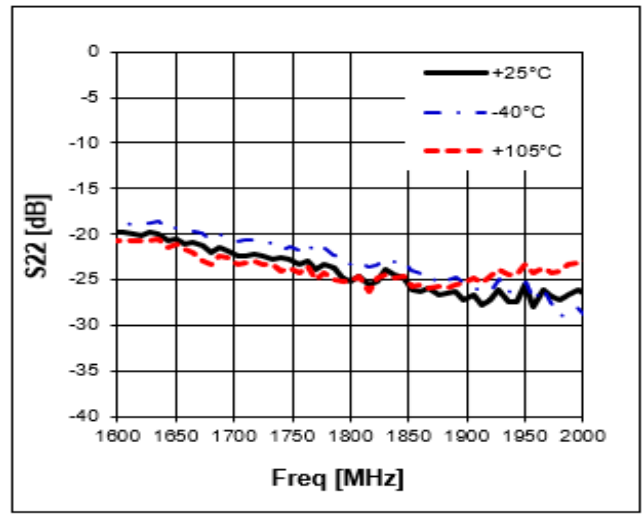
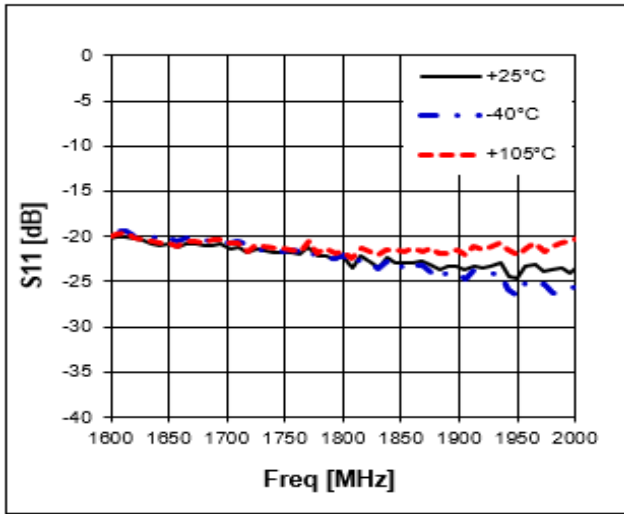
Typical Performance

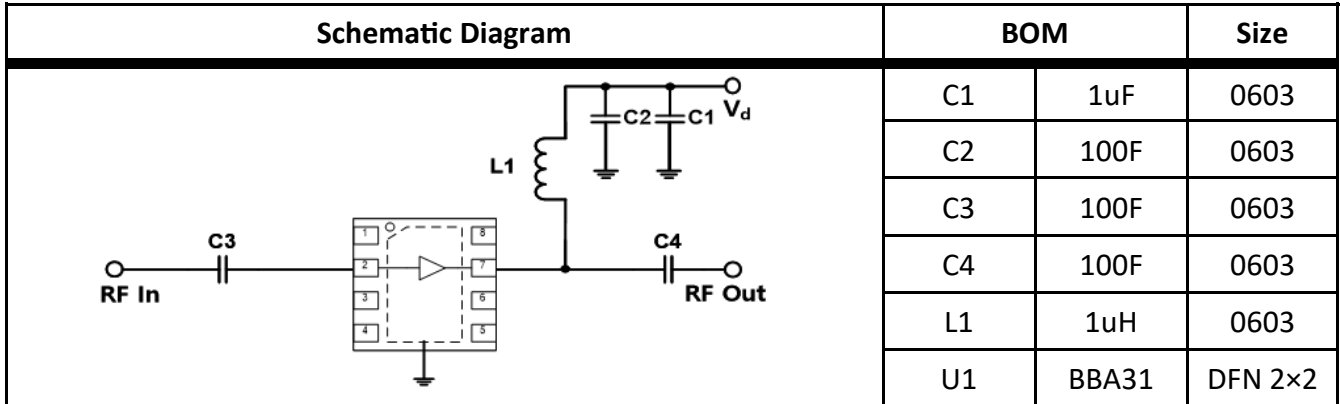
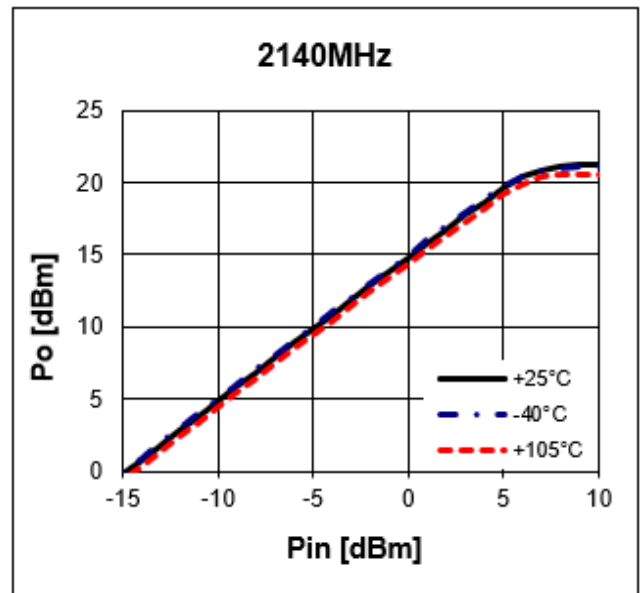
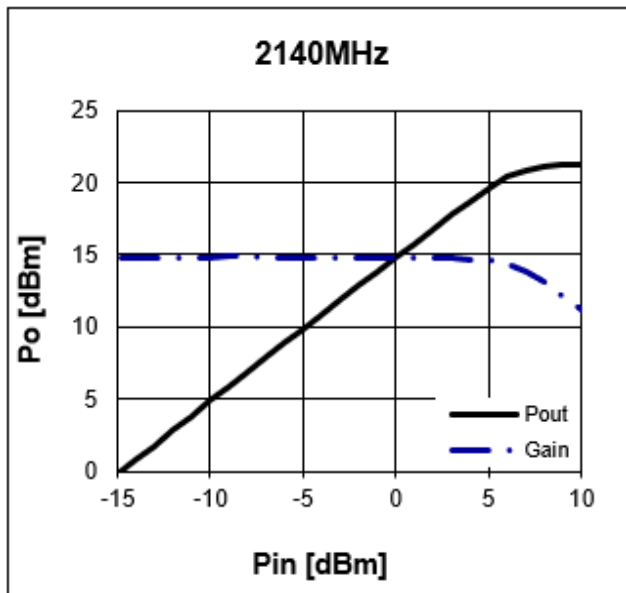
(Vd=5V, Id=100mA, T=25°C)



50-5000 MHz Flat Gain BroadBand AMP

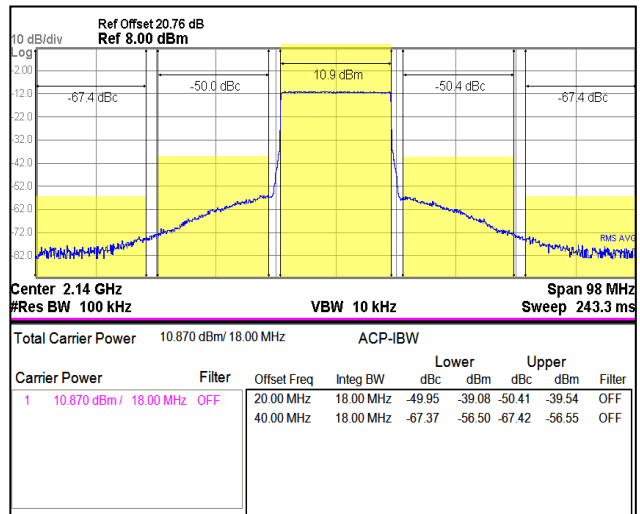
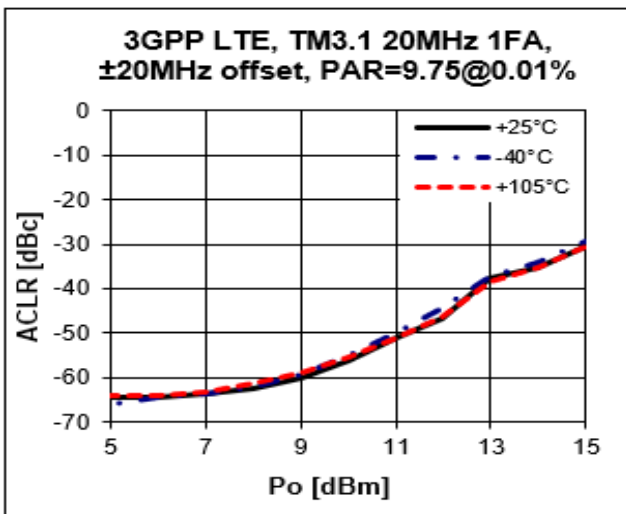
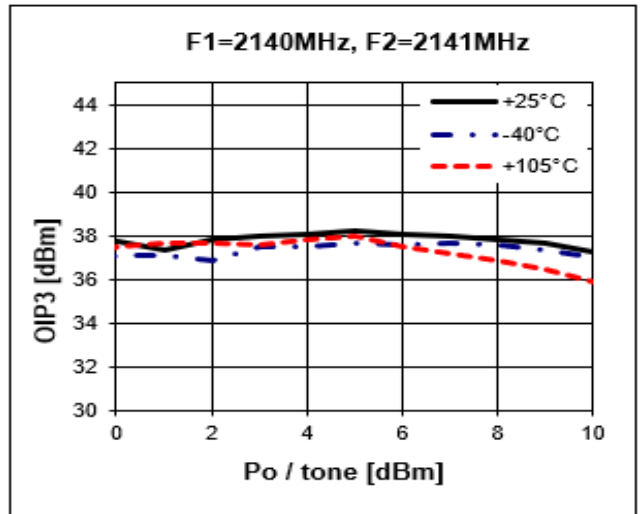
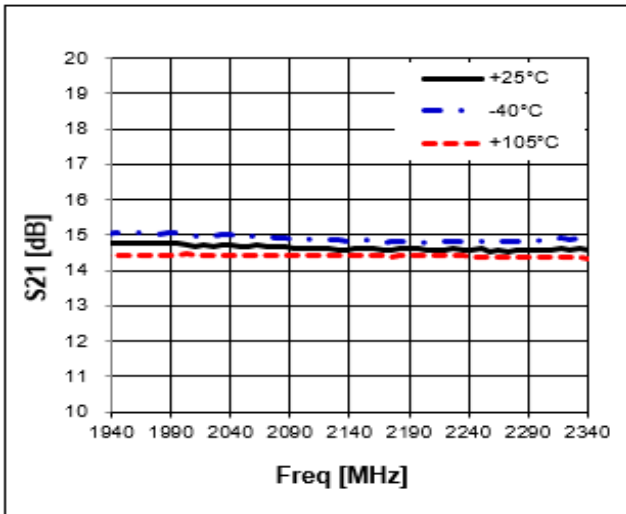
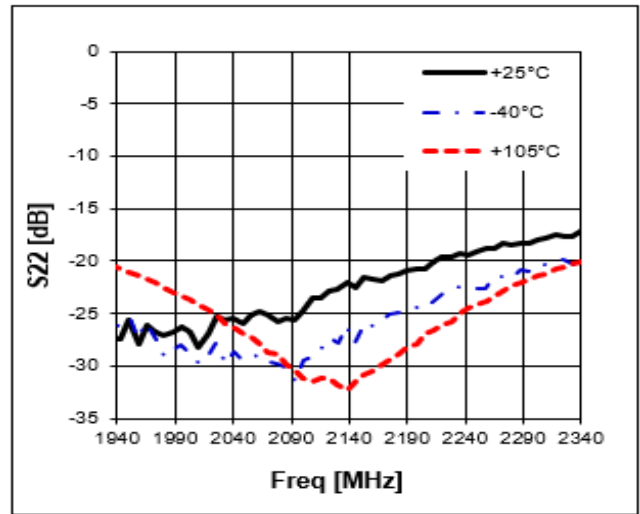
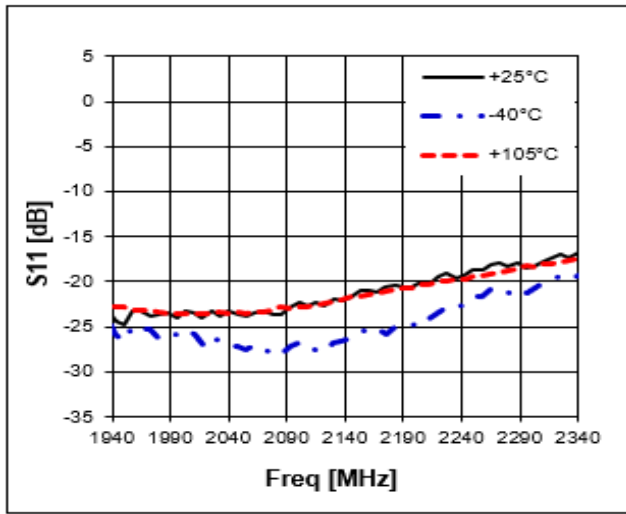
Preliminary Datasheet



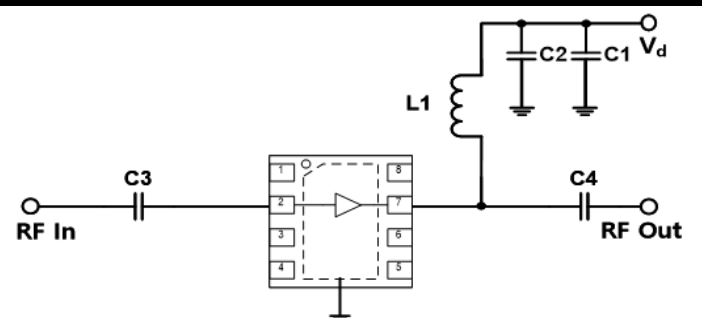
Application Circuit: 2140 MHz

Typical Performance
 (Vd=5V, Id=100mA, T=25°C)


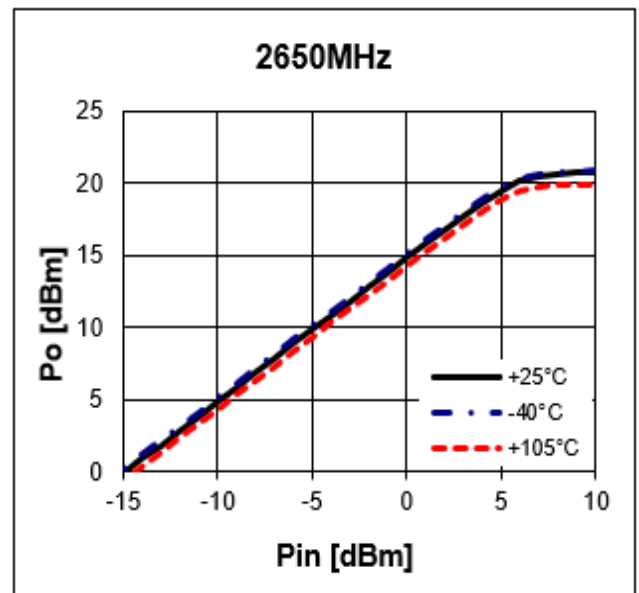
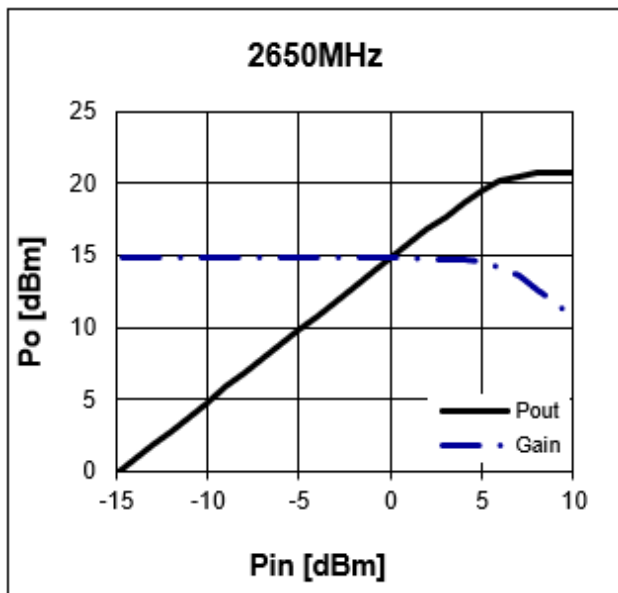
50-5000 MHz Flat Gain BroadBand AMP

Preliminary Datasheet



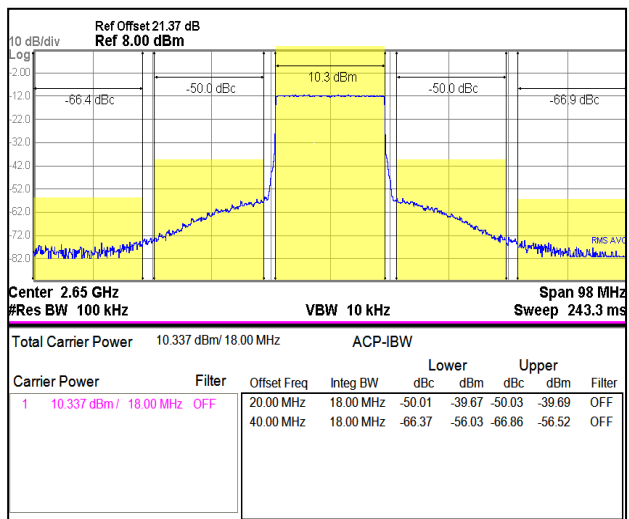
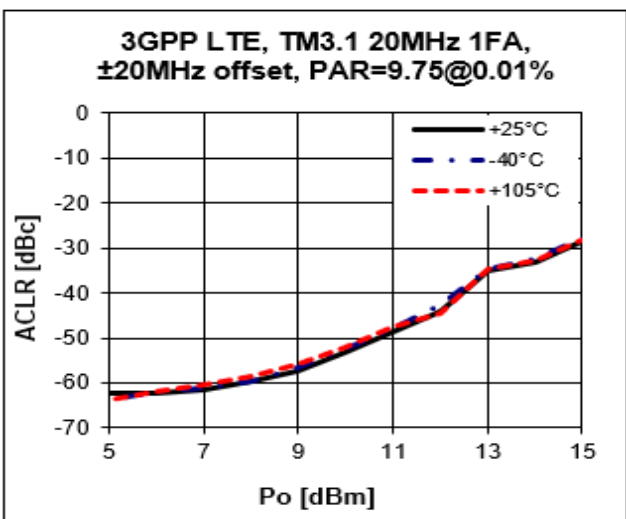
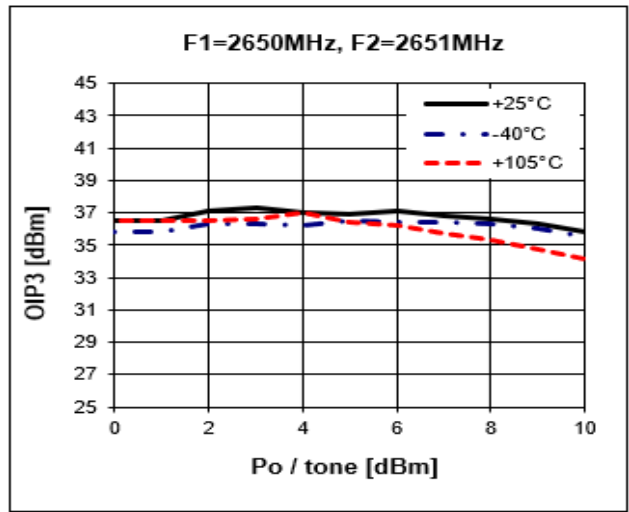
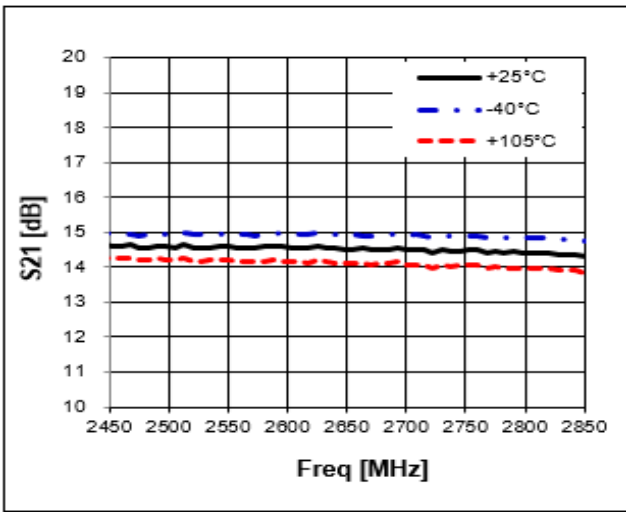
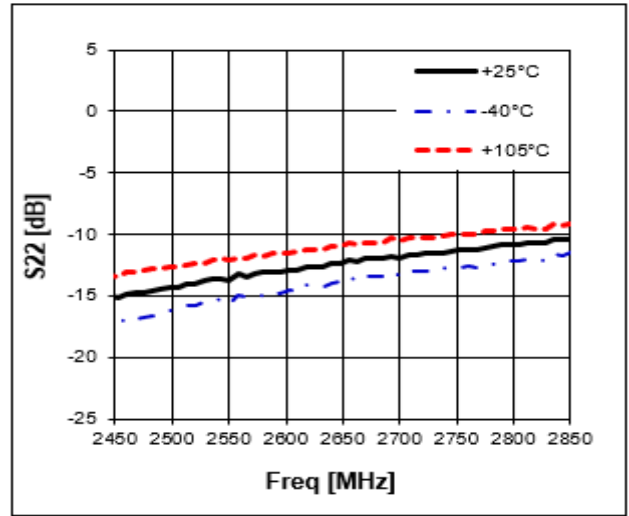
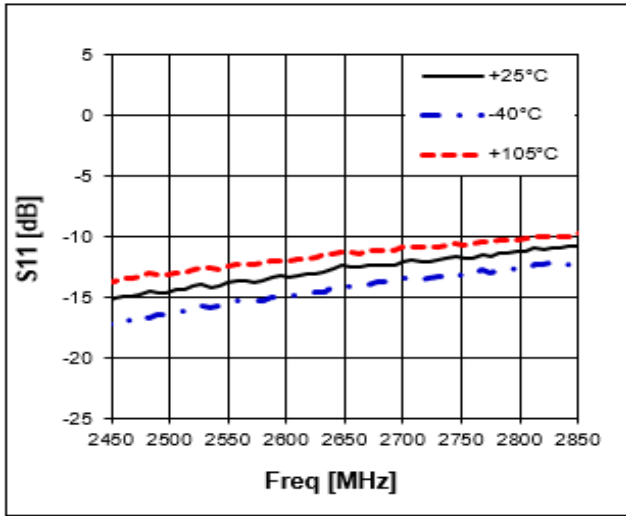
Application Circuit: 2650 MHz

Schematic Diagram	BOM		Size
	C1	1uF	0603
	C2	100F	0603
	C3	100F	0603
	C4	100F	0603
	L1	1uH	0603
	U1	BBA31	DFN 2x2

Typical Performance
 (Vd=5V, Id=100mA, T=25°C)


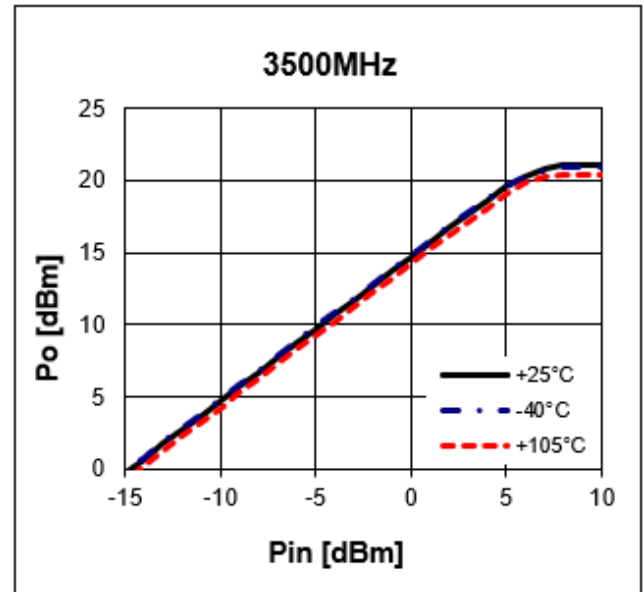
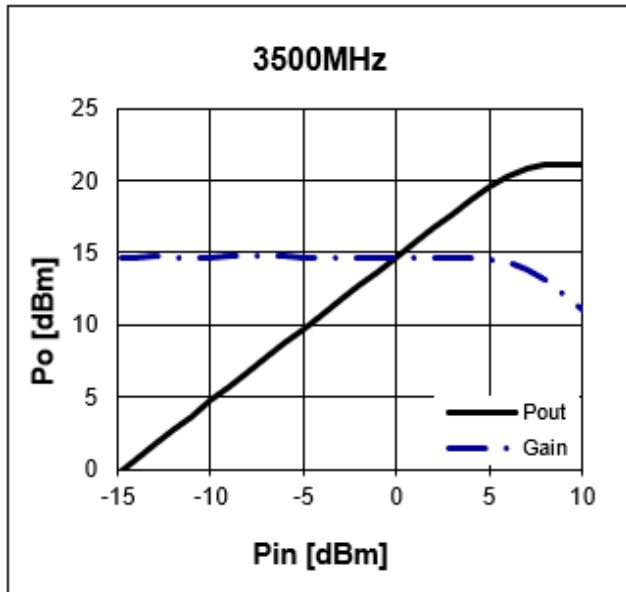
50-5000 MHz Flat Gain BroadBand AMP

Preliminary Datasheet



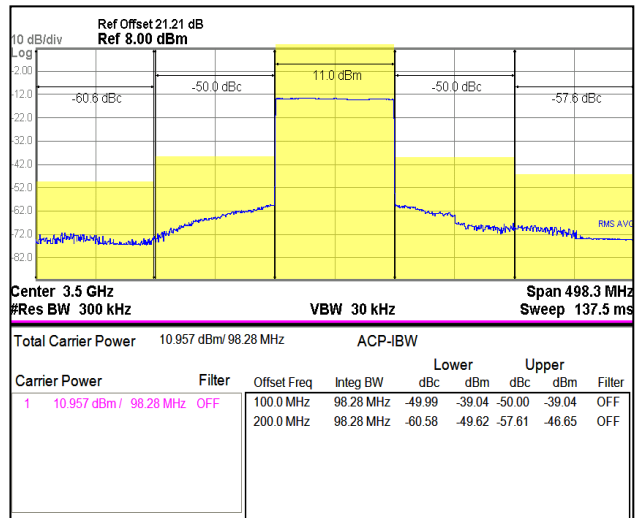
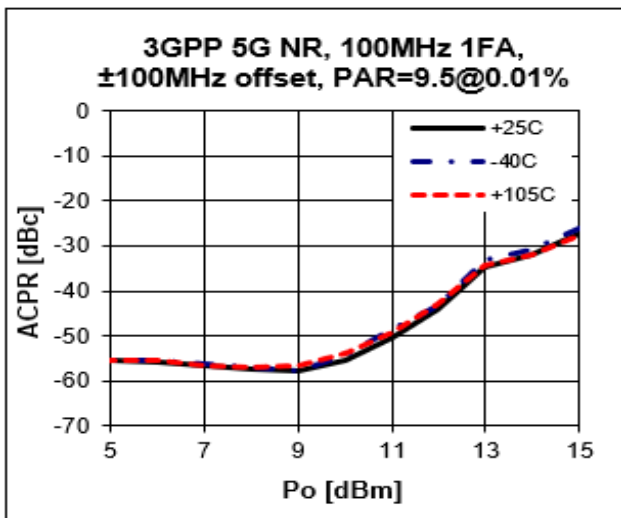
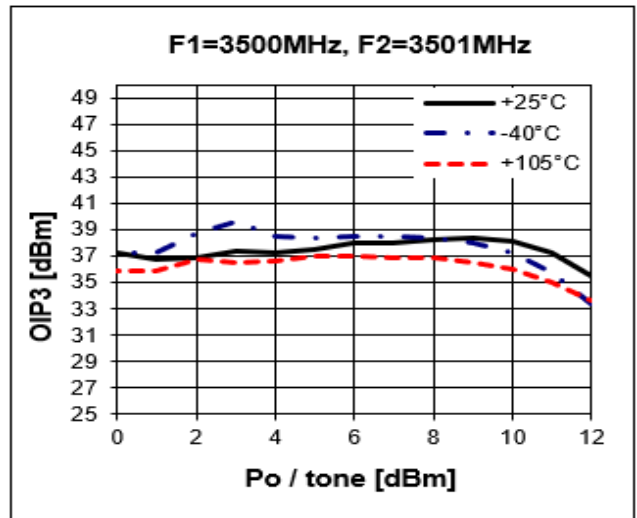
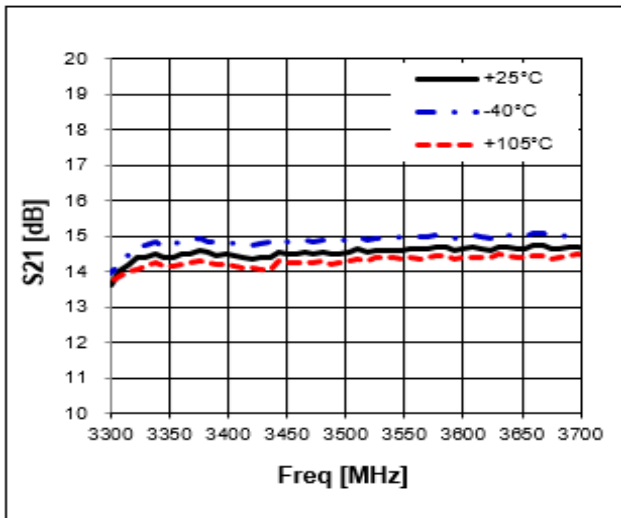
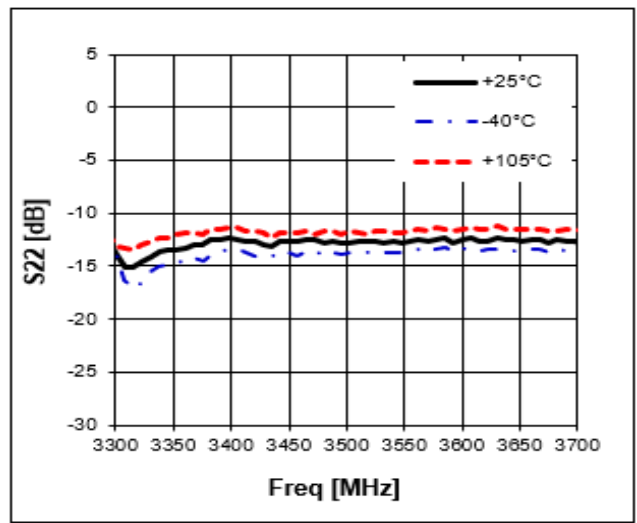
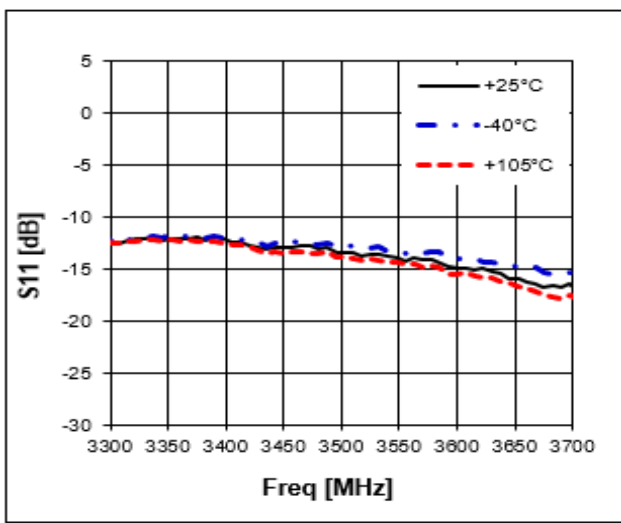
Application Circuit: 3500 MHz

Schematic Diagram	BOM	Size	
	C1	1uF	0603
	C2	100pF	0603
	C3	22pF	0603
	C4	22pF	0603
	C5	0.5pF	0603
	C6	0.75pF	0603
	L1	1nH	0603
	U1	BBA31	DFN 2x2

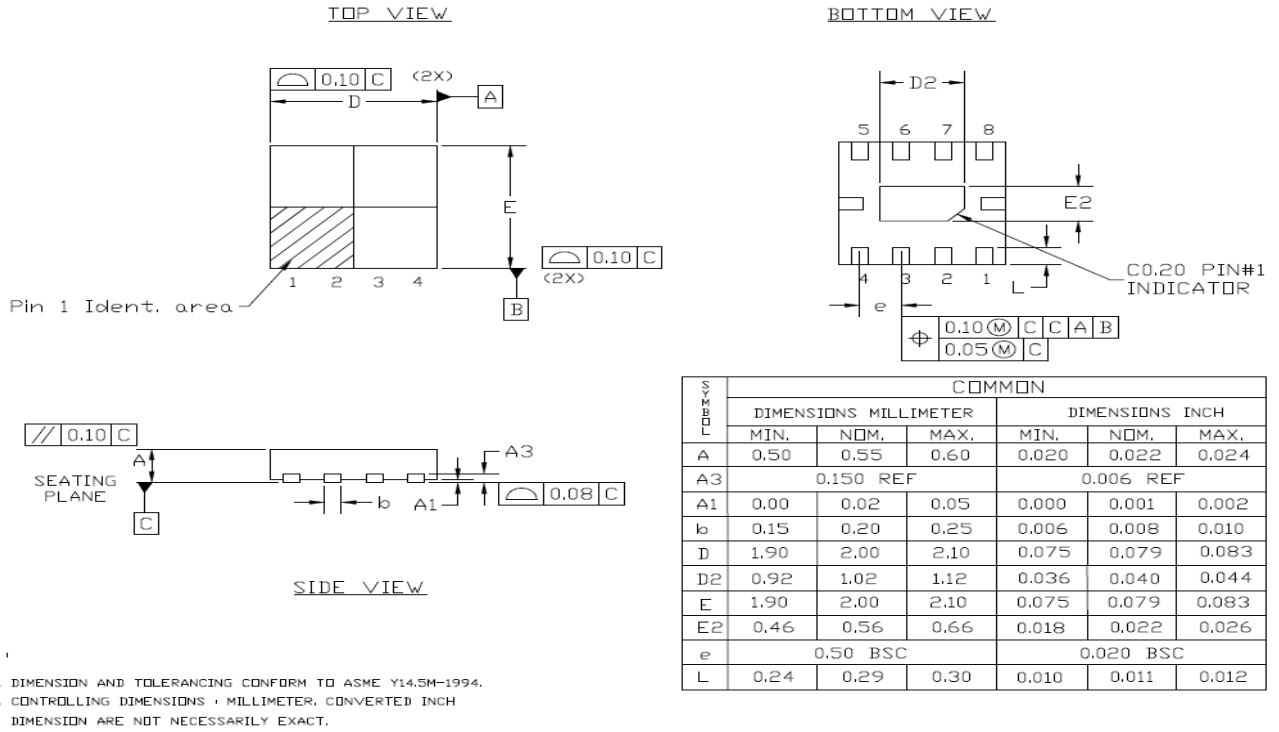
Typical Performance
 (Vd=5V, Id=100mA, T=25°C)


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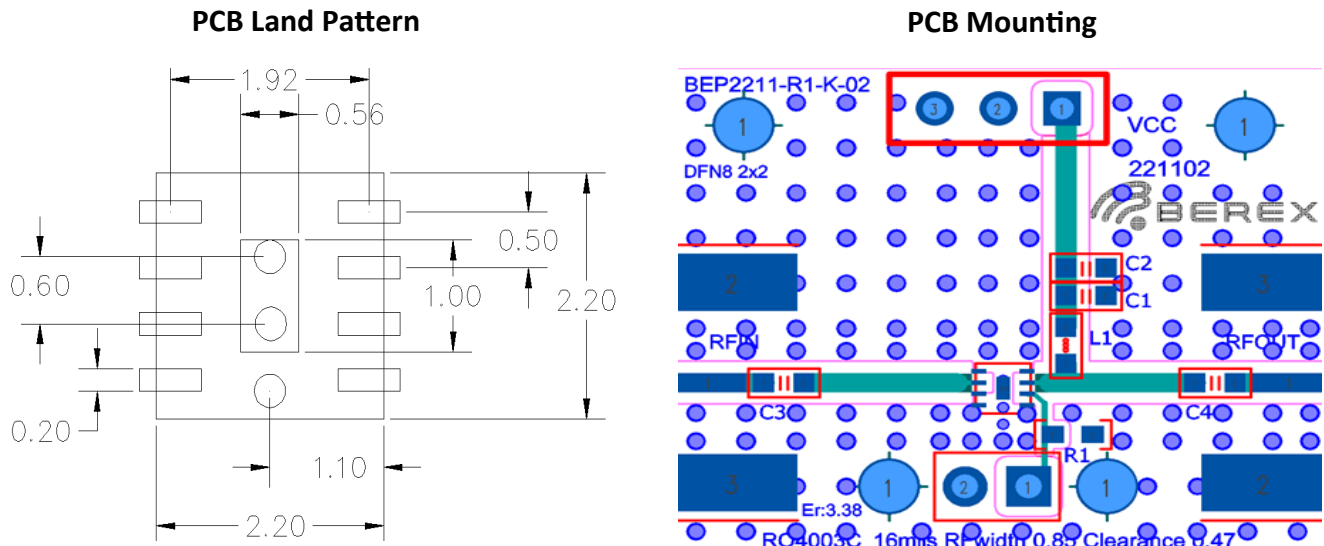
Preliminary Datasheet



Package Outline Dimension



Suggested PCB Land Pattern and PAD Layout



Note : All dimension _ millimeters

PCB lay out _ on BeRex website

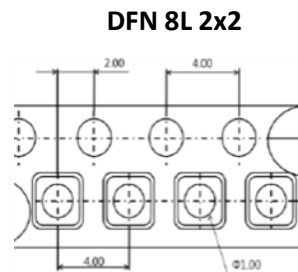
Package Marking



XX = Wafer No.

Pin 1

Tape & Reel



DFN 8L 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 JS-001-2017
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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