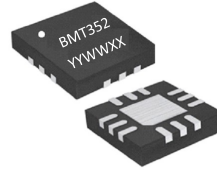


## 3.0-4.0 GHz 1.5W High Linearity 5V 2-Stage Power Amplifier

### Device Features

- +5V/355mA at operating bias condition
- Gain = 20.7 dB @ 3.5 GHz
- P1dB = 31.5 dBm @ 3.5GHz
- LTE 20M ACLR = 21.8dBm Output Power at -50dBc @ 3.5GHz
- Integrated interstage matching
- Green/RoHS2-compliant QFN3x3 SMT package



### Product Description

The BMT352 is a high dynamic range two-stage power amplifier, housed in a green/RoHS2 compliant 3x3mm<sup>2</sup> QFN package. The BMT352 uses a high reliability InGaP/GaAs HBT process technology. The BMT352 is designed for use where high linearity and gain are required. The BMT352 is able to deliver over 22 dBm output power from 3.0 to 4.0GHz while maintaining superior ACLR performance with a few external matching components. All devices are 100% RF/DC screened.

### Typical Performance<sup>1</sup>

Parameter	Frequency					Unit
	3400	3500	3600	3700	3800	MHz
Gain	20.8	20.7	20.6	20.5	20.4	dB
S11	-18.0	-15.0	-16.5	-16.0	-17.0	dB
S22	-9.0	-8.0	-7.0	-6.0	-5.0	dB
OIP3 <sup>2</sup>	47.0	45.0	47.0	45.0	41.5	dBm
P1dB	31.4	31.5	31.8	31.7	31.4	dBm
LTE 20M ACLR	21.8	21.8	22.2	21.7	20.6	dBm
WCDMA ACLR	22.1	22.1	22.4	22.0	21.0	dBm
Noise Figure	5.1	5.1	5.2	5.5	5.8	dB

<sup>1</sup> Device performance \_ measured on a BeRex evaluation board at 25°C, 50 Ω

<sup>2</sup> OIP3 \_ measured on two tones with a output power 17dBm/ tone , F2—F1 = 1 MHz..

\*ACLR Channel Power measured at -50dBc.

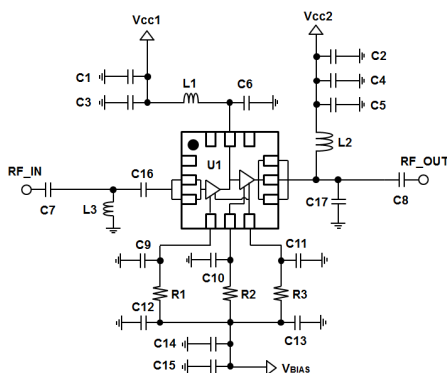
- LTE set-up: 3GPP LTE, FDD E-TM3.1, 20MHz BW, ±5MHz offset, PAR 9.75 @0.01% Prob.

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

### Applications

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

### Application Circuits



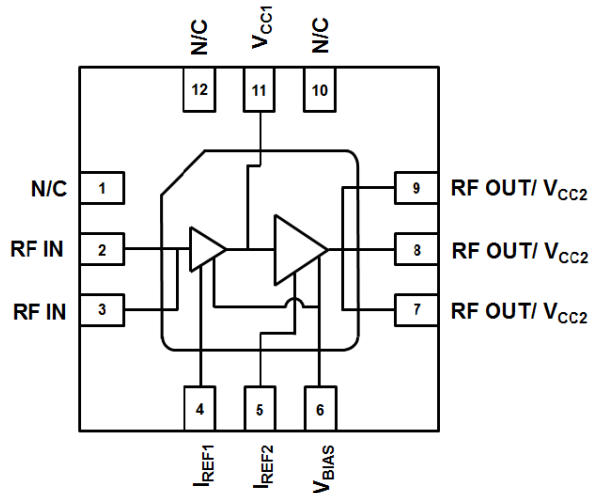
	Min.	Typical	Max.	Unit
Bandwidth	3.0		4.0	GHz
I <sub>bias</sub>		26		mA
I <sub>cq</sub> @ (I <sub>cq1</sub> + I <sub>cq2</sub> )		330		mA
V <sub>CC</sub> /V <sub>bias</sub>		5.0		V
R <sub>TH</sub>		12.9		°C/W

### Absolute Maximum Ratings

Parameter	Rating	Unit
Operating Case Temperature	-40 to +85	°C
Storage Temperature	-55 to +155	°C
Junction Temperature	+175	°C
Operating Voltage	+6.0	V
Supply Current	1.5	A
Input RF Power	26	dBm

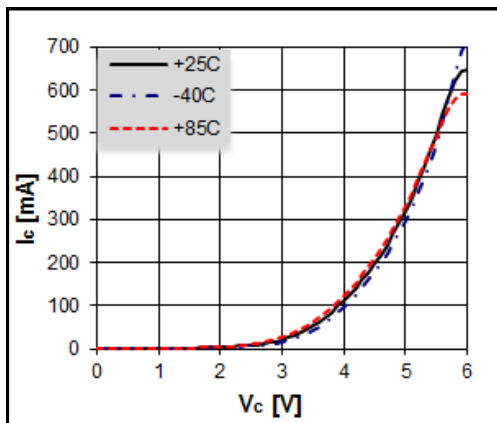
\*Operation of this device above any of these parameters may result in permanent damage.

### Pin Configuration



Pin No.	Label
1,10,12	N/C
2,3	RF IN
4	$I_{REF1}$
5	$I_{REF2}$
6	$V_{BIAS}$
7,8,9	RF OUT/ $V_{CC2}$
11	$V_{CC1}$
Backside Paddle	GND

### V-I Characteristics



### BeRex Evaluation Board

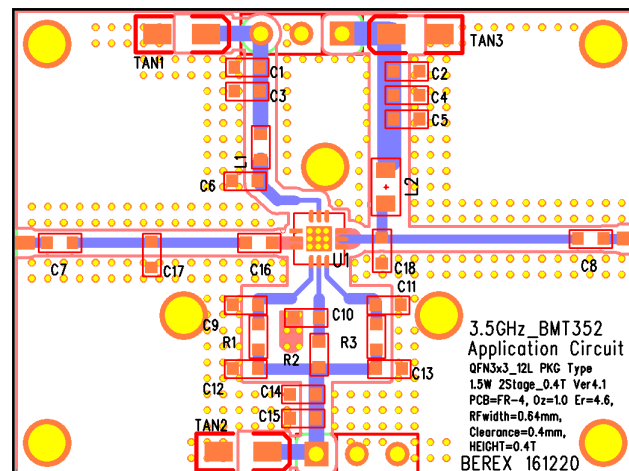
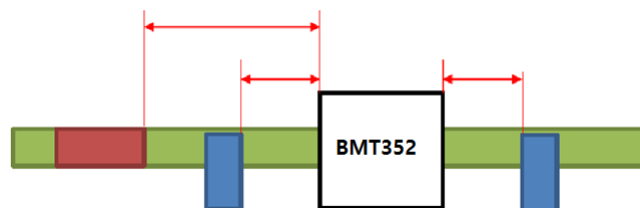


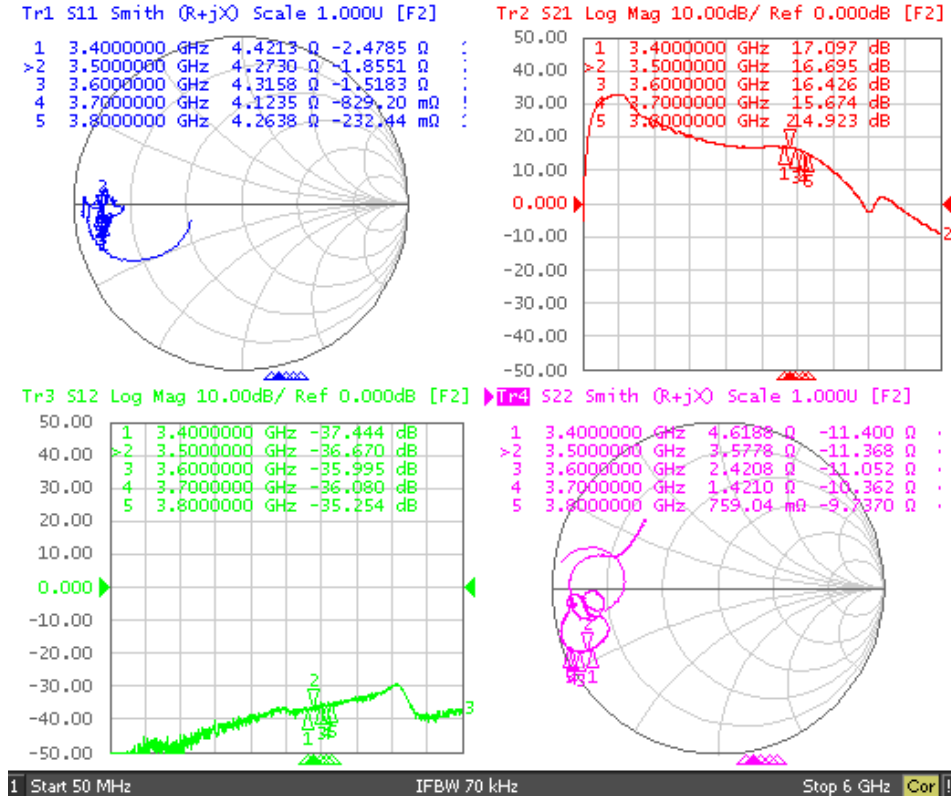
Figure about the reference position of components



## 3.0-4.0 GHz 1.5W High Linearity 5V 2-Stage Power Amplifier

### Typical Device Data

S-parameters ( $V_{cc}$  &  $V_{Bias} = +5V$ ,  $I_{cq}=330mA$ ,  $T_a=25^\circ C$ )

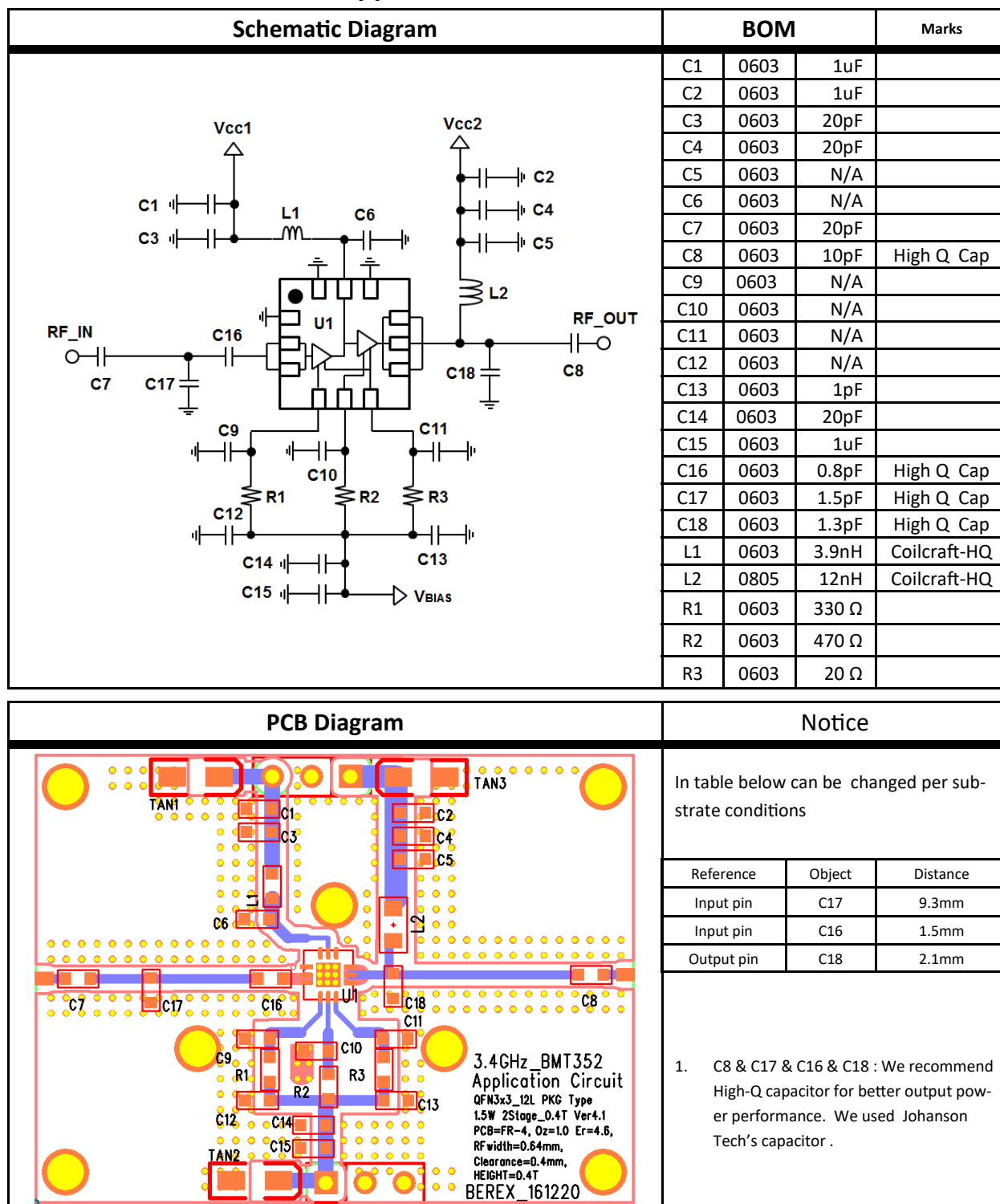


### S-Parameter

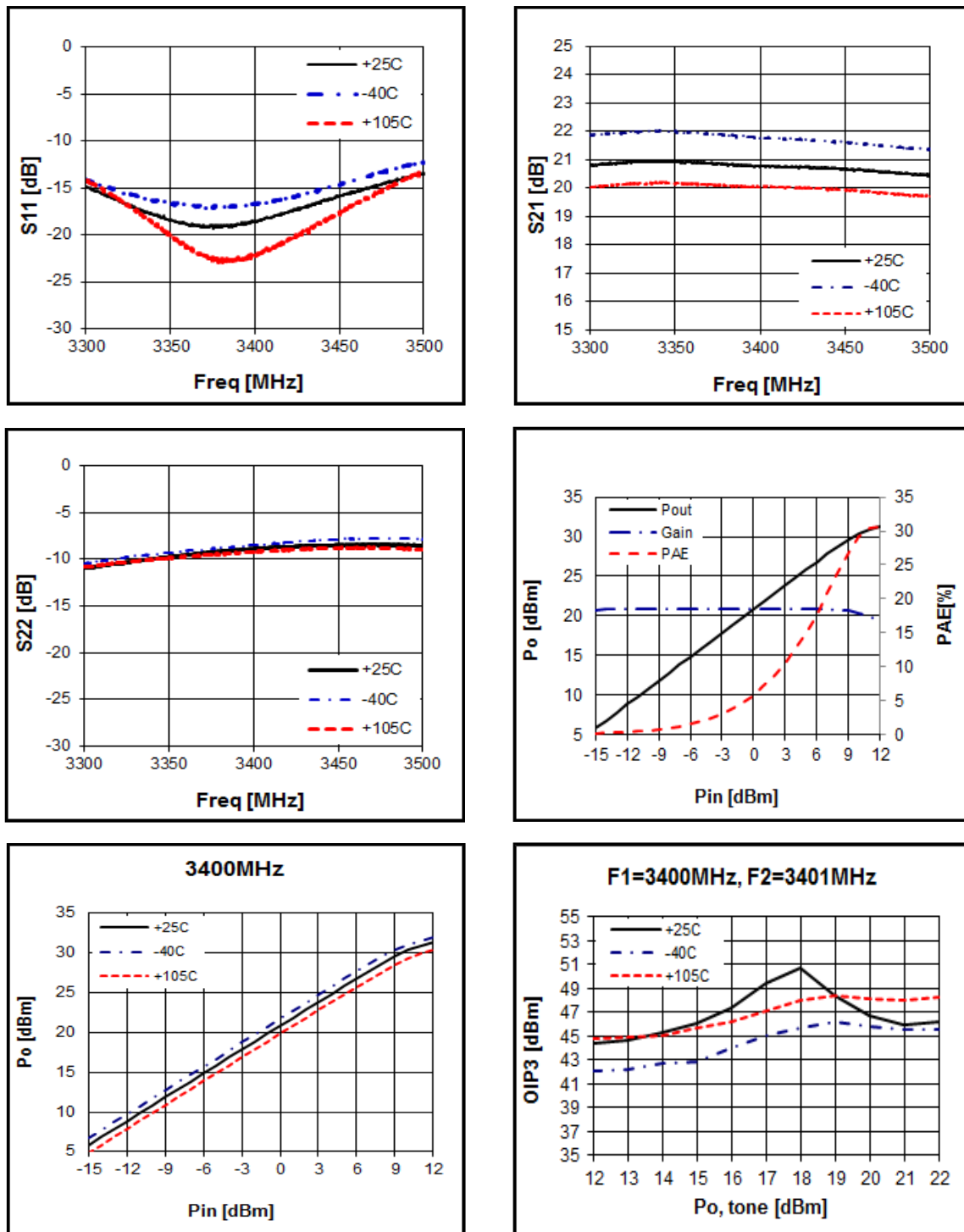
( $V_{cc}$  &  $V_{Bias} = +5V$ ,  $I_{cq} = 330mA$ ,  $T_a = 25^\circ C$ , calibrated to device leads)

Freq [GHz]	S11 [Mag]	S11 [Ang]	S21 [Mag]	S21 [Ang]	S12 [Mag]	S12 [Ang]	S22 [Mag]	S22 [Ang]
3.0	0.85	-169.83	6.80	131.45	0.01	84.90	0.70	-163.38
3.1	0.85	-171.29	7.13	125.18	0.01	82.11	0.72	-157.60
3.2	0.85	-172.08	7.15	112.90	0.01	84.13	0.77	-155.37
3.3	0.84	-173.58	7.13	104.15	0.01	85.52	0.80	-154.65
3.4	0.84	-174.18	7.12	91.77	0.01	83.96	0.84	-154.26
3.5	0.84	-175.94	6.78	80.60	0.01	79.18	0.87	-154.55
3.6	0.84	-176.75	6.57	68.06	0.02	83.97	0.91	-155.12
3.7	0.85	-177.94	6.03	53.82	0.02	76.55	0.95	-156.77
3.8	0.84	-179.59	5.55	42.73	0.02	73.93	0.96	-158.27
3.9	0.84	179.08	4.86	28.34	0.02	68.24	0.98	-160.44
4.0	0.84	177.56	4.28	18.35	0.02	63.23	0.98	-162.53

### Application Circuit: 3.4 GHz

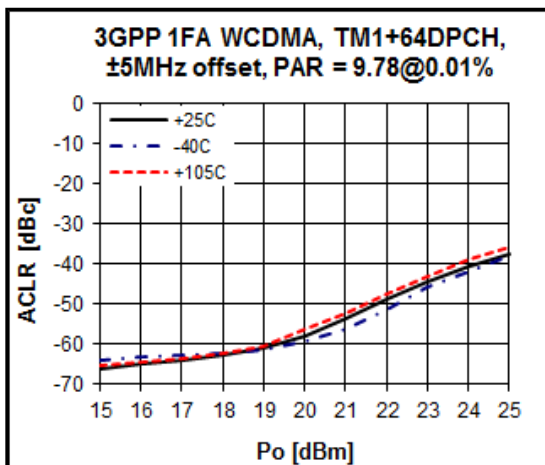


### Typical Performance

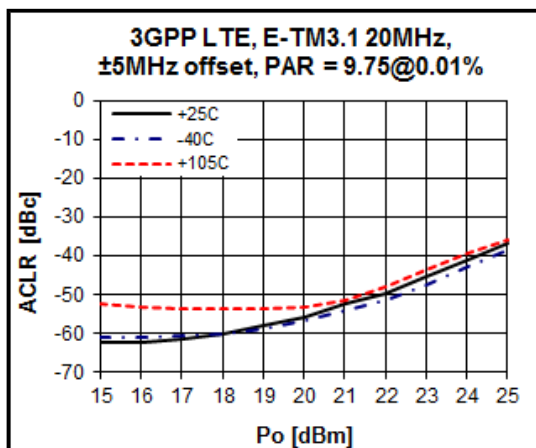


### 3.0-4.0 GHz 1.5W High Linearity 5V 2-Stage Power Amplifier

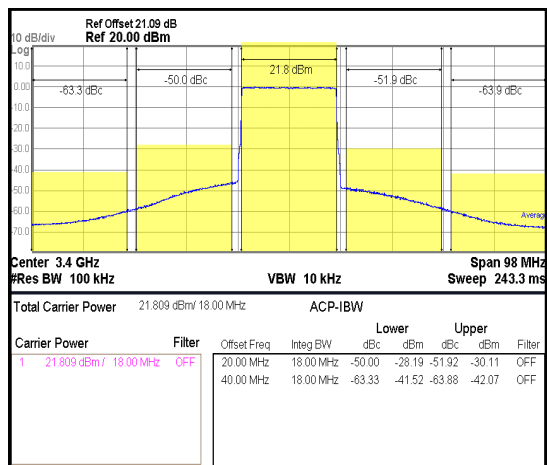
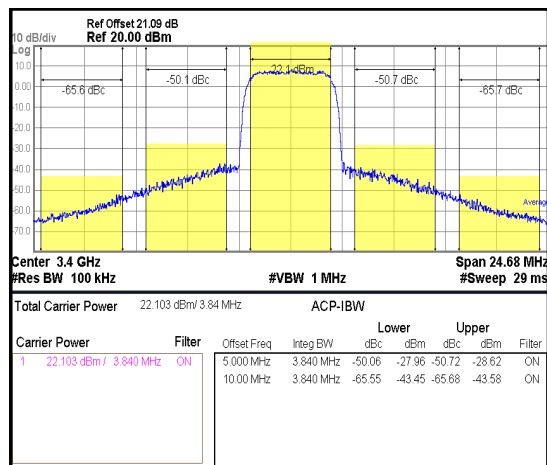
## Typical Performance



3GPP WCDMA TM1 +64DPCH 1FA



3GPP LTE E-TM3.1 20MHz

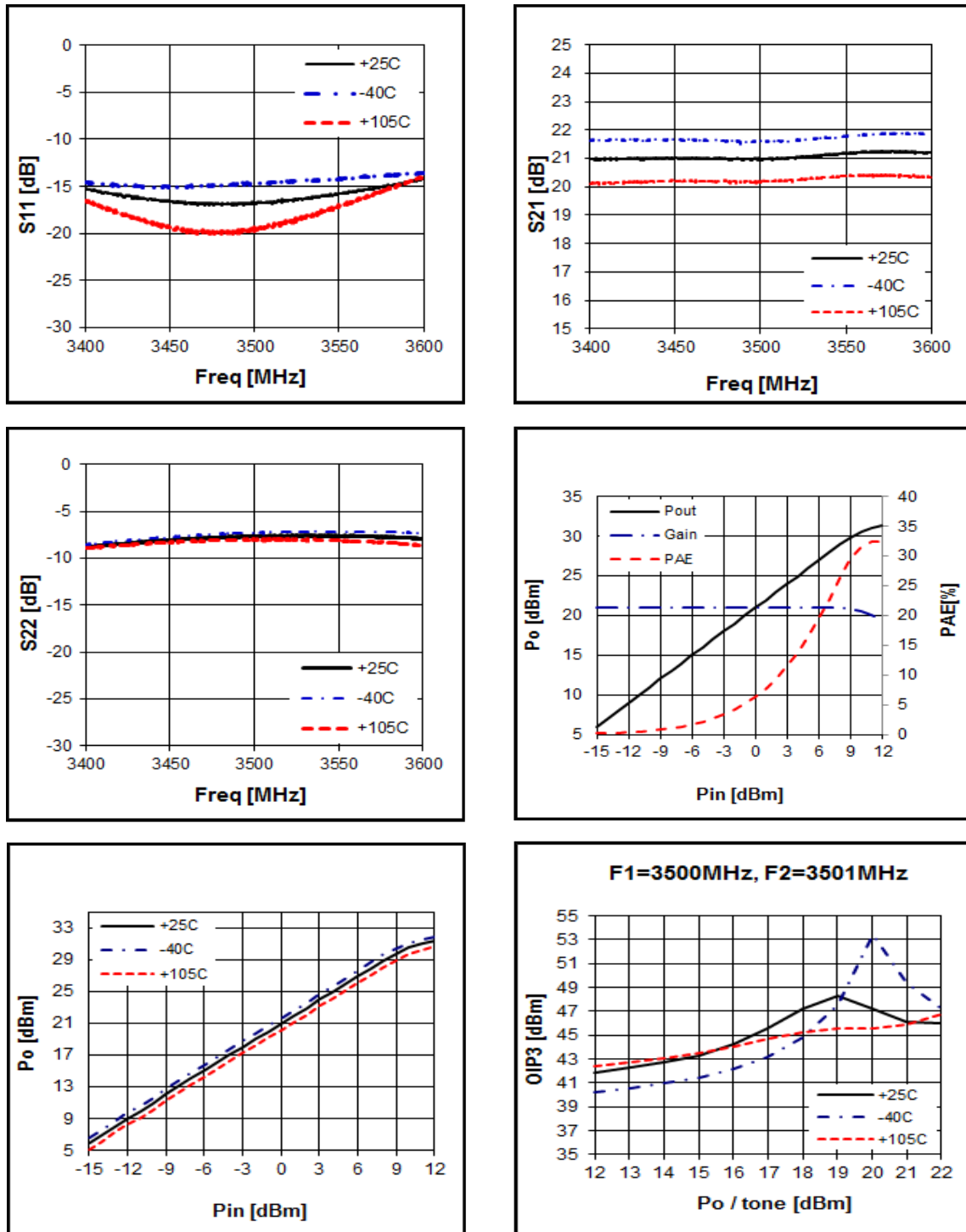


### Application Circuit: 3.5 GHz

Schematic Diagram	BOM			Marks
	C1	0603	1uF	
	C2	0603	1uF	
	C3	0603	20pF	
	C4	0603	20pF	
	C5	0603	N/A	
	C6	0603	N/A	
	C7	0603	20pF	
	C8	0603	10pF	High Q Cap
	C9	0603	N/A	
	C10	0603	N/A	
	C11	0603	N/A	
	C12	0603	N/A	
	C13	0603	2pF	
	C14	0603	20pF	
	C15	0603	1uF	
	C16	0603	0.8pF	High Q Cap
	C17	0603	1.5pF	High Q Cap
	C18	0603	1.3pF	High Q Cap
	L1	0603	3.9nH	Coilcraft-HQ
	L2	0805	12nH	Coilcraft-HQ
	R1	0603	330 Ω	
	R2	0603	470 Ω	
	R3	0603	20 Ω	

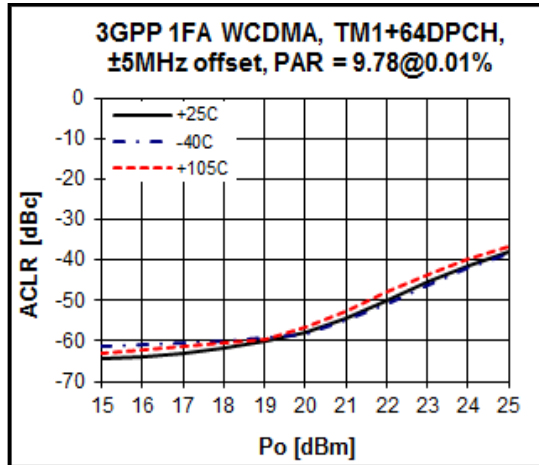
PCB Diagram	Notice		
	In table below can be changed per substrate conditions		
	Reference	Object	Distance
	Input pin	C17	8.9mm
	Input pin	C16	1.5mm
	Output pin	C18	2.0mm
	1. C8 & C17 & C16 & C18 : We recommend High-Q capacitor for better output power performance. We used Johanson Tech's capacitor .		

### Typical Performance

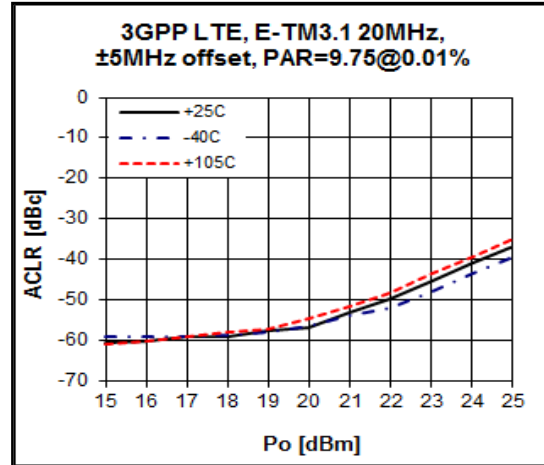




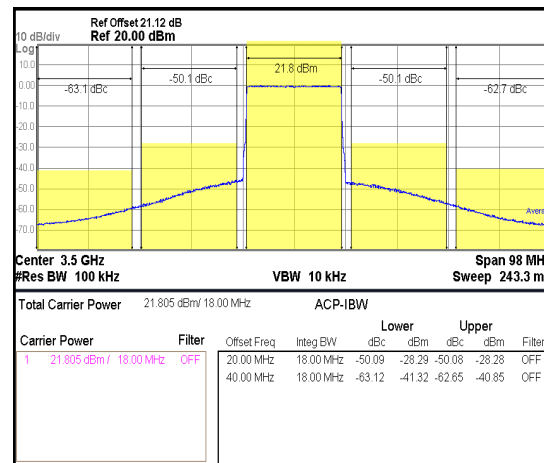
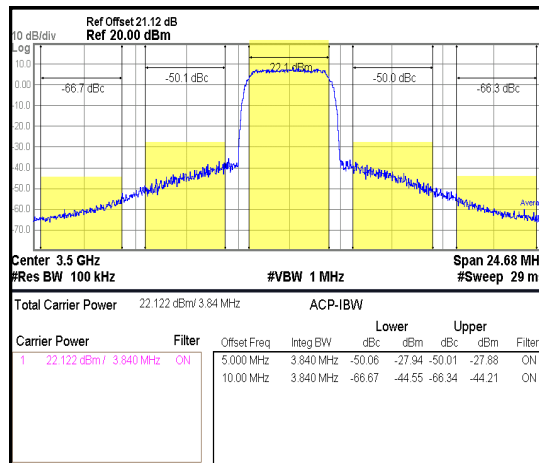
### Typical Performance



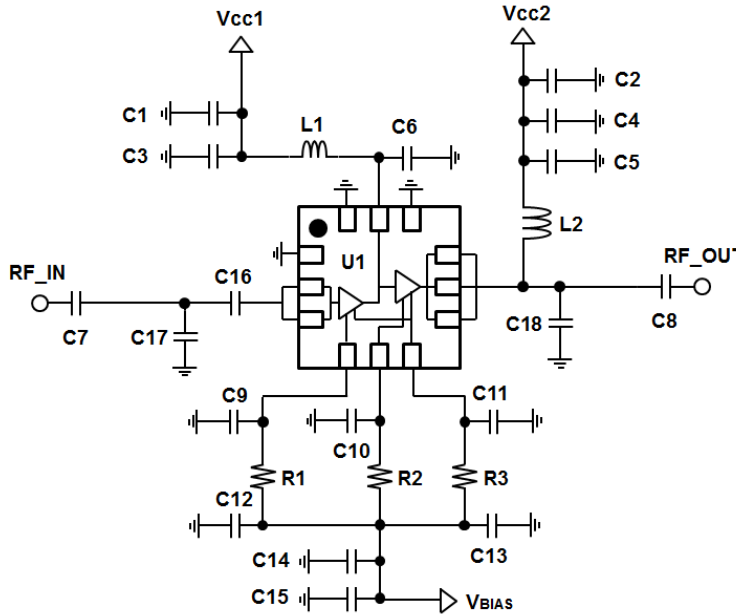
3GPP WCDMA TM1 +64DPCH 1FA

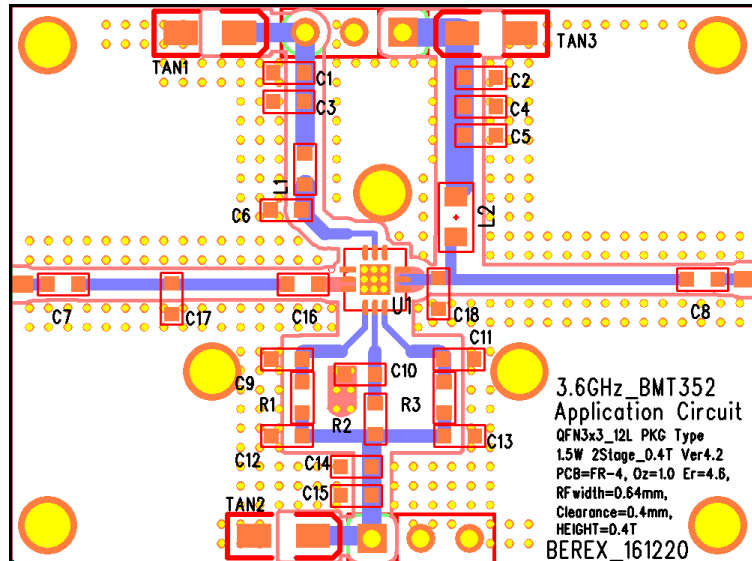


3GPP LTE E-TM3.1 20MHz

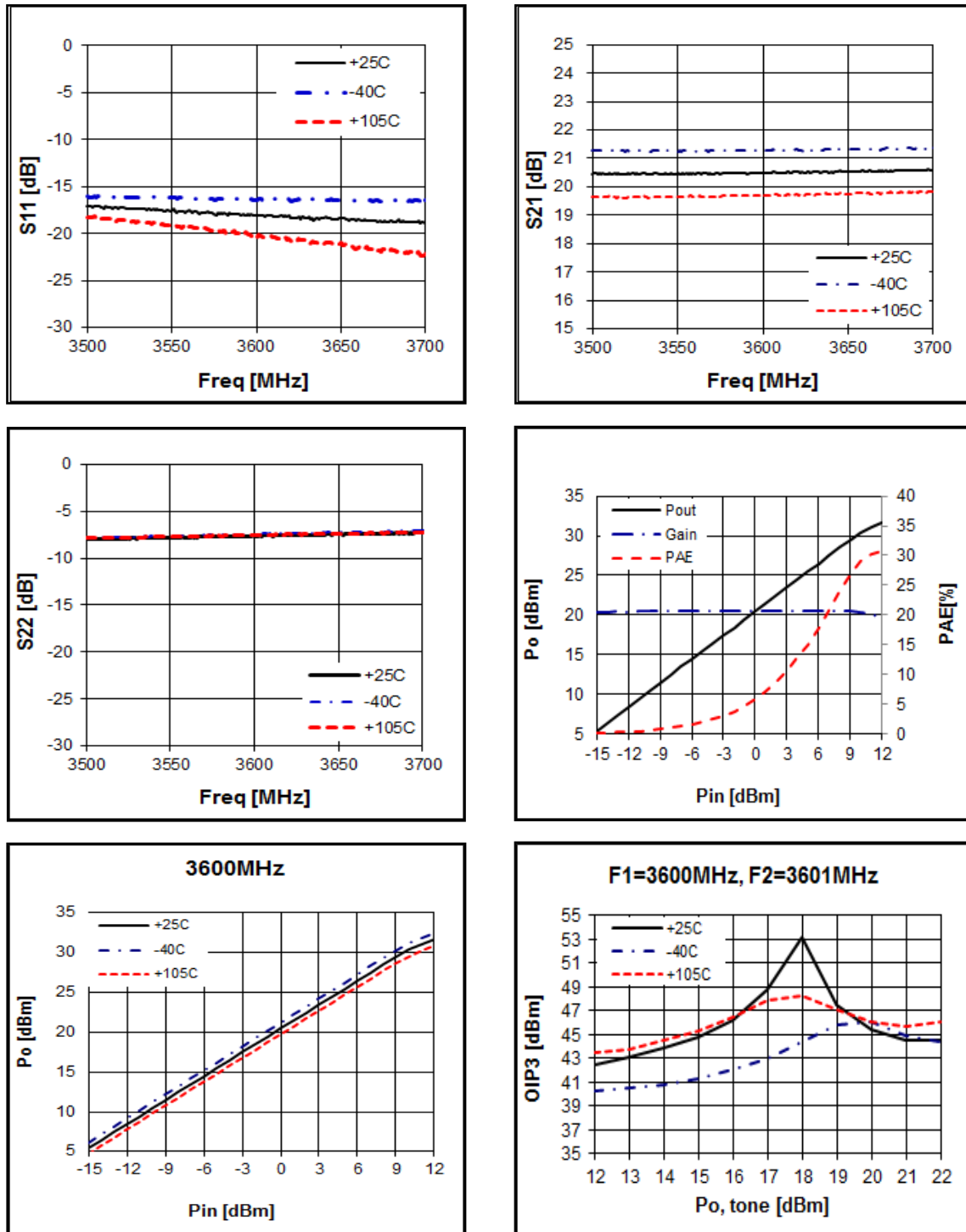


### Application Circuit: 3.6 GHz

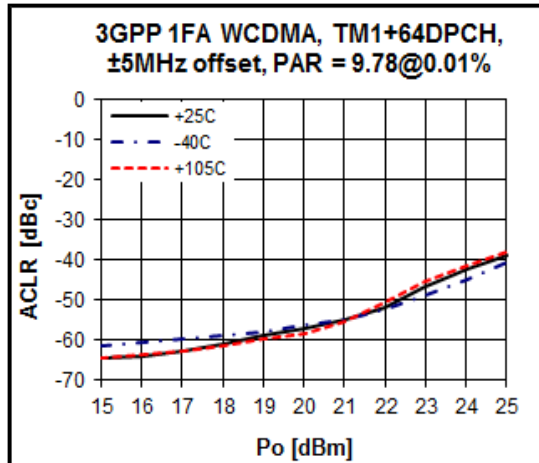
Schematic Diagram	BOM			Marks
	C1	0603	1uF	
	C2	0603	1uF	
	C3	0603	20pF	
	C4	0603	20pF	
	C5	0603	N/A	
	C6	0603	N/A	
	C7	0603	20pF	
	C8	0603	10pF	High Q Cap
	C9	0603	N/A	
	C10	0603	N/A	
	C11	0603	N/A	
	C12	0603	N/A	
	C13	0603	2pF	
	C14	0603	20pF	
	C15	0603	1uF	
	C16	0603	0.8pF	High Q Cap
	C17	0603	1.3pF	High Q Cap
	C18	0603	1.3pF	High Q Cap
	L1	0603	0 $\Omega$	
	L2	0805	12nH	Coilcraft-HQ
	R1	0603	330 $\Omega$	
	R2	0603	470 $\Omega$	
	R3	0603	20 $\Omega$	

PCB Diagram	Notice		
 <p>3.6GHz_BMT352 Application Circuit QFN3x3_12L PKG Type 1.5W 2Stage_0.4T Ver4.2 PCB=FR-4, Oz=1.0 Er=4.6, RFwidth=0.64mm, Clearance=0.4mm, HEIGHT=0.4T BEREX_161220</p>	In table below can be changed per substrate conditions		
	Reference	Object	Distance
	Input pin	C17	8.5mm
	Input pin	C16	1.5mm
	Output pin	C18	1.6mm
	1. C8 & C17 & C16 & C18 : We recommend High-Q capacitor for better output power performance. We used Johanson Tech's capacitor .		

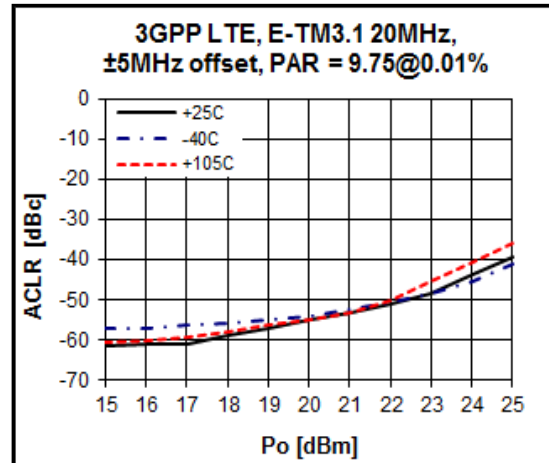
### Typical Performance



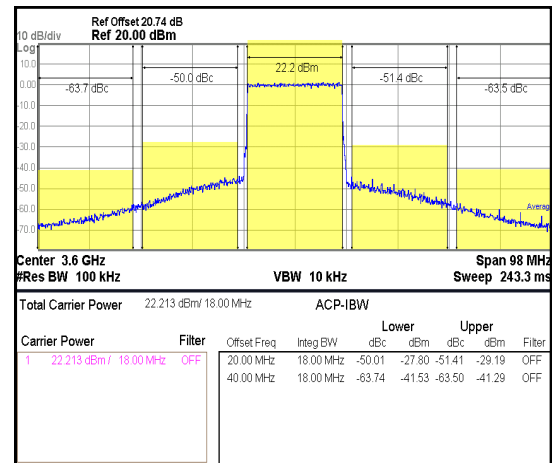
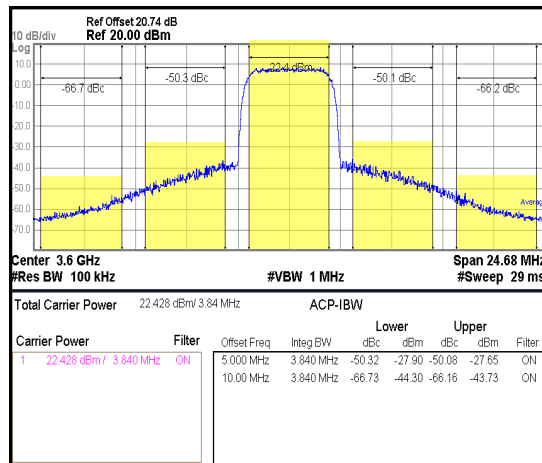
### Typical Performance



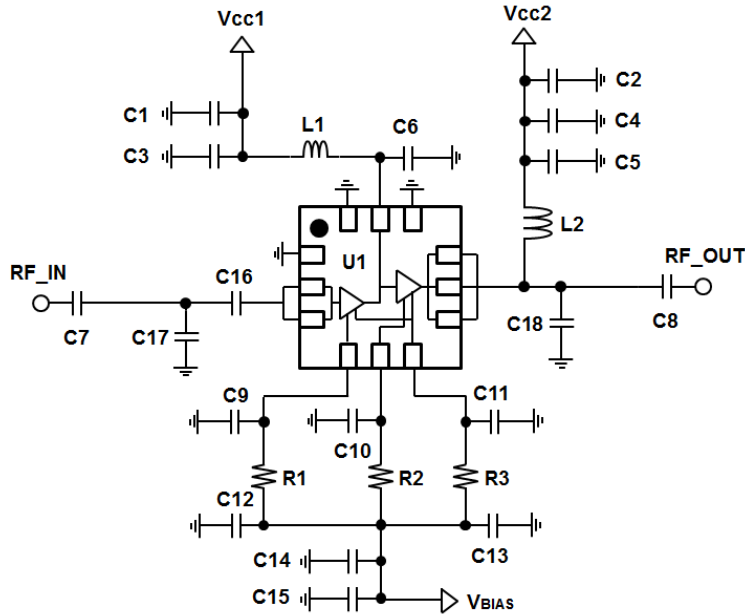
3GPP WCDMA TM1 +64DPCH 1FA

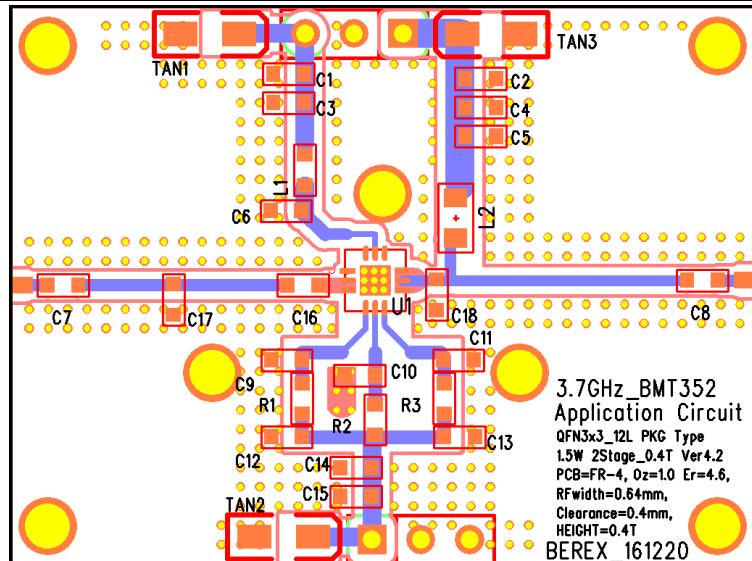


3GPP LTE E-TM3.1 20MHz

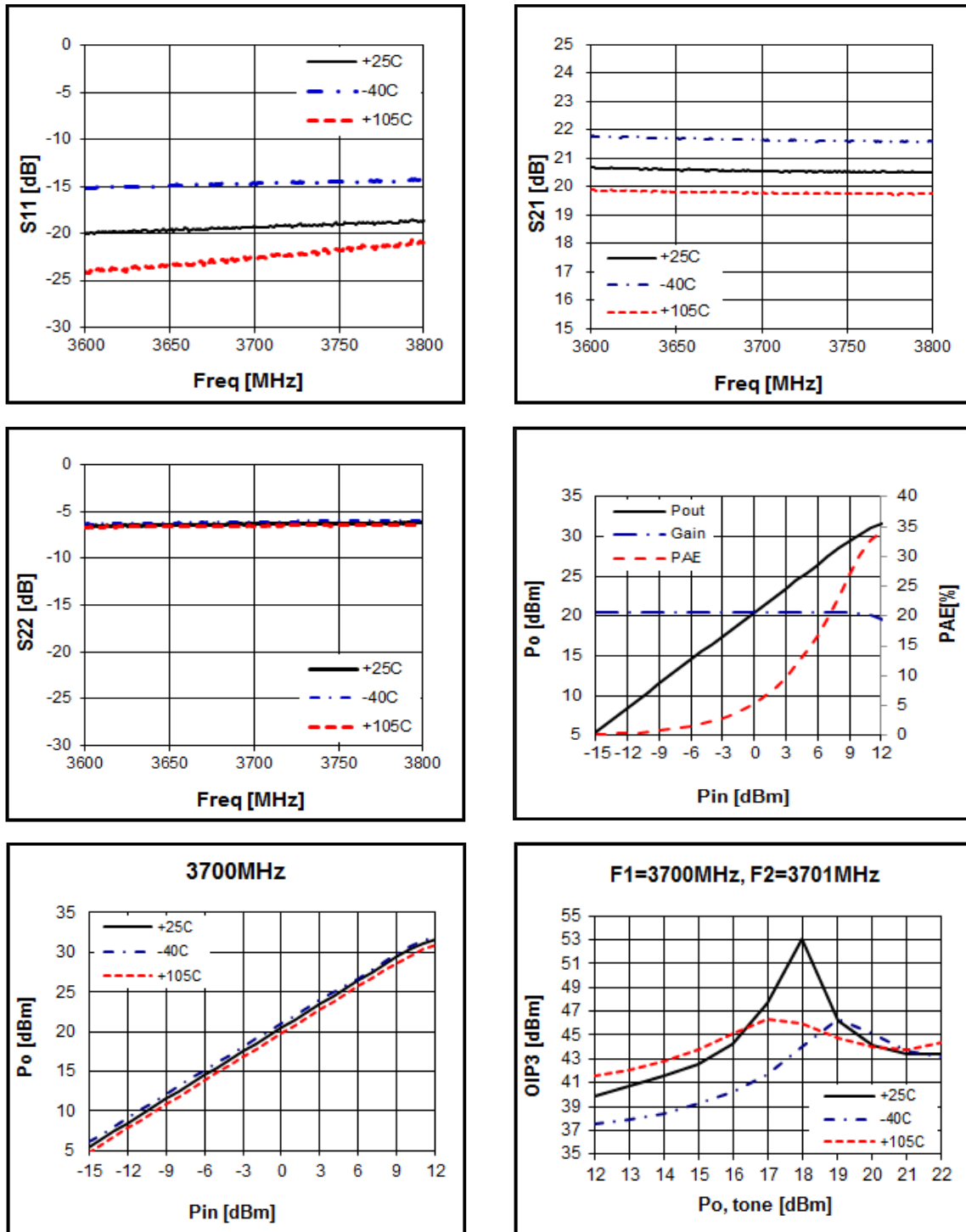


### Application Circuit: 3.7 GHz

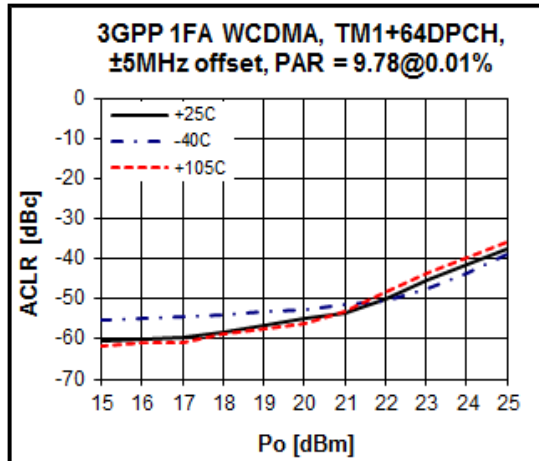
Schematic Diagram	BOM			Marks
	C1	0603	1uF	
	C2	0603	1uF	
	C3	0603	20pF	
	C4	0603	20pF	
	C5	0603	N/A	
	C6	0603	N/A	
	C7	0603	20pF	
	C8	0603	10pF	High Q Cap
	C9	0603	N/A	
	C10	0603	N/A	
	C11	0603	N/A	
	C12	0603	N/A	
	C13	0603	2pF	
	C14	0603	20pF	
	C15	0603	1uF	
	C16	0603	0.8pF	High Q Cap
	C17	0603	1.3pF	High Q Cap
	C18	0603	1.3pF	High Q Cap
	L1	0603	0 Ω	
	L2	0805	12nH	Coilcraft-HQ
	R1	0603	330 Ω	
	R2	0603	470 Ω	
	R3	0603	20 Ω	

PCB Diagram	Notice		
	In table below can be changed per substrate conditions		
	Reference	Object	Distance
	Input pin	C17	8.6mm
	Input pin	C16	1.5mm
	Output pin	C18	1.3mm
	1. C8 & C17 & C16 & C18 : We recommend High-Q capacitor for better output power performance. We used Johanson Tech's capacitor .		

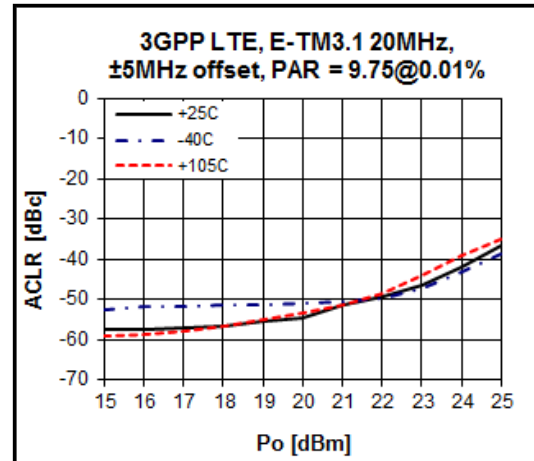
### Typical Performance



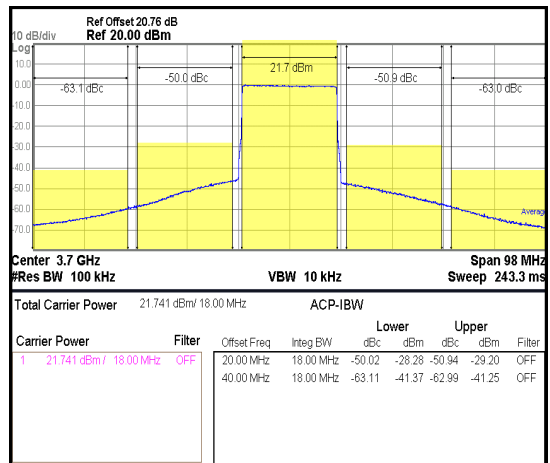
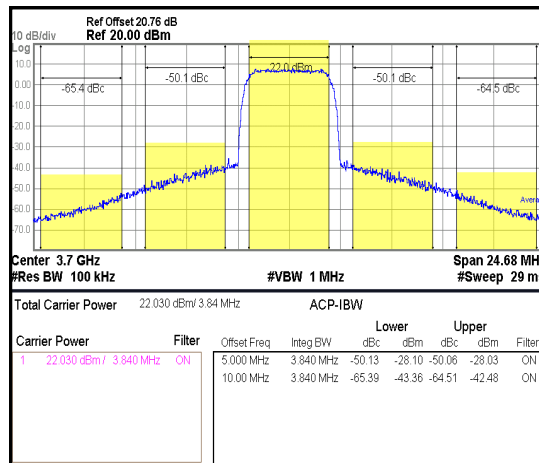
### Typical Performance



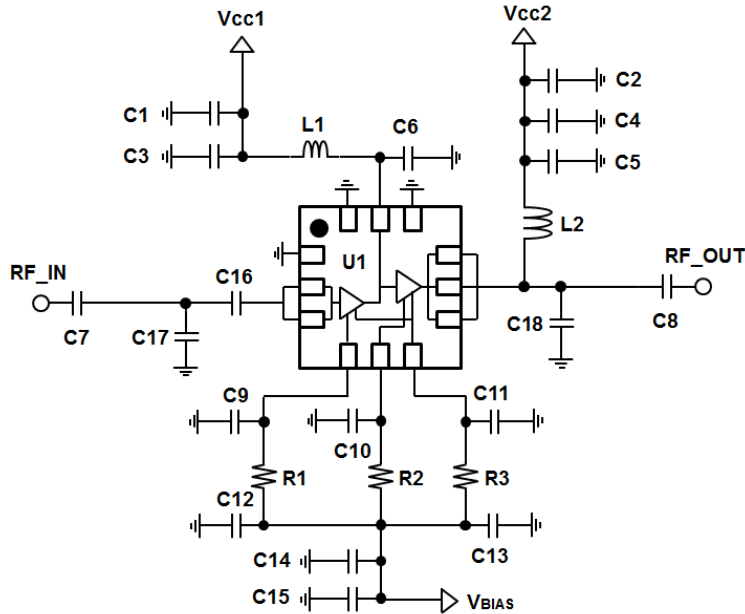
3GPP WCDMA TM1 +64DPCH 1FA

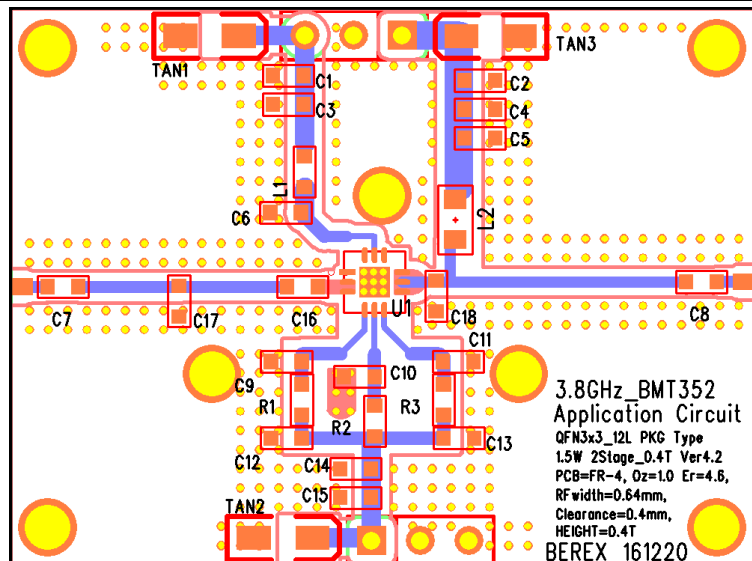


3GPP LTE E-TM3.1 20MHz



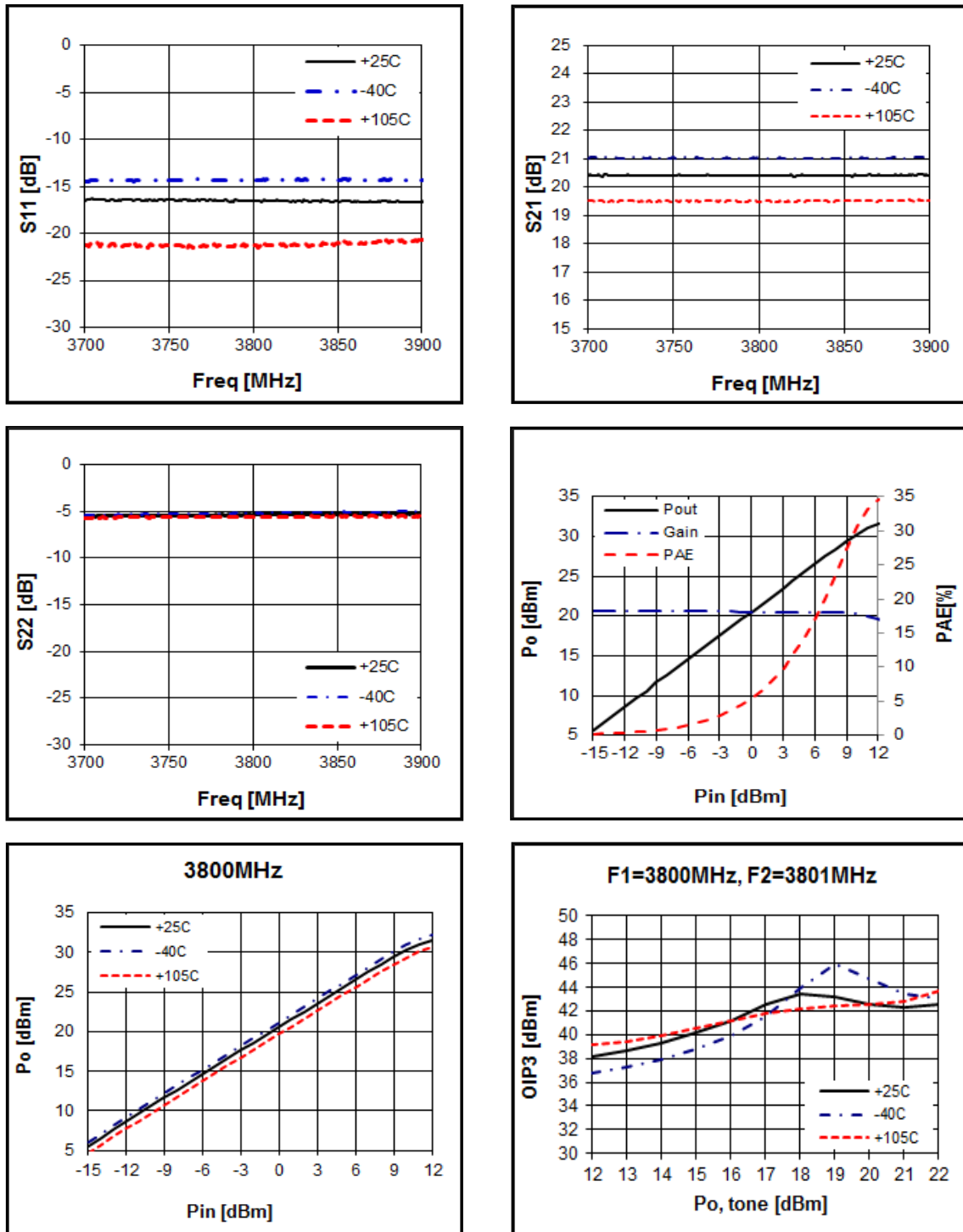
### Application Circuit: 3.8 GHz

Schematic Diagram	BOM			Marks
	C1	0603	1uF	
	C2	0603	1uF	
	C3	0603	20pF	
	C4	0603	20pF	
	C5	0603	N/A	
	C6	0603	N/A	
	C7	0603	20pF	
	C8	0603	10pF	High Q Cap
	C9	0603	N/A	
	C10	0603	N/A	
	C11	0603	N/A	
	C12	0603	N/A	
	C13	0603	2pF	
	C14	0603	20pF	
	C15	0603	1uF	
	C16	0603	0.8pF	High Q Cap
	C17	0603	1.3pF	High Q Cap
	C18	0603	1.2pF	High Q Cap
	L1	0603	0 Ω	
	L2	0805	12nH	Coilcraft-HQ
	R1	0603	330 Ω	
	R2	0603	470 Ω	
	R3	0603	20 Ω	

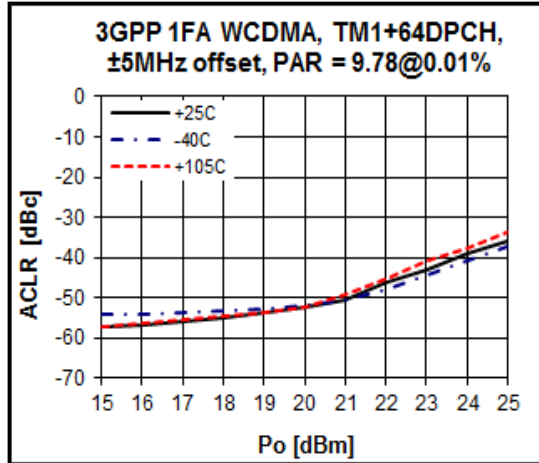
PCB Diagram	Notice		
	In table below can be changed per substrate conditions		
	Reference	Object	Distance
	Input pin	C17	8.0mm
	Input pin	C16	1.5mm
	Output pin	C18	1.4mm
	1. C8 & C17 & C16 & C18 : We recommend High-Q capacitor for better output power performance. We used Johanson Tech's capacitor .		



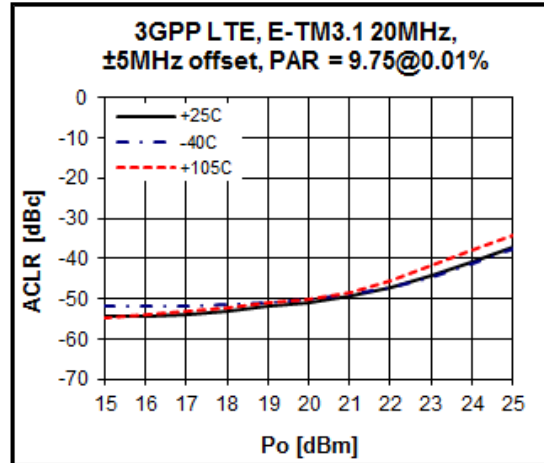
### Typical Performance



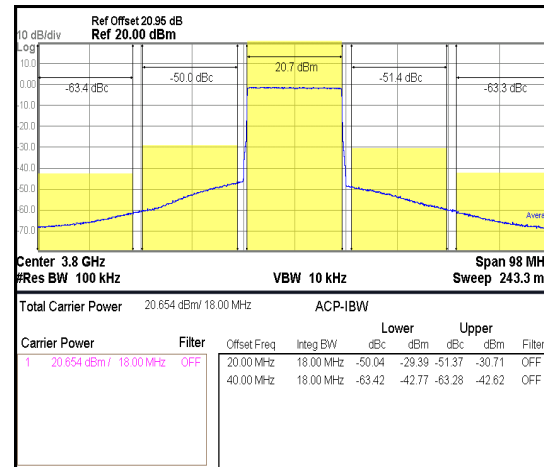
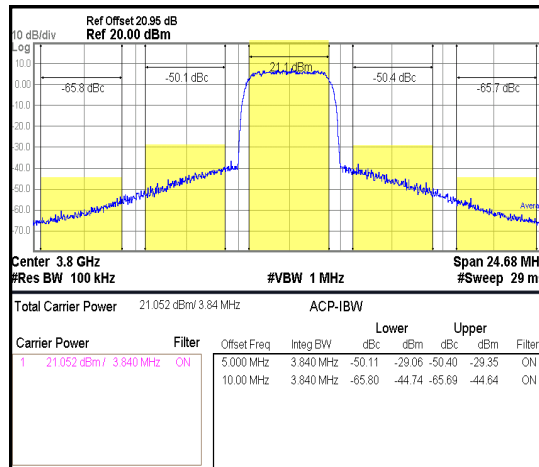
### Typical Performance



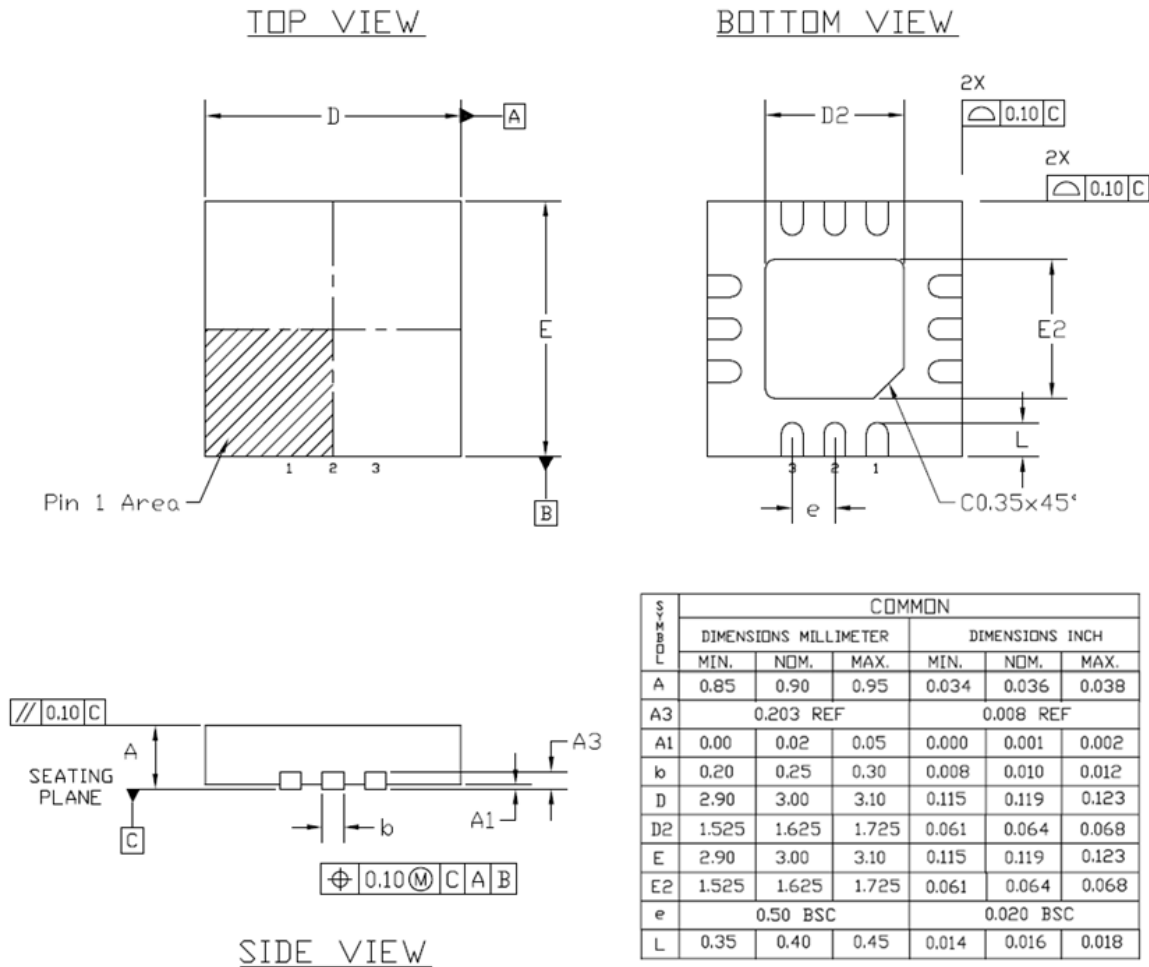
3GPP WCDMA TM1 +64DPCH 1FA



3GPP LTE E-TM3.1 20MHz



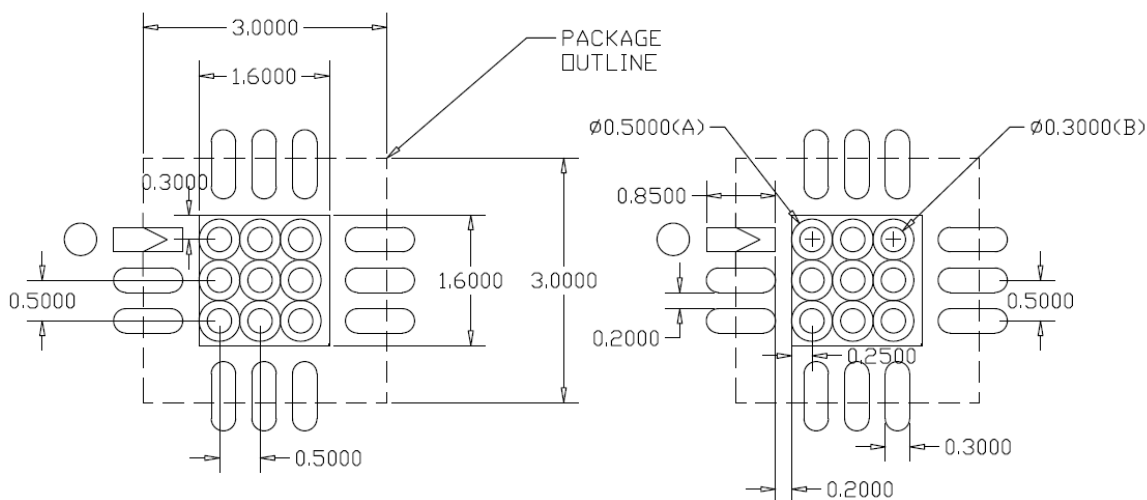
### Package Outline Dimension



#### 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.
4. INSULATION THICKNESS, CLEARANCE OF OVERLAP ARE USER DEFINED.
5. INSULATION NOT COMPLETELY SHOWN FOR REASONS OF CLARITY.

## Suggested PCB Land Pattern and PAD Layout



Unit : mm

- Notes

1. Use 1 oz. copper minimum for top and bottom layer metal.
2. A heatsink underneath the area of the PCB for the mounted device is required for proper thermal operation.
3. Ground / thermal vias are critical for the proper performance of this device.

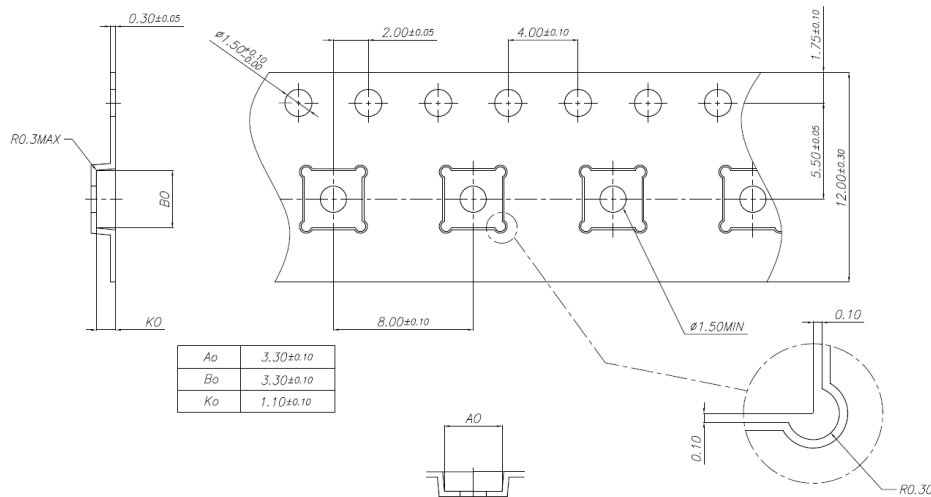
## Package Marking



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

### Tape & Reel

QFN 3x3



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 $\geq 1000V$ to $< 2000 V$
<b>Test:</b>	Human Body Model (HBM)
<b>Standard:</b>	JEDEC Standard JESD22-A114B
<b>ESD Rating:</b>	Class C3
<b>Value:</b>	Passes $>1000V$
<b>Test:</b>	Charged Device Model (CDM)
<b>Standard:</b>	JEDEC Standard JESD22-C101F
<b>MSL Rating:</b>	Level 1 at $+260^{\circ}C$ convection reflow
<b>Standard:</b>	JEDEC Standard J-STD-020

**NATO CAGE code:**

<b>2</b>	<b>N</b>	<b>9</b>	<b>6</b>	<b>F</b>
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**NOTICE**

BeRex Corporation reserves the right to make changes of product specification or to discontinue product at any time without notice.