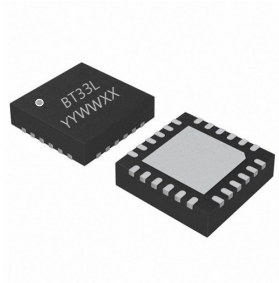
BT33L

100-1000MHz 1.5W ~ 2.0W High Linearity 5V Power Amplifier

Device Features

- OIP3 = 48.5dBm @ 700 MHz
- Gain = 22.0 dB @ 700 MHz
- Output P1 dB = 33dBm @ 700 MHz
- Highly Reliable InGaP/GaAs HBT Technology
- RoHS2-compliant 24L QFN 4X4 SMT package



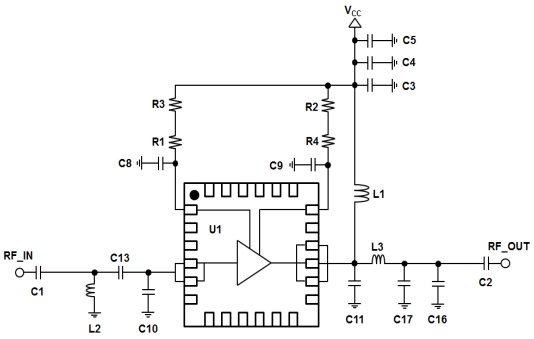
Product Description

The BT33L is a high dynamic range power amplifier housed in RoHS2 compliant 24L, 4x4mm QFN package. The BT33L uses a high reliability InGaP/GaAs HBT process technology. The BT33L is designed for use where high linearity and gain is required. The BT33L is able to deliver over 22 dBm output power from 200 to 1000MHz while maintaining superior ACLR performance with a few external matching components. All devices are 100% RF/DC screened.

Applications

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

Application Circuits



*External matching circuit: refer to the page 4 to 15.

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		100		1000	MHz
Test Frequency			700		MHz
Gain		20.5	22.0		dB
Input Return Loss			-12.1		dB
Output Return Loss			-7.3		dB
Output IP3	20 dBm/tone,	45.5	48.5		dBm
Output P1dB		32.0	33.0		dBm
WCDMA 4FA ACLR*		19.8	20.8		dBm
LTE20M ACLR*		21.2	22.2		dBm
Noise Figure			6.8		dB

* ACLR Channel Power measured at -50dBc.

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

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

Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Bandwidth	100		1000	MHz
I_C @ (Vc = 5V)	320	400	480	mA
V_C	4.75	5.0	5.25	V
R_{TH}		10.9		°C/W
Operating Case Temperature	-40		+85	°C

Electrical specifications are measured at specified test conditions.

Specifications are not guaranteed over all recommended operating conditions.

Absolute Maximum Ratings

Parameter	Rating	Unit
Storage Temperature	-55 to +155	°C
Junction Temperature	+175	°C
Supply Voltage	+6.0	V
Supply Current	1.2	A
Input RF Power	26	dBm

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

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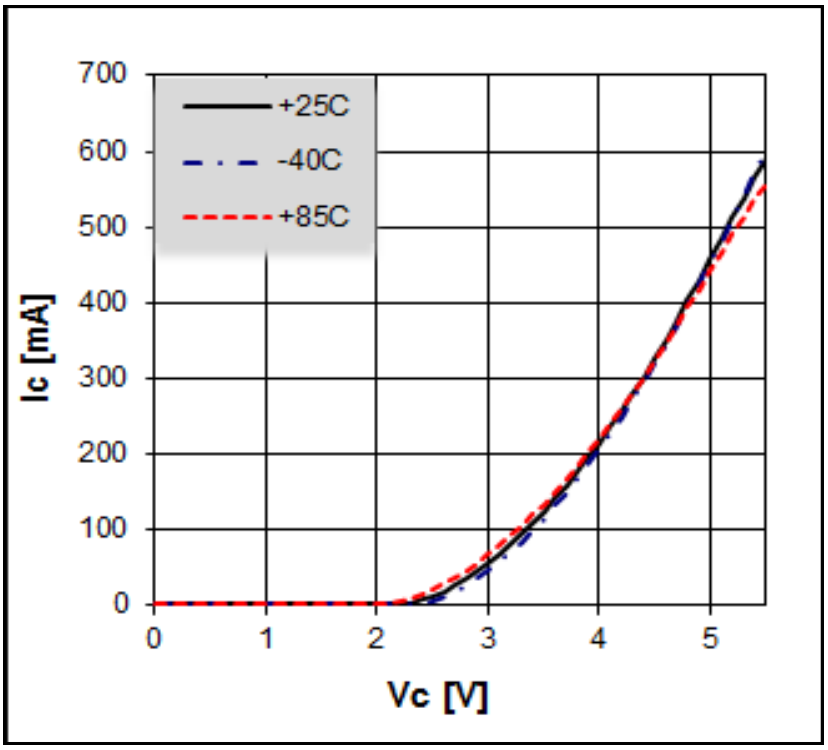
Typical Performance (V_{cc} & V_{Bias} = 5V, I_{cq}=400mA, T_a=25°C)

Parameter	Frequency				Unit
	200	540	700	900	MHz
Gain	25.7	23.4	22.0	21.3	dB
S11	-10.4	-10.3	-12.1	-10.2	dB
S22	-10.3	-7.5	-7.3	-10.7	dB
OIP3	43.0	47.5	48.5	47.5	dBm
P1dB	31.8	32.4	33.0	32.7	dBm
WCDMA 4FA_ACLR	17.5	20.4	20.8	21.6	dBm
LTE20M ACLR	21.4	21.8	22.2	22.0	dBm
Noise Figure	8.6	6.5	6.8	6.8	dB

V-I Characteristics



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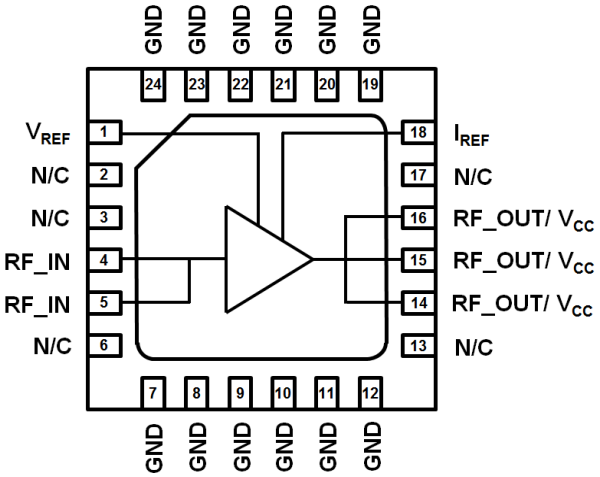
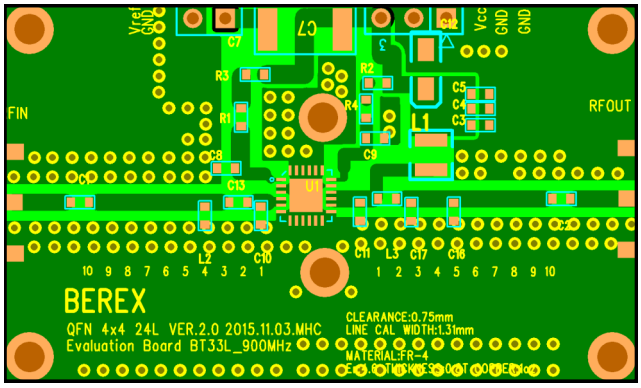
Pin Configuration



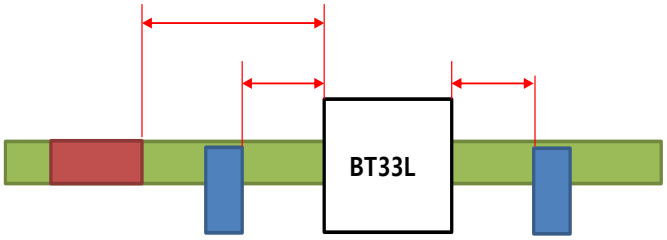
Pin No.	Label
1	V_{REF}
4,5	RF IN
14,15,16	RF OUT/V_{CC}
18	I_{REF}
2,3,6,13,17	N/C
7,8,9,10,11,12 19,20,21,22,23,24	GND
Backside Paddle	GND

BeRex Evaluation Board



*Dielectric constant _ 4.6 *RF pattern width 52mil *31mil thick FR4 PCB

Figure about the reference position of components



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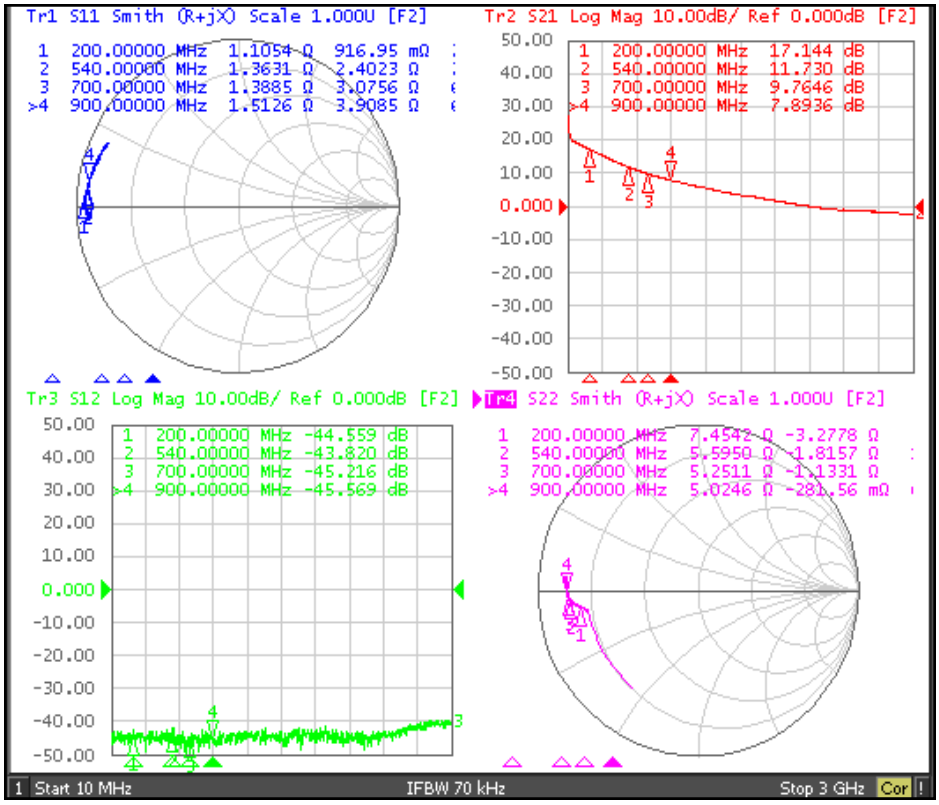
Typical Device Data

S-parameters (V_{cc} & V_{Bias} =+5V, I_{cq}=400mA, T_a=25°C)



S-Parameter

(V_{cc} & V_{Bias} = 5.0V, I_{cq} = 400mA, T_a= 25 °C, calibrated to device leads)

Freq	S11	S11	S21	S21	S12	S12	S22	S22
[MHz]	[Mag]	[Ang]	[Mag]	[Ang]	[Mag]	[Ang]	[Mag]	[Ang]
100	0.955743	179.2819	8.653431	145.1726	0.005675	2.16267	0.702571	-170.56
200	0.954013	177.8986	7.158374	131.9803	0.006977	1.90465	0.73797	-172.26
300	0.953118	176.9255	5.876515	120.3807	0.005183	6.429368	0.764268	-173.566
400	0.949332	175.6345	4.856165	111.2287	0.005855	11.65853	0.780491	-174.609
500	0.949661	174.7228	4.095554	104.4372	0.006112	3.893116	0.789961	-175.507
600	0.944641	173.7638	3.519923	98.68187	0.004056	-7.89958	0.79761	-176.772
700	0.944308	172.9361	3.058906	93.74037	0.005675	9.28646	0.80667	-177.469
800	0.944684	171.9397	2.715006	89.81302	0.004249	26.54267	0.810602	-178.254
900	0.942283	170.6934	2.477931	85.89291	0.006281	17.07312	0.812659	-179.449
1000	0.938657	169.7818	2.244615	82.23878	0.005576	20.27439	0.810386	179.6869

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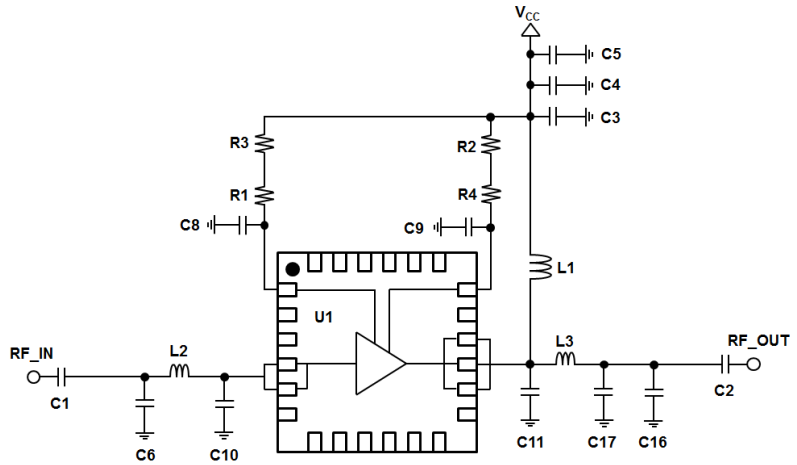
Application Circuit: 200 MHz

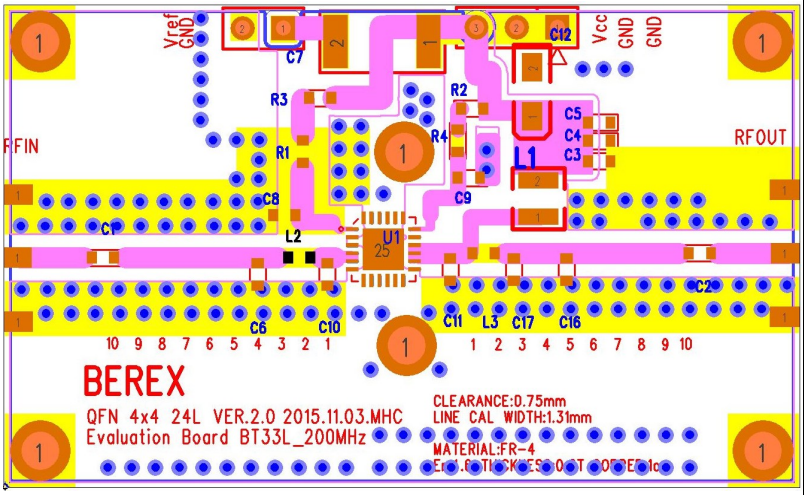
Schematic Diagram



BOM

			Marks
C1	0603	100pF	Samsung
C2	0603	100pF	Samsung
C3	0603	22pF	Samsung
C4	0603	1000pF	Samsung
C5	0603	1 uF	Samsung
C6	0603	39pF	Samsung
C7	0603	N/C	-
C8	0603	N/C	-
C9	0603	N/C	-
C10	0603	N/C	-
C11	0603	27pF	Samsung
C12	0603	N/C	-
C16	0603	N/C	-
C17	0603	33pF	Samsung
L1	1008	56nH	Coilcraft
L2	0603	12nH	Taiyo Yuden
L3	0603	15nH	Taiyo Yuden
R1	0603	51Ω	Samsung
R2	0603	91Ω	Samsung
R3	0603	0Ω	Samsung
R4	0603	0Ω	Samsung
U1	4x4	BT33L	BEREX

PCB Diagram



Notice

Below information is subject to change as conditions of the substrate.

Reference	Object	Distance
Input pin	C6	5.5mm
Input pin	L2	2.5mm
Output pin	C11	2.0mm
Output pin	L3	3.4mm
Output pin	C17	5.7mm

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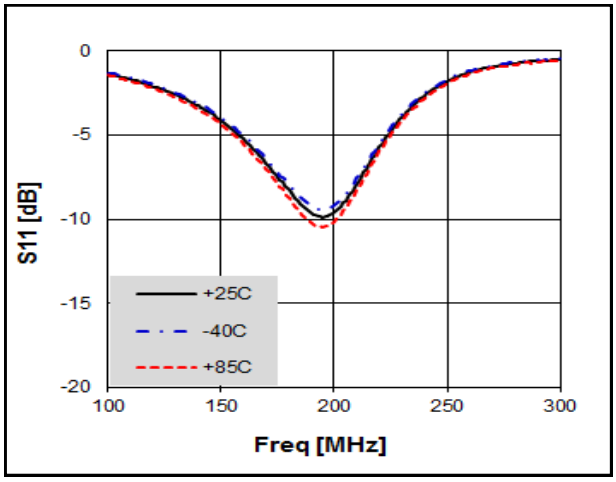
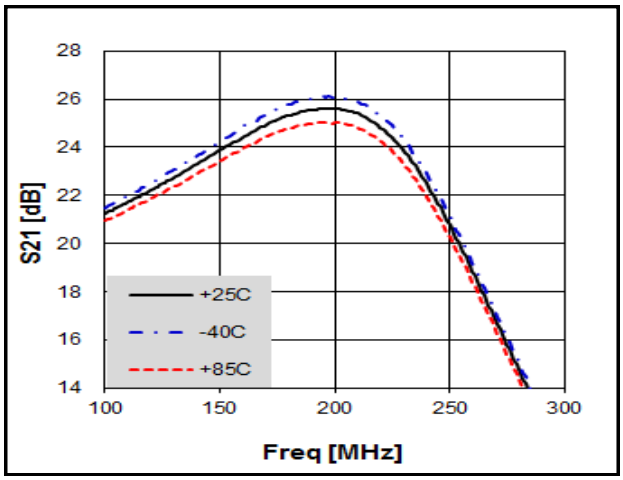
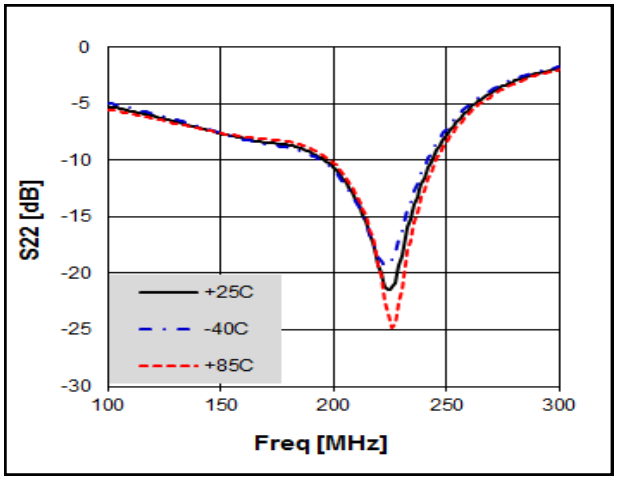
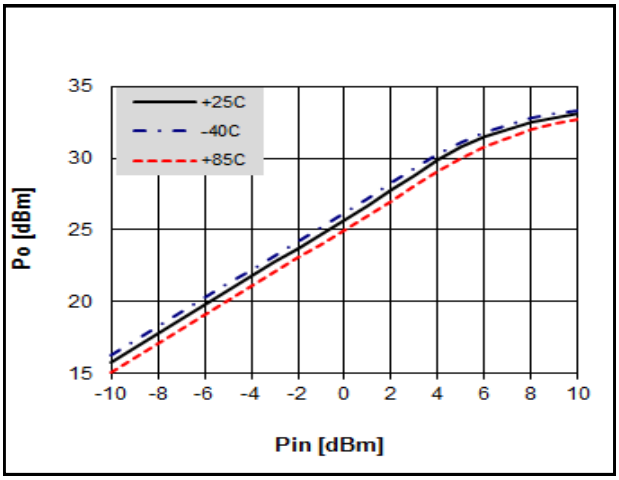
Typical Performance

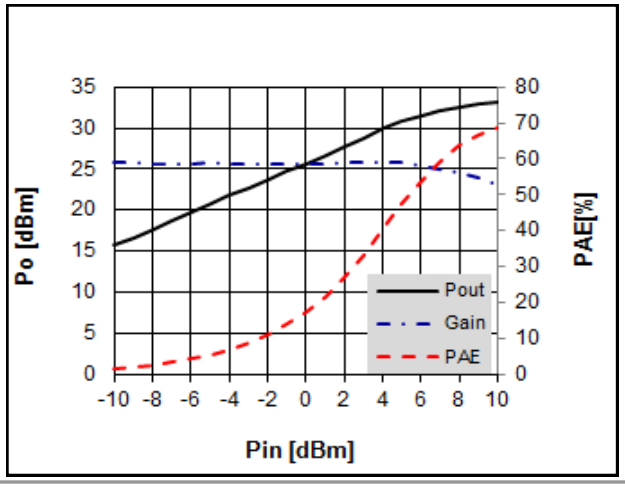
(V_{cc} & V_{Bias} =+5V, I_{cq}=400mA, T_a=25°C)

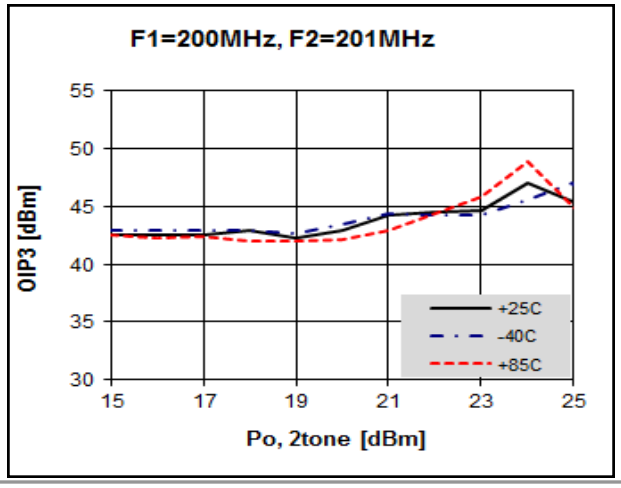












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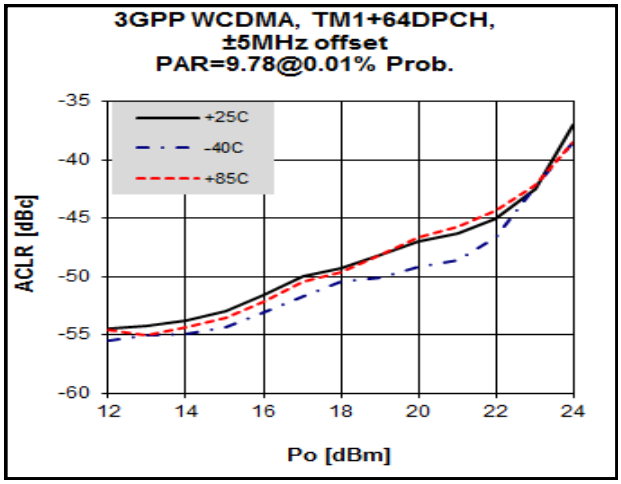
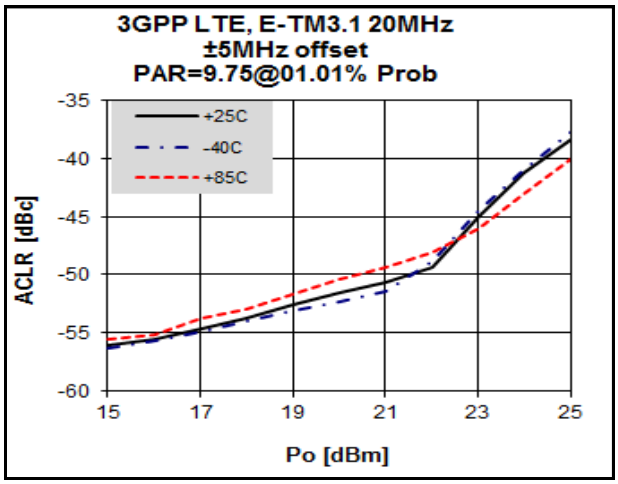
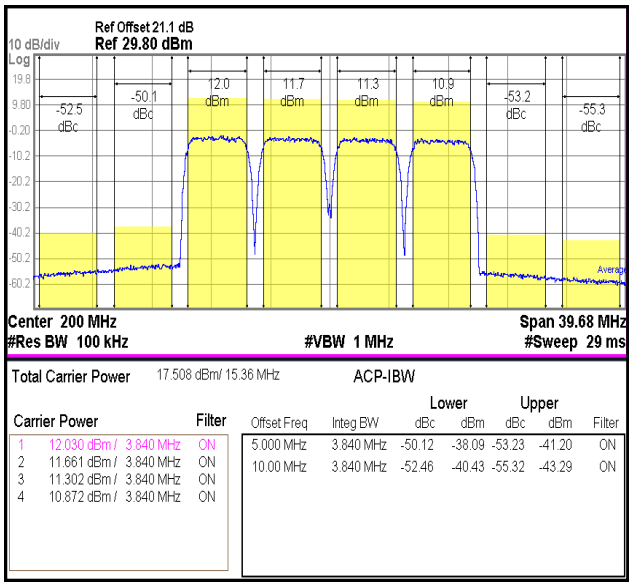
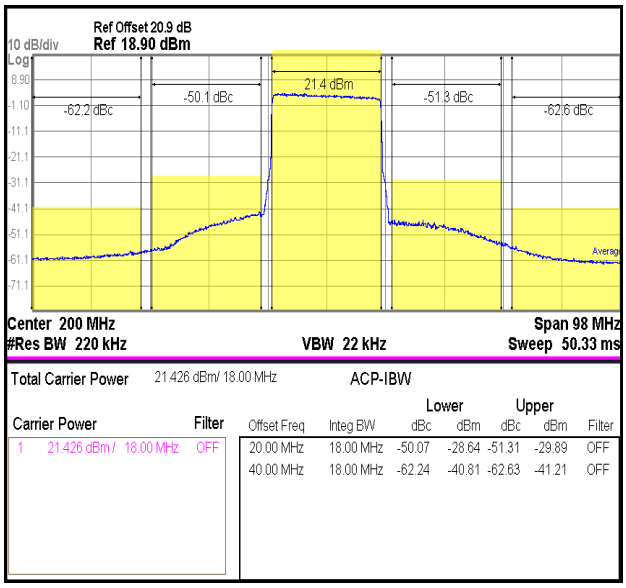


3GPP WCDMA TM1 +64DPCH 4FA



3GPP LTE E-TM3.1 20MHz





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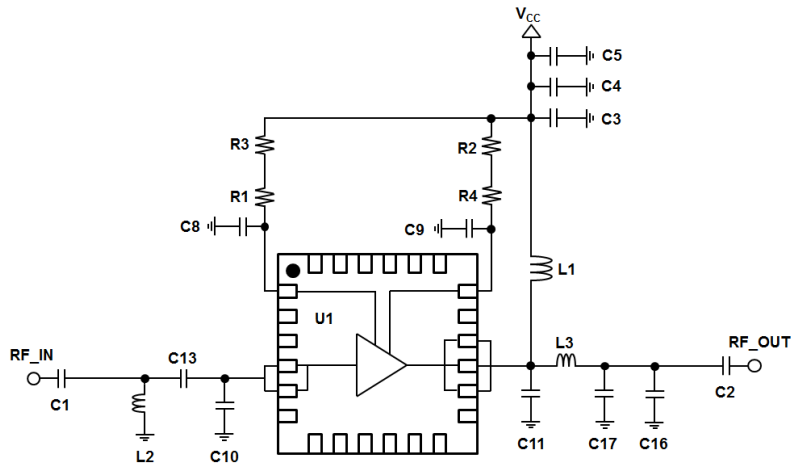
Application Circuit: 540 MHz

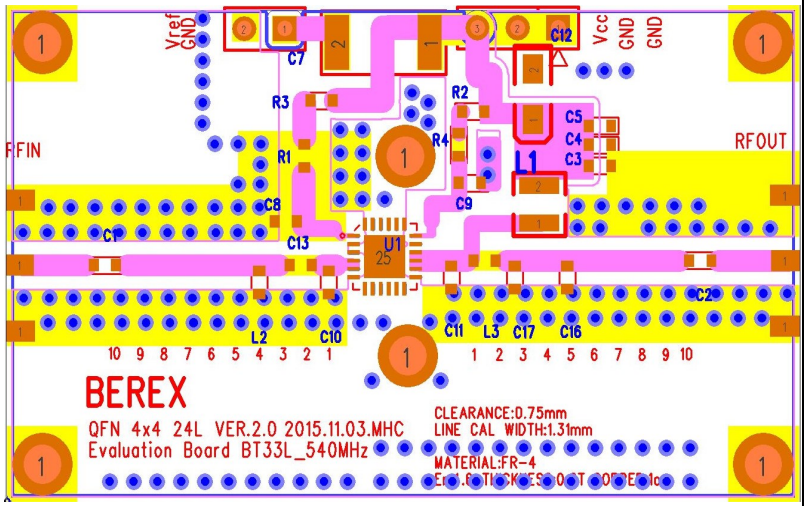
Schematic Diagram



BOM

			Marks
C1	0603	56pF	Samsung
C2	0603	56pF	Samsung
C3	0603	22pF	Samsung
C4	0603	1000pF	Samsung
C5	0603	1 uF	Samsung
C7	0603	N/C	-
C8	0603	N/C	-
C9	0603	33pF	Samsung
C10	0603	30pF	Samsung
C11	0603	12pF	Samsung
C12	0603	N/C	-
C13	0603	10pF	Samsung
C16	0603	N/C	-
C17	0603	12pF	Samsung
L1	1008	56nH	Coilcraft
L2	0603	8.2nH	Taiyo Yuden
L3	0603	3.9nH	Taiyo Yuden
R1	0603	51Ω	Samsung
R2	0603	91Ω	Samsung
R3	0603	0Ω	Samsung
R4	0603	0Ω	Samsung
U1	4x4	BT33L	BEREX

PCB Diagram



Notice

Below information is subject to change as conditions of the substrate.

Reference	Object	Distance
Input pin	L2	5.5mm
Input pin	C13	2.5mm
Input pin	C10	1.3mm
Output pin	C11	1.8mm
Output pin	L3	3.4mm
Output pin	C17	7.0mm

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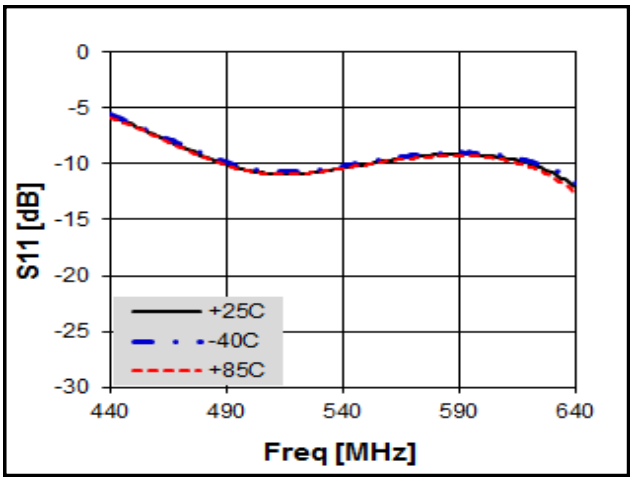
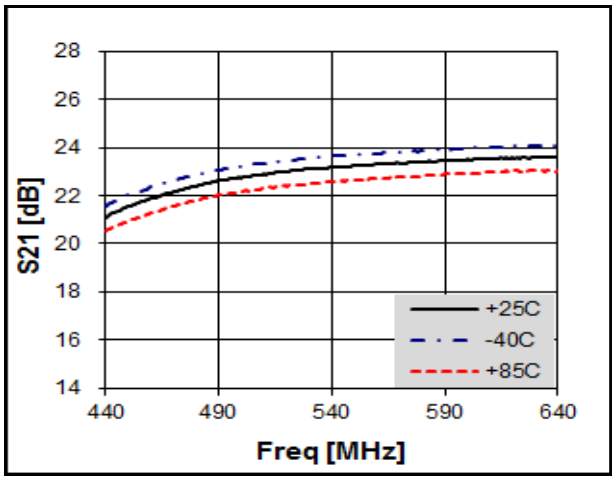
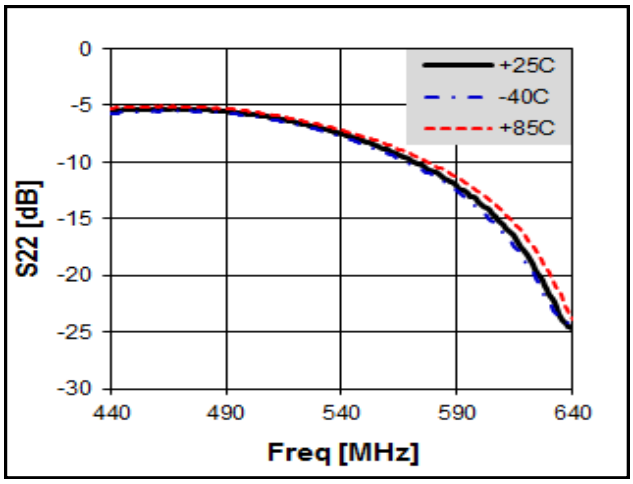
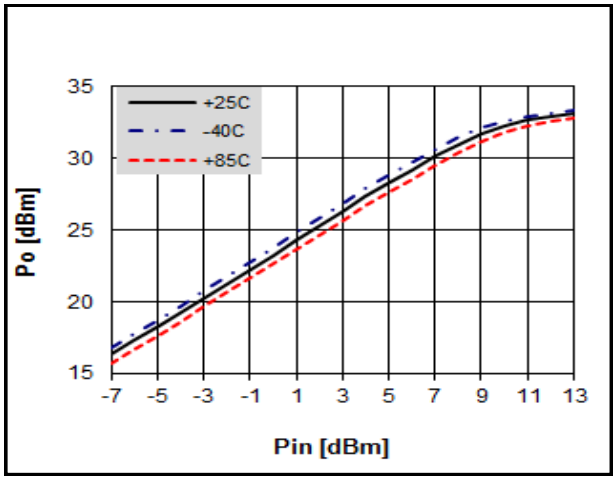
Typical Performance

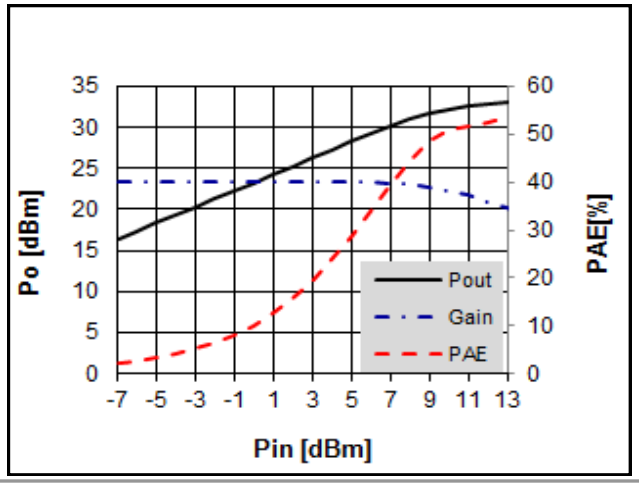
(V_{cc} & V_{Bias} =+5V, I_{cq}=400mA, T_a=25°C)

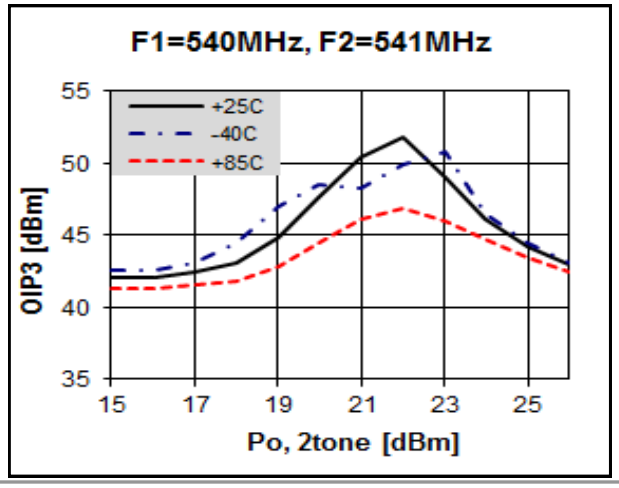












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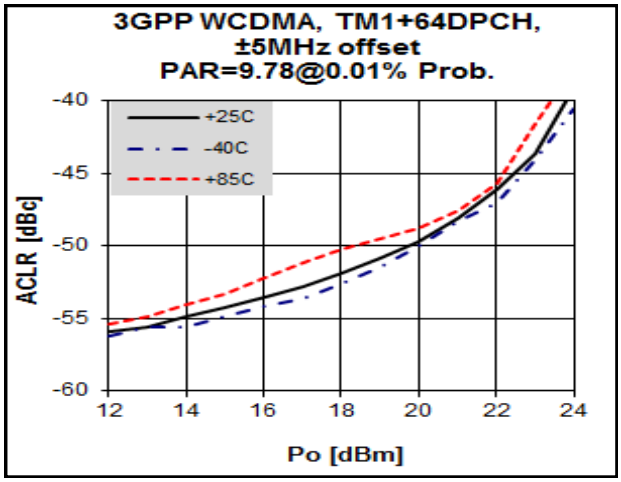
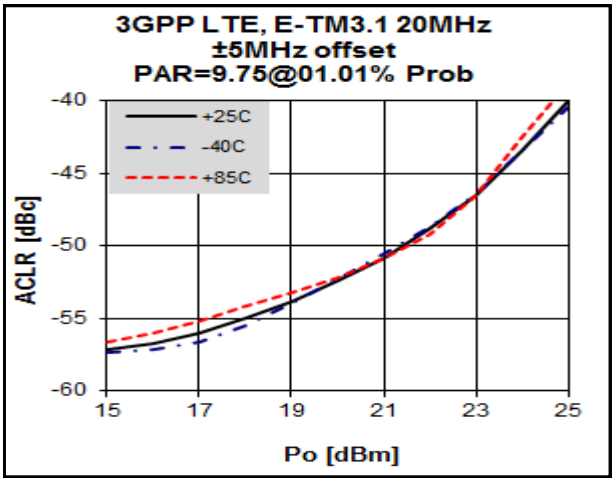
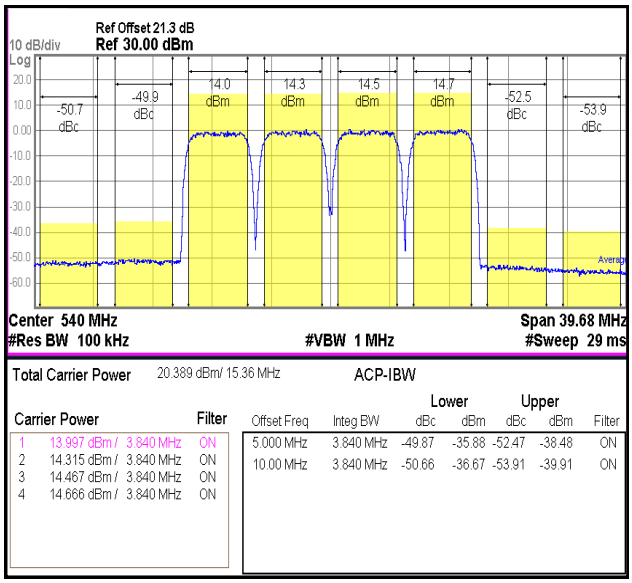
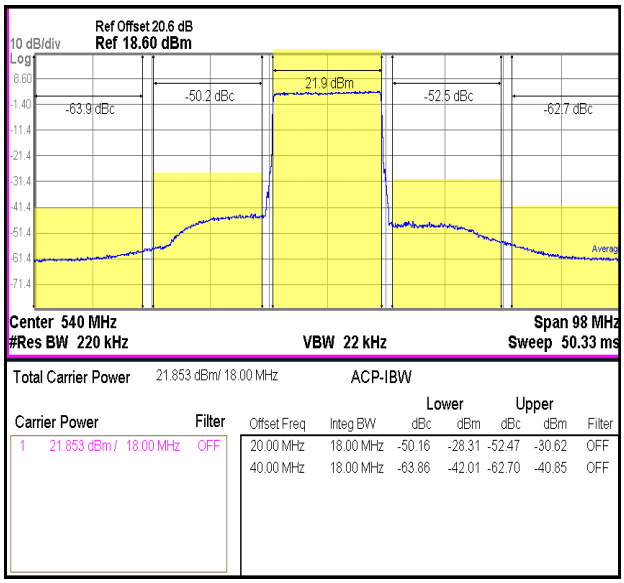


3GPP WCDMA TM1 +64DPCH 4FA



3GPP LTE E-TM3.1 20MHz





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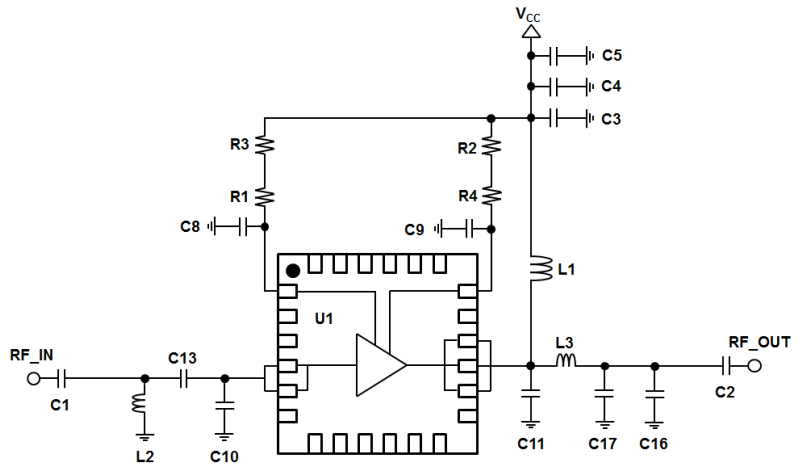
Application Circuit: 700 MHz

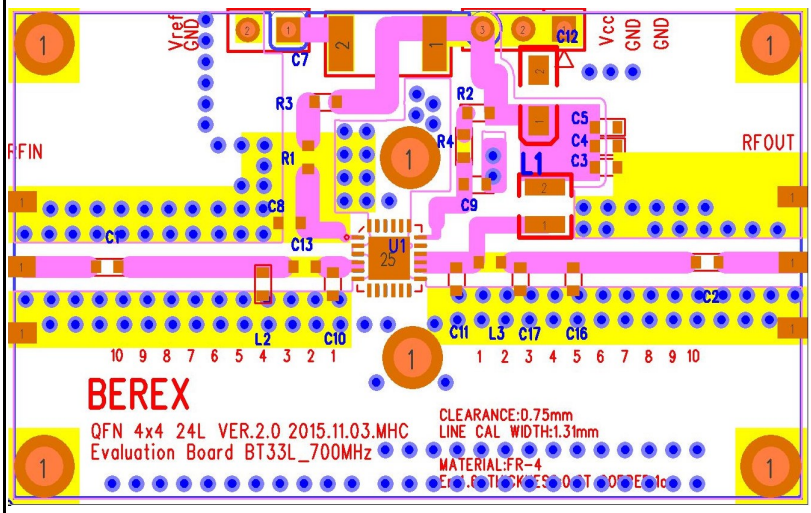
Schematic Diagram



BOM

			Marks
C1	0603	56pF	Samsung
C2	0603	56pF	Samsung
C3	0603	22pF	Samsung
C4	0603	1000pF	Samsung
C5	0603	1 uF	Samsung
C7	0603	N/C	-
C8	0603	2pF	Samsung
C9	0603	33pF	Samsung
C10	0603	22pF	Samsung
C11	0603	9pF	Samsung
C12	0603	N/C	-
C13	0603	8pF	Samsung
C16	0603	9pF	Samsung
C17	0603	N/C	-
L1	1008	47nH	Coilcraft
L2	0603	6.8nH	Taiyo Yuden
L3	0603	1.5nH	Taiyo Yuden
R1	0603	51Ω	Samsung
R2	0603	91Ω	Samsung
R3	0603	0Ω	Samsung
R4	0603	0Ω	Samsung
U1	4x4	BT33L	BEREX

PCB Diagram



Notice

Below information is subject to change as conditions of the substrate.

Reference	Object	Distance
Input pin	L2	5.0mm
Input pin	C13	2.5mm
Input pin	C10	1.0mm
Output pin	C11	2.5mm
Output pin	L3	3.3mm
Output pin	C16	8.3mm

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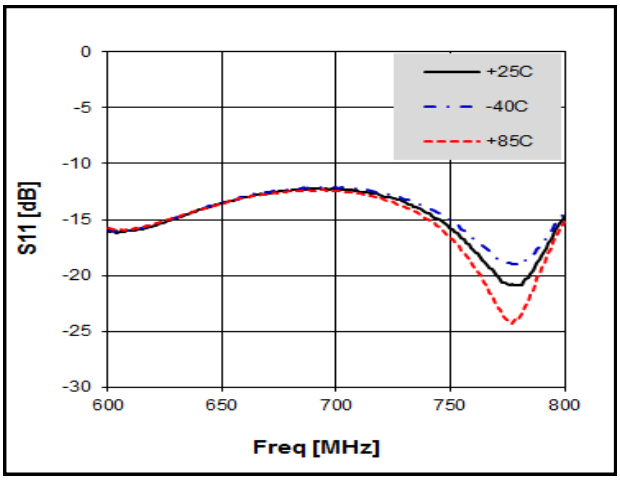
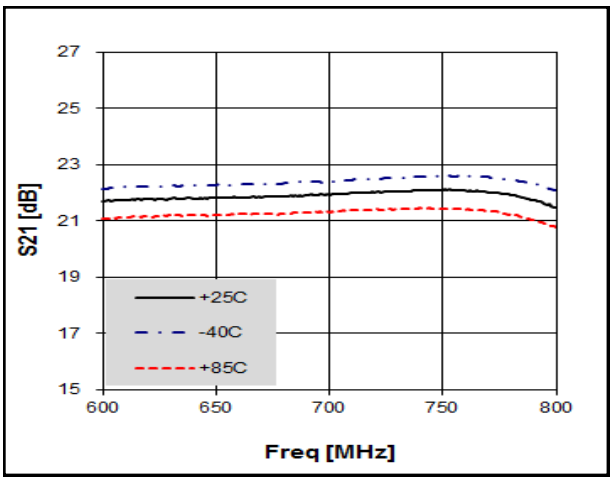
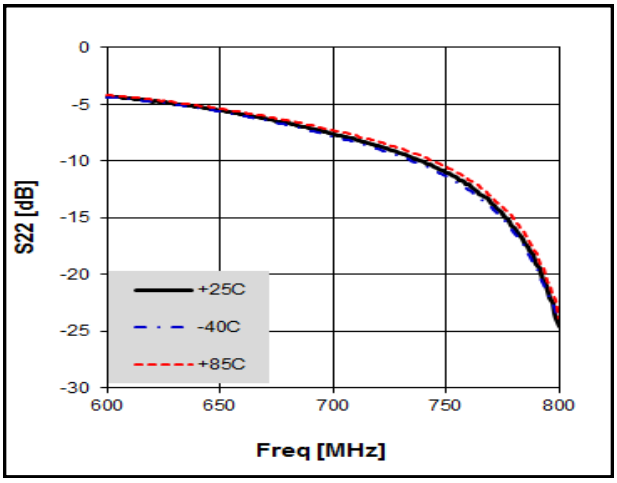
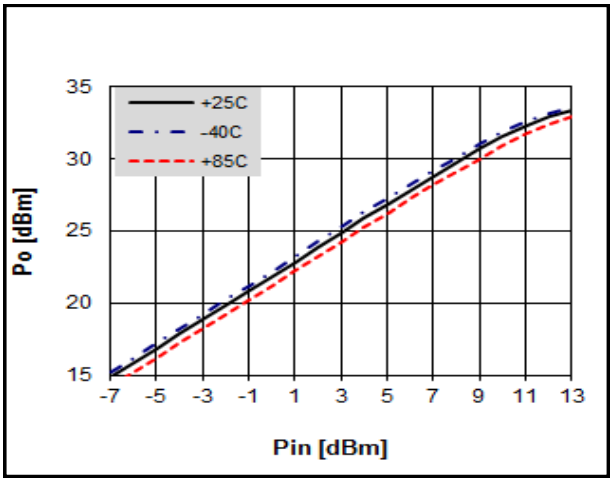
Typical Performance

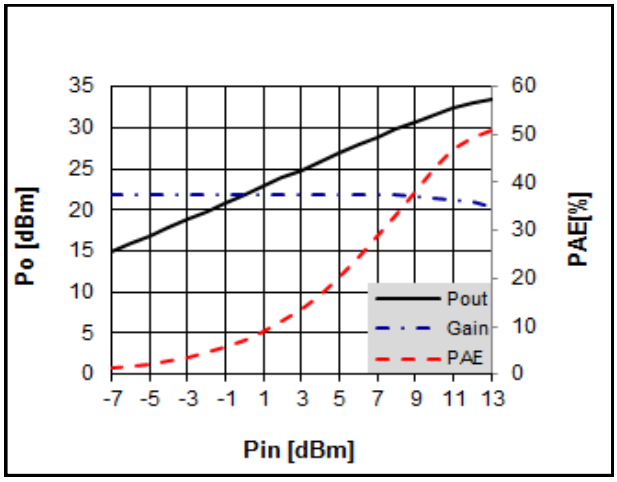
(V_{cc} & V_{Bias} =+5V, I_{cq}=400mA, T_a=25°C)

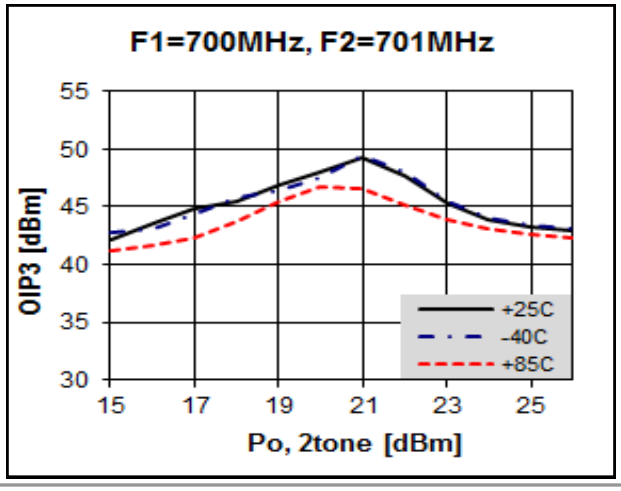












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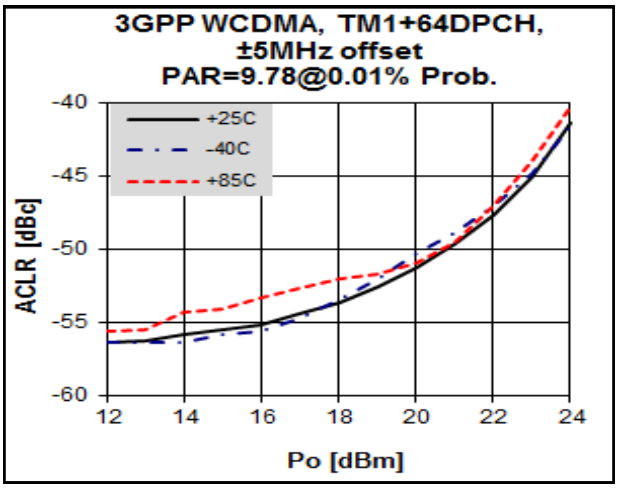
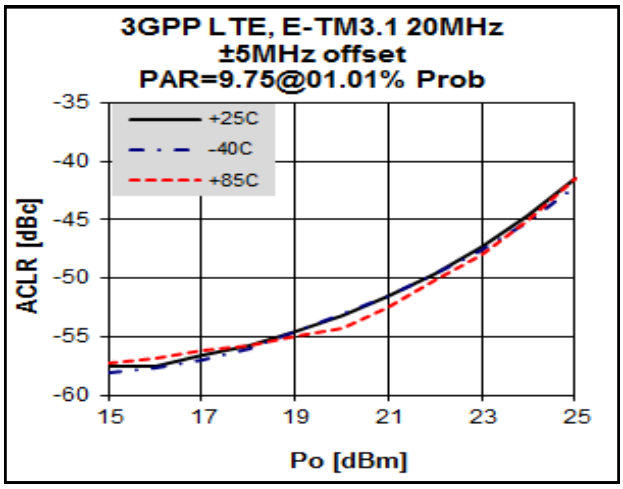
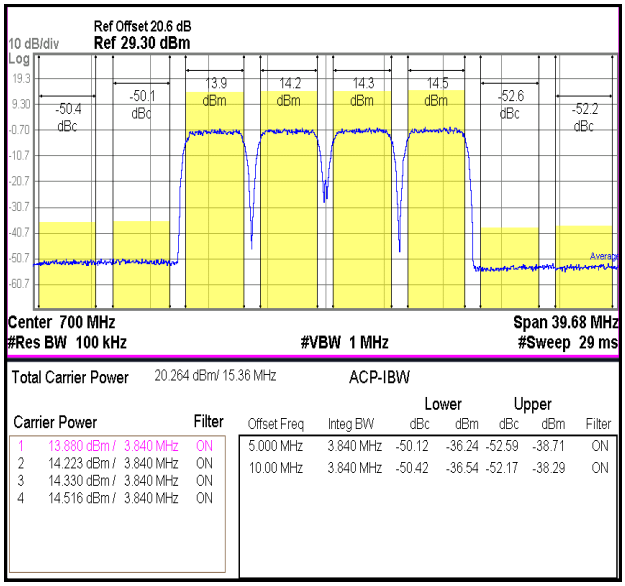
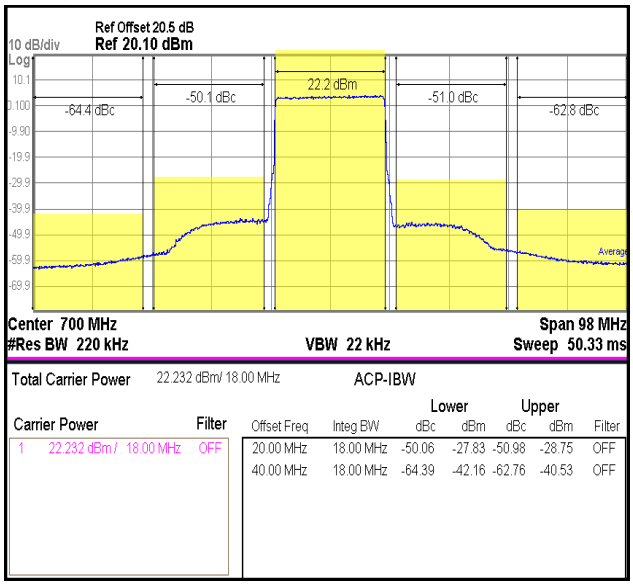


3GPP WCDMA TM1 +64DPCH 4FA



3GPP LTE E-TM3.1 20MHz





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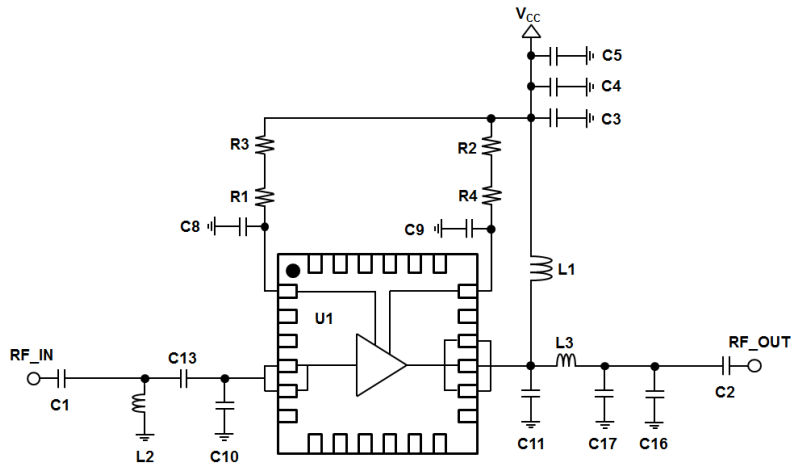
Application Circuit: 900 MHz

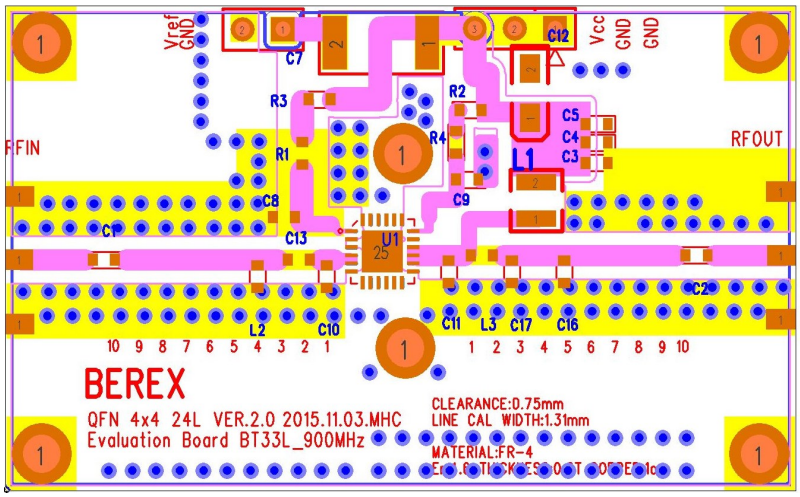
Schematic Diagram



BOM

			Marks
C1	0603	47pF	Samsung
C2	0603	47pF	Samsung
C3	0603	22pF	Samsung
C4	0603	1000pF	Samsung
C5	0603	1 uF	Samsung
C7	0603	N/C	-
C8	0603	N/C	-
C9	0603	33pF	Samsung
C10	0603	10pF	Samsung
C11	0603	N/C	-
C12	0603	N/C	-
C13	0603	3.9pF	Samsung
C16	0603	N/C	-
C17	0603	8.2pF	Samsung
L1	1008	39nH	Coilcraft
L2	0603	5.6nH	Taiyo Yuden
L3	0603	1.2nH	Taiyo Yuden
R1	0603	51Ω	Samsung
R2	0603	91Ω	Samsung
R3	0603	0Ω	Samsung
R4	0603	0Ω	Samsung
U1	4x4	BT33L	BEREX

PCB Diagram



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Output pin	C17	5.6mm

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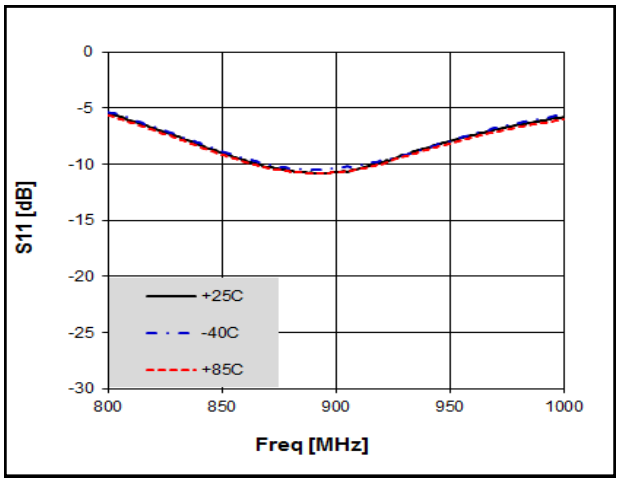
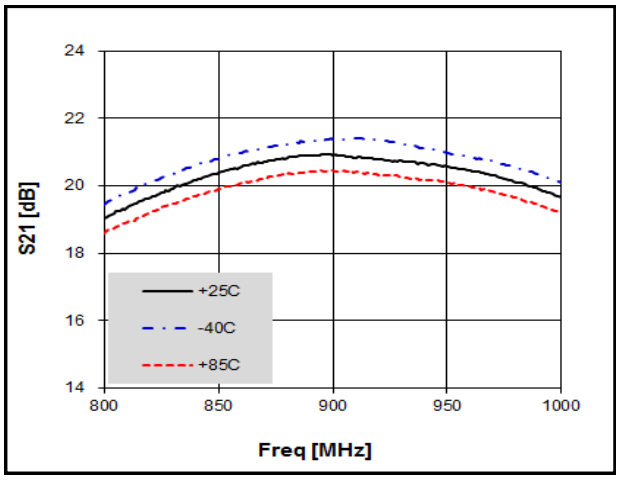
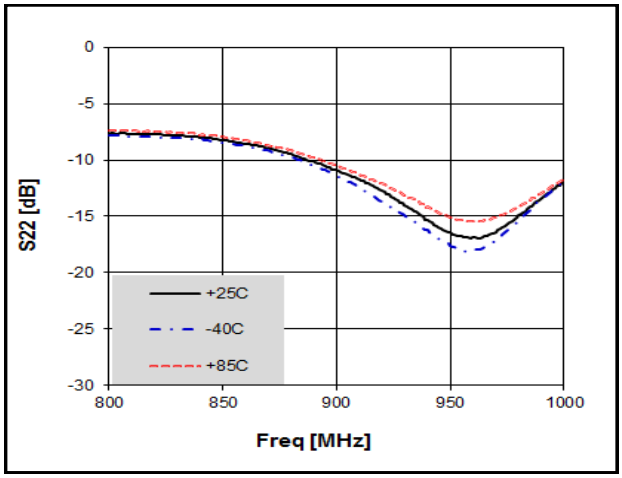
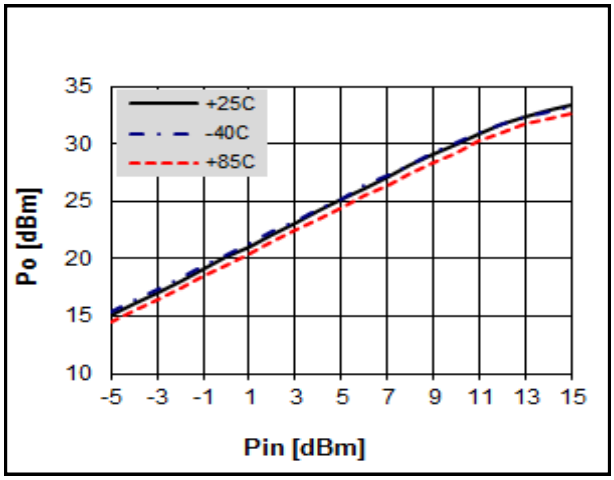
Typical Performance

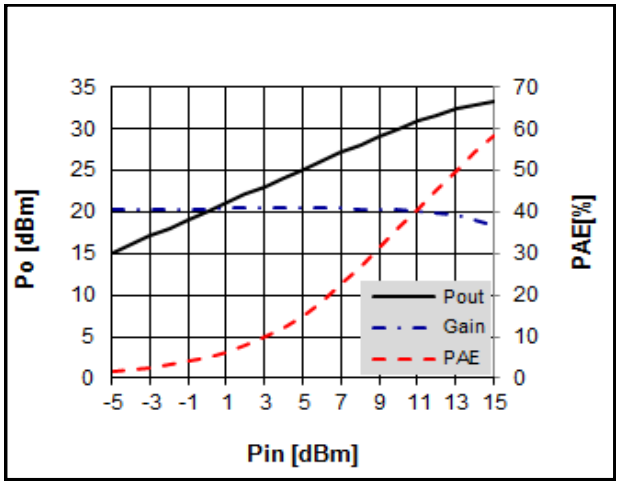
(V_{cc} & V_{Bias} =+5V, I_{cq}=400mA, T_a=25°C)

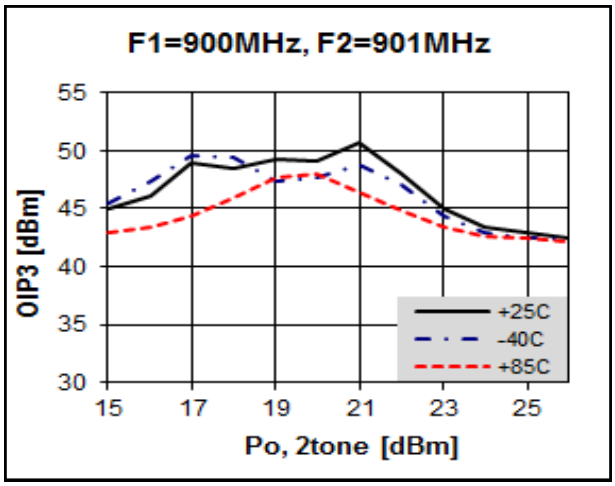












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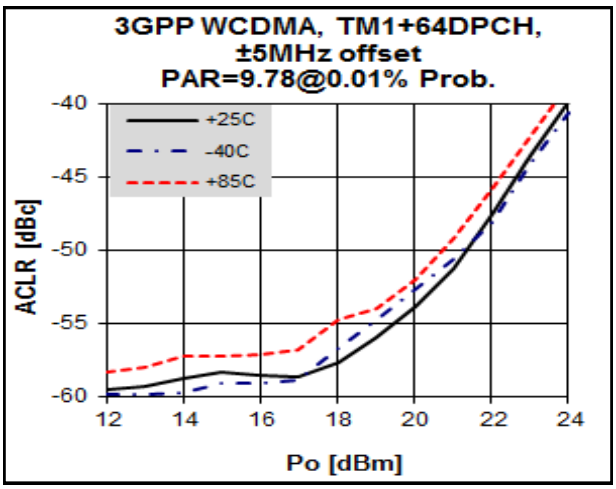
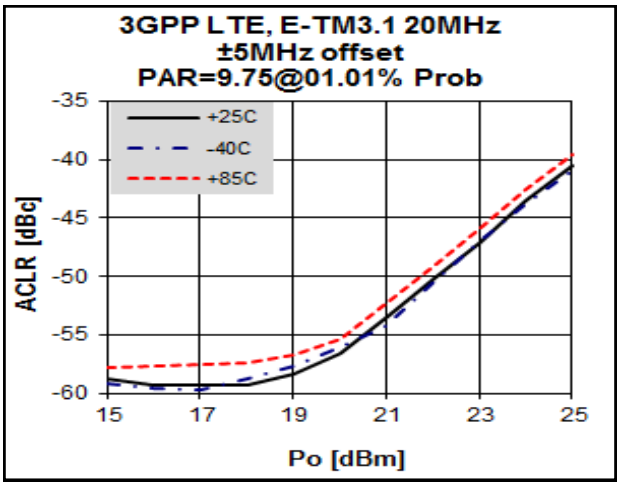
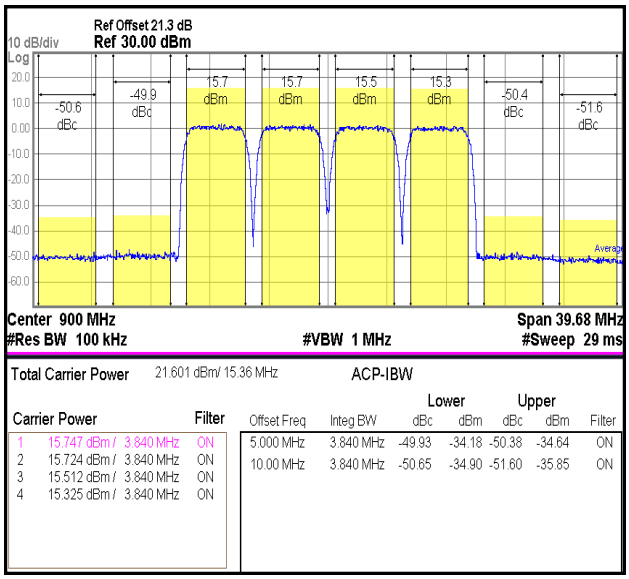
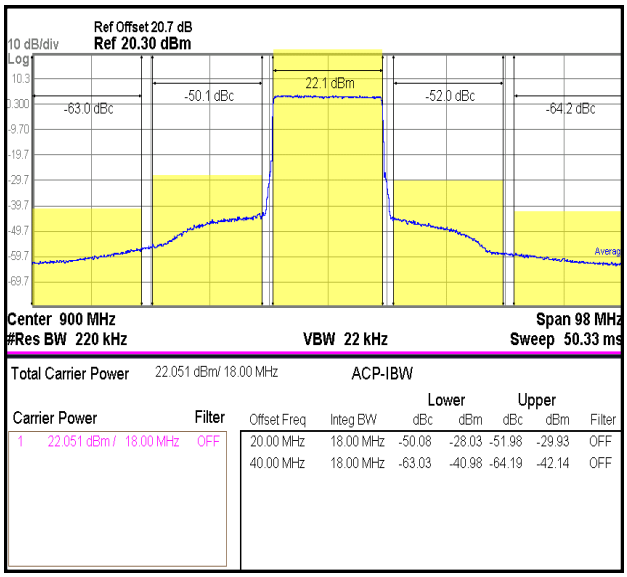


3GPP WCDMA TM1 +64DPCH 4FA



3GPP LTE E-TM3.1 20MHz





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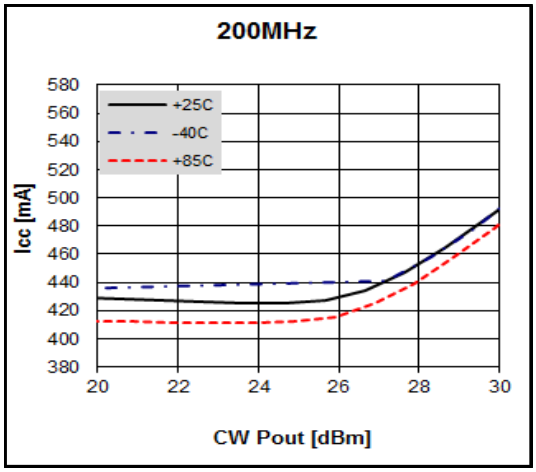
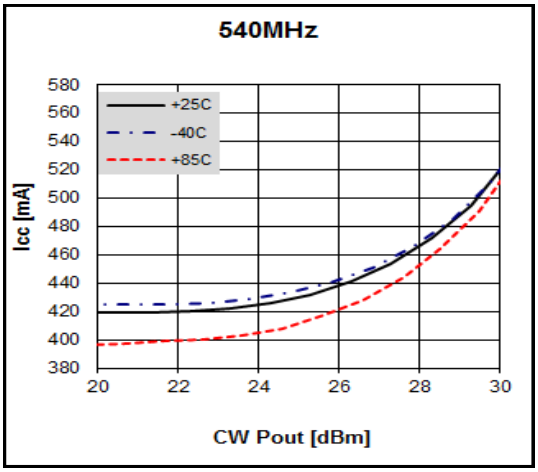
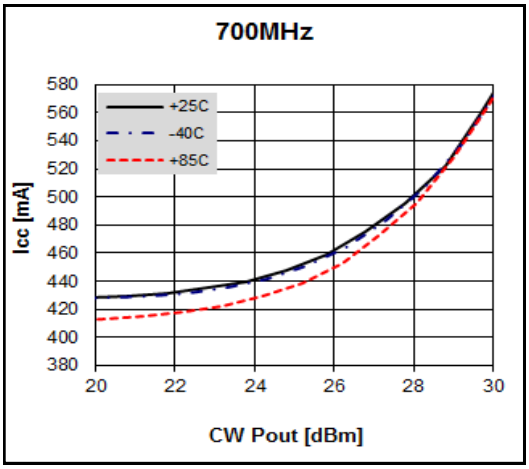
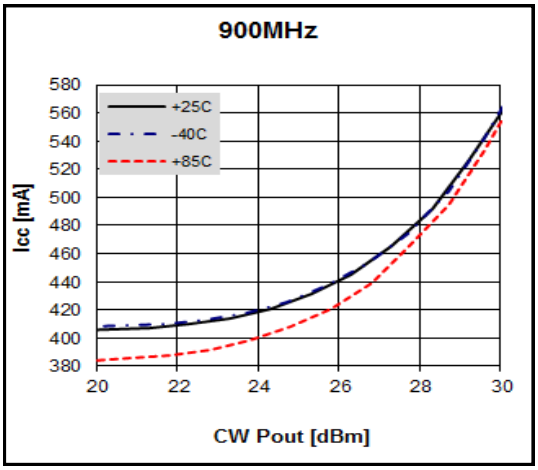
Typical Performance (Pout vs Icc)

(V_{cc} & V_{Bias} =+5V, I_{cq}=400mA, T_a=25°C)









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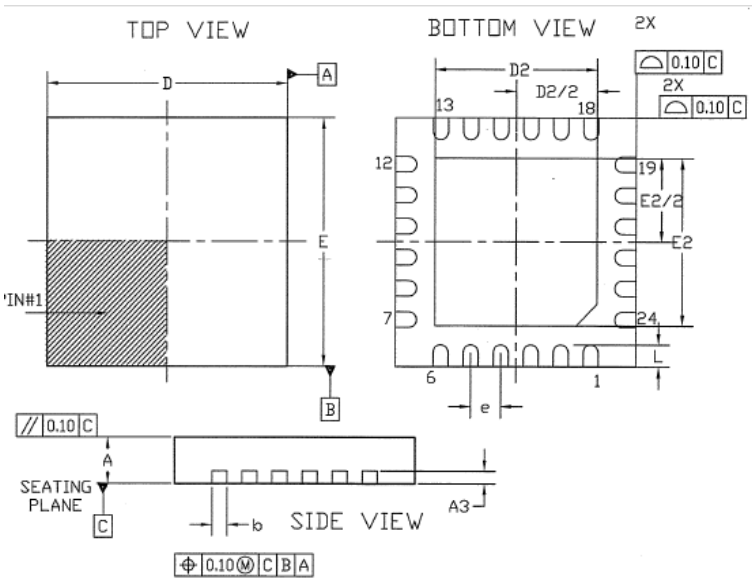
Package Outline Dimension



A	ORIGINAL ISSUE FOR CUSTOMS A,B	Oct 12'05

SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	SEE VARIATION					
A3	0.195	0.203	0.211	0.0077	0.008	0.0083
b	0.180	0.230	0.300	0.007	0.009	0.012
D	3.925	4.0	4.075	0.154	0.157	0.160
E	3.925	4.0	4.075	0.154	0.157	0.160
e	0.50 BSC			0.020 BSC		
L	SEE VARIATION					

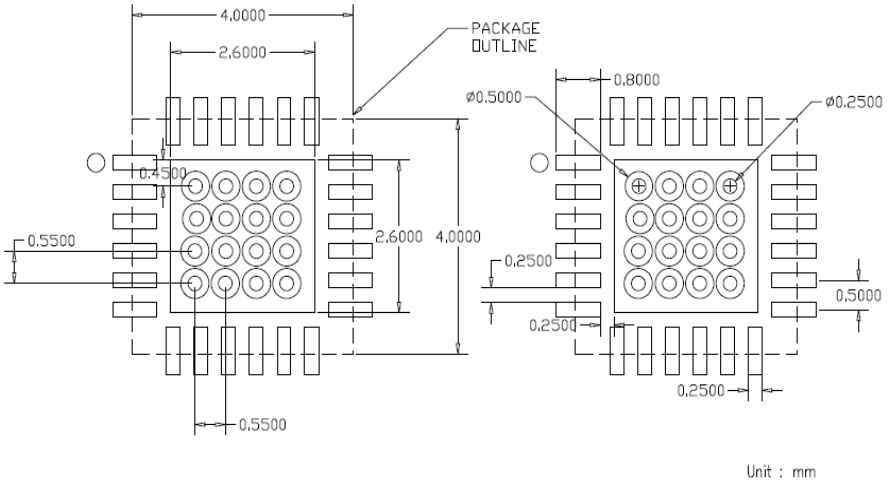
SYMBOL	VARIATION ' A '						REF
	DIMENSIONS MILLIMETER			DIMENSIONS INCH			
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
TQFN	0.70	0.75	0.80	0.027	0.029	0.031	W/VERY VERY THIN
QFN	0.85	0.90	0.95	0.033	0.035	0.037	V/ VERY THIN

PAD SIZE	VARIATION ' L '						REF
	DIMENSIONS MILLIMETER			DIMENSIONS INCH			
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
118x118	0.30	0.35	0.40	0.012	0.014	0.016	CUSTOMS A,B

NOTES :

1. DIMENSION AND TOLERANCING CONFORM TO ASME Y14.5M-1994.
2. CONTROLLING DIMENSIONS : MILLIMETER. CONVERTED INCH DIMENSION ARE NOT NECESSARILY EXACT.
3. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM. FROM TERMINAL TIP.

Suggested PCB Land Pattern and PAD Layout



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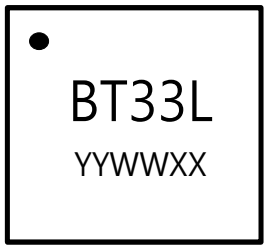
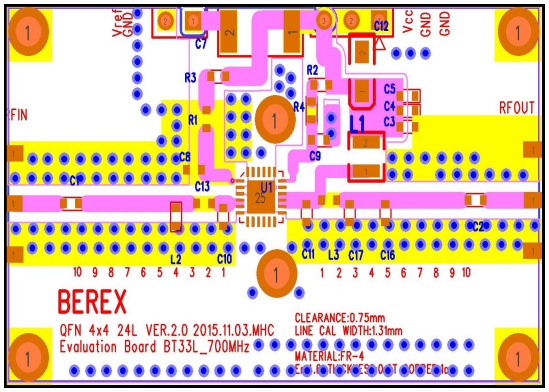
Package Marking

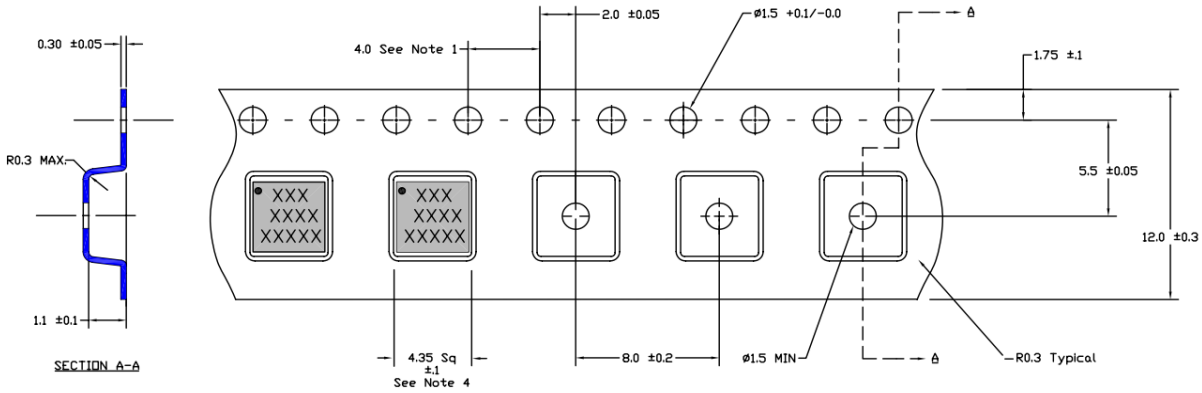


YY = Year, WW = Working Week,
XX = Wafer No.

PCB Mounting



Tape & Reel



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.)

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MSL / ESD Rating

ESD Rating:	Class 1C
Value:	Passes ≥ 1000V to < 2000 V
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JS-001-2012

ESD Rating:	Class C3
Value:	Passes >1000V
Test:	Charged Device Model (CDM)
Standard:	JEDEC Standard JESD22-C101F

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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- BeRex Corporation Information

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- Obsolete Management
- Cost Control Management
- Shortage Management
- Alternative Solution
- Excess Inventory Management