BT302

0.5-4.0 GHz 1W High Power Amplifier

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
- Lead-free/Green/RoHS-compliant SOT89 SMT package

Product Description

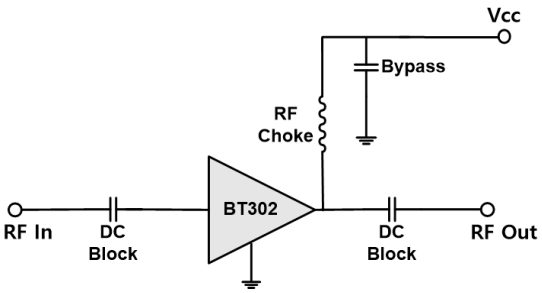
The BT302 is a high performance and a high dynamic range amplifier in a low cost surface mount package(SOT-89) with a RoHS-compliant, that incorporates reliable heterojunction-bipolar-transistor (HBT) devices fabricated with InGaP/GaAs technology.

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.

Typical Performance[1]

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[2]	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

[1] Device performance _ measured on a BeRex evaluation board at 25°C, 50 Ω
[2] OIP3 _ measured on two tones with a output power 16dBm/ tone , F2—F1 = 1 MHz..

*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.

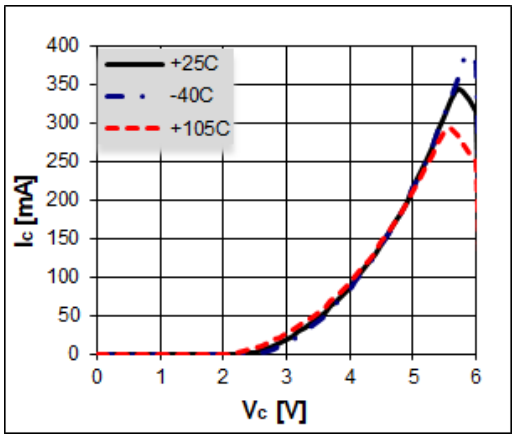
	Min.	Typical	Max.	Unit
Bandwidth	500		4000	MHz
I_{cq} @ (Vcc&Vbias=5V)	195	215	235	mA
V_{CC}/V_{bias}		5.0		V
R_{TH}		19.5		°C/W

Absolute Maximum Ratings

Parameter	Rating	Unit
Operating Case Temperature	-40 to +105	°C
Storage Temperature	-55 to +155	°C
Junction Temperature	220	°C
Operating Voltage	+6.0	V
Supply Current	550	mA
Input RF Power	24	dBm

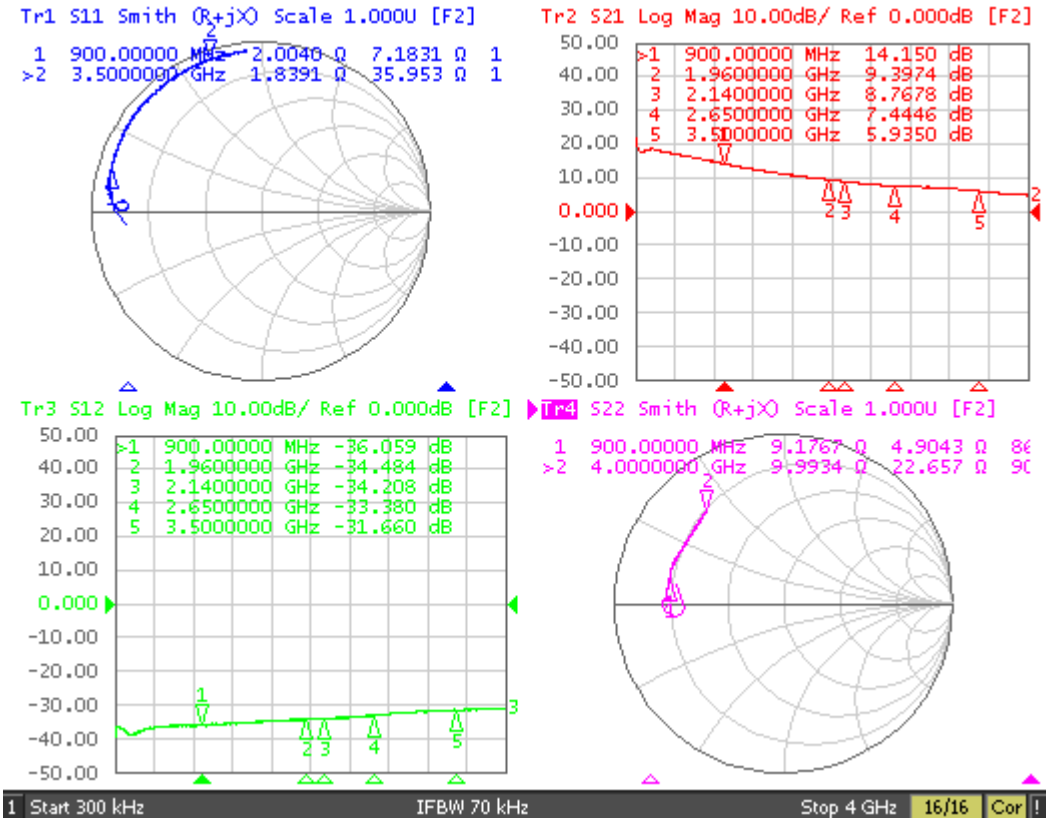
*Operation of this device above any of these parameters may result in permanent damage.

V-I Characteristics



Typical Device Data

S-parameters (V_C=5V, I_C=215mA, T=25°C)



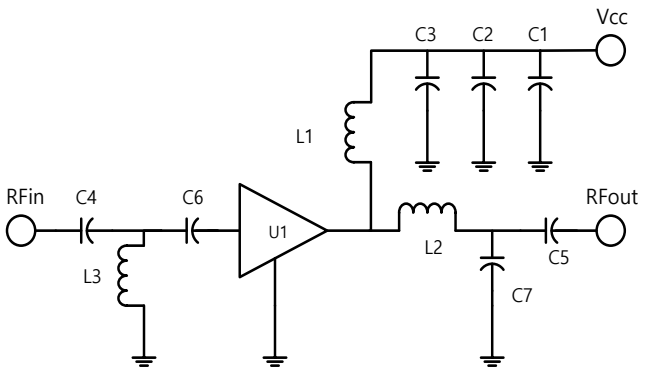
S-Parameter

(Vdevice = 5.0V, I_c = 215mA, T = 25 °C, calibrated to device leads)

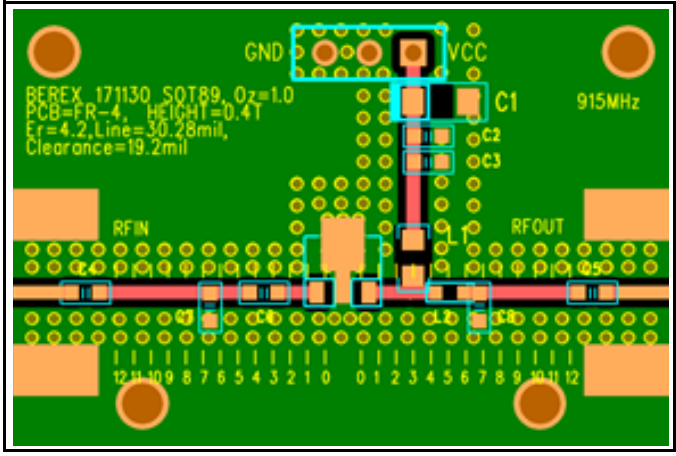
Freq [MHz]	S11 [Mag]	S11 [Ang]	S21 [Mag]	S21 [Ang]	S12 [Mag]	S12 [Ang]	S22 [Mag]	S22 [Ang]
500	0.91	172.90	6.65	135.78	0.015	11.72	0.70	173.01
600	0.91	170.31	6.23	129.10	0.015	10.72	0.69	171.51
700	0.92	168.00	5.84	123.25	0.015	11.65	0.69	170.18
800	0.92	165.60	5.47	117.61	0.016	11.53	0.69	169.26
900	0.92	163.61	5.10	112.46	0.016	11.72	0.69	168.35
1000	0.93	161.62	4.76	108.08	0.016	13.86	0.69	167.44
1100	0.93	159.83	4.45	104.06	0.016	14.48	0.70	166.46
1200	0.93	158.14	4.18	100.16	0.016	14.53	0.70	165.67
1300	0.93	156.58	3.96	96.31	0.017	14.31	0.70	164.94
1400	0.93	154.90	3.77	93.11	0.017	14.97	0.70	164.19
1500	0.94	153.12	3.57	89.90	0.018	14.61	0.70	163.57
1600	0.94	151.63	3.43	86.54	0.018	15.01	0.70	162.55
1700	0.94	150.34	3.26	83.68	0.018	14.36	0.70	161.77
1800	0.94	148.55	3.14	80.43	0.019	15.13	0.70	160.93
1900	0.94	146.83	3.01	77.25	0.019	14.47	0.70	160.22
2000	0.94	145.20	2.89	74.02	0.019	13.74	0.70	159.29
2100	0.95	143.19	2.79	71.03	0.019	12.40	0.69	158.14
2200	0.94	141.46	2.69	68.15	0.020	13.77	0.69	156.91
2300	0.94	139.38	2.59	65.72	0.020	14.15	0.69	155.94
2400	0.95	136.88	2.52	63.57	0.020	13.40	0.69	154.78
2500	0.94	135.06	2.44	60.76	0.021	12.19	0.69	153.38
2600	0.95	132.76	2.40	58.88	0.022	12.17	0.69	151.92
2700	0.95	130.47	2.34	56.69	0.022	13.21	0.68	150.86
2800	0.95	127.90	2.31	53.61	0.023	12.11	0.68	149.05
2900	0.95	125.20	2.29	50.59	0.024	9.70	0.68	147.56
3000	0.95	122.86	2.27	47.41	0.025	9.36	0.69	145.83
3100	0.95	119.89	2.23	44.51	0.025	9.71	0.69	144.11
3200	0.95	116.94	2.13	40.75	0.025	6.11	0.69	142.53
3300	0.95	114.13	2.11	36.73	0.026	5.00	0.69	140.79
3400	0.95	111.26	2.05	33.66	0.026	4.11	0.69	139.25
3500	0.95	108.49	1.98	30.66	0.026	1.98	0.69	137.21
3600	0.95	105.74	1.92	27.79	0.027	1.21	0.70	135.77
3700	0.95	102.74	1.86	25.27	0.027	0.57	0.70	134.23
3800	0.95	100.24	1.83	22.61	0.027	-0.77	0.71	132.66
3900	0.96	97.55	1.76	20.97	0.028	-2.34	0.71	131.13
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	
U1	SOT89	BT302	



Note:

1. Distance between the edge of the series cap(C6) and the input pin of BT302 - ***1.7mm.***
2. Distance between the edge of the shunt ind(L3) and the input pin of BT302 - ***5.0mm.***
3. Distance between the edge of the series ind(L2) and the output pin of BT302 - ***3.3mm.***
4. Distance between the edge of the shunt cap(C7) and the output pin of BT302 - ***5.6mm.***

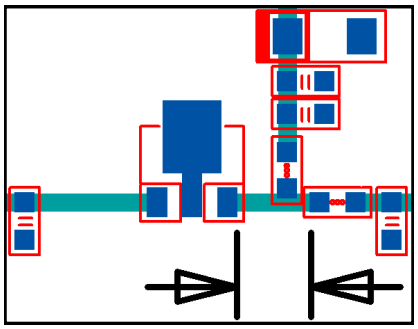
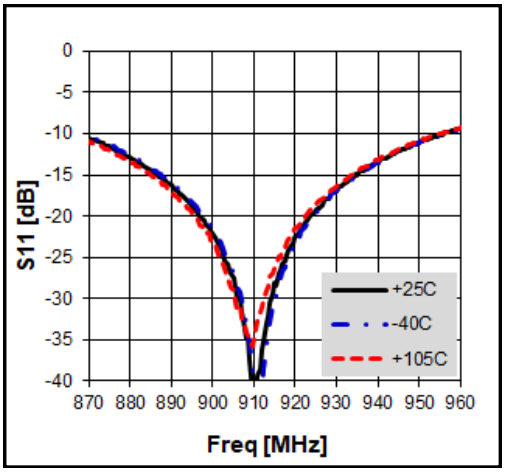
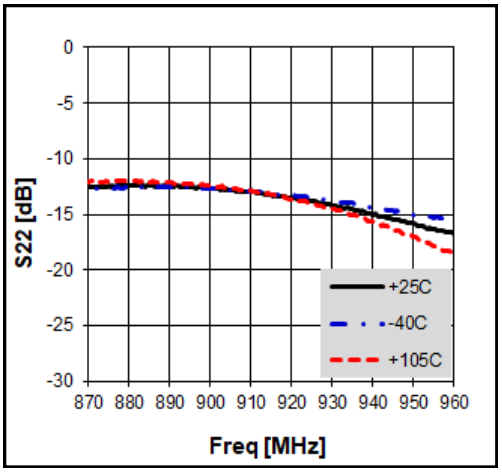


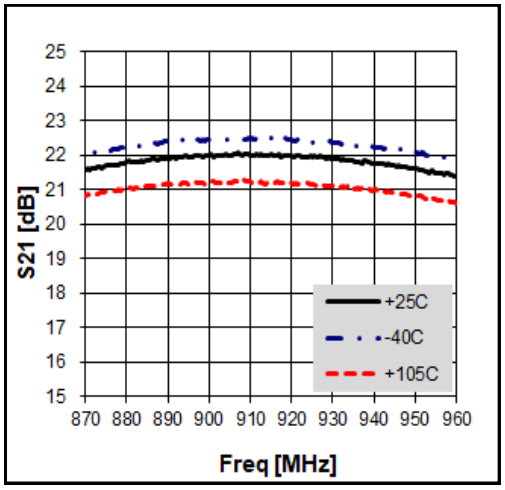
Figure about the reference position of components

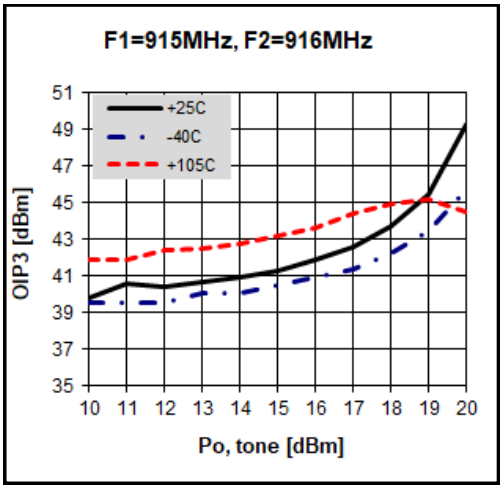
Typical Performance

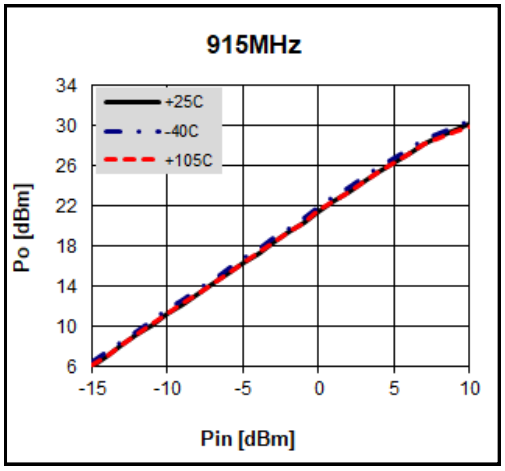
V_c = 5V, I_c = 215mA

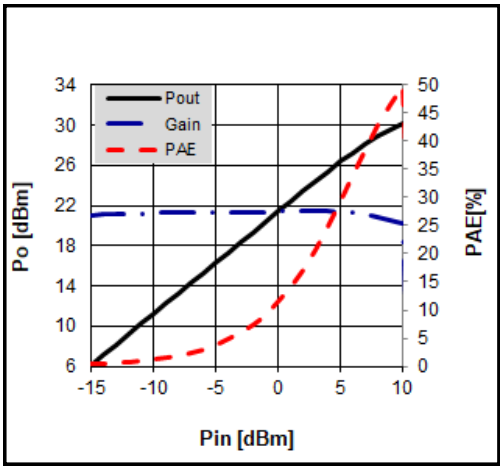






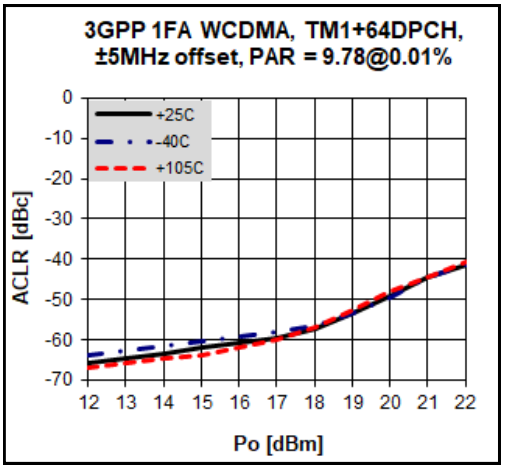


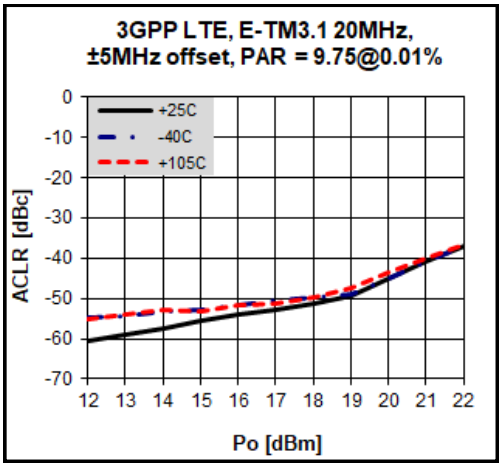




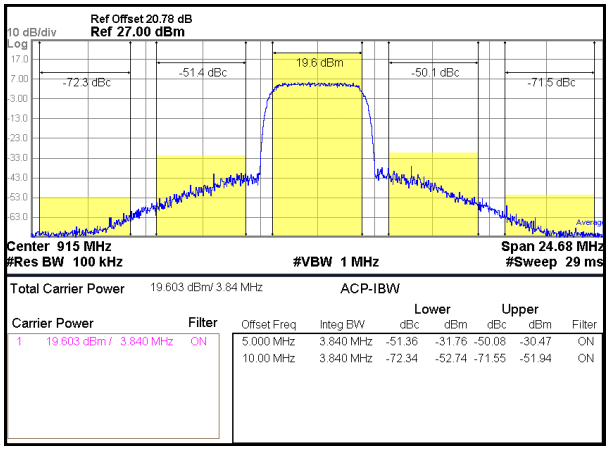
Typical Performance

V_c = 5V, I_c = 215mA

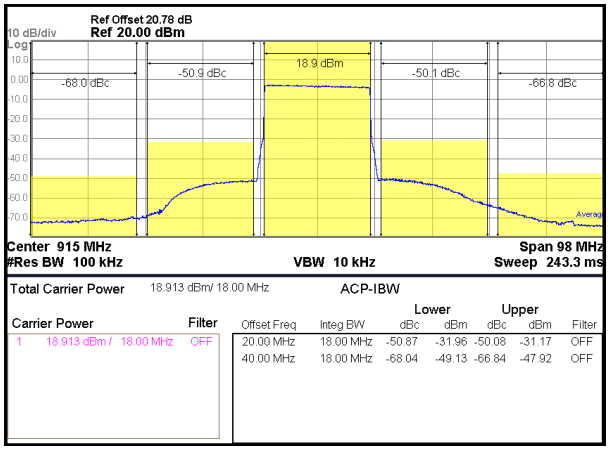




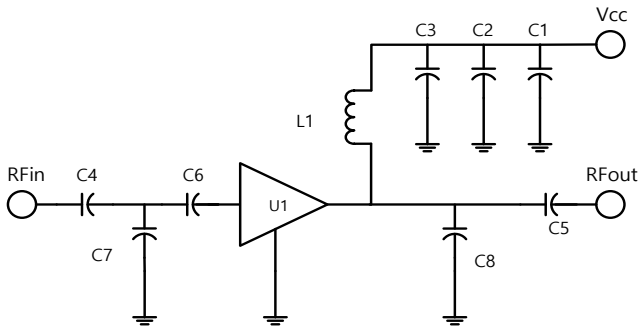
3GPP WCDMA 1FA ACLR (–50dBc)

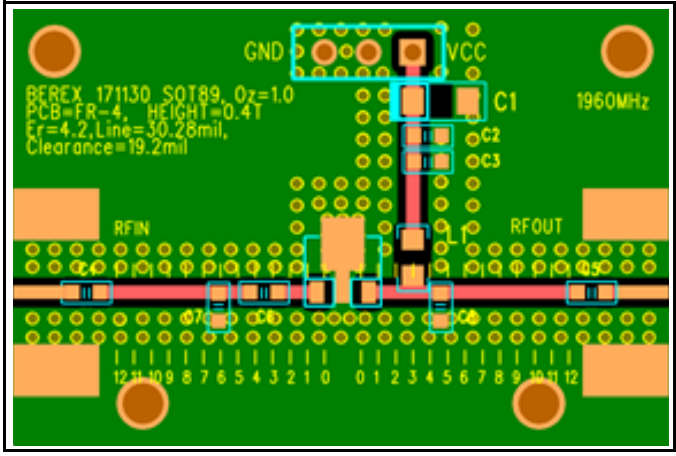


3GPP LTE TM3.1 20MHz ACLR (–50dBc)



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
	U1	SOT89	BT302	



Note:

1. Distance between the edge of the series cap(C6) and the input pin of BT302 - ***1.7mm.***
2. Distance between the edge of the shunt ind(C7) and the input pin of BT302 - ***5.0mm.***
3. Distance between the edge of the shunt cap(C8) and the output pin of BT302 - ***3.6mm.***

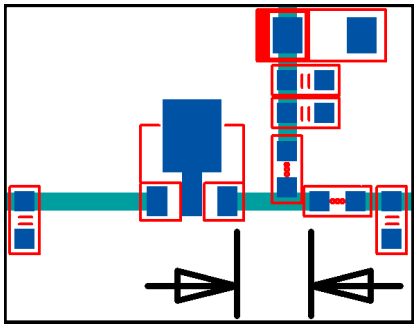
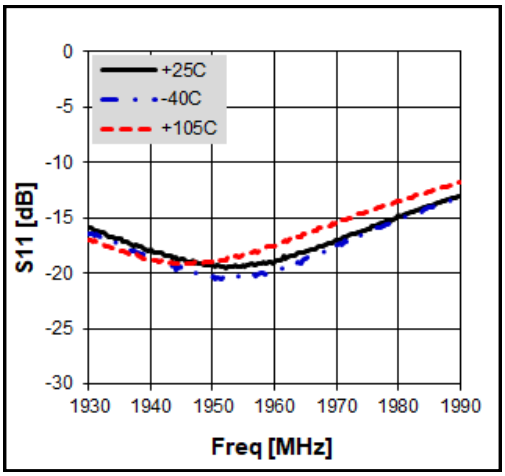
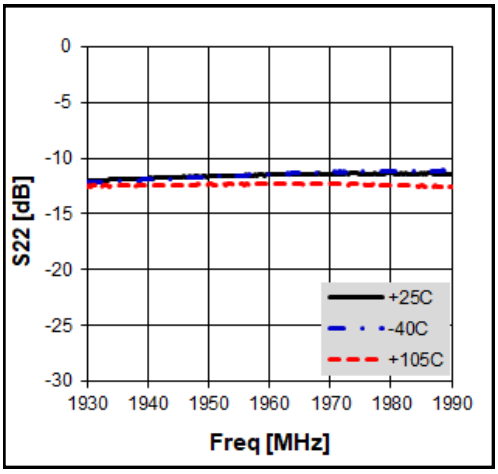


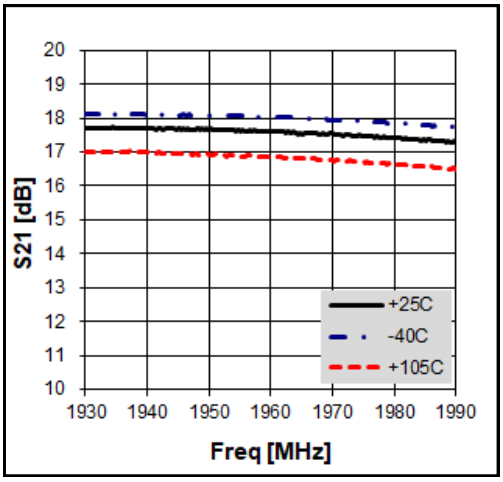
Figure about the reference position of components

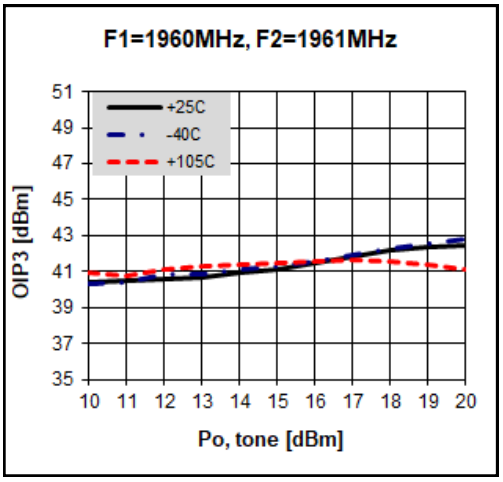
Typical Performance

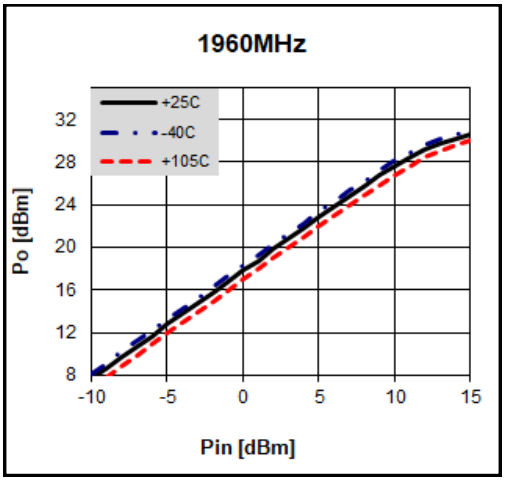
V_c = 5V, I_c = 215mA

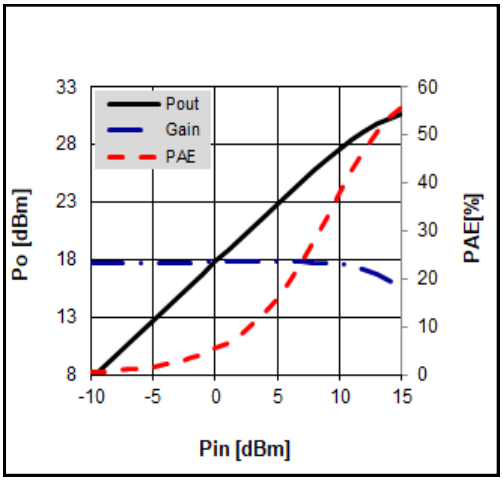






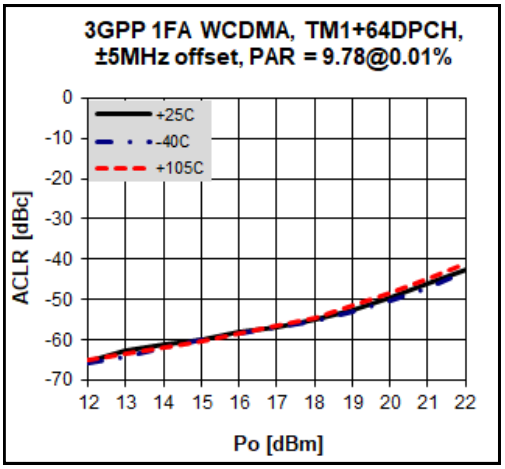


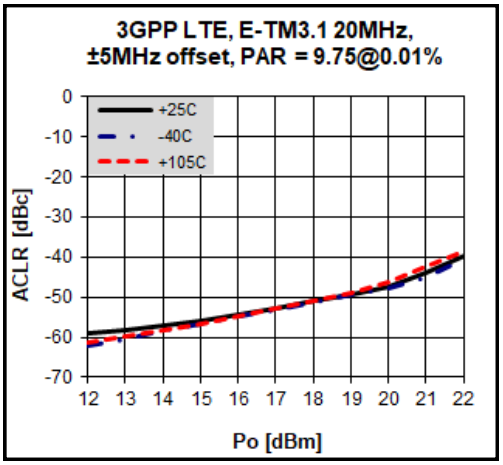




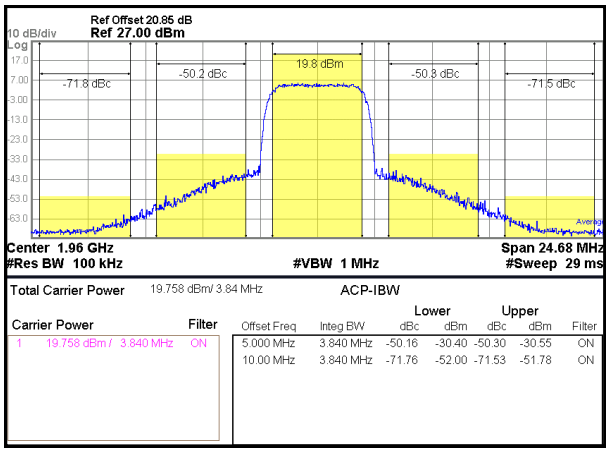
Typical Performance

V_c = 5V, I_c = 215mA

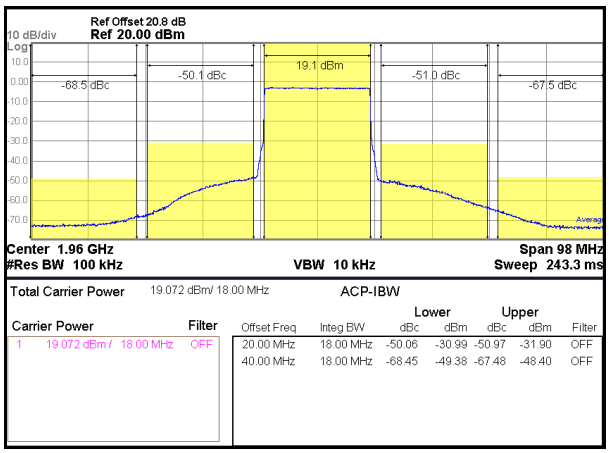




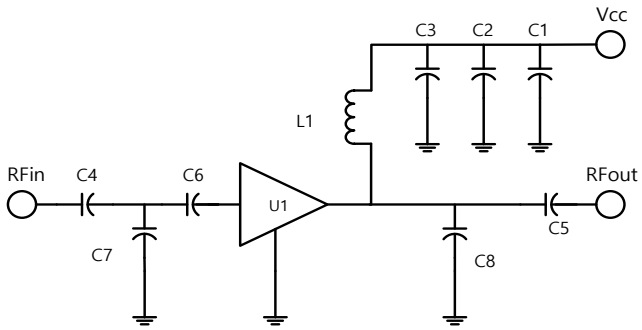
3GPP WCDMA 1FA ACLR (–50dBc)

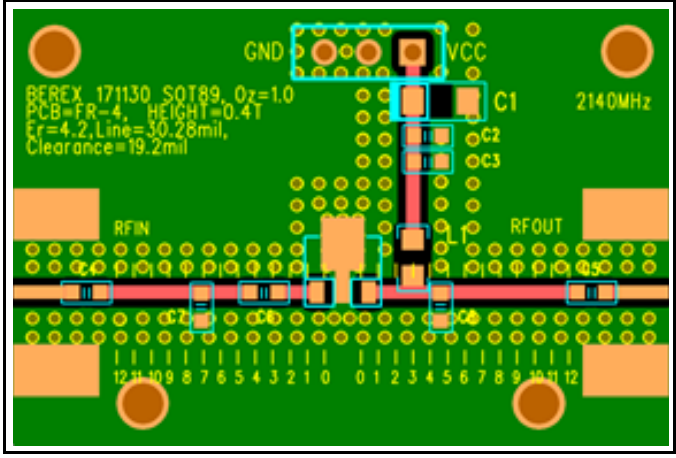


3GPP LTE TM3.1 20MHz ACLR (–50dBc)



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
	U1	SOT89	BT302	



Note:

1. Distance between the edge of the series cap(C6) and the input pin of BT302 - ***1.7mm.***
2. Distance between the edge of the shunt ind(C7) and the input pin of BT302 - ***5.6mm.***
3. Distance between the edge of the shunt cap(C8) and the output pin of BT302 - ***3.3mm.***

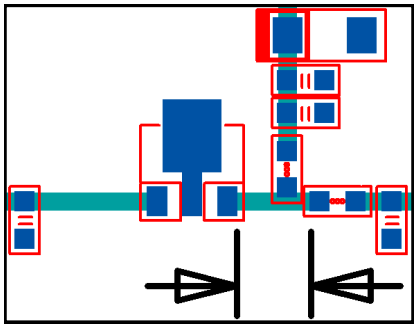
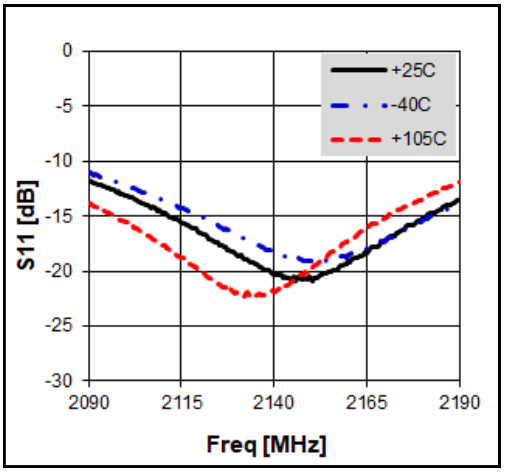
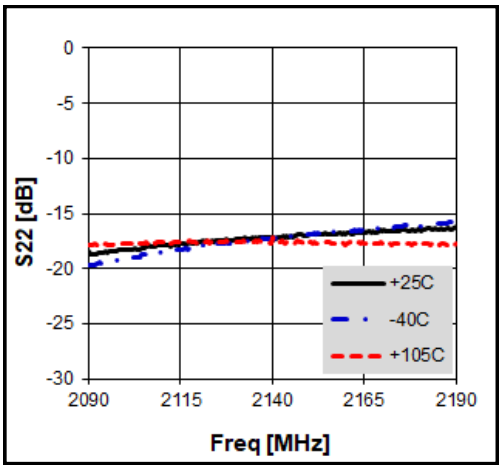


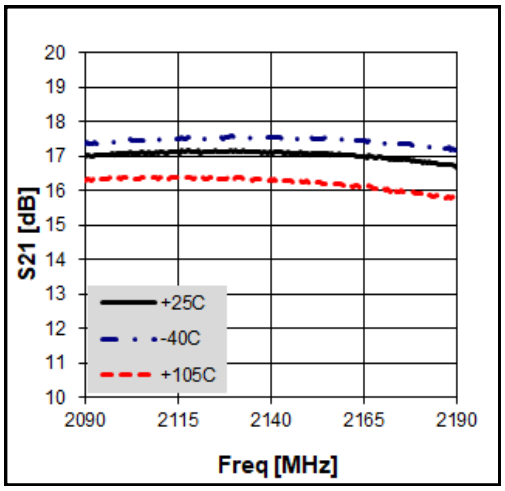
Figure about the reference position of components

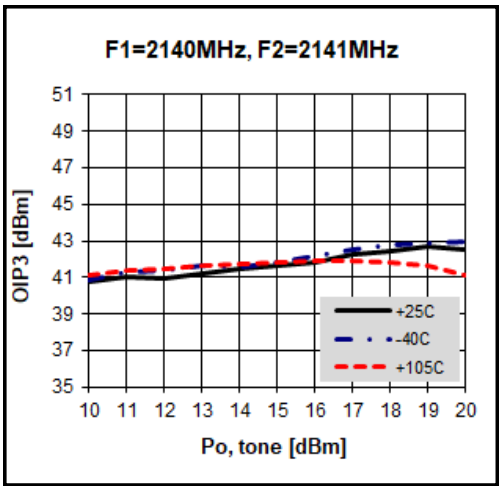
Typical Performance

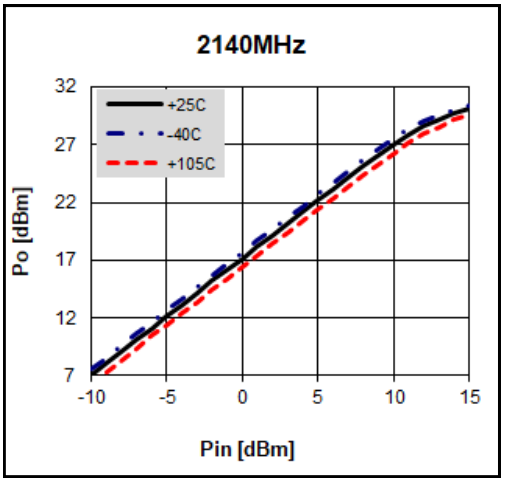
V_c = 5V, I_c = 215mA

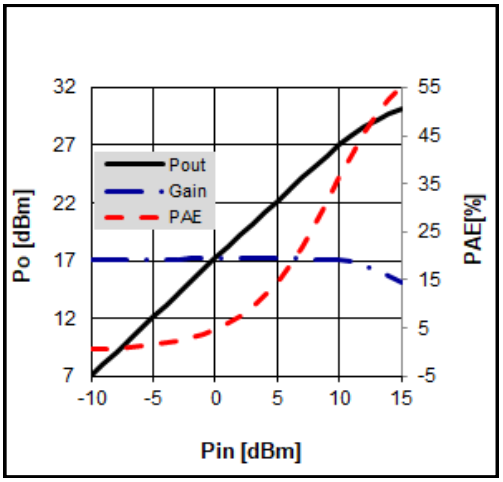






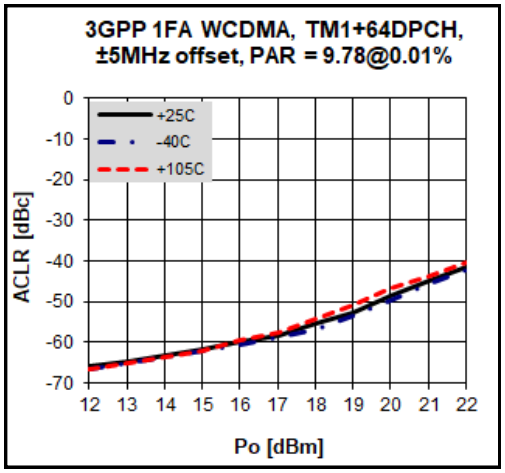


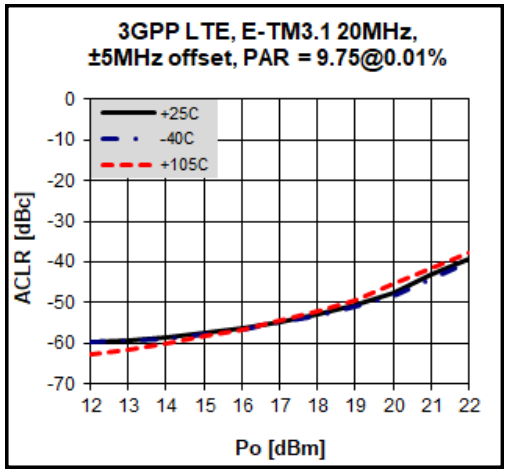




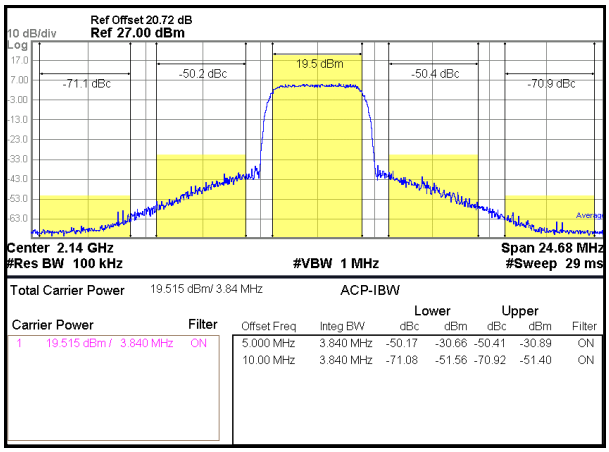
Typical Performance

V_c = 5V, I_c = 215mA

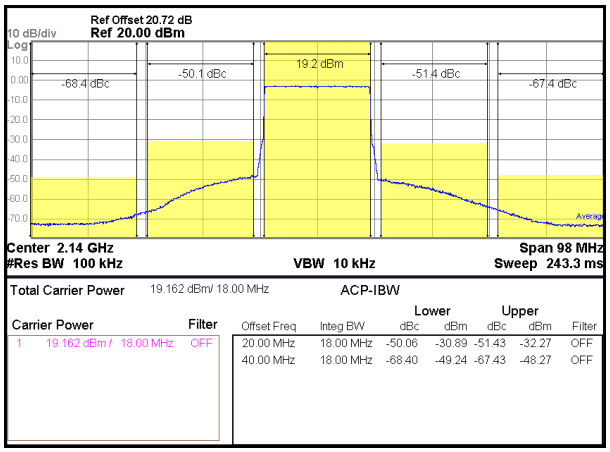




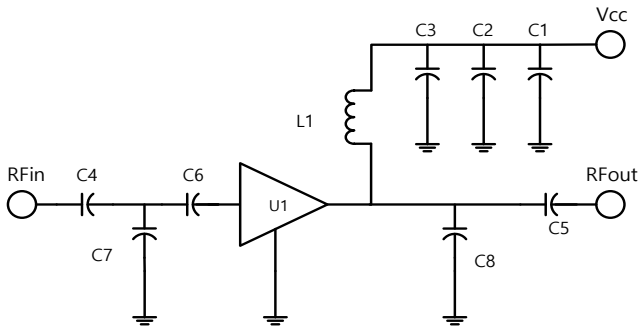
3GPP WCDMA 1FA ACLR (–50dBc)

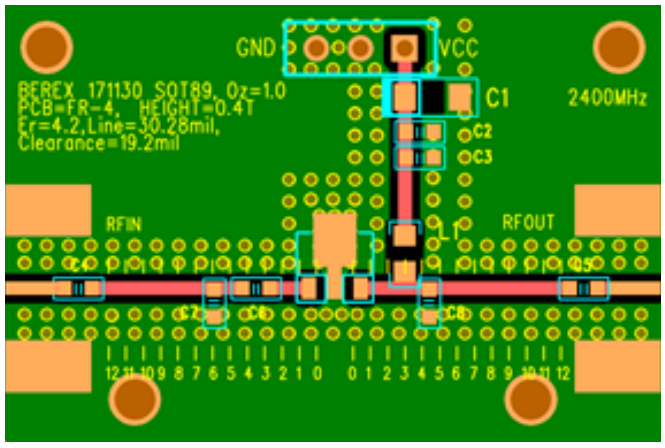


3GPP LTE TM3.1 20MHz ACLR (–50dBc)



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
	U1	SOT89	BT302	



Note:

1. Distance between the edge of the series cap(C6) and the input pin of BT302 - ***1.7mm.***
2. Distance between the edge of the shunt ind(C7) and the input pin of BT302 - 4.***5mm.***
3. Distance between the edge of the shunt cap(C8) and the output pin of BT302 - ***3.0mm.***

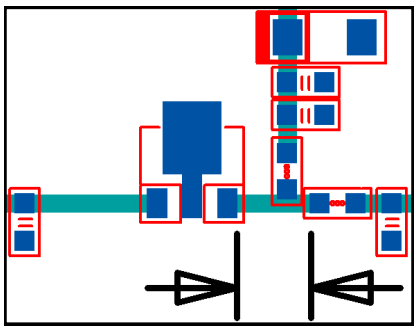
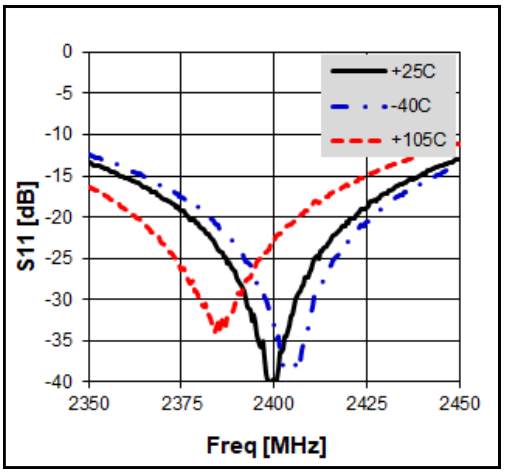
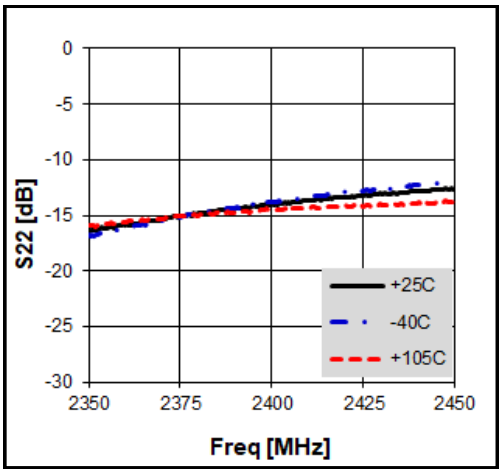


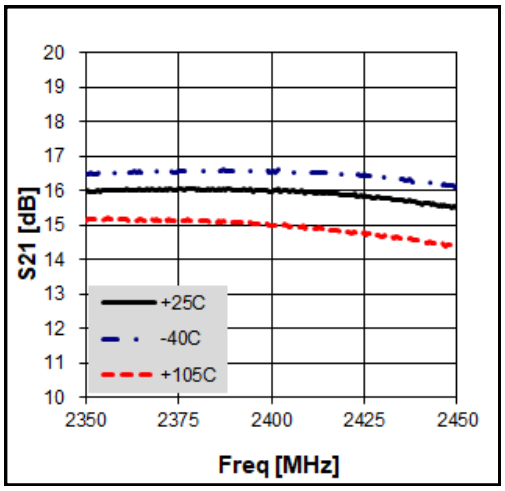
Figure about the reference position of components

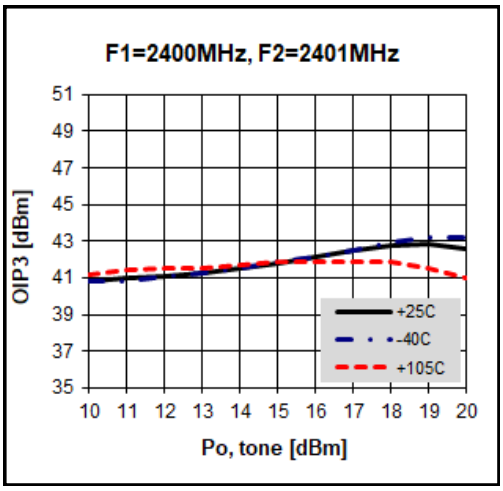
Typical Performance

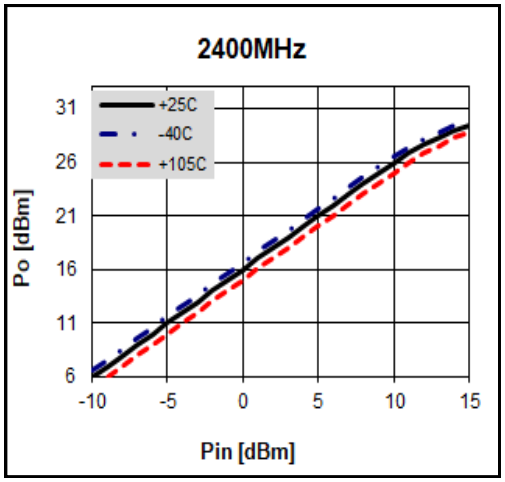
V_c = 5V, I_c = 215mA

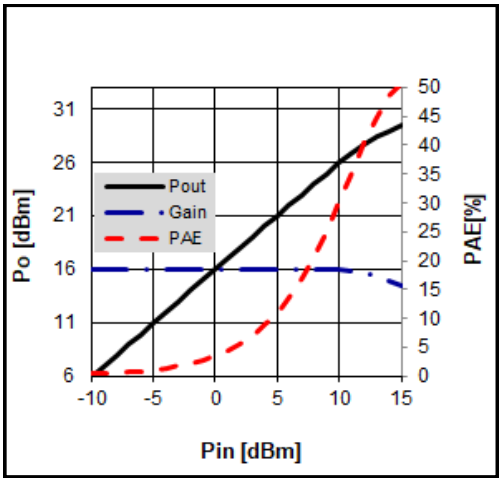






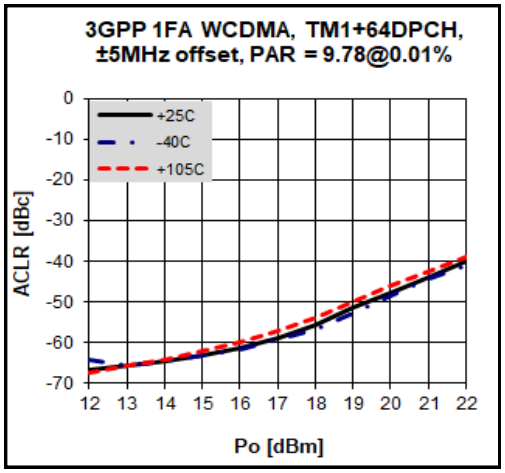


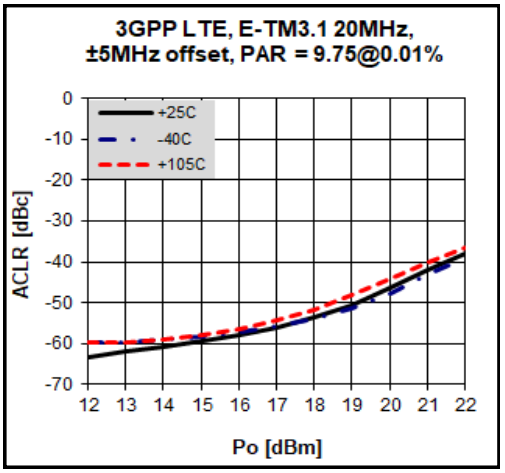




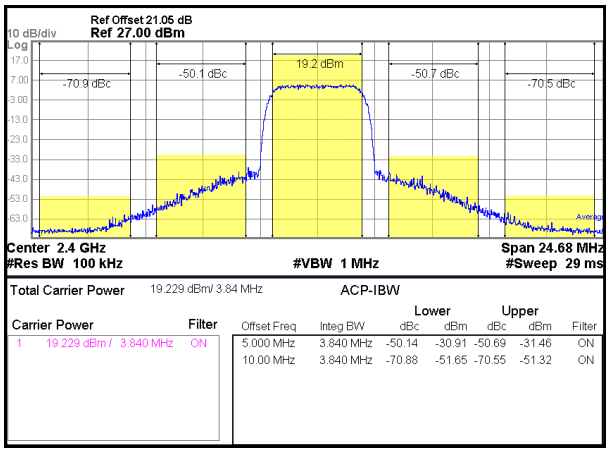
Typical Performance

V_c = 5V, I_c = 215mA

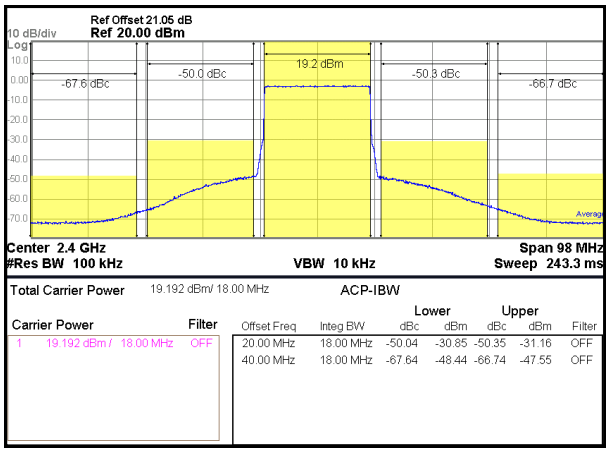




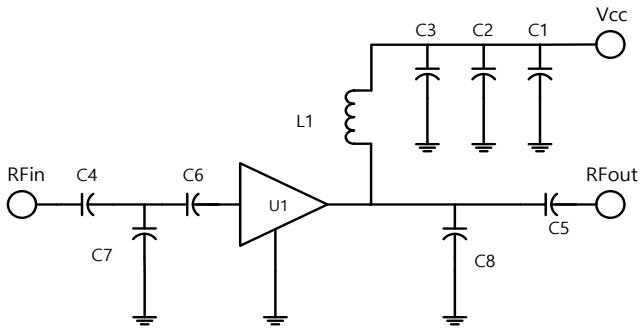
3GPP WCDMA 1FA ACLR (–50dBc)

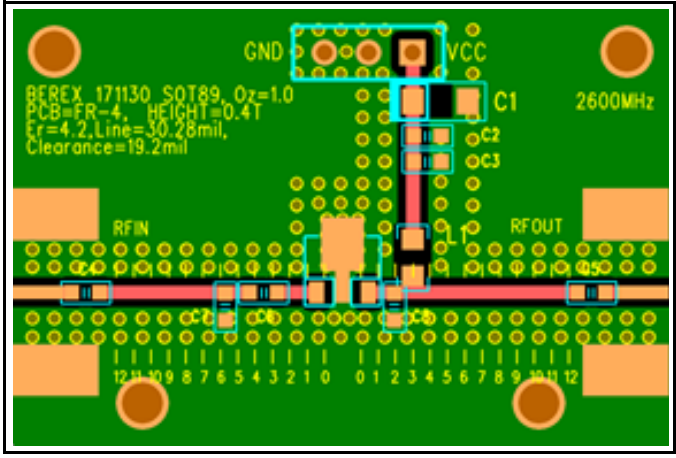


3GPP LTE TM3.1 20MHz ACLR (–50dBc)



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
	U1	SOT89	BT302	



Note:

1. Distance between the edge of the series cap(C6) and the input pin of BT302 - ***1.7mm.***
2. Distance between the edge of the shunt ind(C7) and the input pin of BT302 - ***3.6mm.***
3. Distance between the edge of the shunt cap(C8) and the output pin of BT302 - ***0.8mm.***

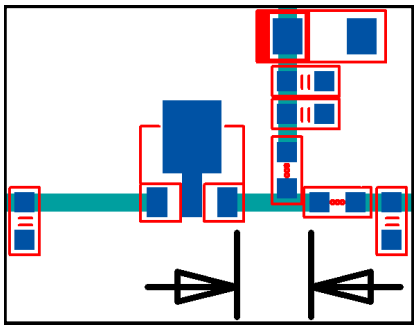
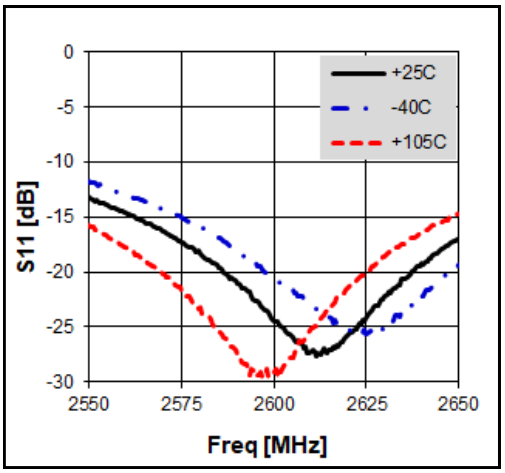
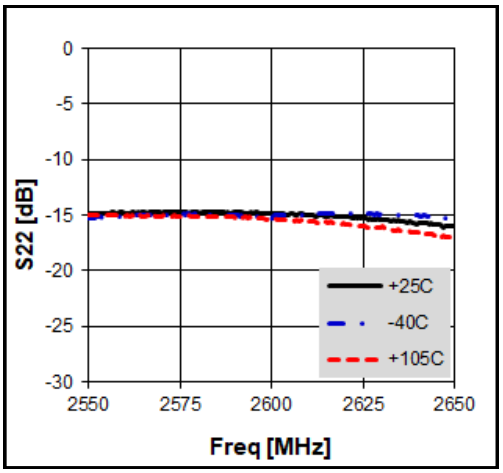


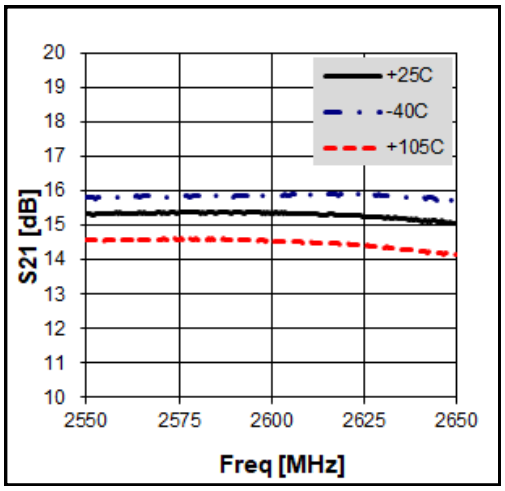
Figure about the reference position of components

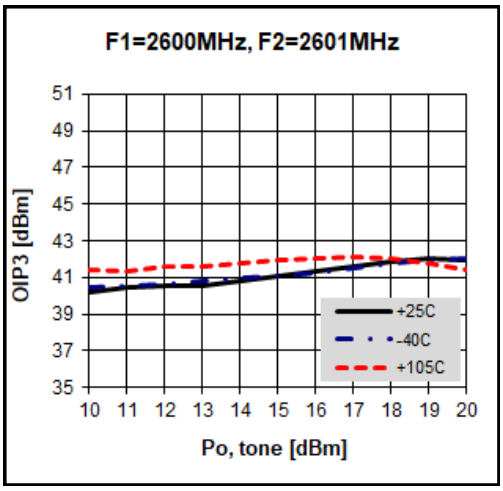
Typical Performance

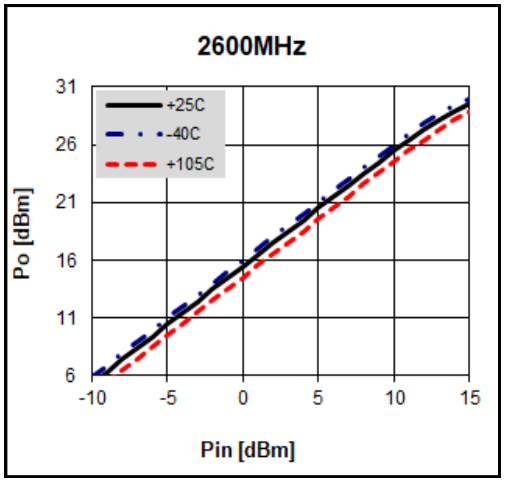
V_c = 5V, I_c = 215mA

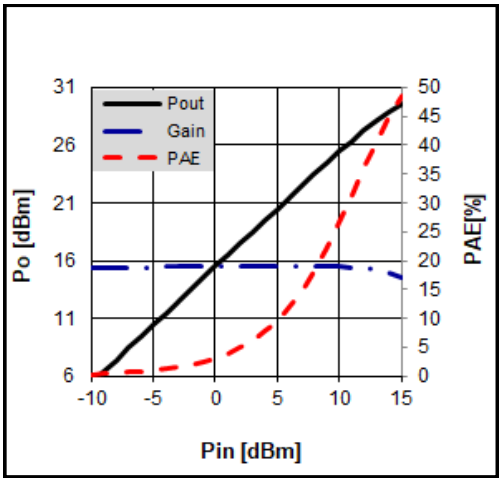






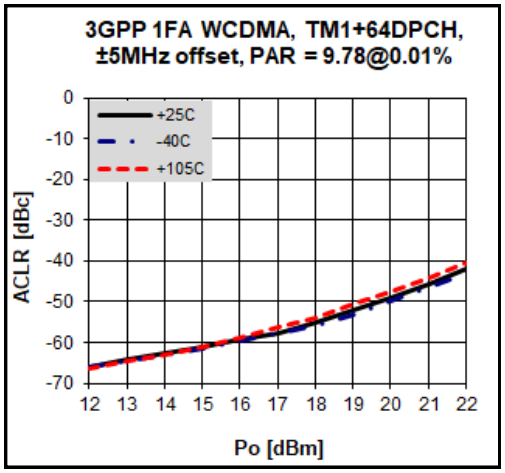


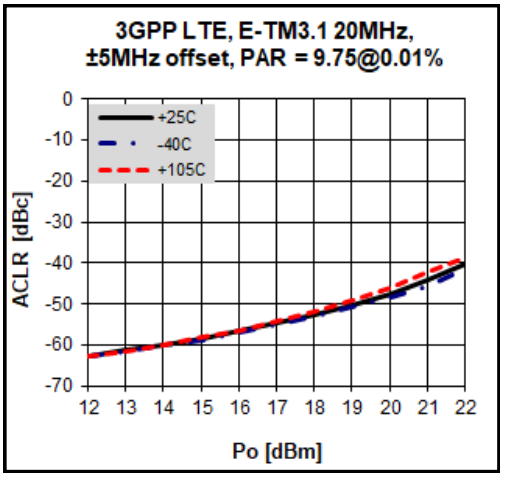




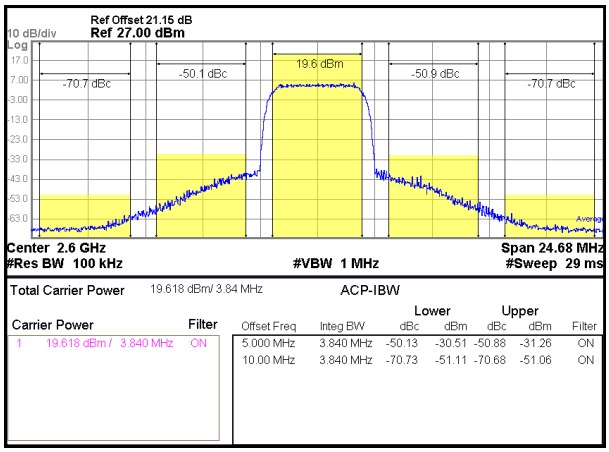
Typical Performance

V_c = 5V, I_c = 215mA

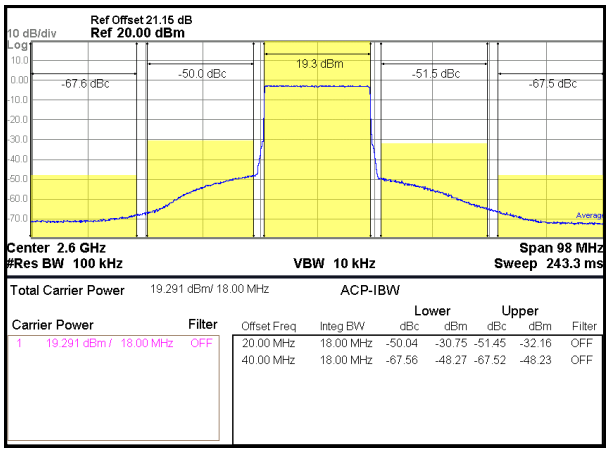




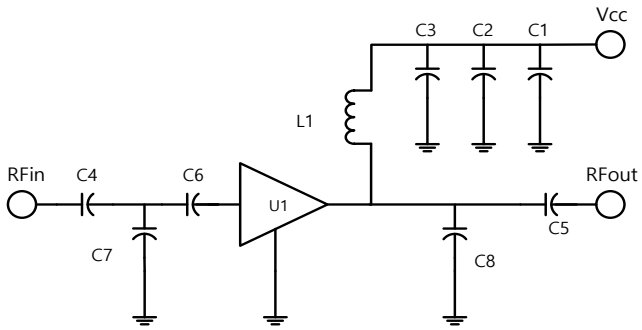
3GPP WCDMA 1FA ACLR (–50dBc)

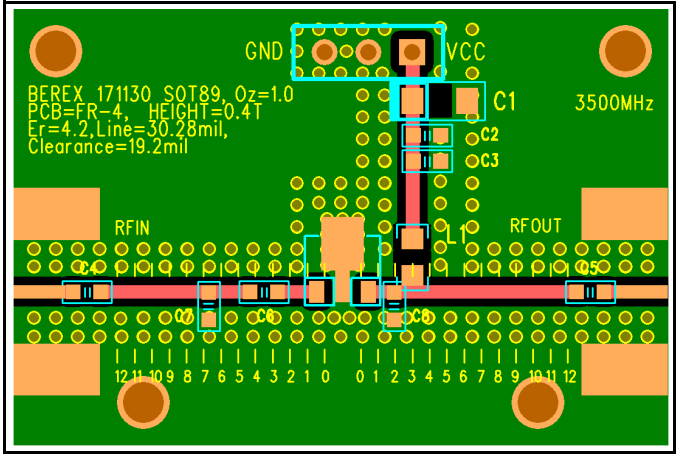


3GPP LTE TM3.1 20MHz ACLR (–50dBc)



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
	U1	SOT89	BT302	



Note:

1. Distance between the edge of the series cap(C6) and the input pin of BT302 - ***1.7mm.***
2. Distance between the edge of the shunt cap(C7) and the input pin of BT302 - ***6.7mm.***
3. Distance between the edge of the shunt cap(C8) and the output pin of BT302 - ***0.4mm.***

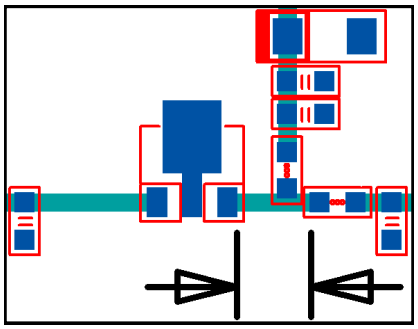
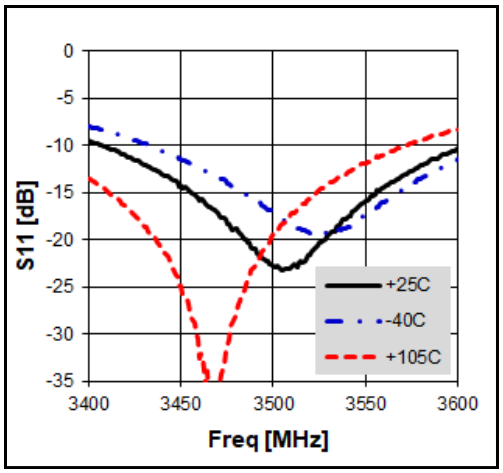
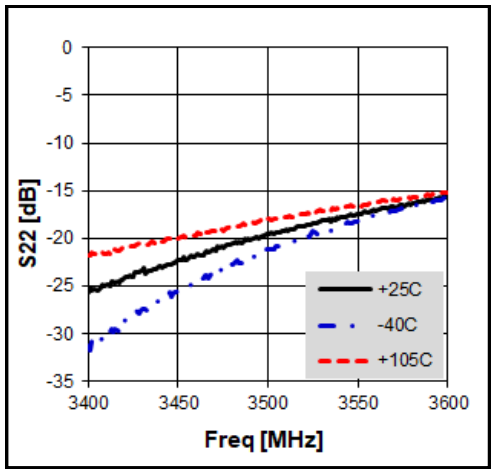


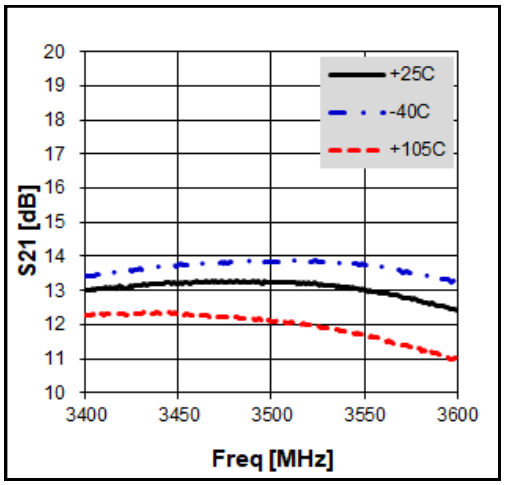
Figure about the reference position of components

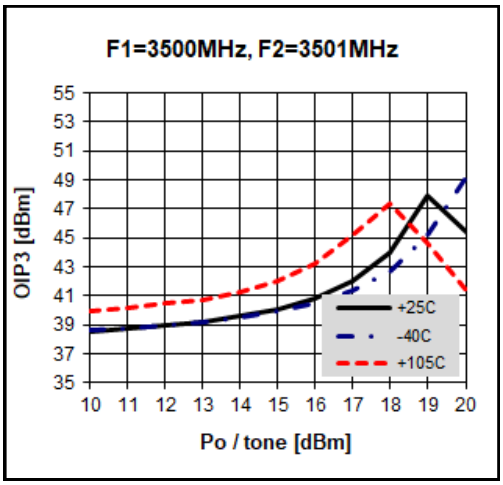
Typical Performance

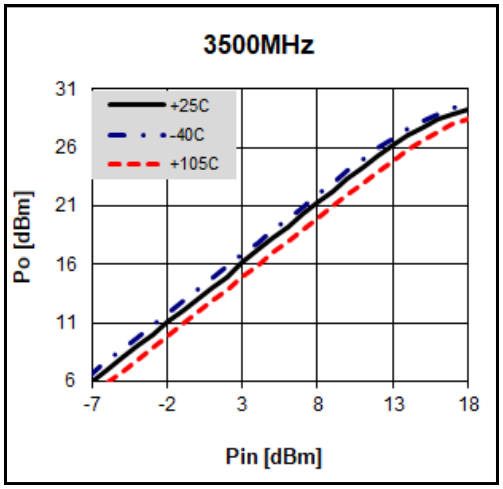
V_c = 5V, I_c = 215mA

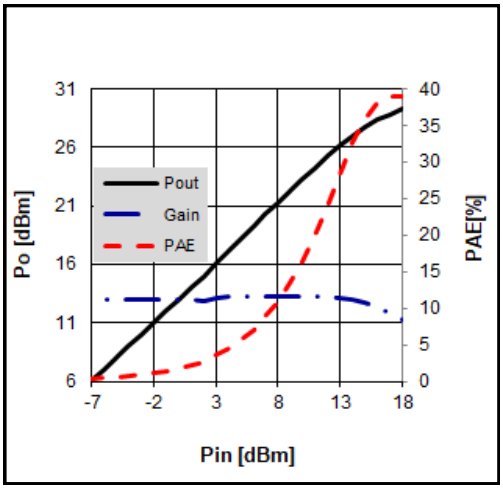






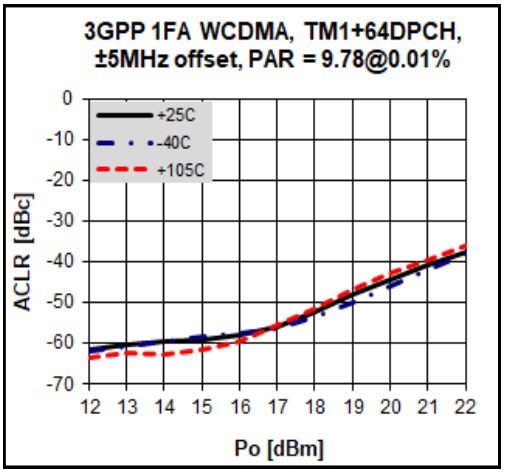


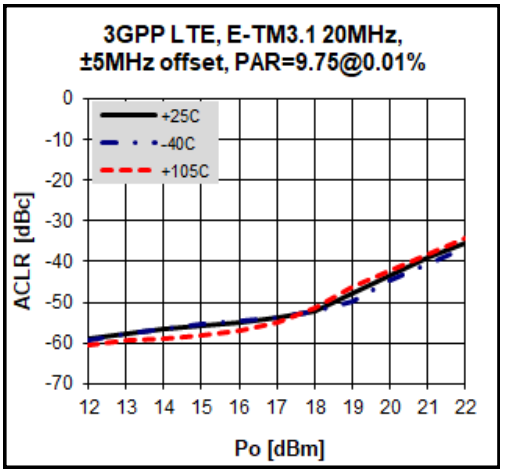




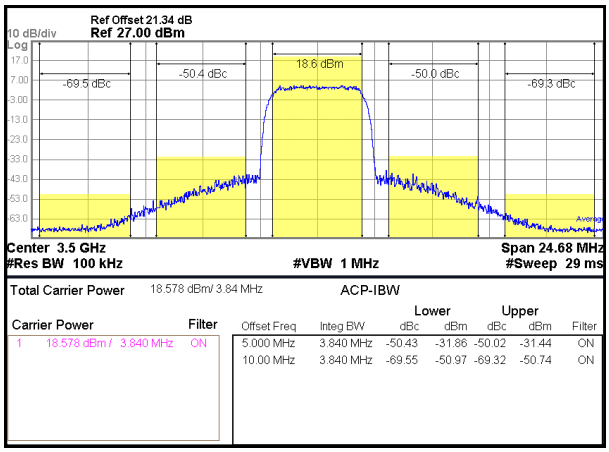
Typical Performance

V_c = 5V, I_c = 215mA

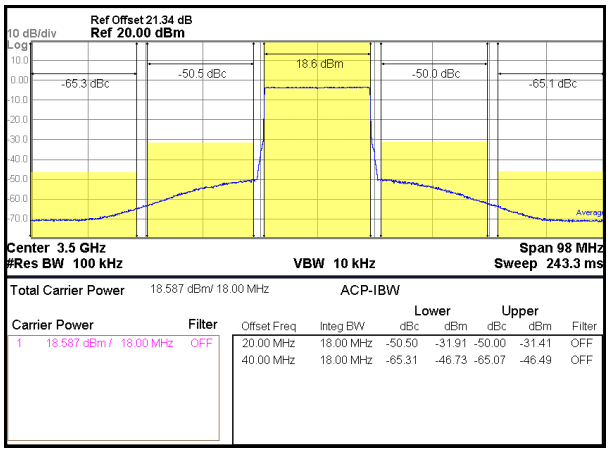


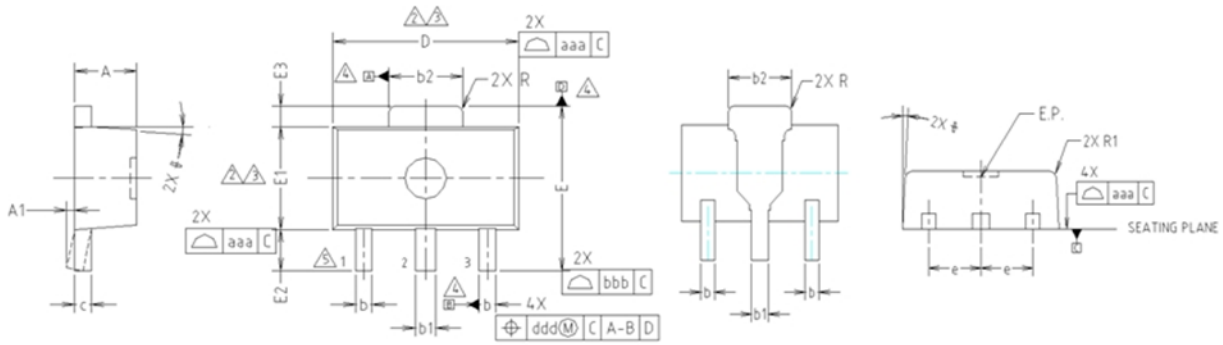


3GPP WCDMA 1FA ACLR (–50dBc)



3GPP LTE TM3.1 20MHz ACLR (–50dBc)





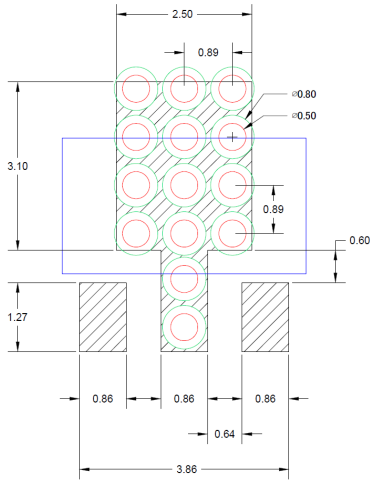
NOTE:

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	

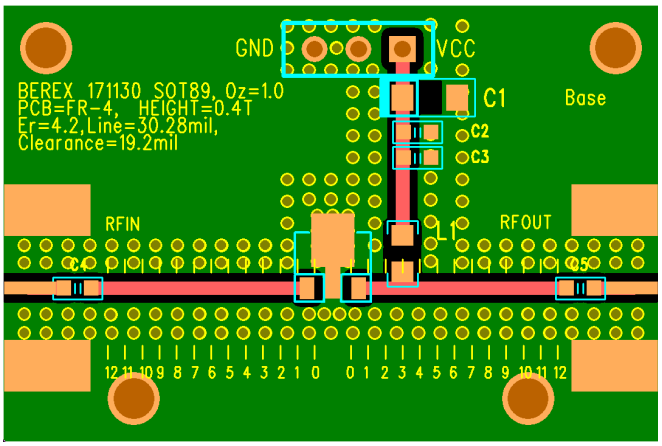
PCB Land Pattern



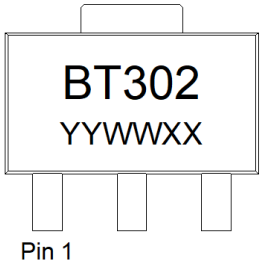
Note : All dimension _ millimeters

PCB lay out _ on BeRex website

PCB Mounting



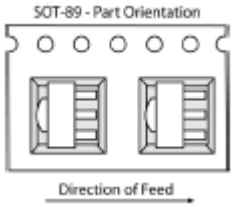
Package Marking



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 1C
Value:	**Passes <2000V**
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114B
MSL Rating:	**Level 1 at +265°C convection reflow**
Standard:	JEDEC Standard J-STD-020

NATO CAGE code:

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