

### Device Features

- +5V/215mA at operating bias condition
- Gain = 16.0 dB @ 2400MHz
- P1dB = 29.5 dBm @ 2400MHz
- OIP3 = 42.1dBm 16dBm/tone at 2400MHz
- LTE 20M ACLR = 19.1dBm Output Power at -50dBc @ 2400MHz
- Green/RoHS2-compliant SOT89 SMT package



### Product Description

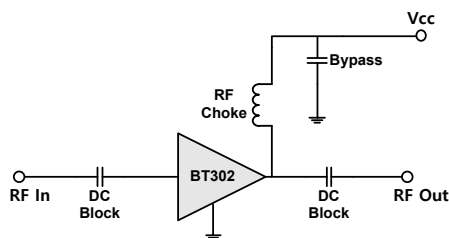
The BT302 is a high performance and a high dynamic range amplifier in a low cost surface mount package(SOT-89) with a RoHS2-compliant, that incorporates reliable hetero-junction-bipolar-transistor (HBT) devices fabricated with InGaP/GaAs technology.

This device is designed for use where high linearity is required and features high ACLR and P1 performance with low consumption current(215mA) and requires a few external matching components, DC blocking capacitors on the In/Output pin and a bypass capacitor and a RF choke for the out port.

### Applications

- Base station /Repeaters Infrastructure/Small Cell
- Commercial/Industrial/Military wireless system
- LTE / WCDMA /CDMA Wireless Infrastructure

### Application Circuits



\*External matching circuit:  
Refer to application circuit for each frequency.

### Electrical Specifications

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

Parameter	Conditions	Min	Typ	Max	Unit
Operational Frequency Range		500		4000	MHz
Test Frequency			2400		MHz
Gain		14.5	16.0		dB
Input Return Loss			-32.8		dB
Output Return Loss			-14.0		dB
Output IP3	16 dBm/tone, Δf=1 MHz	39.1	42.1		dBm
Output P1dB		28.5	29.5		dBm
LTE 20M ACLR*		18.1	19.1		dBm
WCDMA ACLR*		18.2	19.2		dBm
Noise Figure			4.2		dB

\*ACLR Channel Power measured at -50dBc.

- LTE set-up: 3GPP LTE, FDD E-TM3.1, 20MHz BW, ±5MHz offset, PAR 9.75 @0.01% Prob.

- WCDMA set-up: 3GPP WCDMA, TM1+64DPCH, +5MHz offset, PAR 9.78 at 0.01% Prob.

### Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Bandwidth	500		4000	MHz
I <sub>c</sub> @ (V <sub>c</sub> = 5V)	175	215	255	mA
V <sub>c</sub>	4.75	5.0	5.25	V
R <sub>TH</sub>		19.5		°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

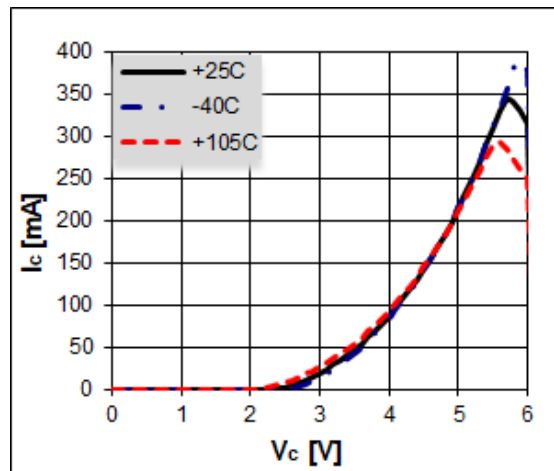
Parameter	Rating	Unit
Storage Temperature	-55 to +155	°C
Junction Temperature	+170	°C
Supply Voltage	+6.0	V
Supply Current	550	mA
Input RF Power	24	dBm

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

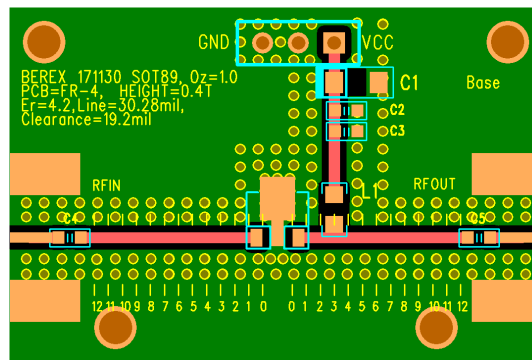
### Typical Performance (Vc=5V, Ic=215mA, T=25°C)

Parameter	Frequency						Unit
	915	1960	2140	2400	2600	3500	MHz
Gain	22.0	17.5	17.0	16.0	15.3	13.2	dB
S11	-27.5	-19.5	-19.4	-32.8	-22.6	-22.7	dB
S22	-13.0	-11.5	-17.3	-14.0	-14.8	-19.5	dB
OIP3	41.8	41.5	41.8	42.1	41.3	40.8	dBm
P1dB	29.5	29.6	29.3	29.5	29.5	29.2	dBm
LTE 20M ACLR	18.5	19.1	19.1	19.1	19.2	18.5	dBm
WCDMA ACLR	19.2	19.5	19.4	19.2	19.3	18.5	dBm
Noise Figure	4.1	4.1	4.2	4.2	4.2	4.3	dB

### V-I Characteristics



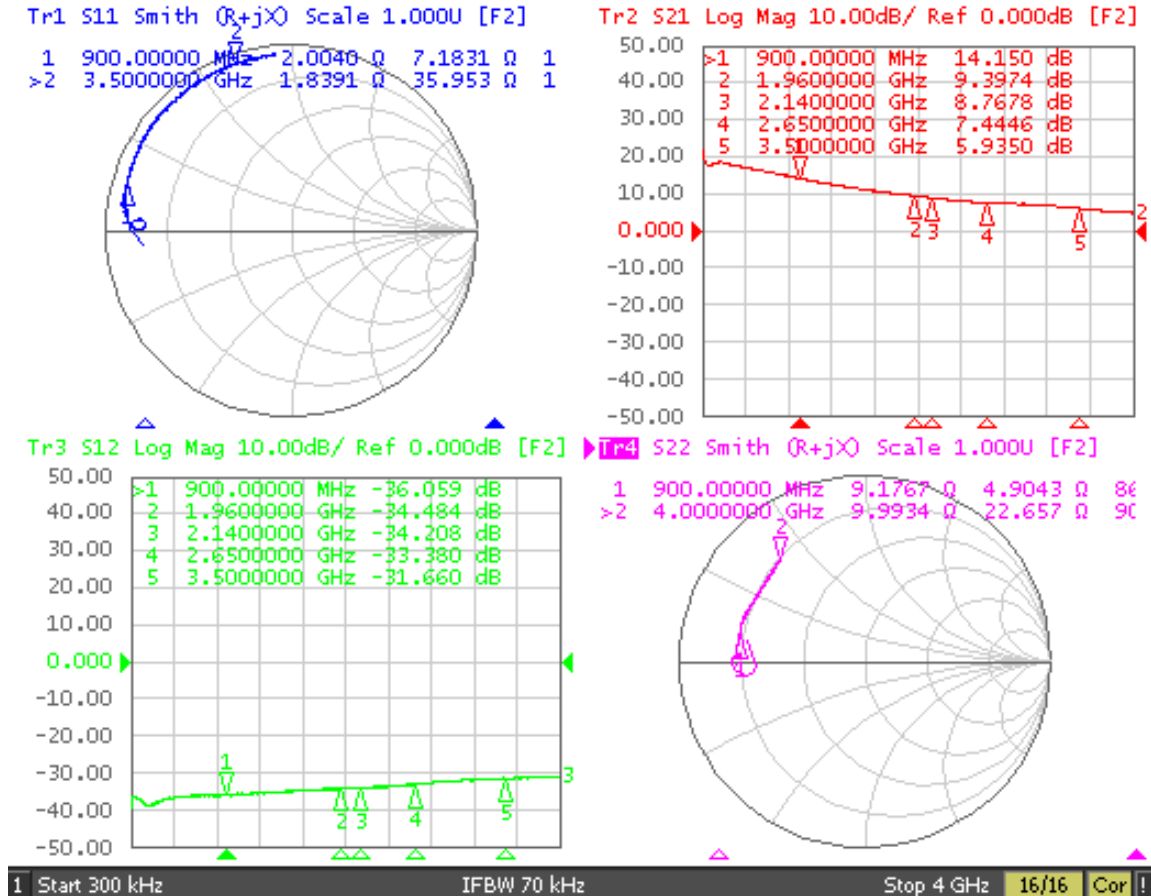
### BeRex SOT89 Evaluation Board



\*Dielectric constant \_ 4.2 \*0.4T thick FR4 PCB

### Typical Device Data

S-parameters ( $V_c=5V$ ,  $I_c=215mA$ ,  $T=25^\circ C$ )

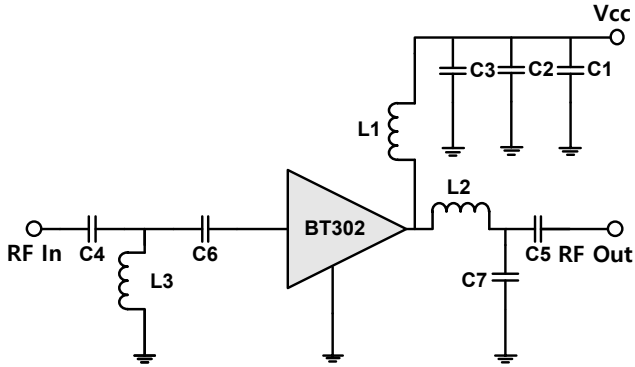
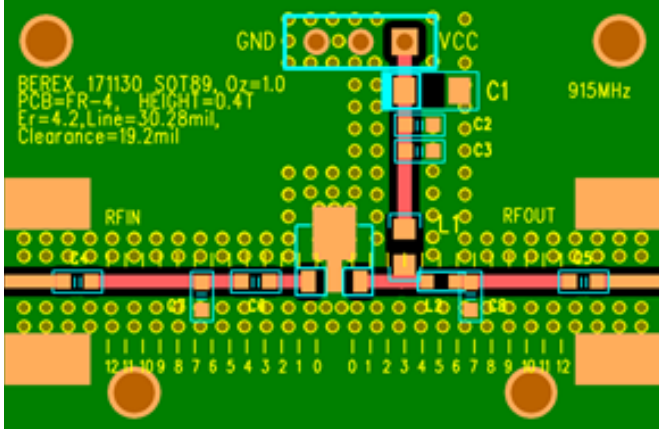


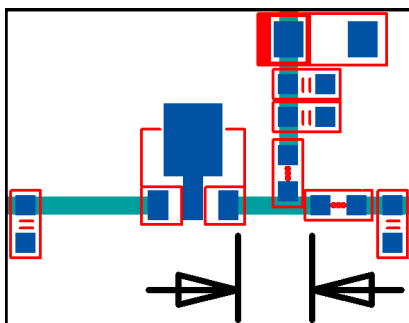
### S-Parameter

( $V_{device} = 5.0V$ ,  $I_c = 215mA$ ,  $T = 25^\circ C$ , calibrated to device leads)

Freq [MHz]	S11 [Mag]	S11 [Ang]	S21 [Mag]	S21 [Ang]	S12 [Mag]	S12 [Ang]	S22 [Mag]	S22 [Ang]
500	0.91	172.90	6.65	135.78	0.015	11.72	0.70	173.01
1000	0.93	161.62	4.76	108.08	0.016	13.86	0.69	167.44
1500	0.94	153.12	3.57	89.90	0.018	14.61	0.70	163.57
2000	0.94	145.20	2.89	74.02	0.019	13.74	0.70	159.29
2500	0.94	135.06	2.44	60.76	0.021	12.19	0.69	153.38
3000	0.95	122.86	2.27	47.41	0.025	9.36	0.69	145.83
3500	0.95	108.49	1.98	30.66	0.026	1.98	0.69	137.21
4000	0.96	95.01	1.71	17.13	0.027	-5.09	0.72	129.78

### Application Circuit: 915 MHz

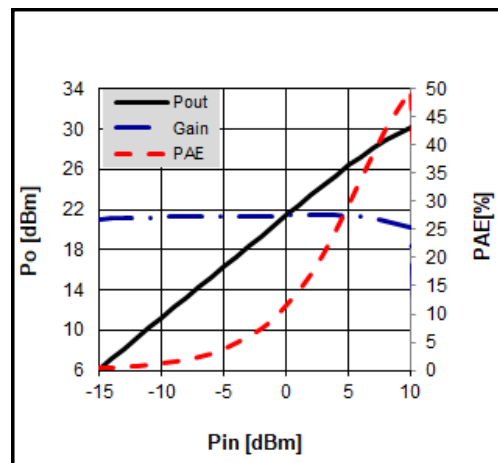
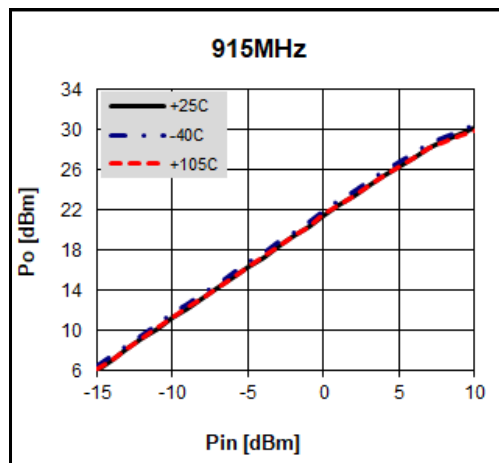
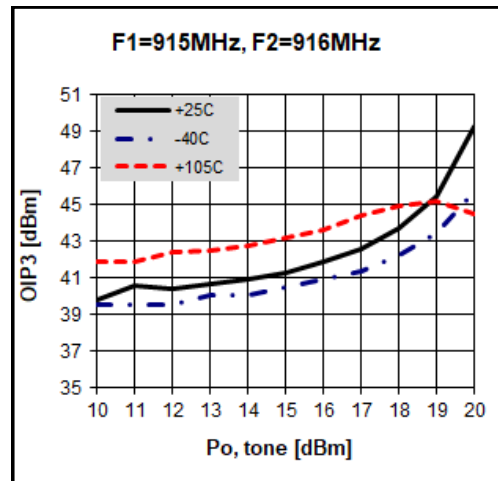
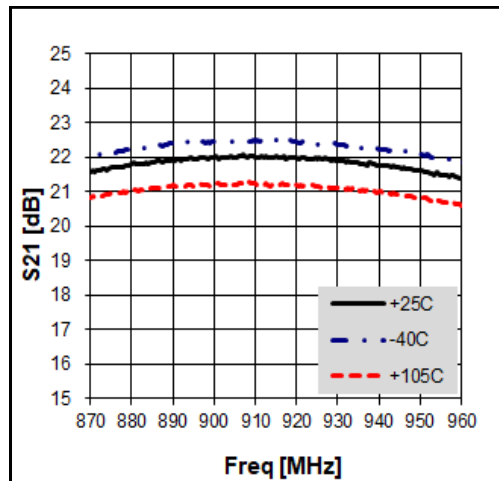
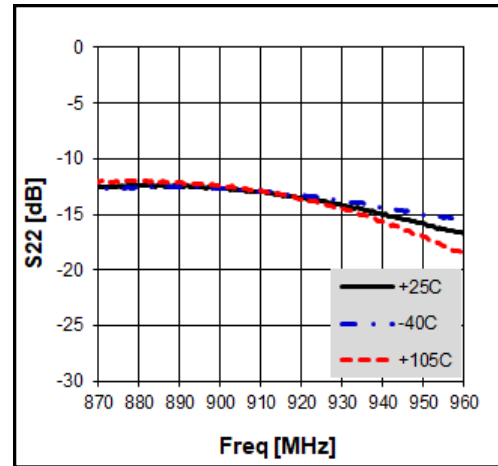
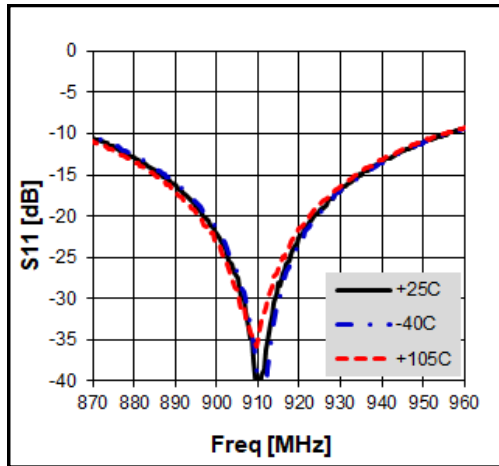
Schematic Diagram	BOM			Remark
	C1	1206	10uF	
	C2	0603	1nF	
	C3	0603	100pF	
	C4	0603	100pF	
	C5	0603	100pF	
	C6	0603	6pF	
	C7	0603	4.7pF	
	L1	0805	39nH	Coil
	L2	0603	2.7nH	
L3	0603	2.7nH		
 <p>BEREX 171130 SOT89, Oz=1.0 PCB=FR-4, HEIGHT=0.4T Er=4.2, Line=30.28mil, Clearance=19.2mil</p> <p>915MHz</p>	<b>Note:</b>			
	1. Distance between the edge of the series cap(C6) and the input pin of BT302 - <b><u>1.7mm.</u></b>			
	2. Distance between the edge of the shunt ind(L3) and the input pin of BT302 - <b><u>5.0mm.</u></b>			
	3. Distance between the edge of the series ind(L2) and the output pin of BT302 - <b><u>3.3mm.</u></b>			
	4. Distance between the edge of the shunt cap(C7) and the output pin of BT302 - <b><u>5.6mm.</u></b>			

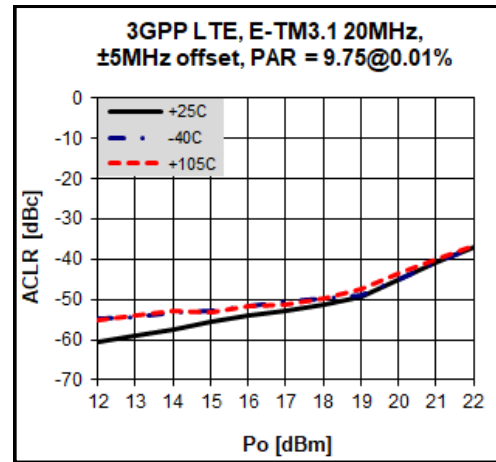
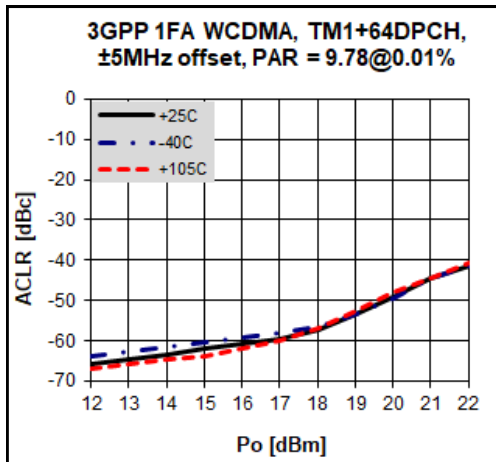
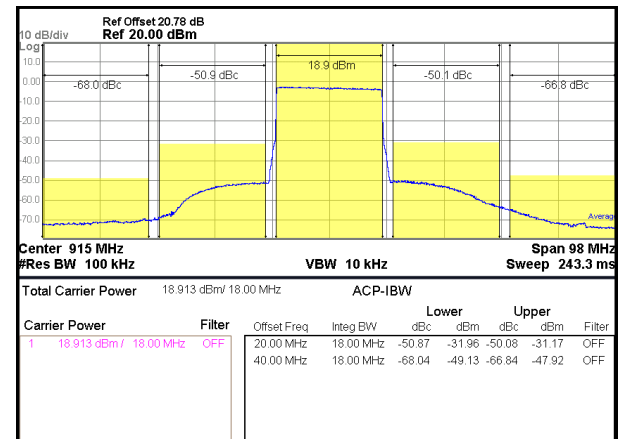
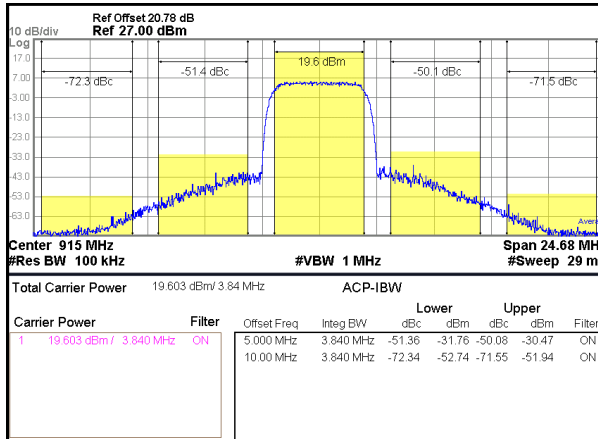


**Figure about the reference position of components**

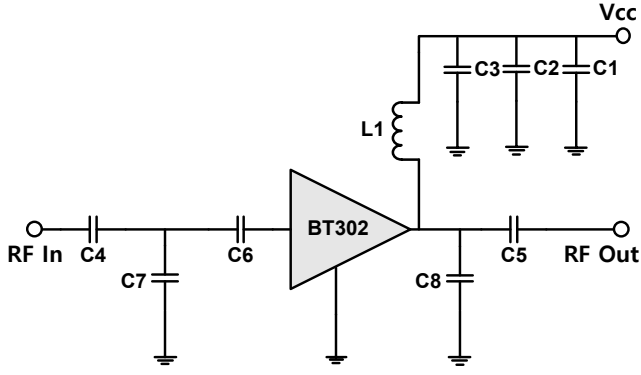
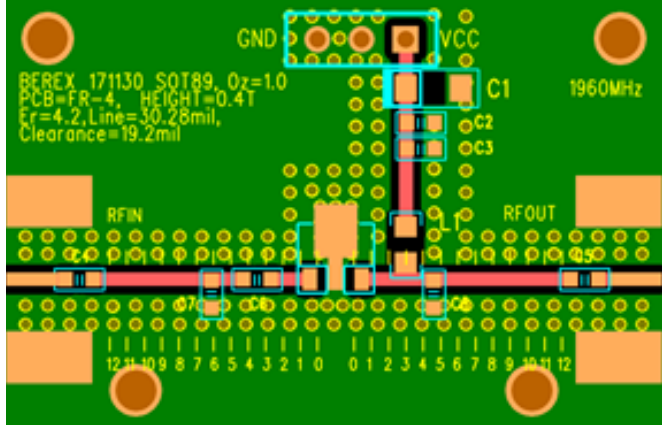
### Typical Performance

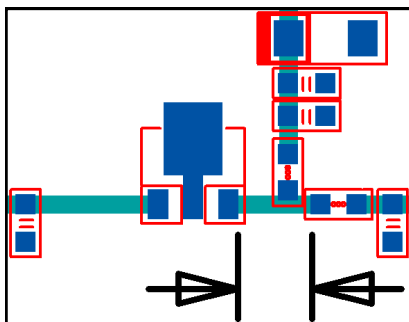
(Vc=5V, Ic=215mA, T=25°C)




**3GPP WCDMA 1FA ACLR (-50dBc)**
**3GPP LTE TM3.1 20MHz ACLR (-50dBc)**


### Application Circuit: 1960 MHz

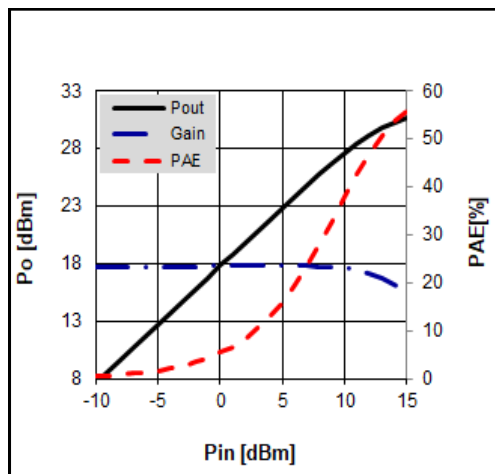
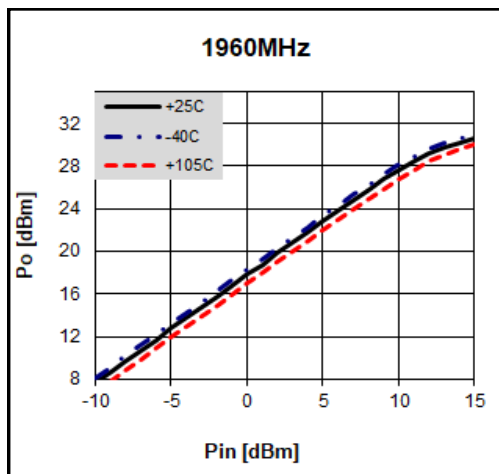
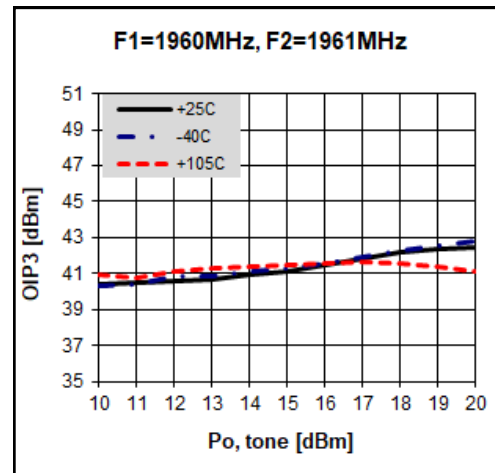
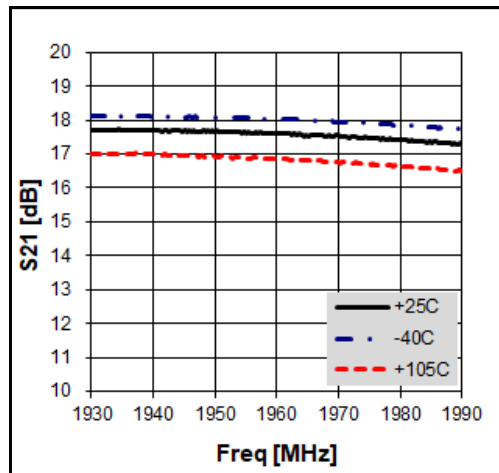
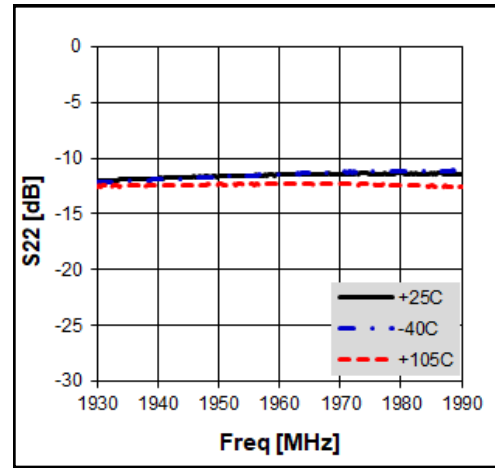
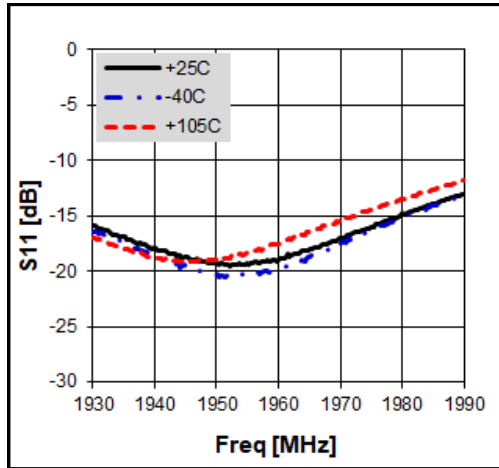
Schematic Diagram	BOM			Remark
	C1	1206	10uF	
	C2	0603	1nF	
	C3	0603	100pF	
	C4	0603	100pF	
	C5	0603	100pF	
	C6	0603	2.7pF	
	C7	0603	3.5pF	
	C8	0603	2pF	
L1	0805	27nH	Coil	
	<b>Note:</b>			
	<ol style="list-style-type: none"> <li>Distance between the edge of the series cap(C6) and the input pin of BT302 - <u><b>1.7mm.</b></u></li> <li>Distance between the edge of the shunt ind(C7) and the input pin of BT302 - <u><b>5.0mm.</b></u></li> <li>Distance between the edge of the shunt cap(C8) and the output pin of BT302 - <u><b>3.6mm.</b></u></li> </ol>			



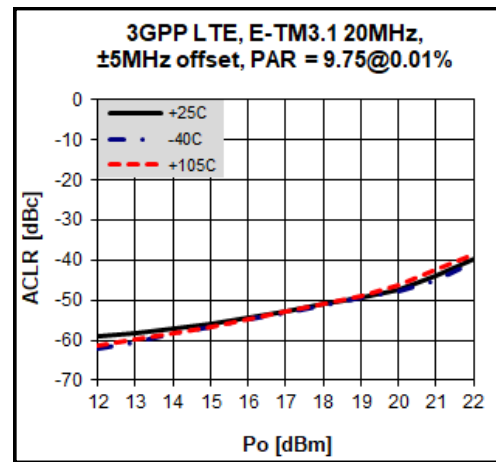
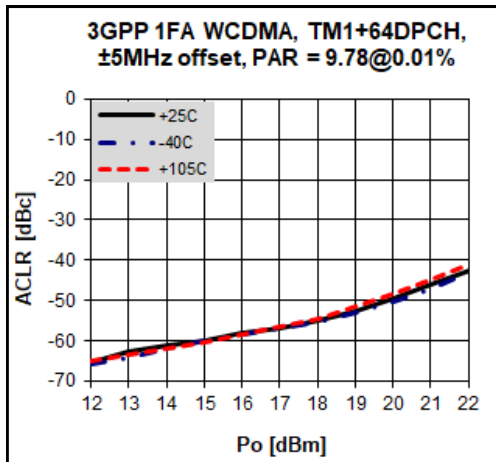
**Figure about the reference position of components**

### Typical Performance

(Vc=5V, Ic=215mA, T=25°C)

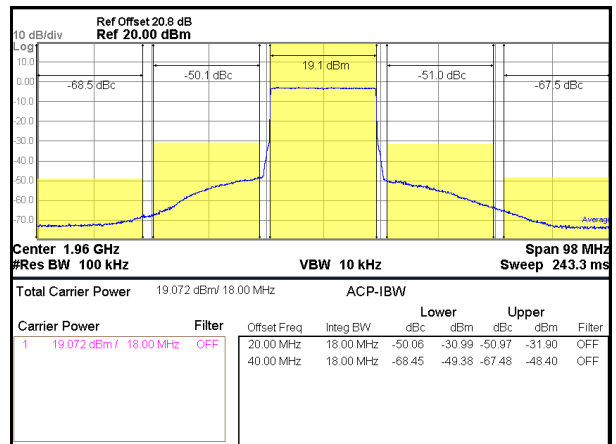
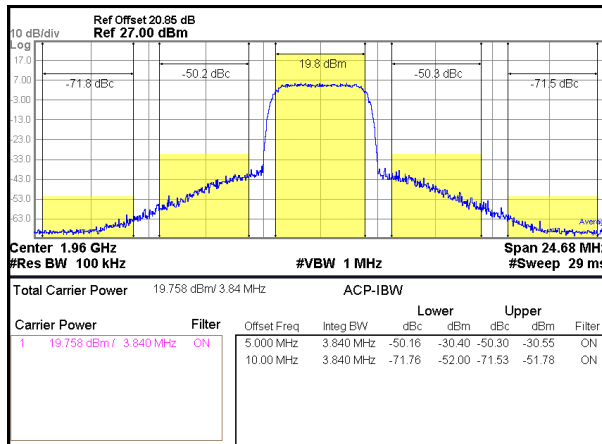




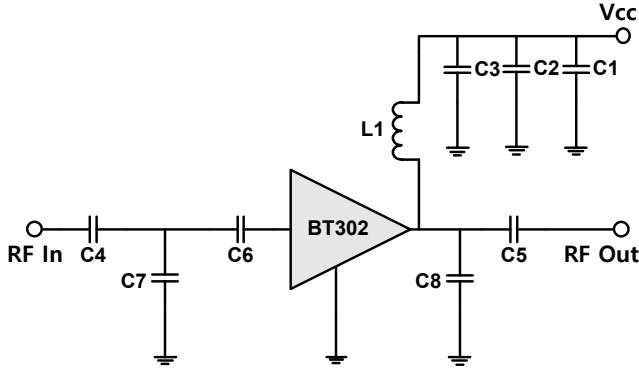
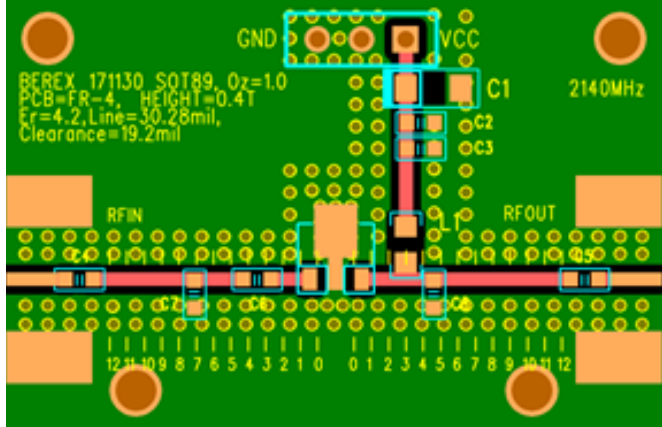


**3GPP WCDMA 1FA ACLR (-50dBc)**

**3GPP LTE TM3.1 20MHz ACLR (-50dBc)**



### Application Circuit: 2140 MHz

Schematic Diagram	BOM			Remark
	C1	1206	10uF	
	C2	0603	1nF	
	C3	0603	100pF	
	C4	0603	100pF	
	C5	0603	100pF	
	C6	0603	2pF	
	C7	0603	2.5pF	
	C8	0805	1.5pF	
L1	0603	20nH	Coil	
 <p>BEREX 171130 SOT89, Oz=1.0 PCB=FR-4, HEIGHT=0.4T Er=4.2, L, Line=30.28mil, Clearance=19.2mil</p> <p>2140MHz</p>	<p>Note:</p> <ol style="list-style-type: none"> <li>1. Distance between the edge of the series cap(C6) and the input pin of BT302 - <b><u>1.7mm.</u></b></li> <li>2. Distance between the edge of the shunt ind(C7) and the input pin of BT302 - <b><u>5.6mm.</u></b></li> <li>3. Distance between the edge of the shunt cap(C8) and the output pin of BT302 - <b><u>3.3mm.</u></b></li> </ol>			

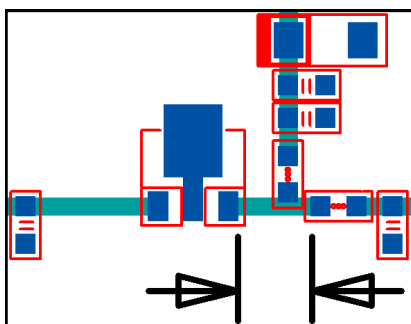
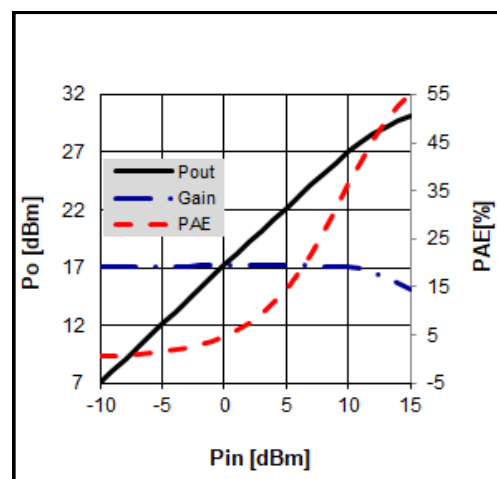
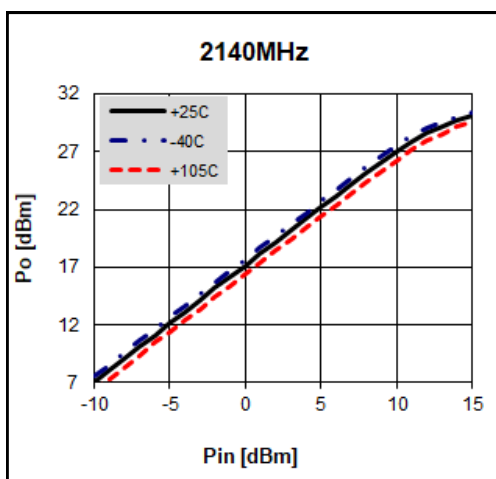
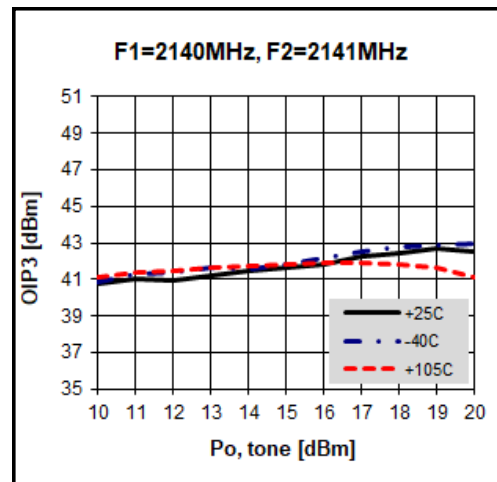
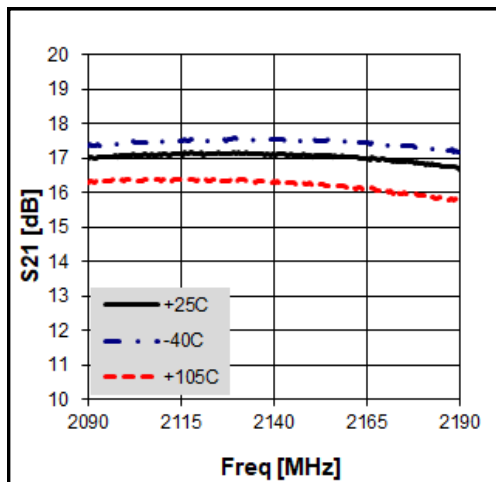
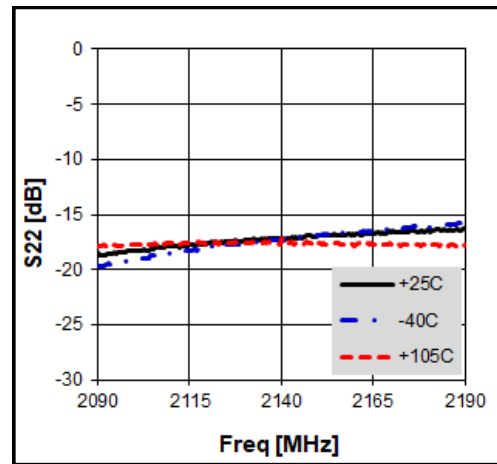
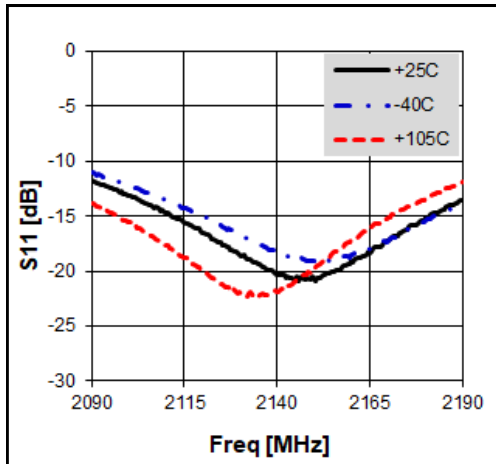
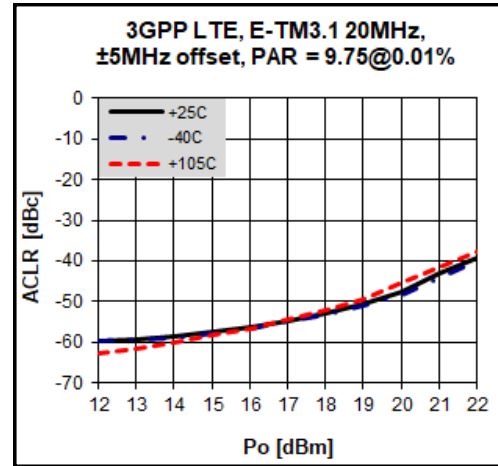
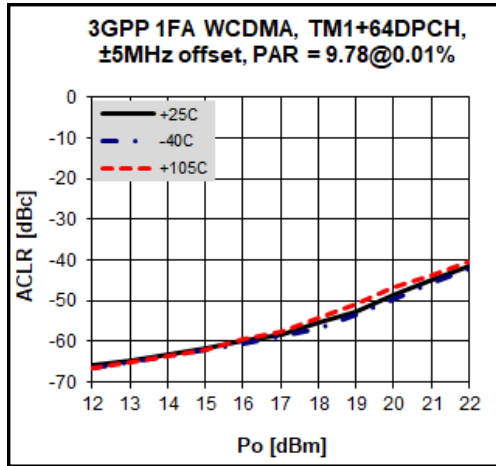


Figure about the reference position of components

### Typical Performance

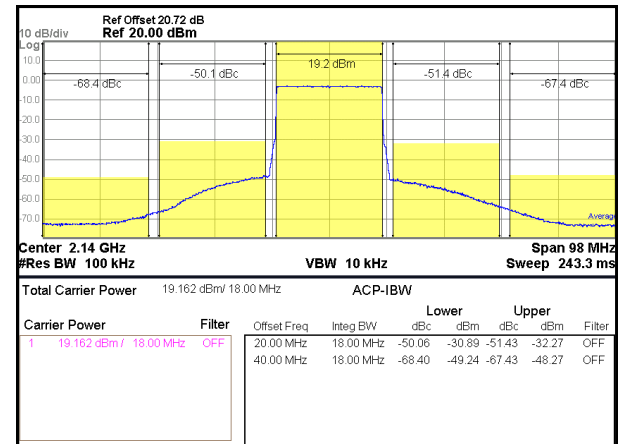
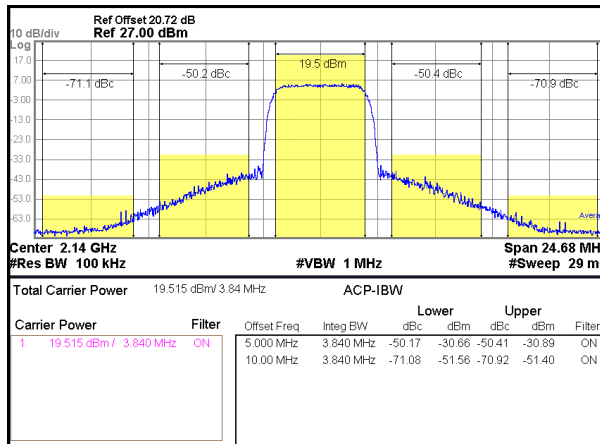
(Vc=5V, Ic=215mA, T=25°C)



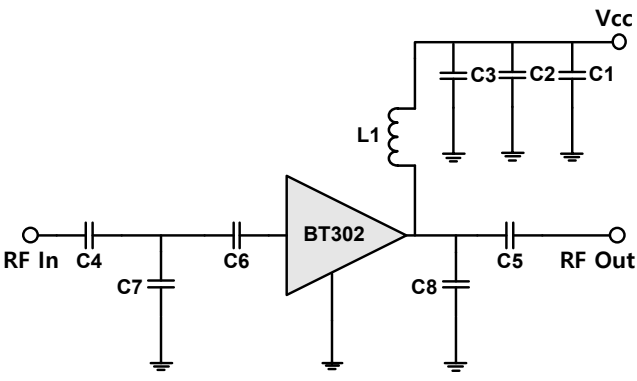
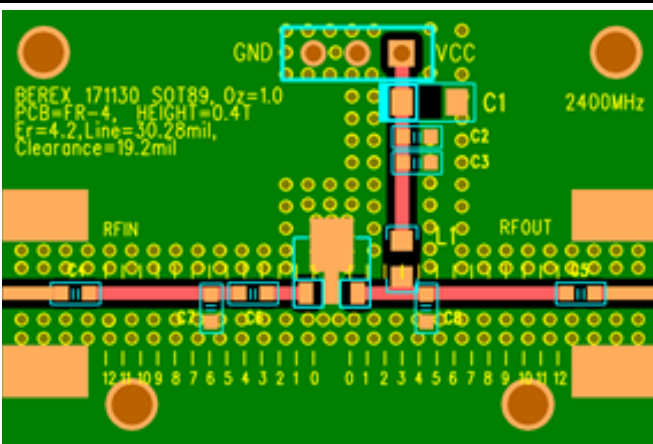


**3GPP WCDMA 1FA ACLR (-50dBc)**

**3GPP LTE TM3.1 20MHz ACLR (-50dBc)**



### Application Circuit: 2400 MHz

Schematic Diagram	BOM			Remark
	C1	1206	10uF	
	C2	0603	1nF	
	C3	0603	100pF	
	C4	0603	100pF	
	C5	0603	100pF	
	C6	0603	1.5pF	
	C7	0603	2.2pF	
	C8	0603	1.2pF	
L1	0805	18nH	Coil	
	<p>Note:</p> <ol style="list-style-type: none"> <li>Distance between the edge of the series cap(C6) and the input pin of BT302 - <u>1.7mm.</u></li> <li>Distance between the edge of the shunt ind(C7) and the input pin of BT302 - <u>4.5mm.</u></li> <li>Distance between the edge of the shunt cap(C8) and the output pin of BT302 - <u>3.0mm.</u></li> </ol>			

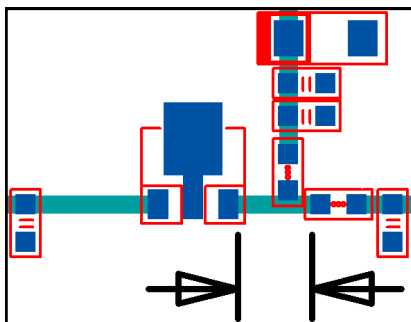
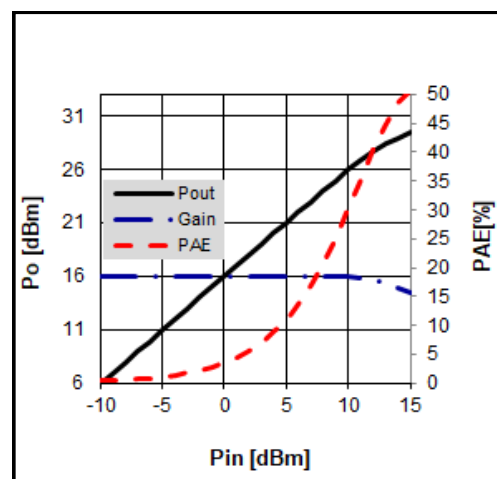
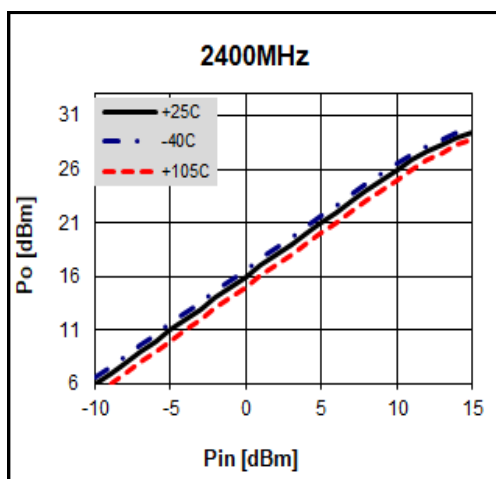
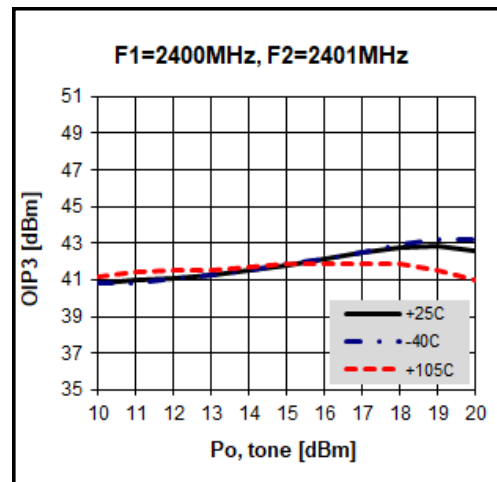
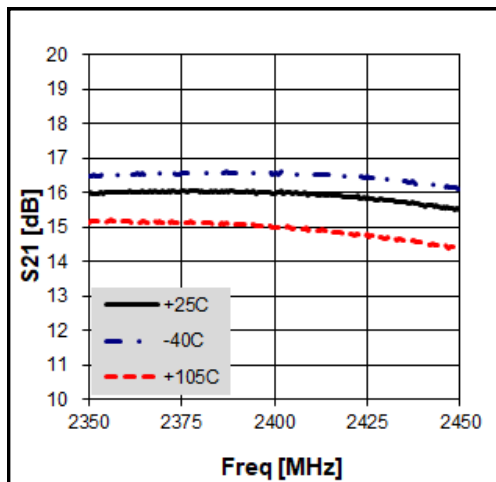
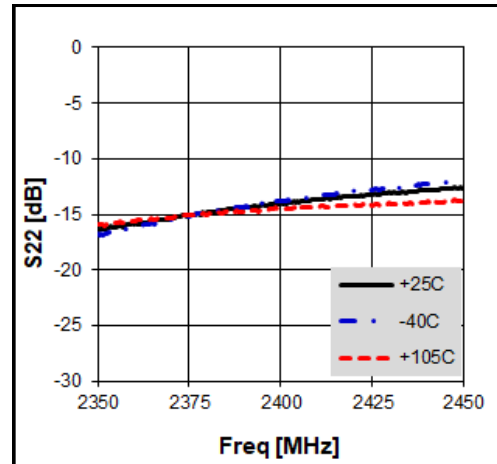
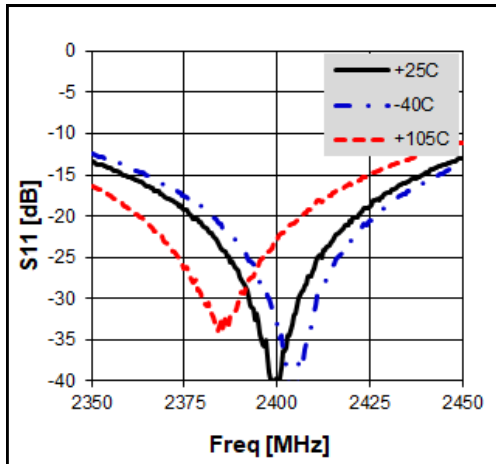
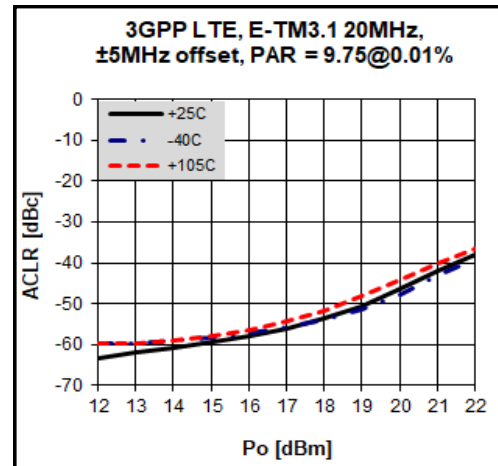
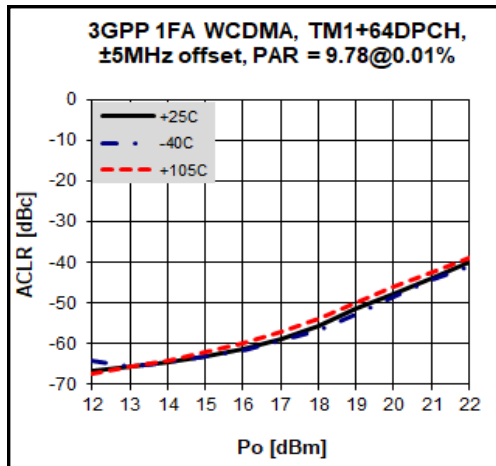
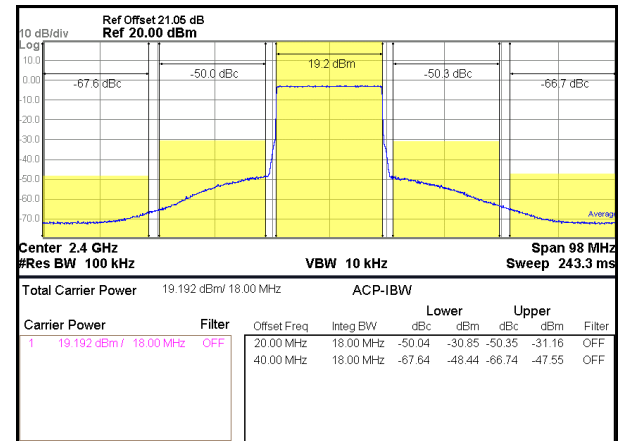
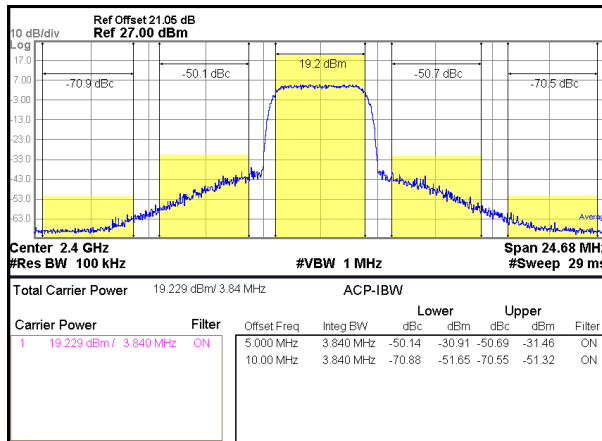


Figure about the reference position of components

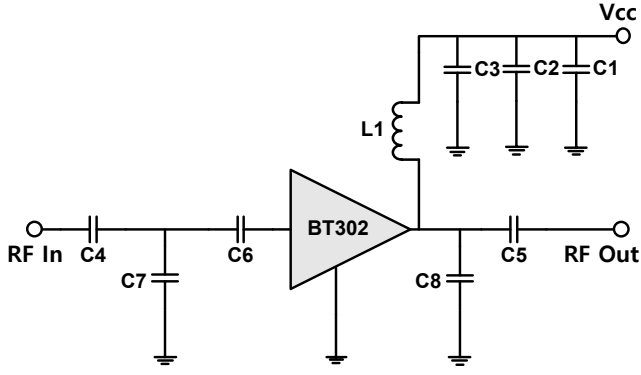
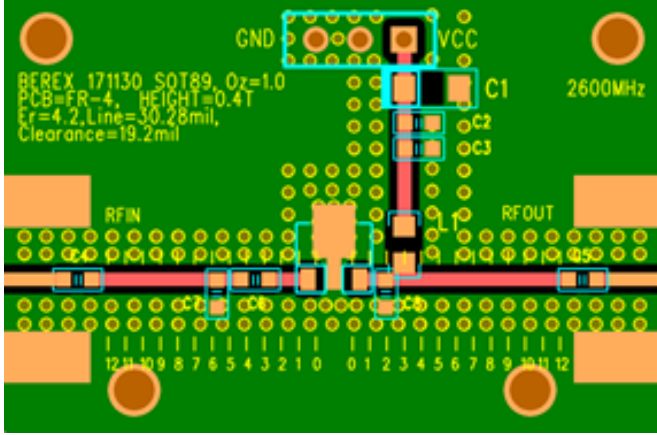
### Typical Performance

(Vc=5V, Ic=215mA, T=25°C)




**3GPP WCDMA 1FA ACLR (-50dBc)**
**3GPP LTE TM3.1 20MHz ACLR (-50dBc)**


### Application Circuit: 2600 MHz

Schematic Diagram	BOM			Remark
	C1	1206	10uF	
	C2	0603	1nF	
	C3	0603	100pF	
	C4	0603	100pF	
	C5	0603	100pF	
	C6	0603	1.2pF	
	C7	0603	2pF	
	C8	0603	1.2pF	
L1	0805	12nH	Coil	
	<p>Note:</p> <ol style="list-style-type: none"> <li>1. Distance between the edge of the series cap(C6) and the input pin of BT302 - <b><u>1.7mm.</u></b></li> <li>2. Distance between the edge of the shunt ind(C7) and the input pin of BT302 - <b><u>3.6mm.</u></b></li> <li>3. Distance between the edge of the shunt cap(C8) and the output pin of BT302 - <b><u>0.8mm.</u></b></li> </ol>			

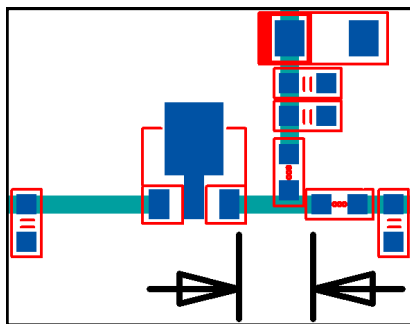
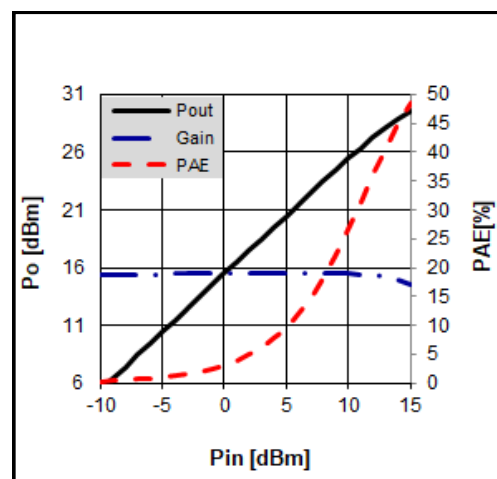
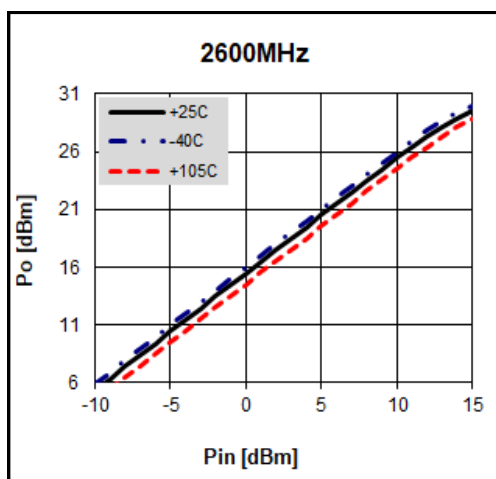
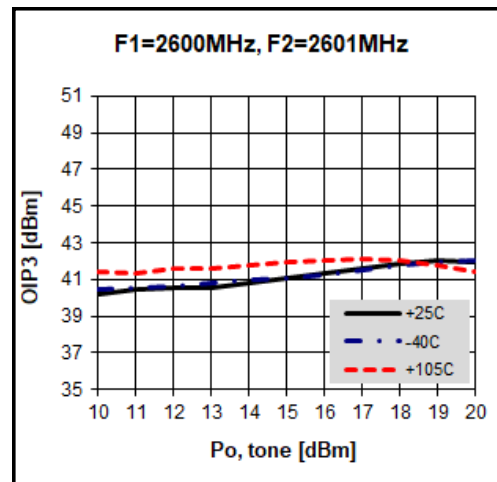
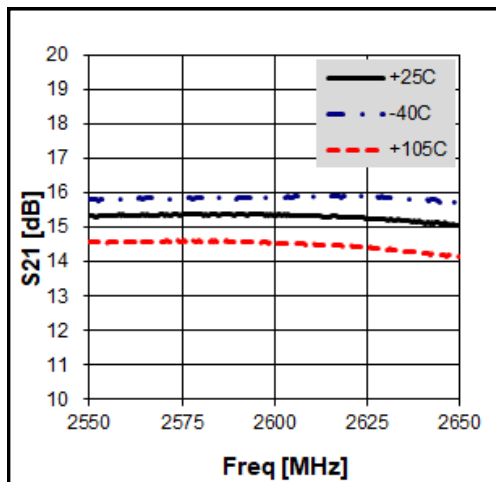
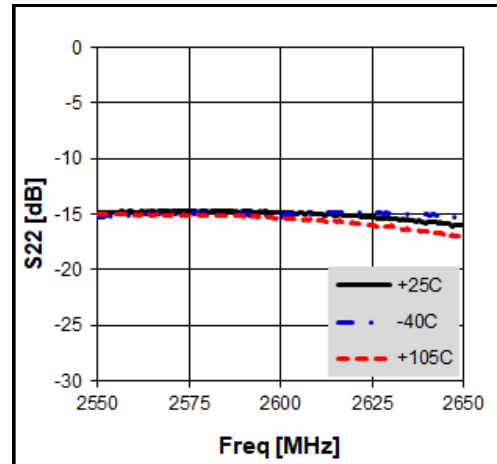
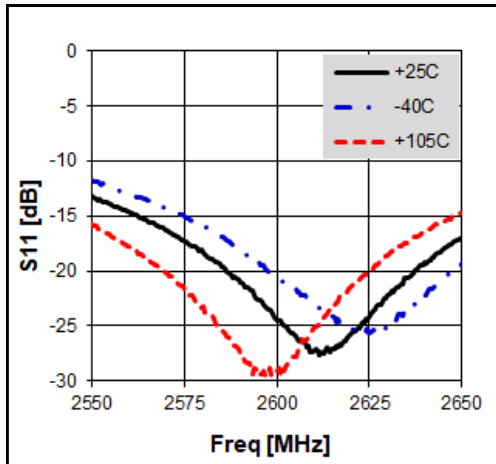


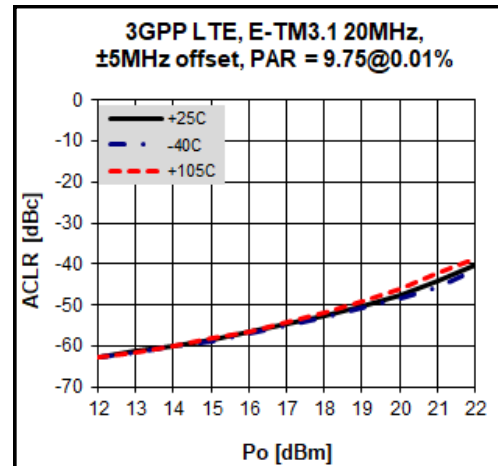
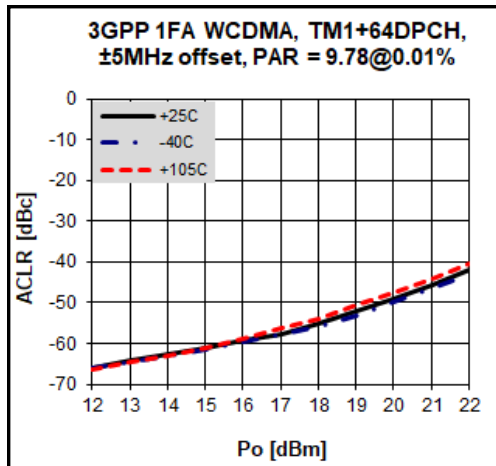
Figure about the reference position of components



### Typical Performance

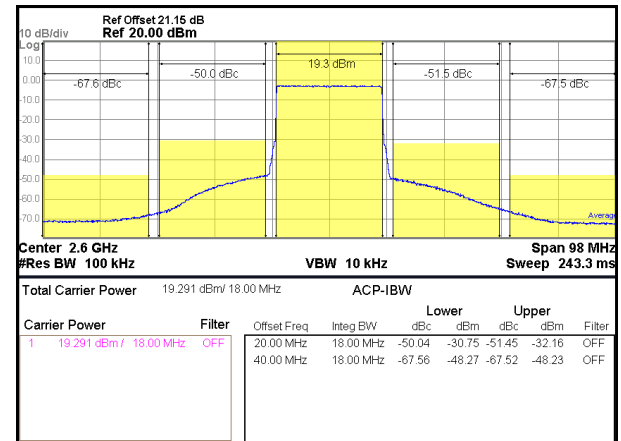
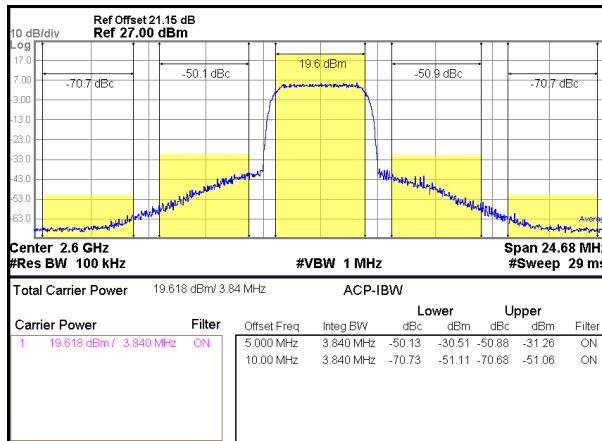
(Vc=5V, Ic=215mA, T=25°C)



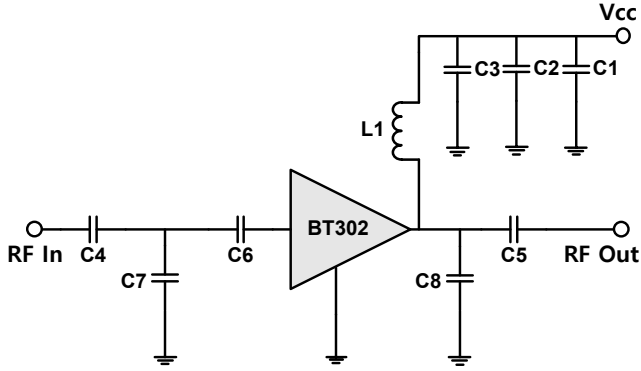
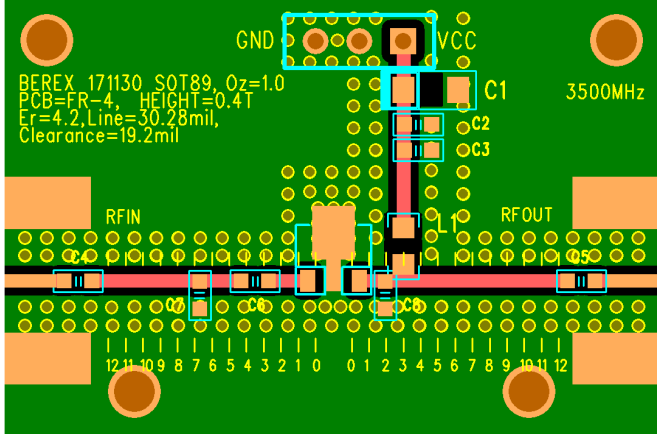


**3GPP WCDMA 1FA ACLR (-50dBc)**

**3GPP LTE TM3.1 20MHz ACLR (-50dBc)**



### Application Circuit: 3500 MHz

Schematic Diagram	BOM			Remark
	C1	1206	10uF	
	C2	0603	1nF	
	C3	0603	100pF	
	C4	0603	100pF	
	C5	0603	100pF	
	C6	0603	0.3pF	
	C7	0603	0.5pF	
	C8	0603	0.75pF	
L1	0805	18nH	Coil	
	<b>Note:</b>			
	<ol style="list-style-type: none"> <li>Distance between the edge of the series cap(C6) and the input pin of BT302 - <b><u>1.7mm.</u></b></li> <li>Distance between the edge of the shunt cap(C7) and the input pin of BT302 - <b><u>6.7mm.</u></b></li> <li>Distance between the edge of the shunt cap(C8) and the output pin of BT302 - <b><u>0.4mm.</u></b></li> </ol>			

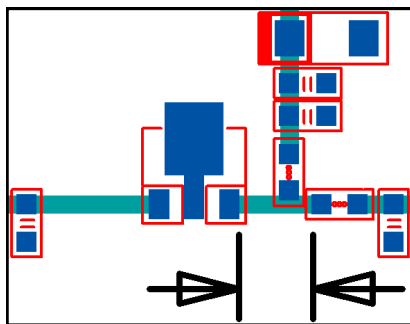
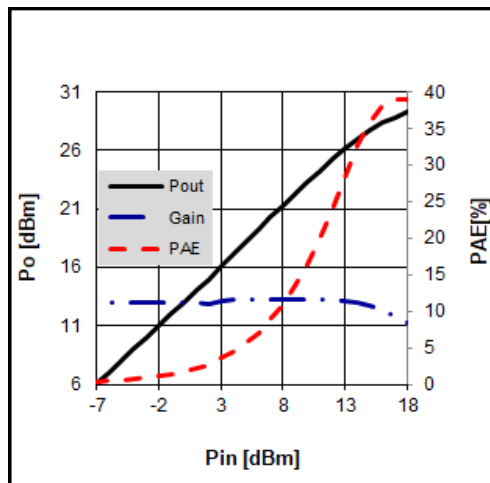
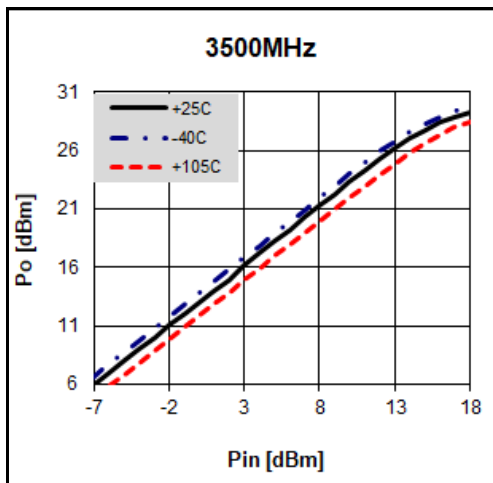
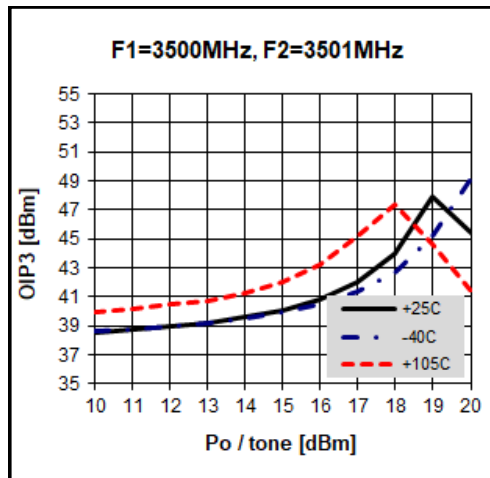
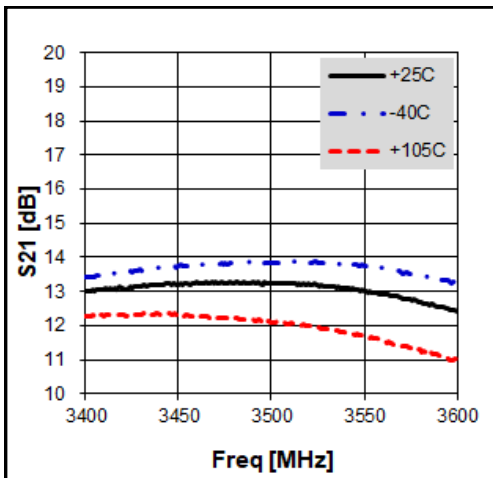
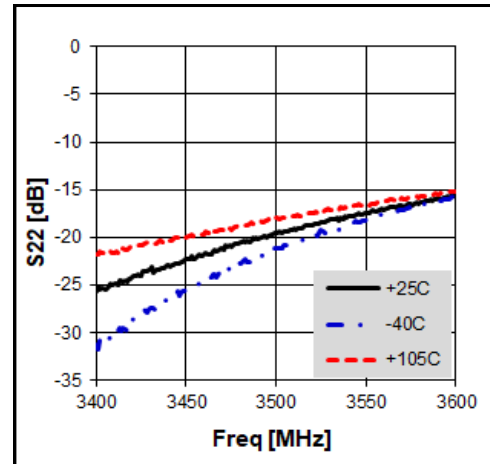
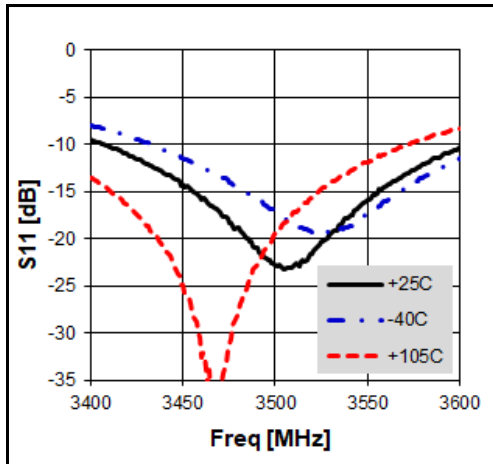
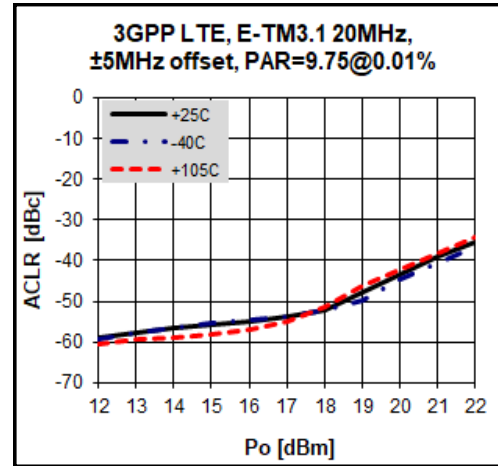
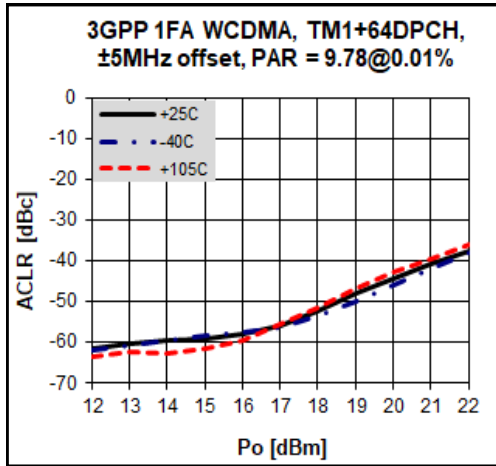
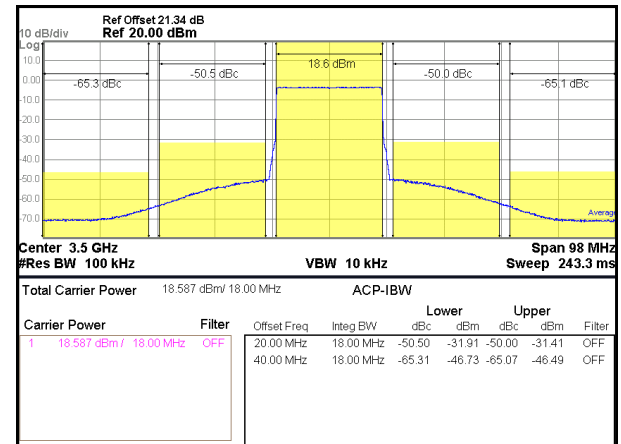
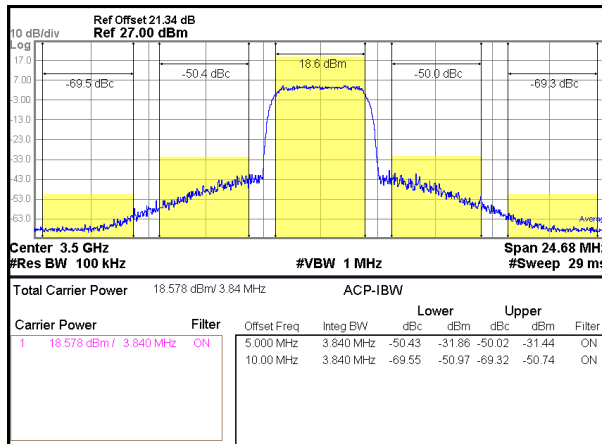


Figure about the reference position of components

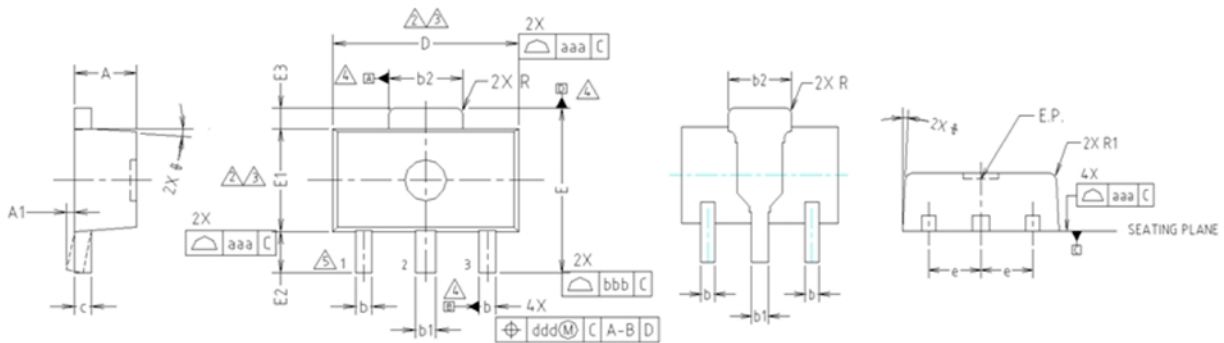
### Typical Performance

(Vc=5V, Ic=215mA, T=25°C)




**3GPP WCDMA 1FA ACLR (-50dBc)**
**3GPP LTE TM3.1 20MHz ACLR (-50dBc)**


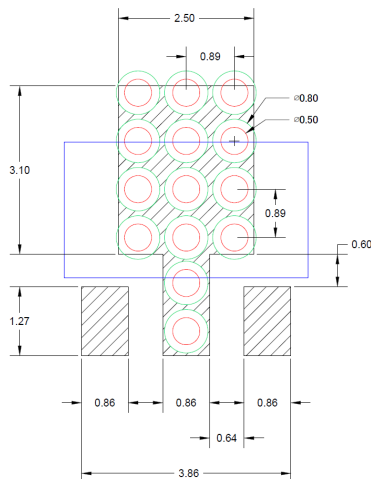
### Package Outline Dimension



- 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	1.40	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.			
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			

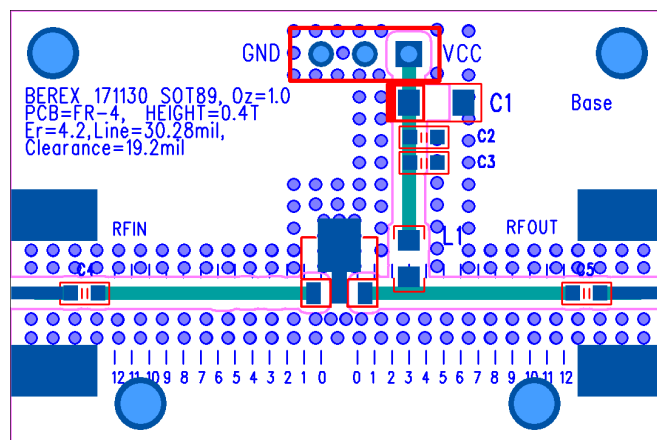
### PCB Land Pattern



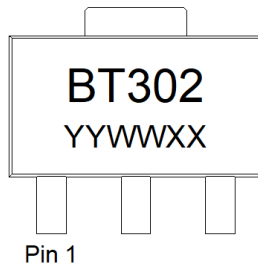
Note : All dimension \_ millimeters

PCB lay out \_ on BeRex website

### PCB Mounting



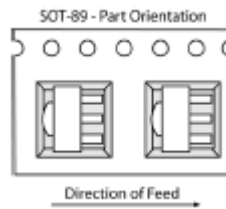
### Package Marking



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

<b>ESD Rating:</b>	Class 1C
<b>Value:</b>	Passes <2000V
<b>Test:</b>	Human Body Model (HBM)
<b>Standard:</b>	JEDEC Standard JS-001-2014
<b>MSL Rating:</b>	Level 1 at +260°C convection reflow
<b>Standard:</b>	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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