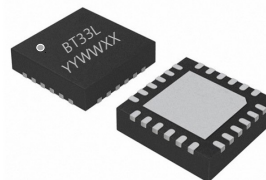


Device Features

- 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



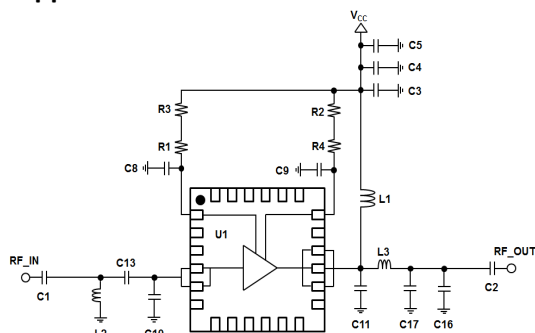
Product Description

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 @ (V _C = 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.

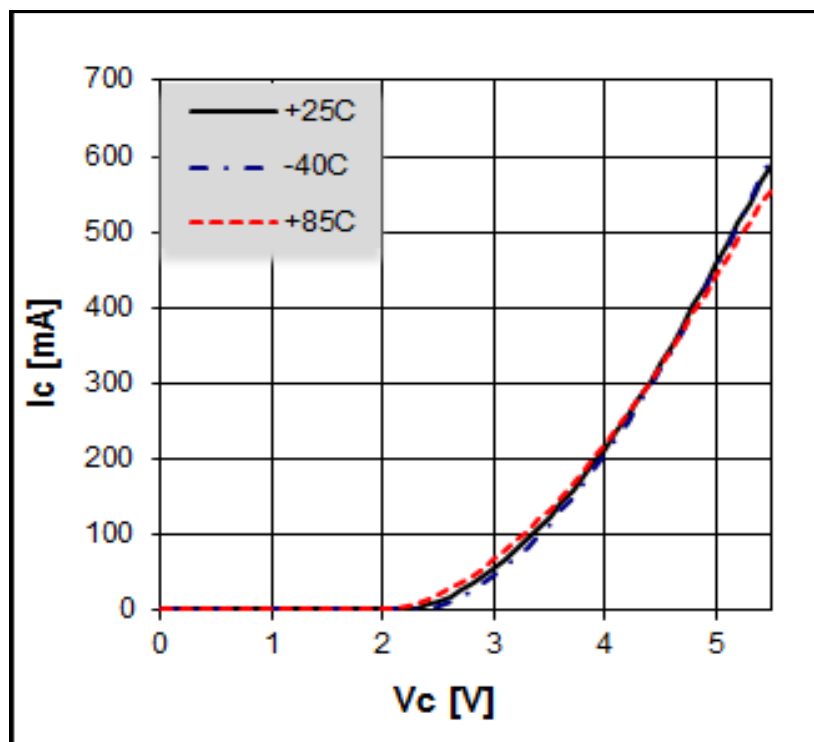
Absolute Maximum Ratings

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

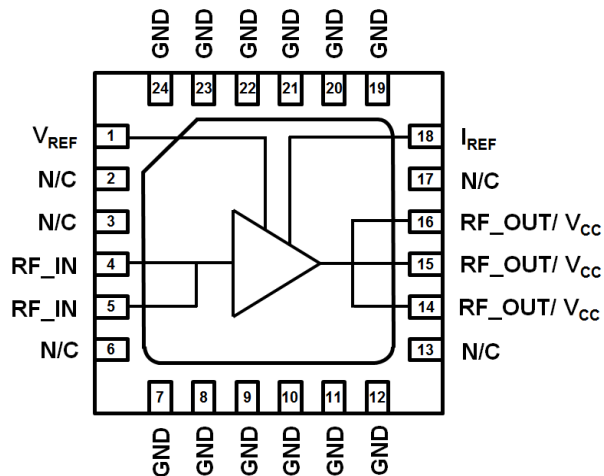
*Operation of this device above any of these parameters may result in permanent damage.

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

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

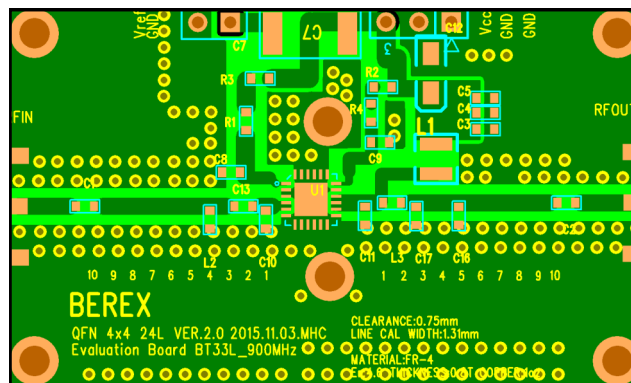
V-I Characteristics


Pin Configuration



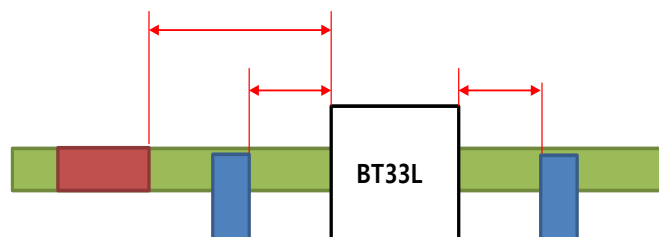
Pin No.	Label
1	V_{REF}
4,5	RF IN
14,15,16	RF OUT/ V_{CC}
18	I_{REF}
2,3,6,13,17	N/C
7,8,9,10,11,12 19,20,21,22,23,24	GND
Backside Paddle	GND

BeRex Evaluation Board



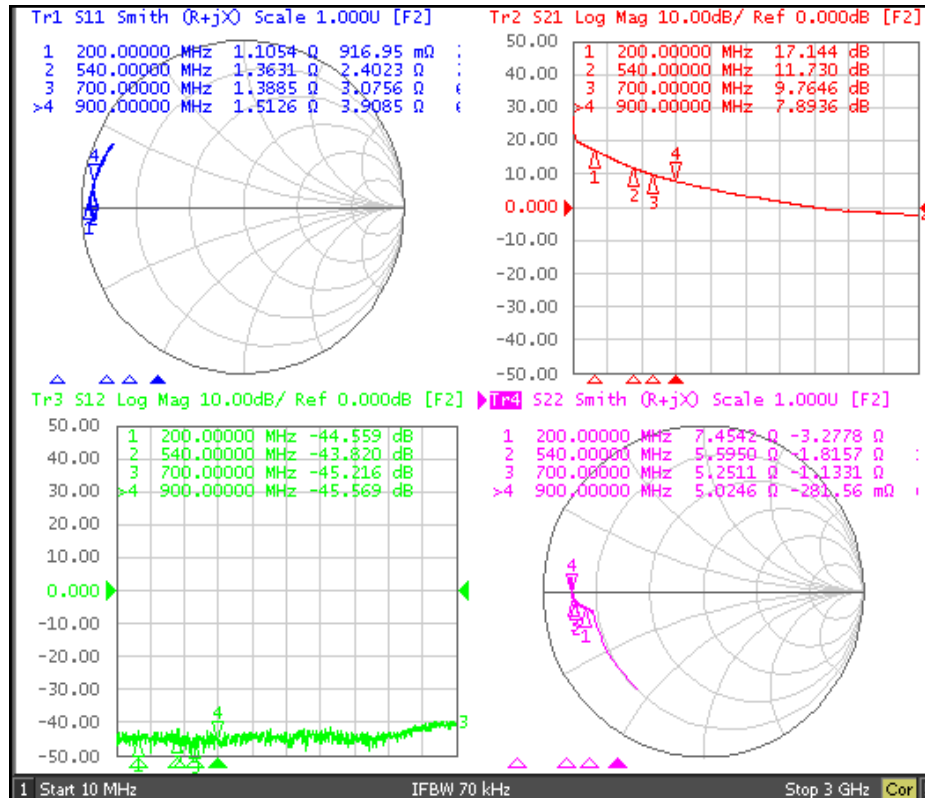
*Dielectric constant _ 4.6 *RF pattern width 52mil *31mil thick FR4 PCB

Figure about the reference position of components



Typical Device Data

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

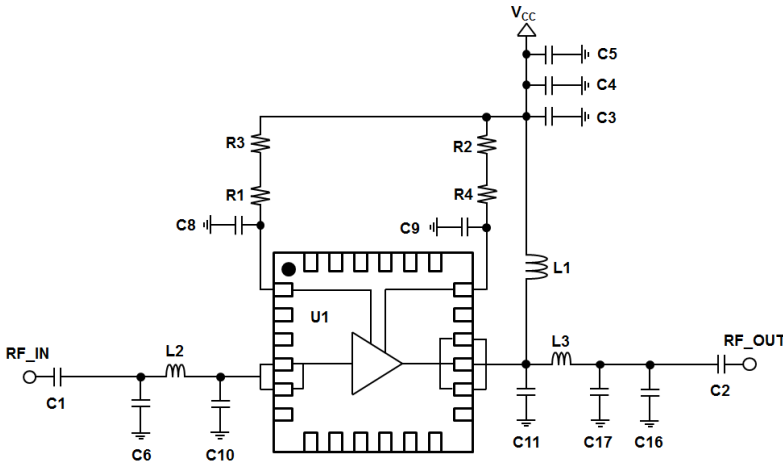
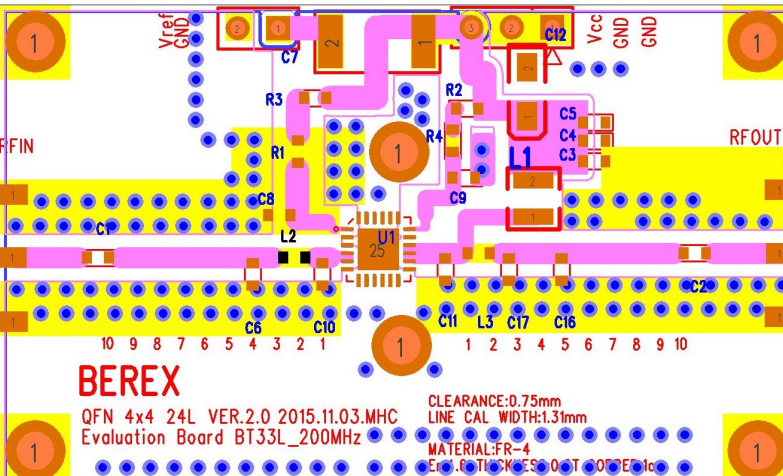


S-Parameter

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

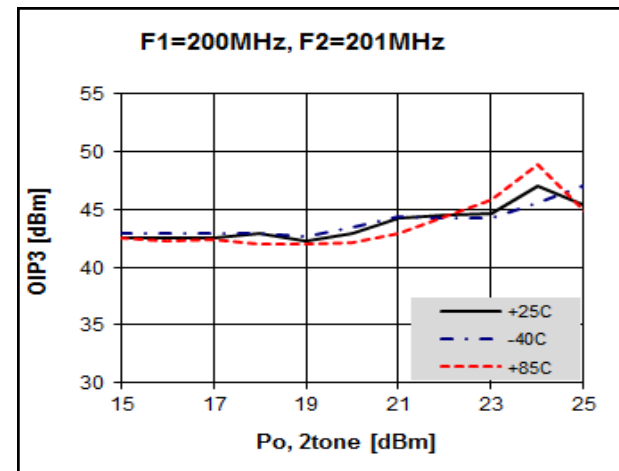
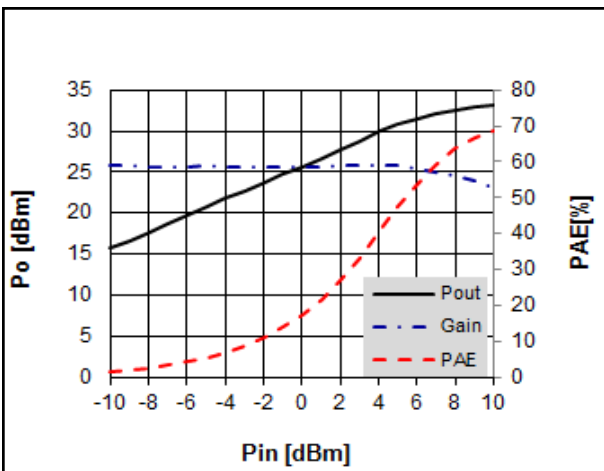
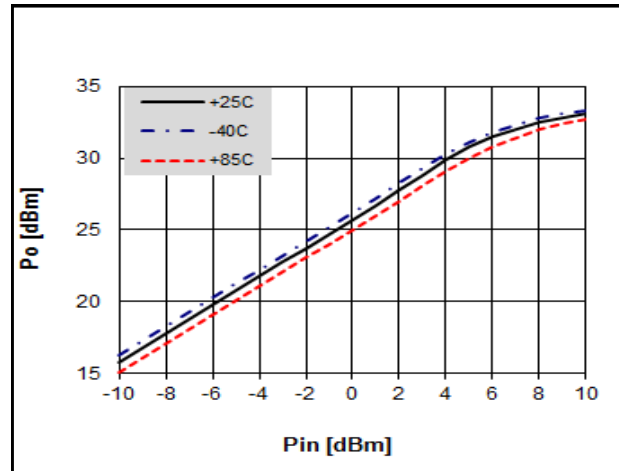
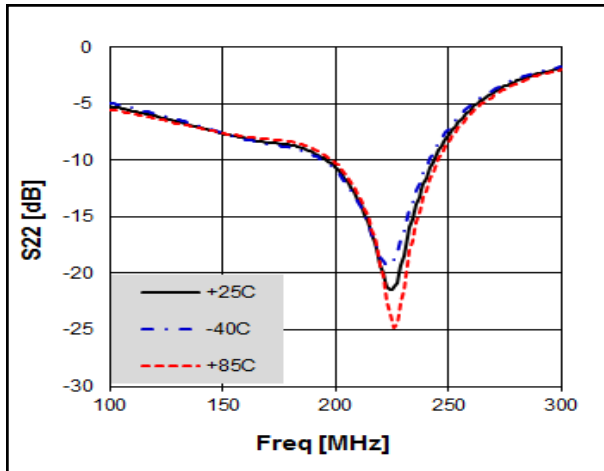
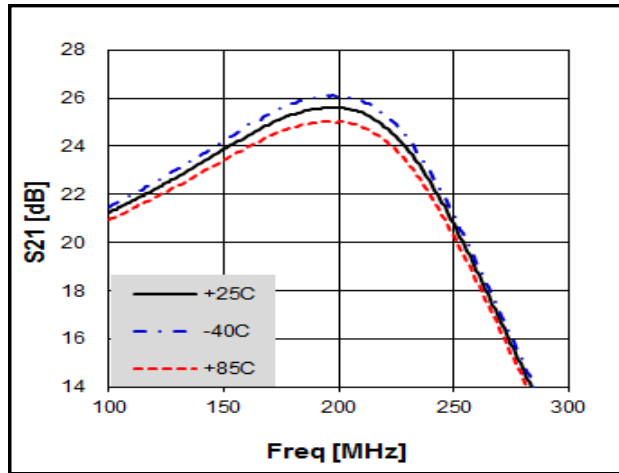
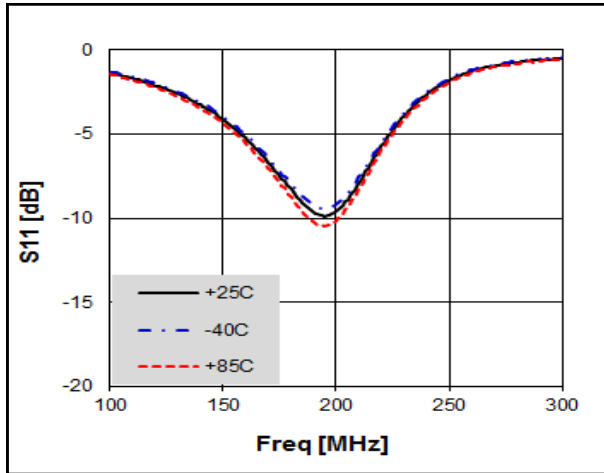
Freq [MHz]	S11 [Mag]	S11 [Ang]	S21 [Mag]	S21 [Ang]	S12 [Mag]	S12 [Ang]	S22 [Mag]	S22 [Ang]
100	0.955743	179.2819	8.653431	145.1726	0.005675	2.16267	0.702571	-170.56
200	0.954013	177.8986	7.158374	131.9803	0.006977	1.90465	0.73797	-172.26
300	0.953118	176.9255	5.876515	120.3807	0.005183	6.429368	0.764268	-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

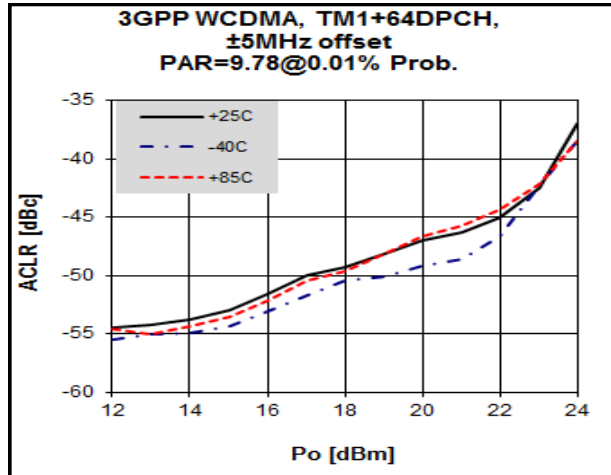
Application Circuit: 200 MHz

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	
 BEREX QFN 4x4 24L VER.2.0 2015.11.03.MHC Evaluation Board BT33L_200MHz CLEARANCE:0.75mm LINE CAL WIDTH:1.31mm MATERIAL:FR-4 E.C.TICKES:0.01T 0.01P 0.01C	Below information is subject to change as conditions of the substrate.	
	Reference	Object
	Distance	
	Input pin	C6
	Input pin	L2
	Output pin	C11
	Output pin	L3
	Output pin	C17

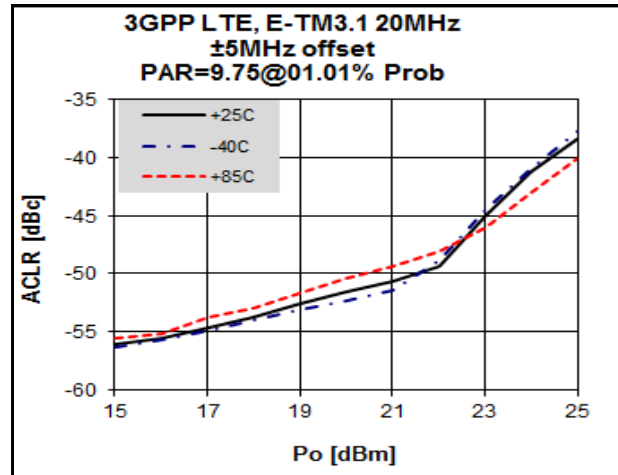
Typical Performance

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

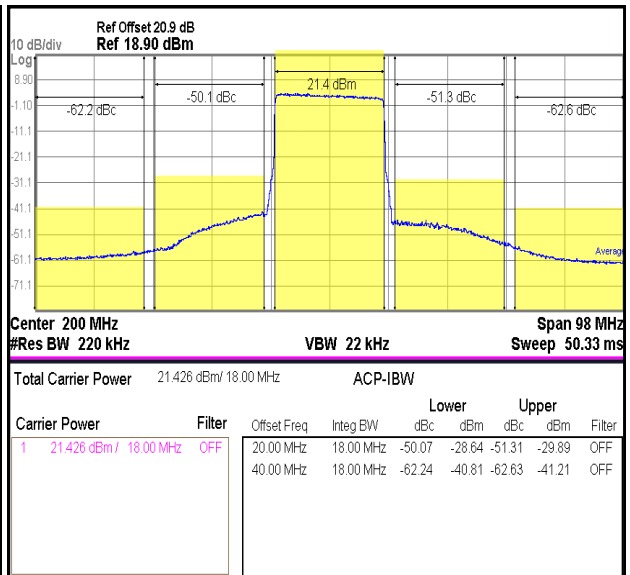
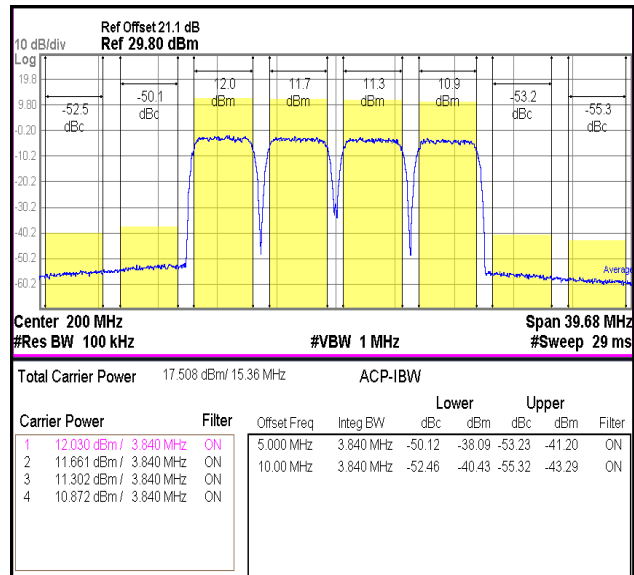




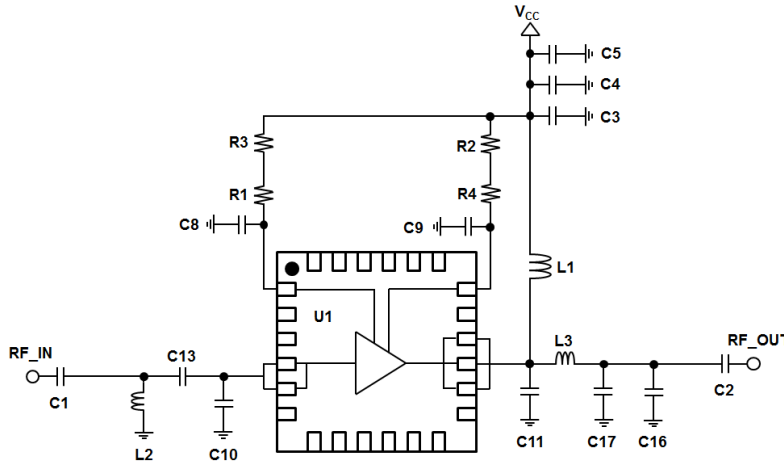
3GPP WCDMA TM1 +64DPCH 4FA

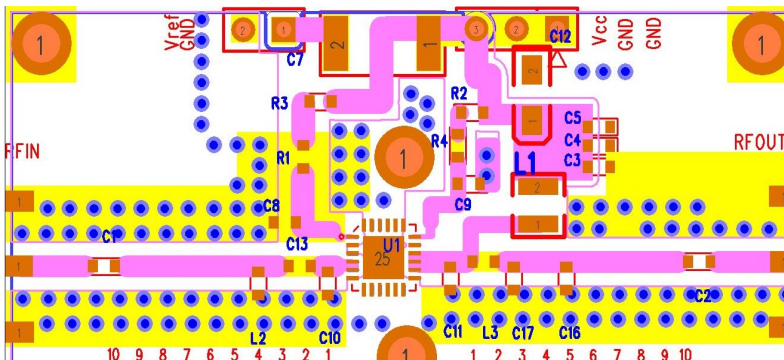


3GPP LTE E-TM3.1 20MHz



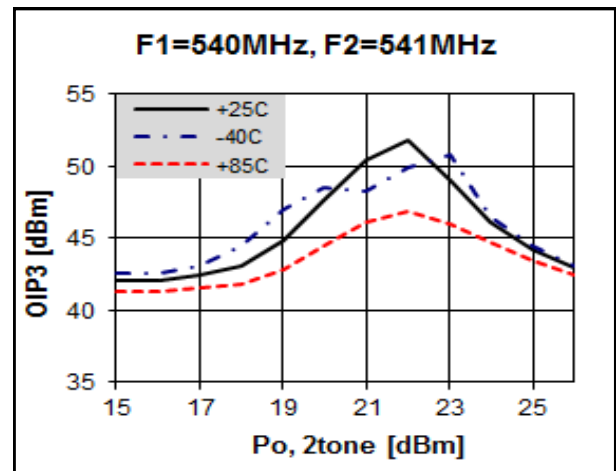
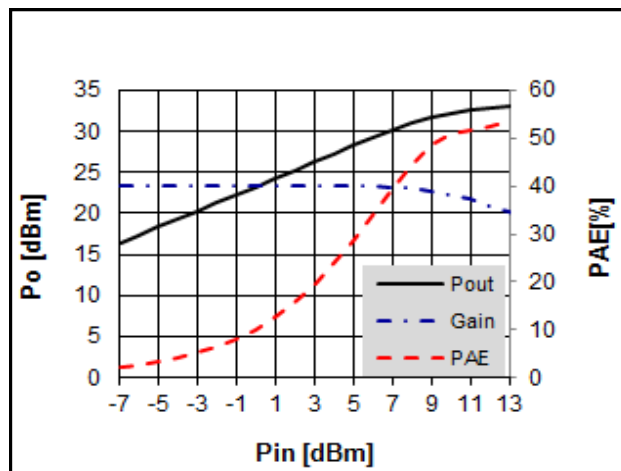
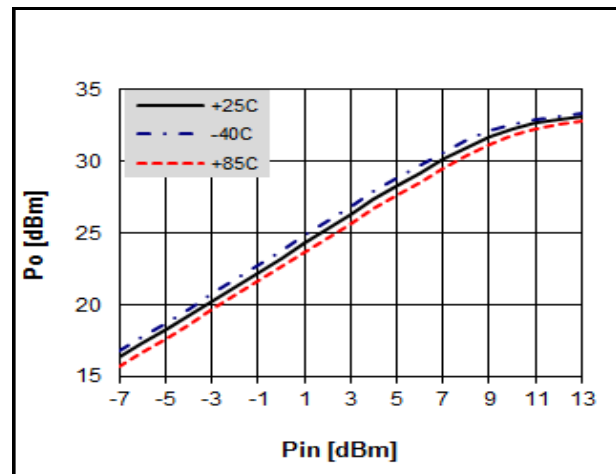
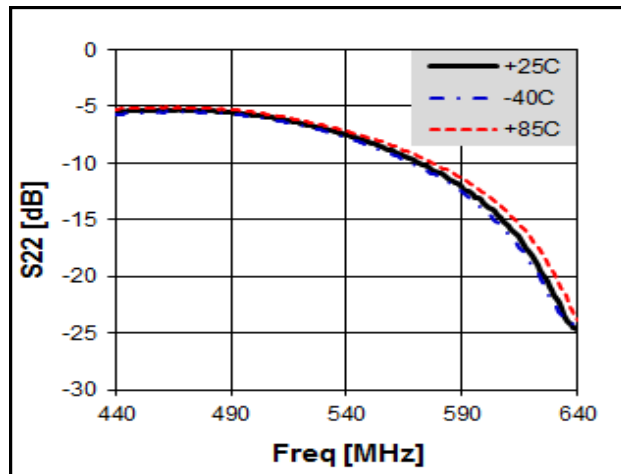
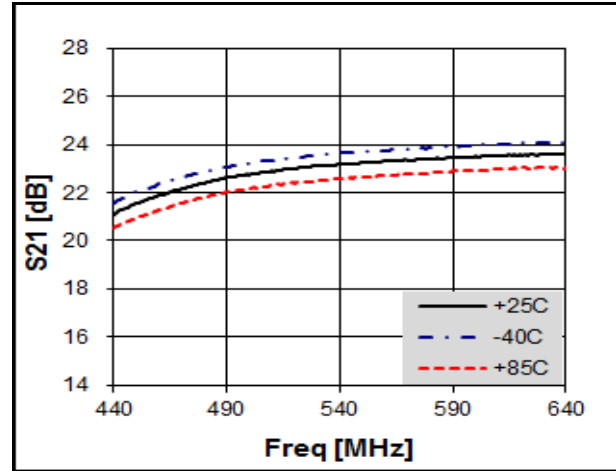
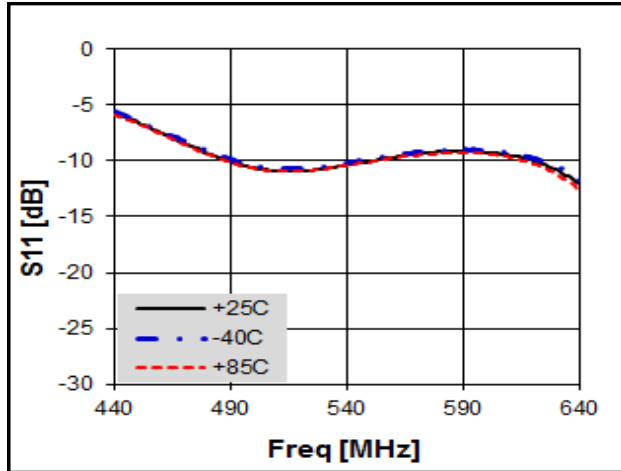
Application Circuit: 540 MHz

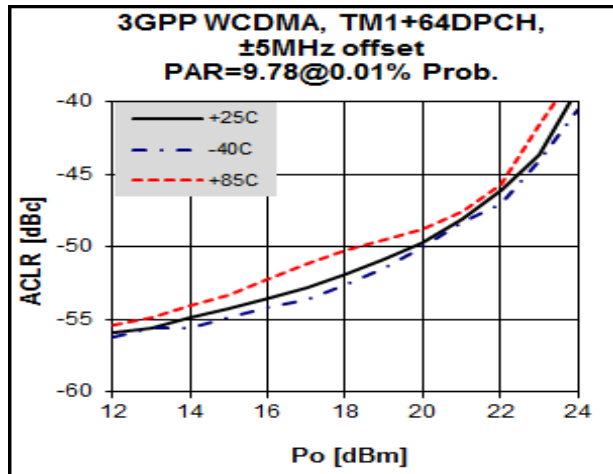
Schematic Diagram	BOM			Marks
	C1	0603	56pF	Samsung
	C2	0603	56pF	Samsung
	C3	0603	22pF	Samsung
	C4	0603	1000pF	Samsung
	C5	0603	1 uF	Samsung
	C7	0603	N/C	-
	C8	0603	N/C	-
	C9	0603	33pF	Samsung
	C10	0603	30pF	Samsung
	C11	0603	12pF	Samsung
	C12	0603	N/C	-
	C13	0603	10pF	Samsung
	C16	0603	N/C	-
	C17	0603	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																					
 BEREX QFN 4x4 24L VER.2.0 2015.11.03.MHC Evaluation Board BT33L_540MHz CLEARANCE:0.75mm LINE CAL WIDTH:1.31mm MATERIAL:FR-4 Etch: 0.1mm SKES: 0.075mm	Below information is subject to change as conditions of the substrate. <table><tr><th>Reference</th><th>Object</th><th>Distance</th></tr><tr><td>Input pin</td><td>L2</td><td>5.5mm</td></tr><tr><td>Input pin</td><td>C13</td><td>2.5mm</td></tr><tr><td>Input pin</td><td>C10</td><td>1.3mm</td></tr><tr><td>Output pin</td><td>C11</td><td>1.8mm</td></tr><tr><td>Output pin</td><td>L3</td><td>3.4mm</td></tr><tr><td>Output pin</td><td>C17</td><td>7.0mm</td></tr></table>	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
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																				

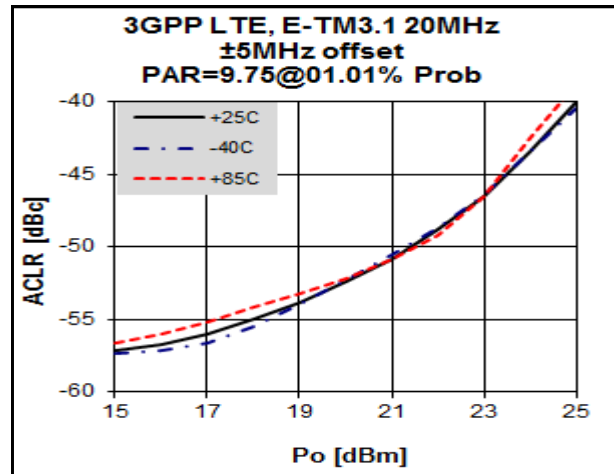
Typical Performance

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

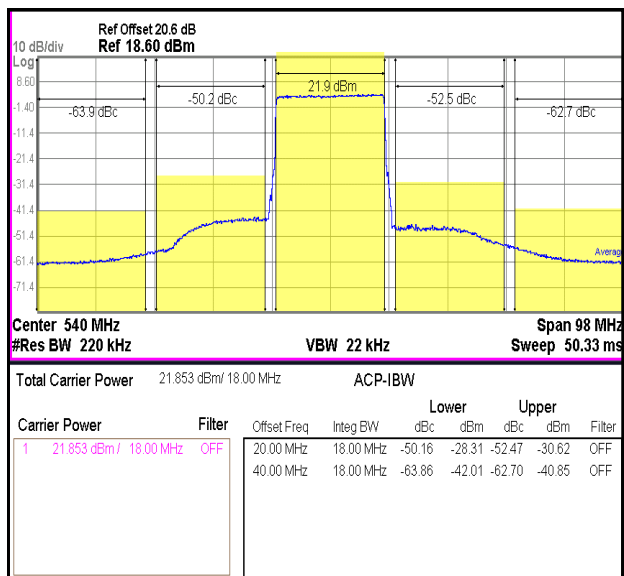
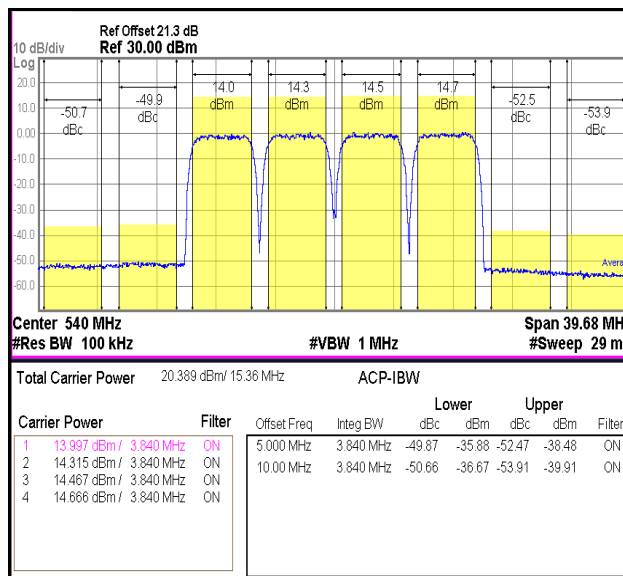




3GPP WCDMA TM1 +64DPCH 4FA



3GPP LTE E-TM3.1 20MHz



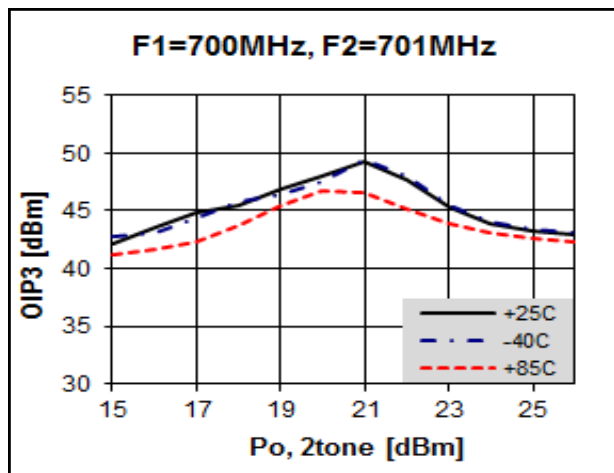
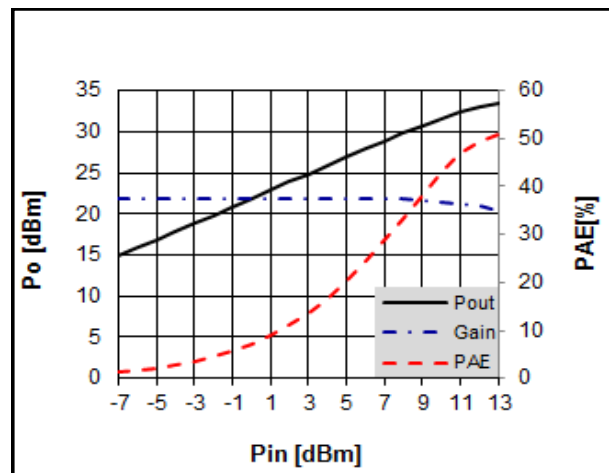
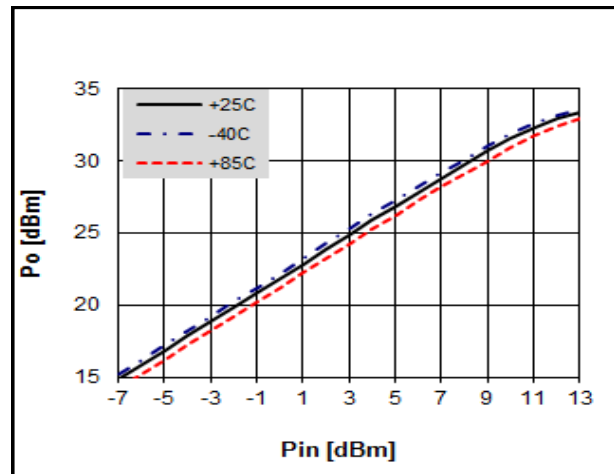
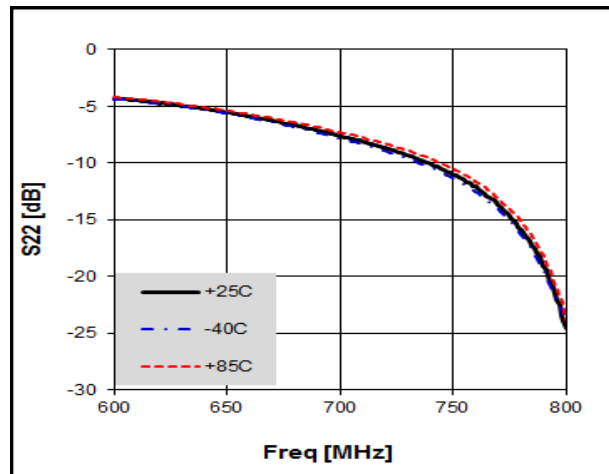
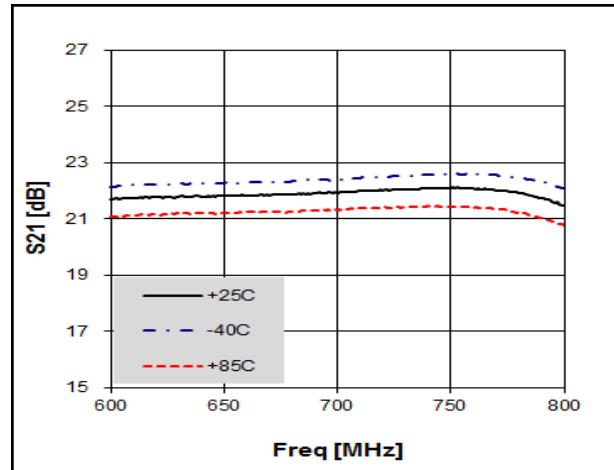
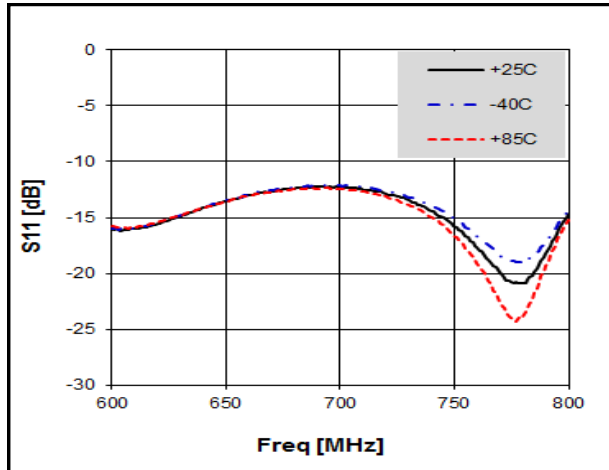
Application Circuit: 700 MHz

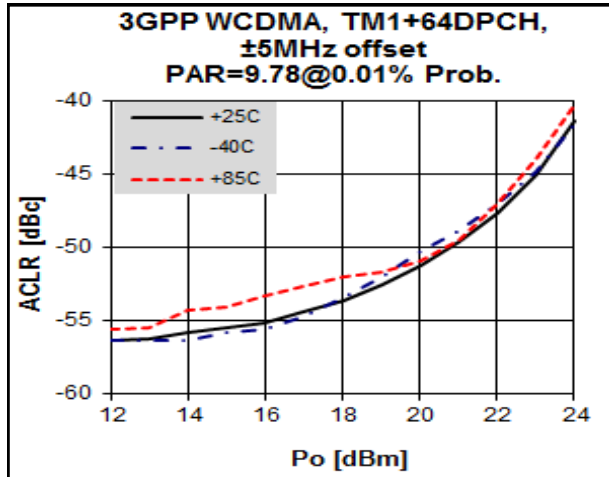
Schematic Diagram	BOM	Marks
	C1	0603 56pF Samsung
	C2	0603 56pF Samsung
	C3	0603 22pF Samsung
	C4	0603 1000pF Samsung
	C5	0603 1 uF Samsung
	C7	0603 N/C -
	C8	0603 2pF Samsung
	C9	0603 33pF Samsung
	C10	0603 22pF Samsung
	C11	0603 9pF Samsung
	C12	0603 N/C -
	C13	0603 8pF Samsung
	C16	0603 9pF Samsung
	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																					
BEREX QFN 4x4 24L VER.2.0 2015.11.03.MHC Evaluation Board BT33L_700MHz CLEARANCE:0.75mm LINE CAL WIDTH:1.31mm MATERIAL:FR-4 Copper Thickness:0.075mm	Below information is subject to change as conditions of the substrate. <table><tr><th>Reference</th><th>Object</th><th>Distance</th></tr><tr><td>Input pin</td><td>L2</td><td>5.0mm</td></tr><tr><td>Input pin</td><td>C13</td><td>2.5mm</td></tr><tr><td>Input pin</td><td>C10</td><td>1.0mm</td></tr><tr><td>Output pin</td><td>C11</td><td>2.5mm</td></tr><tr><td>Output pin</td><td>L3</td><td>3.3mm</td></tr><tr><td>Output pin</td><td>C16</td><td>8.3mm</td></tr></table>	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
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																				

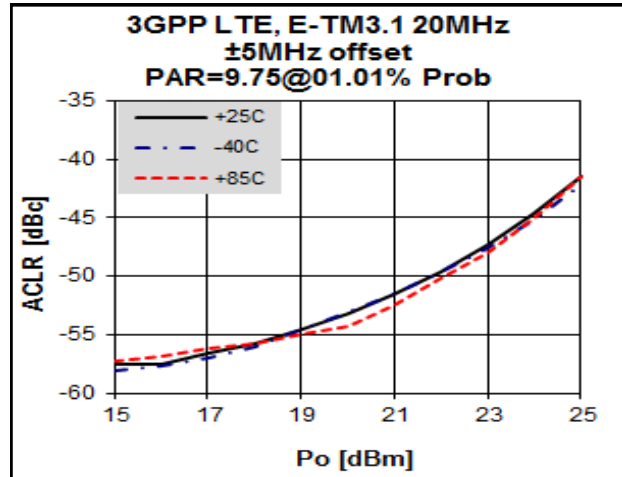
Typical Performance

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

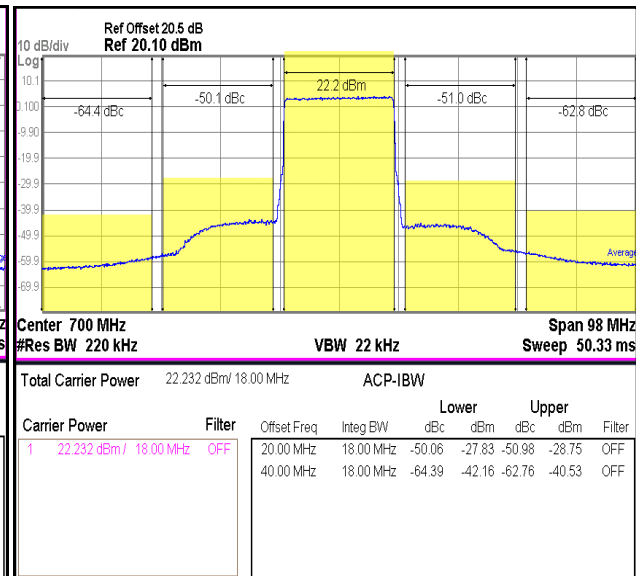
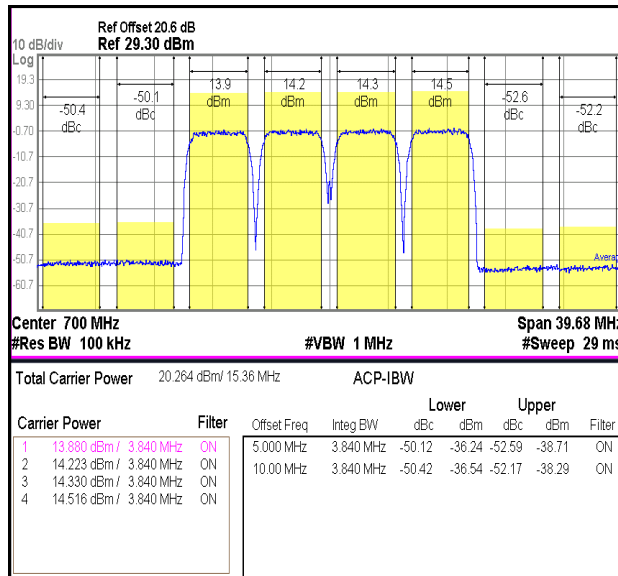




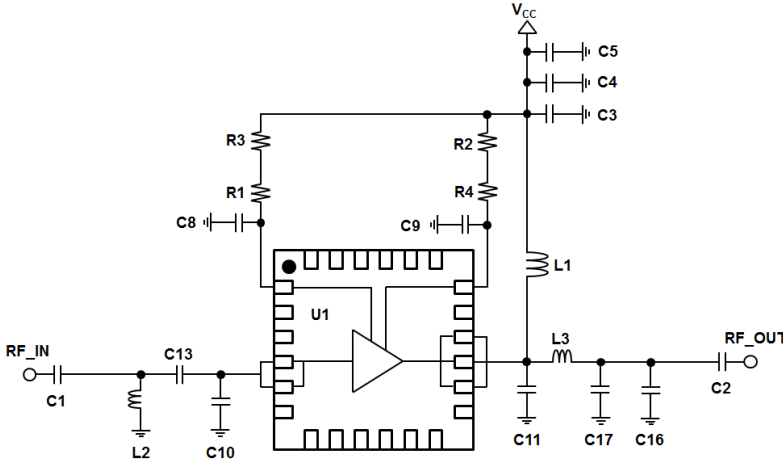
3GPP WCDMA TM1 +64DPCH 4FA

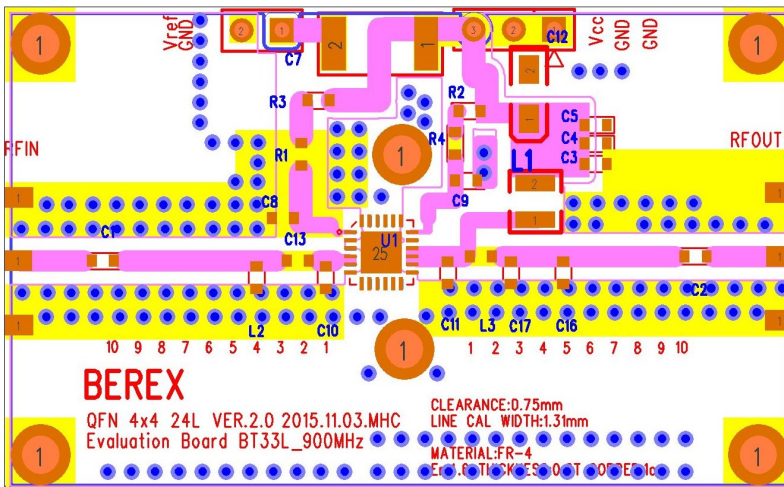


3GPP LTE E-TM3.1 20MHz



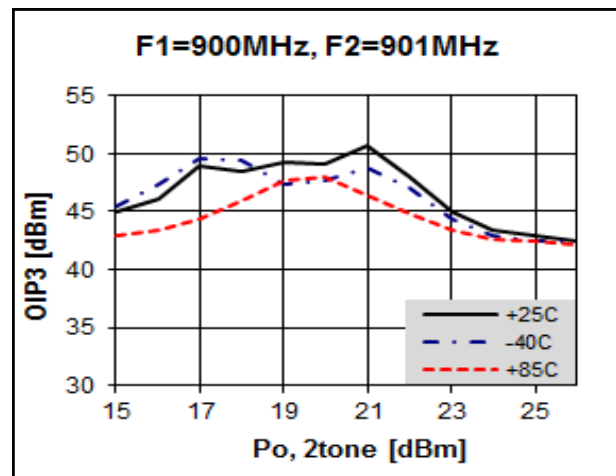
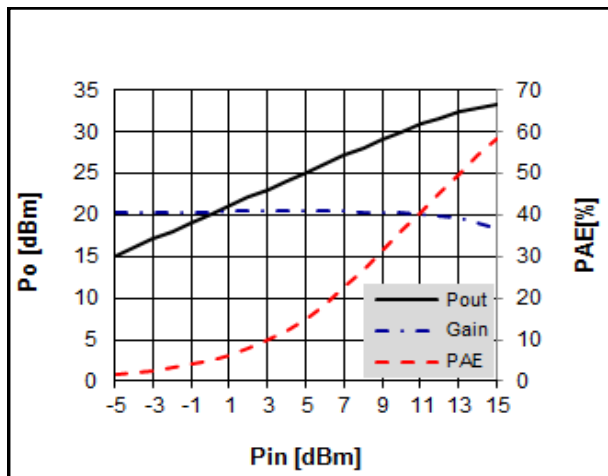
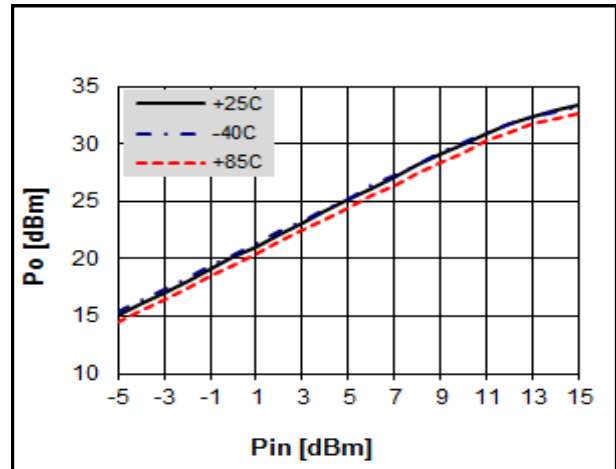
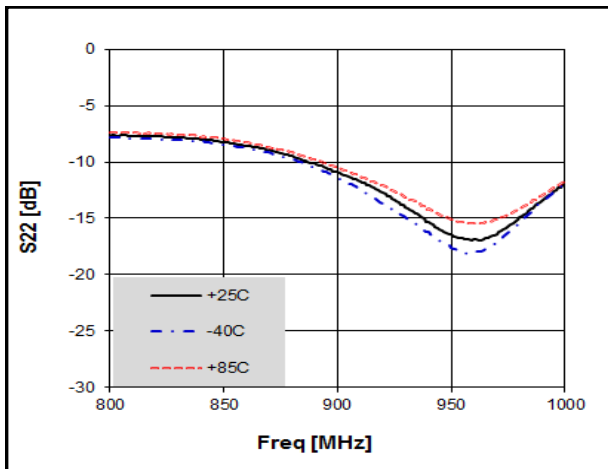
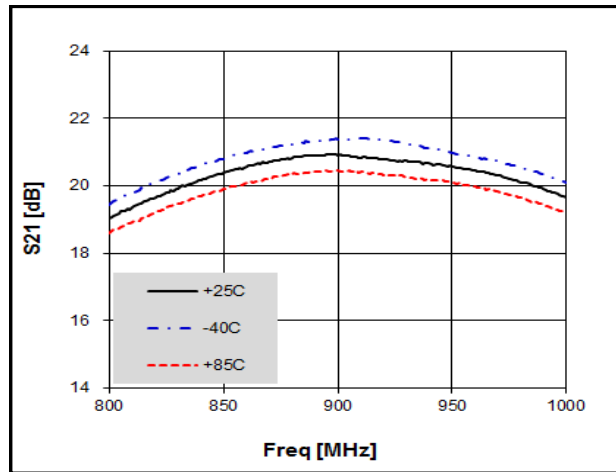
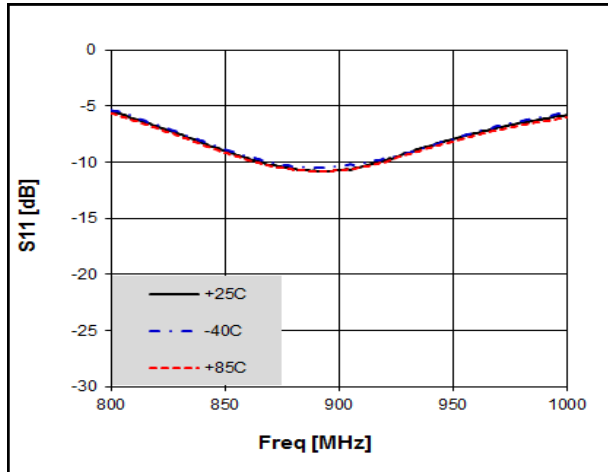
Application Circuit: 900 MHz

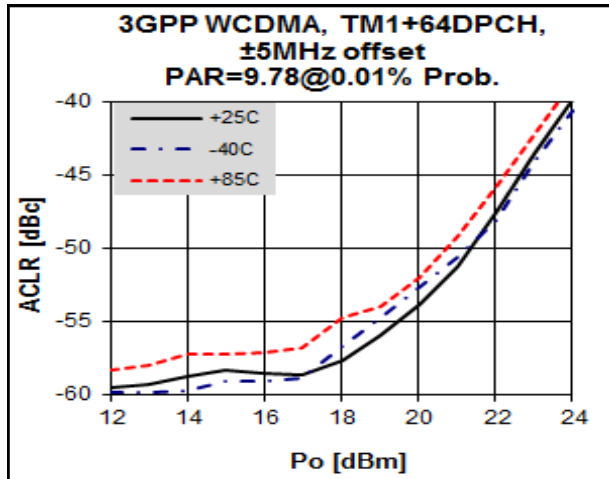
Schematic Diagram	BOM			Marks
	C1	0603	47pF	Samsung
	C2	0603	47pF	Samsung
	C3	0603	22pF	Samsung
	C4	0603	1000pF	Samsung
	C5	0603	1 uF	Samsung
	C7	0603	N/C	-
	C8	0603	N/C	-
	C9	0603	33pF	Samsung
	C10	0603	10pF	Samsung
	C11	0603	N/C	-
	C12	0603	N/C	-
	C13	0603	3.9pF	Samsung
	C16	0603	N/C	-
	C17	0603	8.2pF	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	Notice																		
 BEREX QFN 4x4 24L VER.2.0 2015.11.03.MHC Evaluation Board BT33L_900MHz CLEARANCE:0.75mm LINE CAL WIDTH:1.31mm MATERIAL:FR-4 E.C.TICK:ES-0.0T 100°C/1s	Below information is subject to change as conditions of the substrate. <table><tr><th>Reference</th><th>Object</th><th>Distance</th></tr><tr><td>Input pin</td><td>L2</td><td>5.5mm</td></tr><tr><td>Input pin</td><td>C13</td><td>2.5mm</td></tr><tr><td>Input pin</td><td>C10</td><td>1.3mm</td></tr><tr><td>Output pin</td><td>L3</td><td>3.3mm</td></tr><tr><td>Output pin</td><td>C17</td><td>5.6mm</td></tr></table>	Reference	Object	Distance	Input pin	L2	5.5mm	Input pin	C13	2.5mm	Input pin	C10	1.3mm	Output pin	L3	3.3mm	Output pin	C17	5.6mm
Reference	Object	Distance																	
Input pin	L2	5.5mm																	
Input pin	C13	2.5mm																	
Input pin	C10	1.3mm																	
Output pin	L3	3.3mm																	
Output pin	C17	5.6mm																	

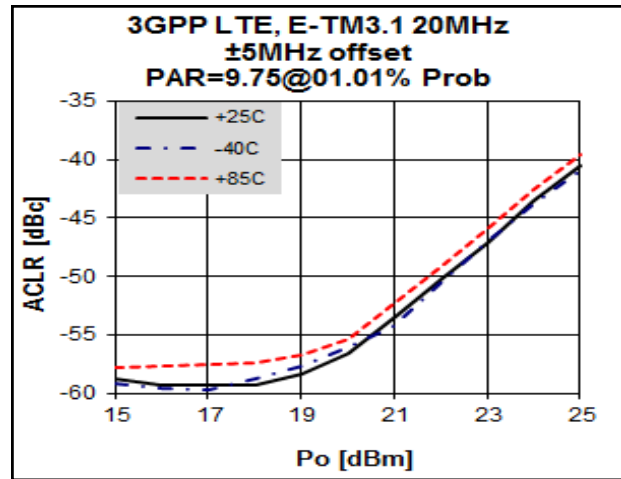
Typical Performance

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

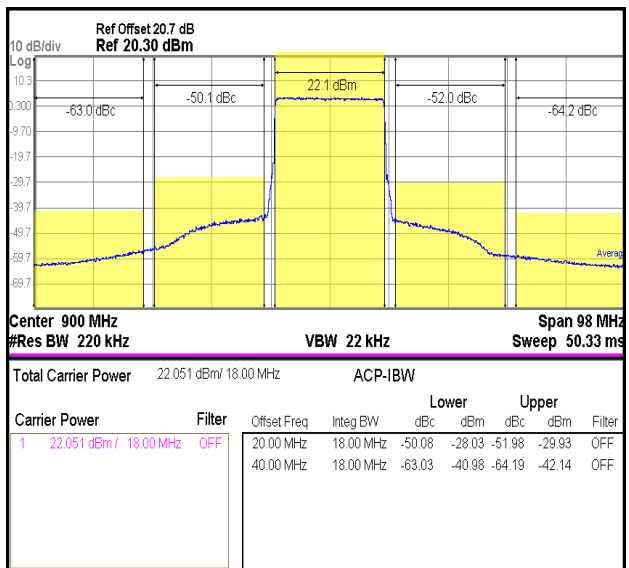
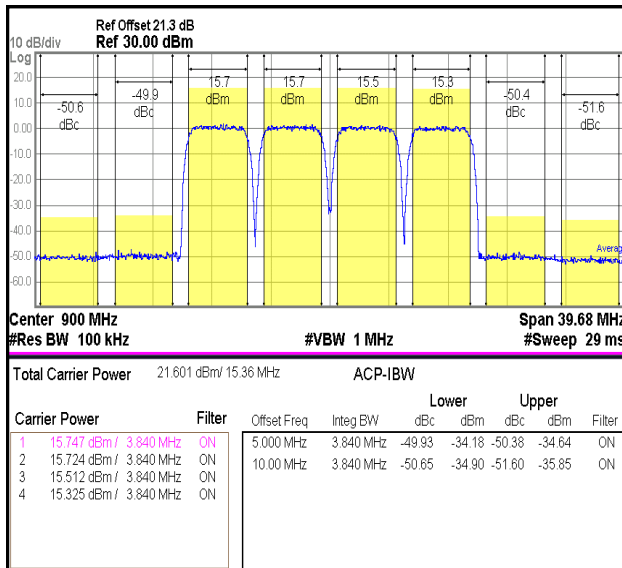




3GPP WCDMA TM1 +64DPCH 4FA

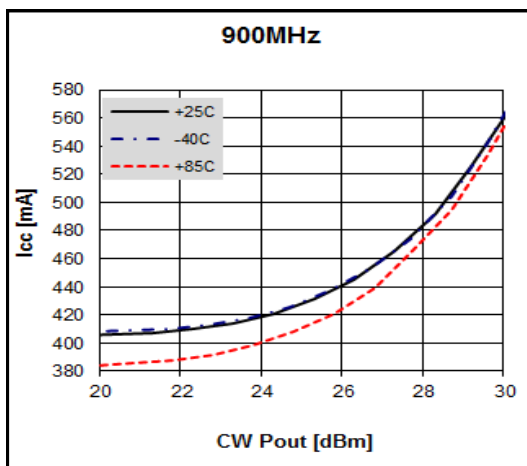
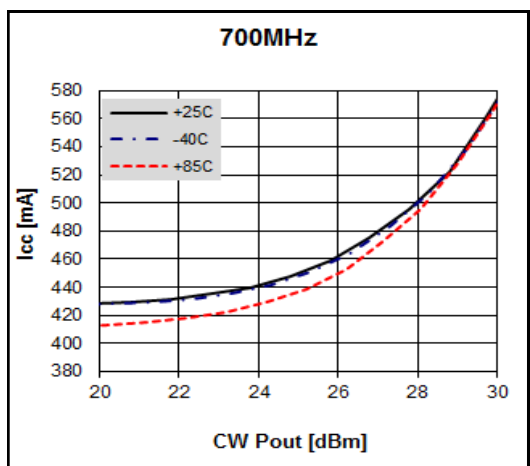
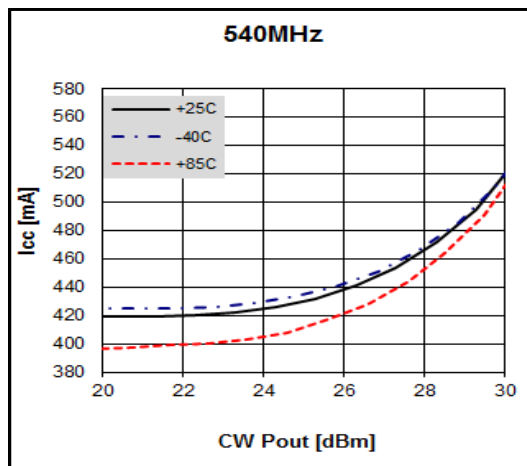
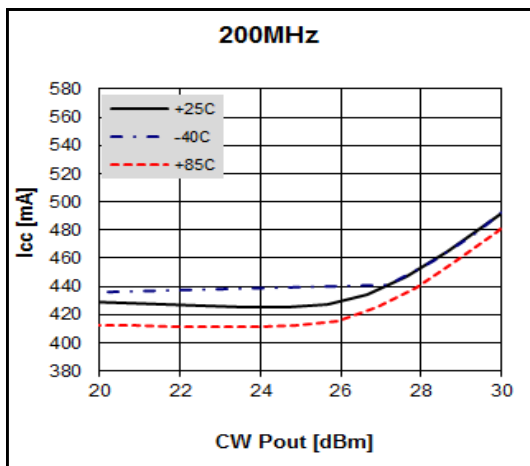


3GPP LTE E-TM3.1 20MHz

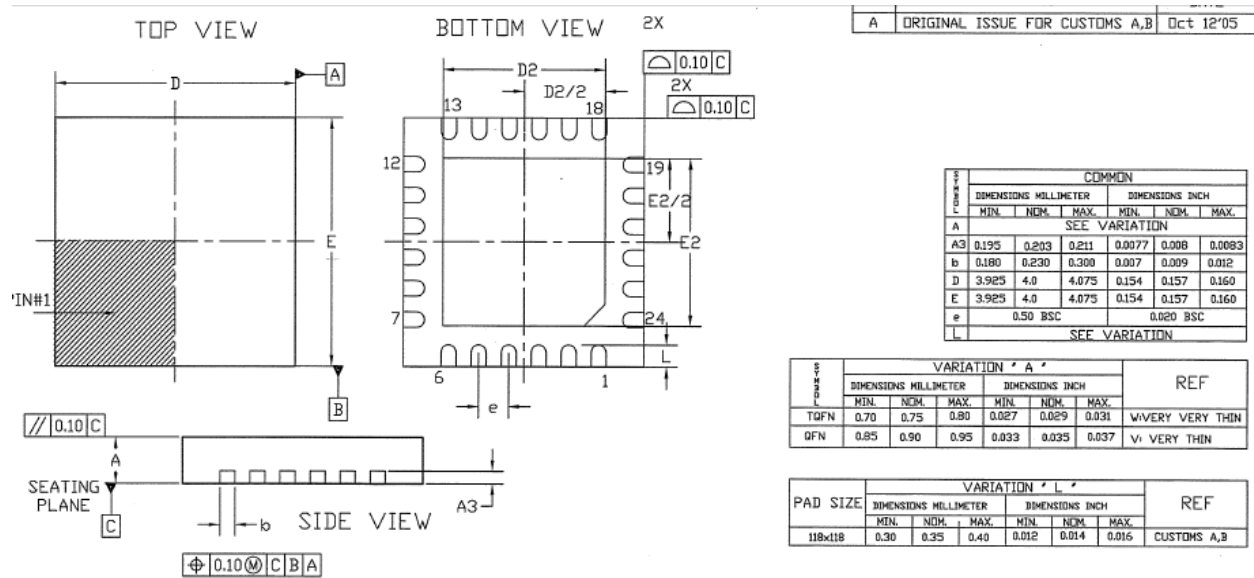


Typical Performance (Pout vs Icc)

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



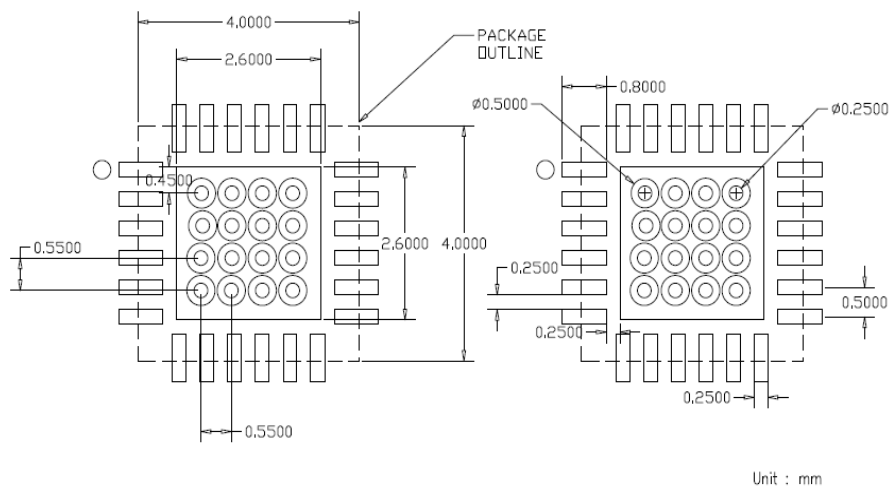
Package Outline Dimension



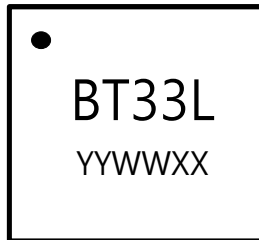
NOTES :

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

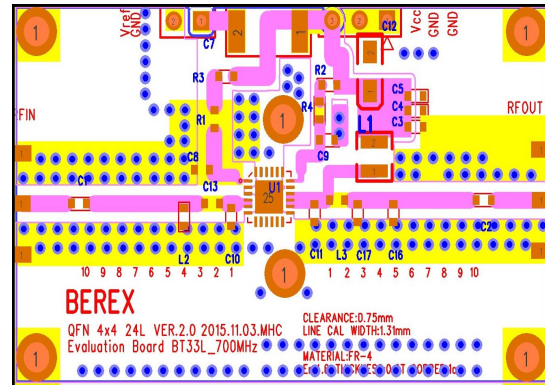


Package Marking

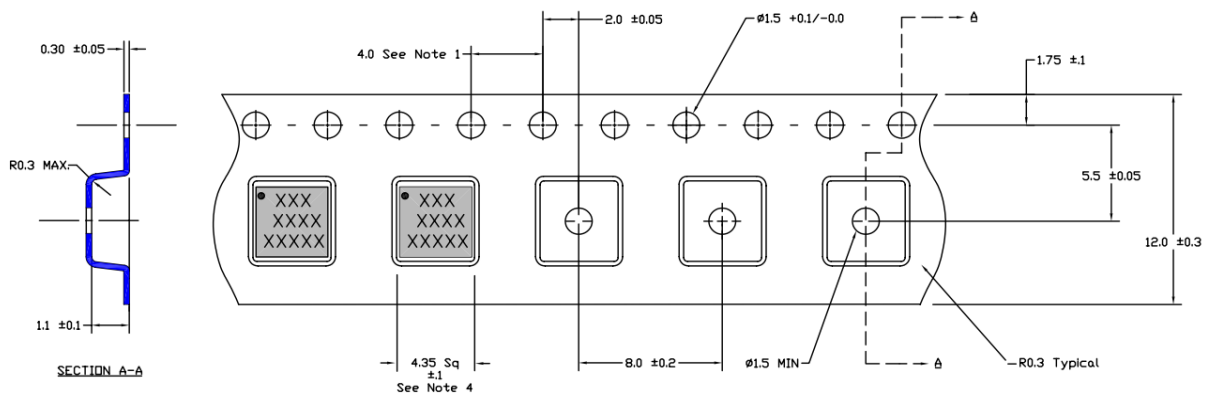


YY = Year, WW = Working Week,
XX = Wafer No.

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.)

MSL / ESD Rating

ESD Rating: Class 1C
Value: Passes $\geq 1000V$ 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 $+260^{\circ}C$ 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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Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

-  View [BT33L](#) on WIN SOURCE
-  [BeRex Corporation](#) Information

Optimize Your Supply Chain with WIN SOURCE Solutions

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-  Alternative Solution
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