BMT352

3000-4000 MHz 1.5W High Linearity 5V 2-Stage Power Amplifier

Device Features

- +5V/330mA at operating bias condition
- Gain = 20.8 dB @ 3500 MHz
- P1dB = 31.5 dBm @ 3500 MHz
- 5G NR ACLR = 18dBm Output Power at -50dBc @ 3500 MHz
- Intergrated interstage matching
- Green/RoHS2-compliant QFN3x3 SMT package



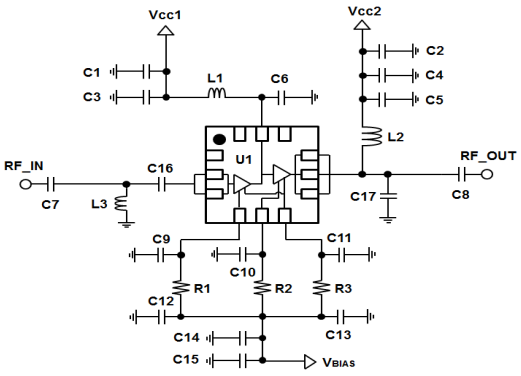
Product Description

The BMT352 is a high dynamic range two-stage power amplifier, housed in a green/RoHS2 compliant 3x3mm² 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 typically delivers 18 dBm output power from 3000 to 4000 MHz while maintaining superior ACLR performance with a few external matching components. All devices are 100% RF/DC screened.

Applications

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

Application Circuits



*External matching circuit: refer to the page 5 to 17.

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		3000		4000	MHz
Test Frequency			3500		MHz
Gain		19.3	20.8		dB
Input Return Loss			-17.0		dB
Output Return Loss			-9.0		dB
Output IP3	17 dBm/tone, Δf=1 MHz	45.0	48.0		dBm
Output P1dB		30.5	31.5		dBm
5G NR ACLR*		17.0	18.0		dBm
Noise Figure			5.1		dB

*ACLR Channel Power measured at -50dBc.

- 5G set-up: 3GPP 5G NR, 100MHz BW, ±100MHz offset, PAR 9.5 at 0.01% Prob.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Bandwidth	3000		4000	MHz
I_{bias} @ ($I_{REF1\&2}$ + $I_{B1\&2}$)	21	26	31	mA
I_{cq} @ (I_{cq1} + I_{cq2})	270	330	390	mA
V_{CC}/V_{bias}	4.75	5.0	5.25	V
R_{TH}		12.9		°C/W
Operating Case Temperature	-40		+105	°C

Electrical specifications are measured at specified test conditions.
Specifications are not guaranteed over all recommended operating conditions.

Absolute Maximum Ratings

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

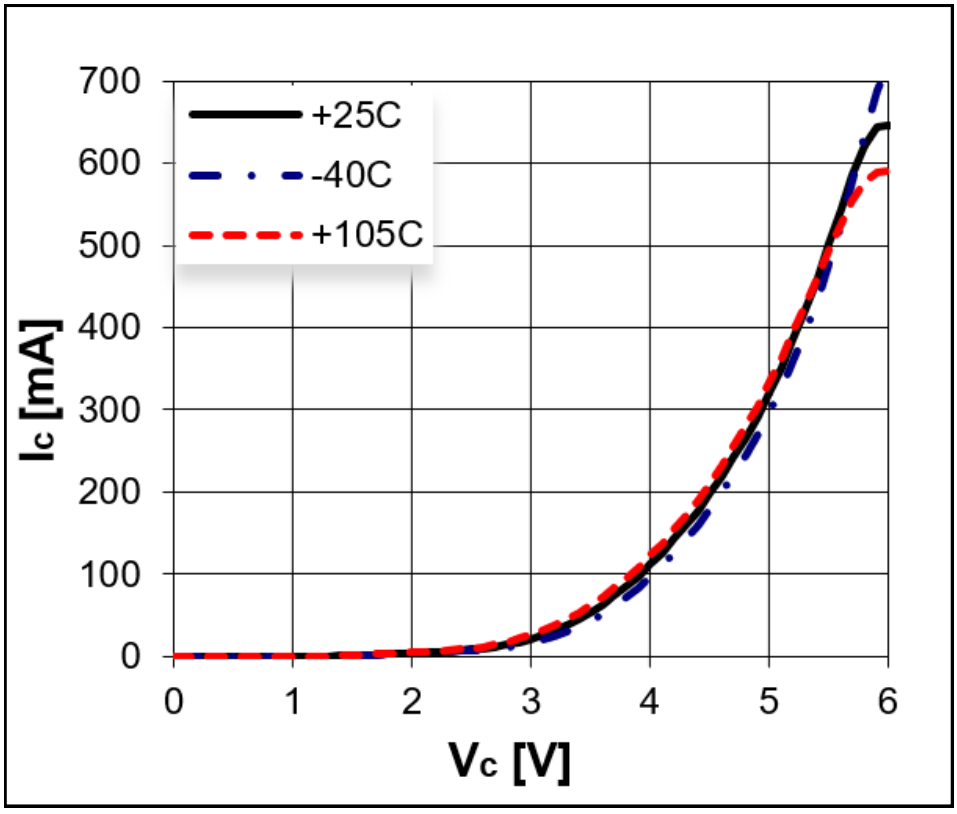
*Operation of this device above any of these parameters may result in permanent damage.

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Typical Performance (Vcc & VBias = +5V, Icq = 330mA, Ta= 25 °C)

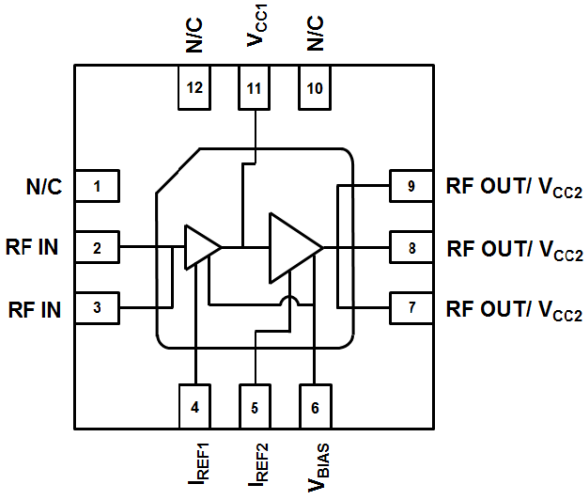
Parameter	Frequency					Unit
	3400	3500	3600	3700	3800	MHz
Gain	21.0	20.8	20.7	20.5	20.2	dB
S11	-17.0	-17.0	-16.8	-17.0	-15.3	dB
S22	-10.7	-9.0	-7.8	-5.5	-3.8	dB
OIP3	50.0	48.0	46.2	43.0	40.6	dBm
P1dB	30.8	31.5	31.2	31.4	31.4	dBm
5G NR ACLR	17.0	18.0	17.9	18.0	16.2	dBm
Noise Figure	5.1	5.1	5.2	5.5	5.8	dB

V-I Characteristics



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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

BeRex Evaluation Board

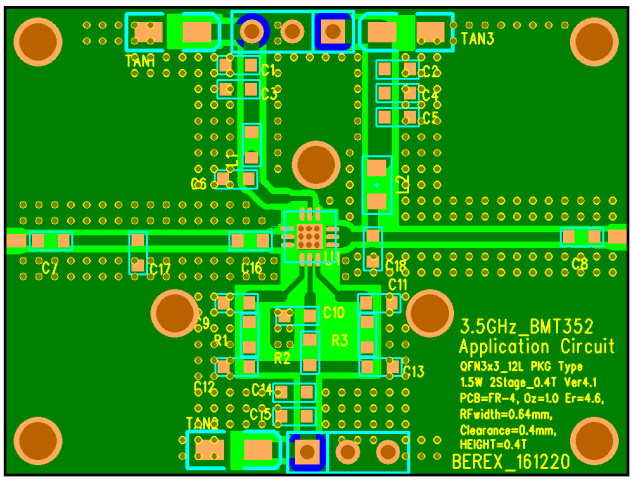
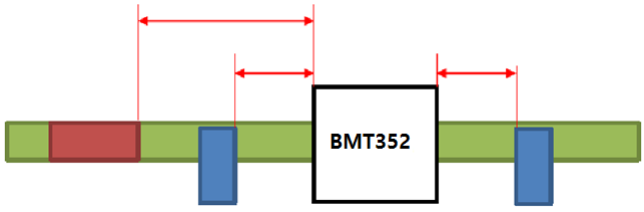


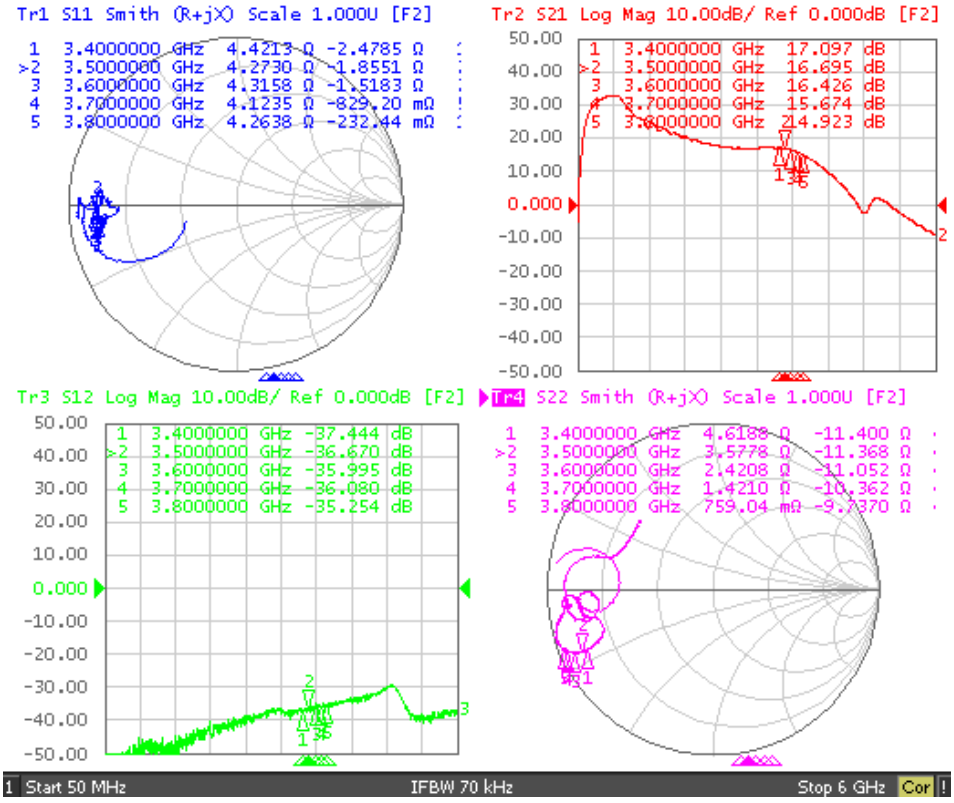
Figure about the reference position of components



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Typical Device Data

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



S-Parameter

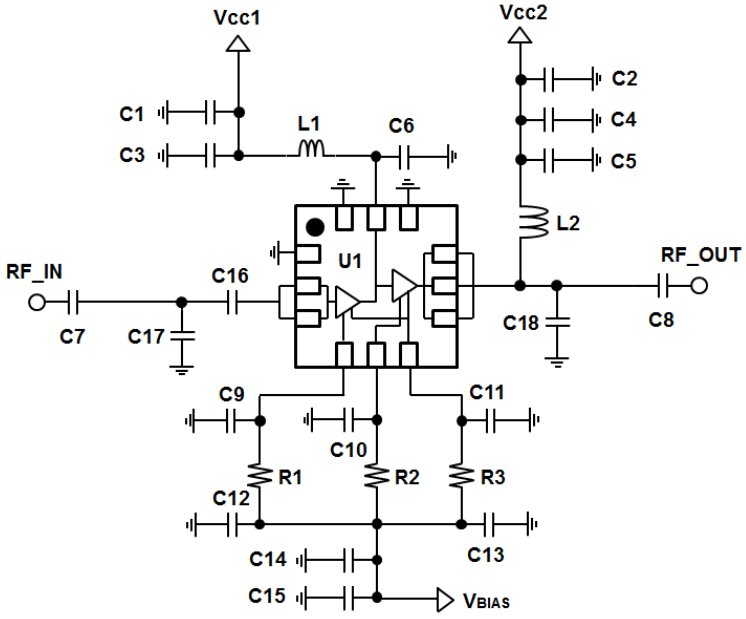
(V_{cc} & V_{Bias} = +5V, I_{cq} = 330mA, T_a= 25 °C, calibrated to device leads)

Freq [MHz]	S11 [Mag]	S11 [Ang]	S21 [Mag]	S21 [Ang]	S12 [Mag]	S12 [Ang]	S22 [Mag]	S22 [Ang]
3000	0.85	-169.83	6.80	131.45	0.01	84.90	0.70	-163.38
3100	0.85	-171.29	7.13	125.18	0.01	82.11	0.72	-157.60
3200	0.85	-172.08	7.15	112.90	0.01	84.13	0.77	-155.37
3300	0.84	-173.58	7.13	104.15	0.01	85.52	0.80	-154.65
3400	0.84	-174.18	7.12	91.77	0.01	83.96	0.84	-154.26
3500	0.84	-175.94	6.78	80.60	0.01	79.18	0.87	-154.55
3600	0.84	-176.75	6.57	68.06	0.02	83.97	0.91	-155.12
3700	0.85	-177.94	6.03	53.82	0.02	76.55	0.95	-156.77
3800	0.84	-179.59	5.55	42.73	0.02	73.93	0.96	-158.27
3900	0.84	179.08	4.86	28.34	0.02	68.24	0.98	-160.44
4000	0.84	177.56	4.28	18.35	0.02	63.23	0.98	-162.53

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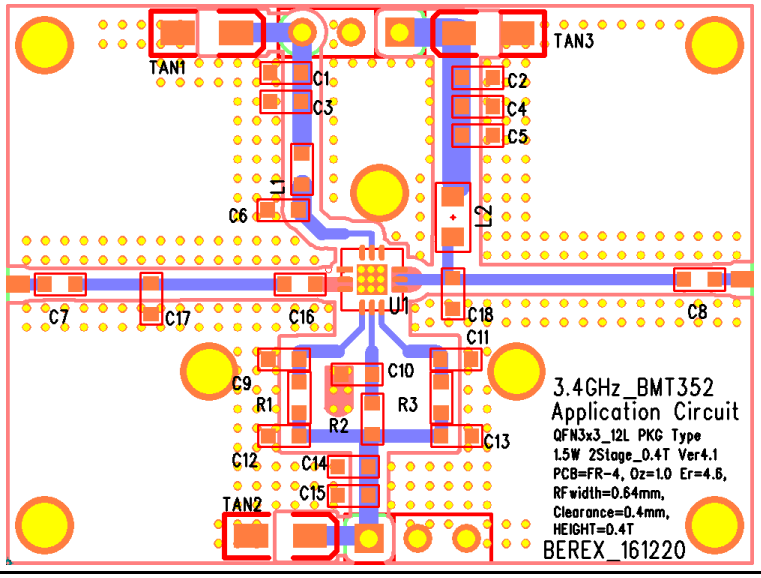
Application Circuit: 3400 MHz

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	1pF	
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	0 Ω	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 sub-strate conditions

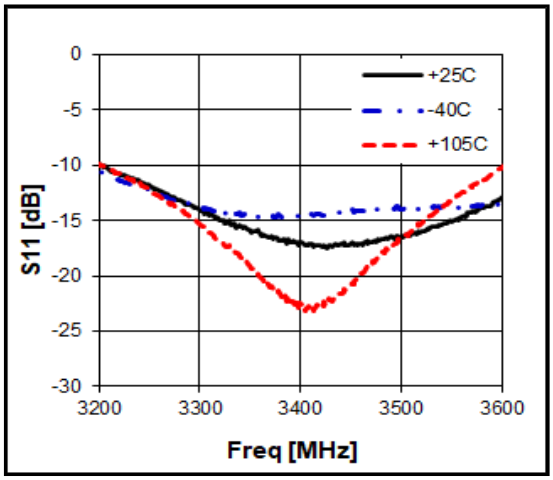
Reference	Object	Distance
Input pin	C17	9.3mm
Input pin	C16	1.5mm
Output pin	C18	2.1mm

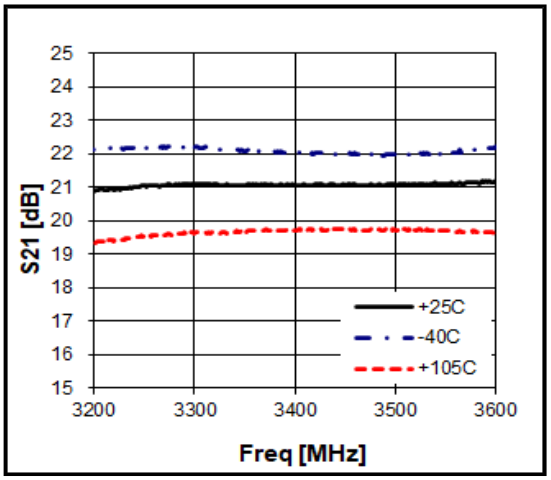
1. C8 & C17 & C16 & C18 : We recommend High-Q capacitor for better output power performance. We used Johanson Tech's capacitor .

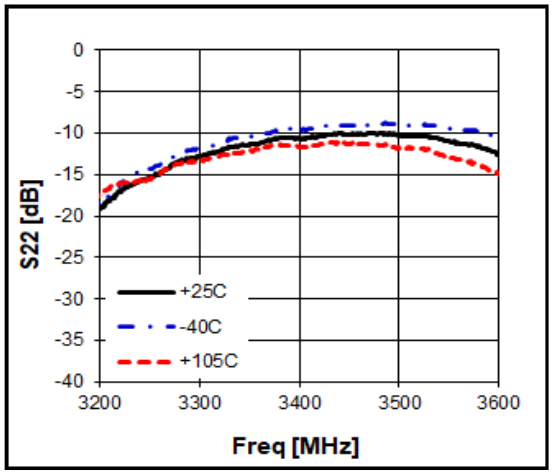
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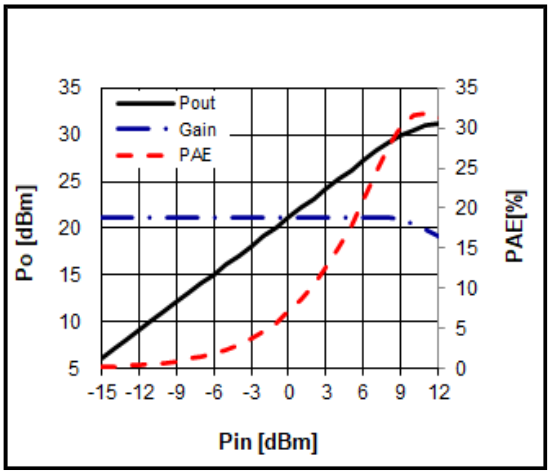
Typical Performance

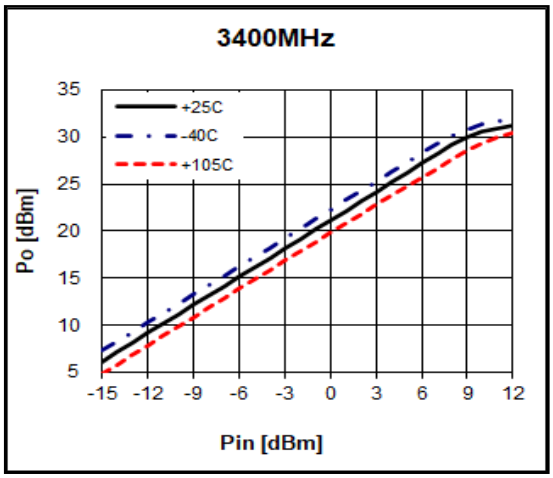
(V_{cc} & V_{Bias} = +5V, I_{cq} = 330mA, T_a= 25 °C)

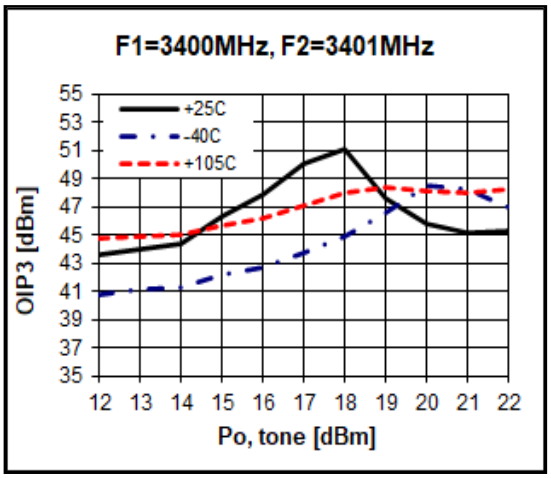






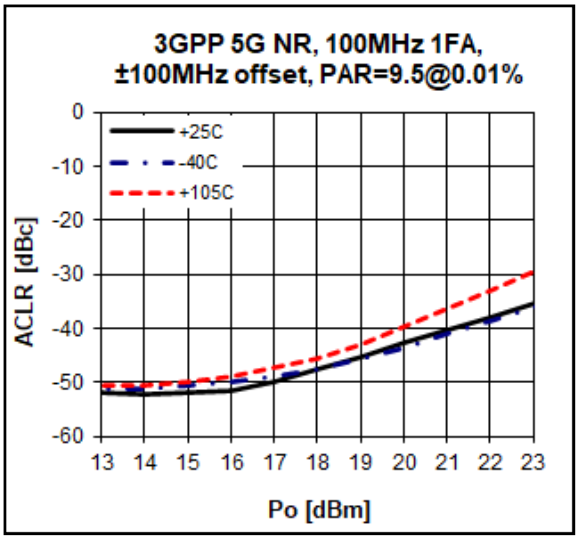




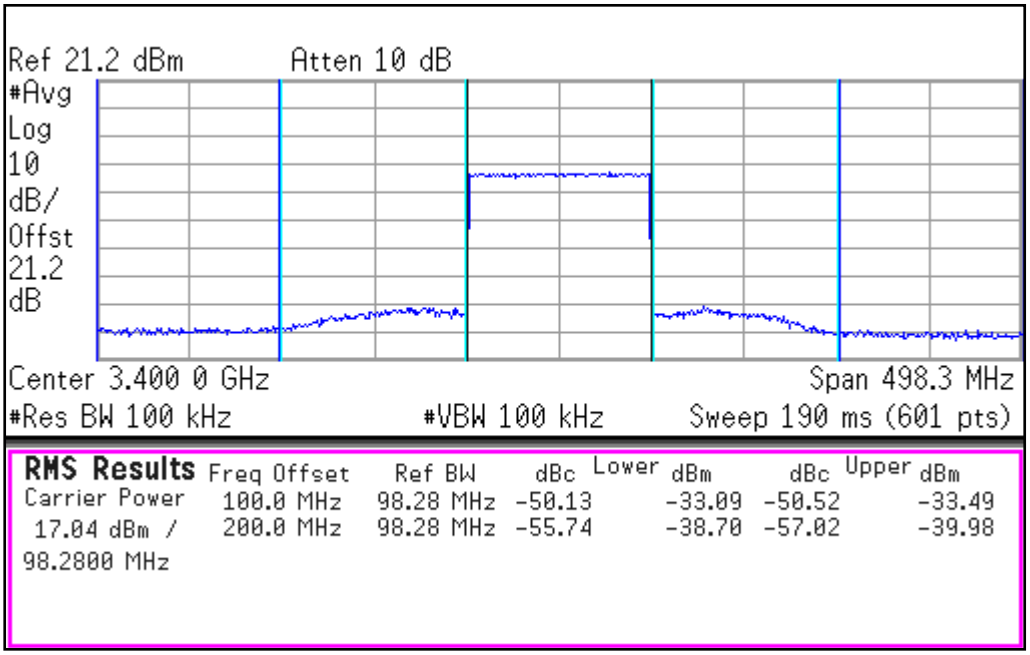


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3GPP 5G NR 1FA ACLR 3.4GHz



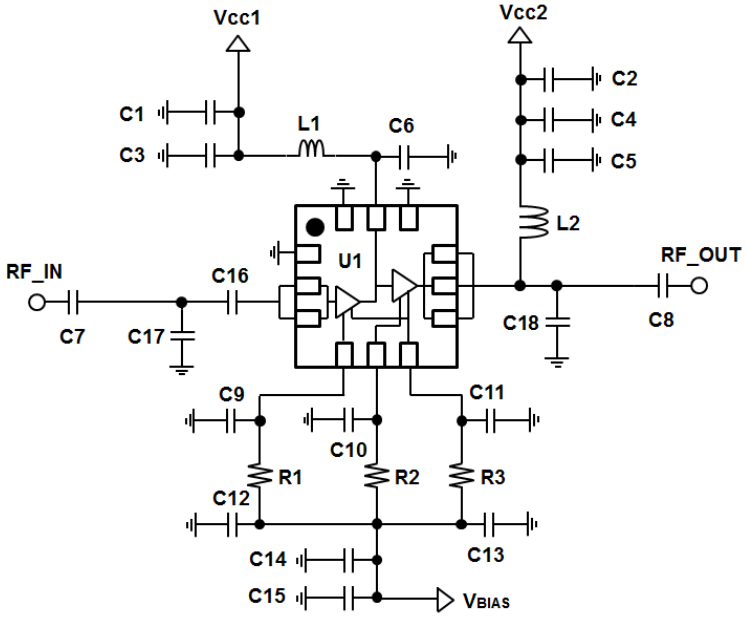
3GPP 5G NR 1FA ACLR (-50dBc)



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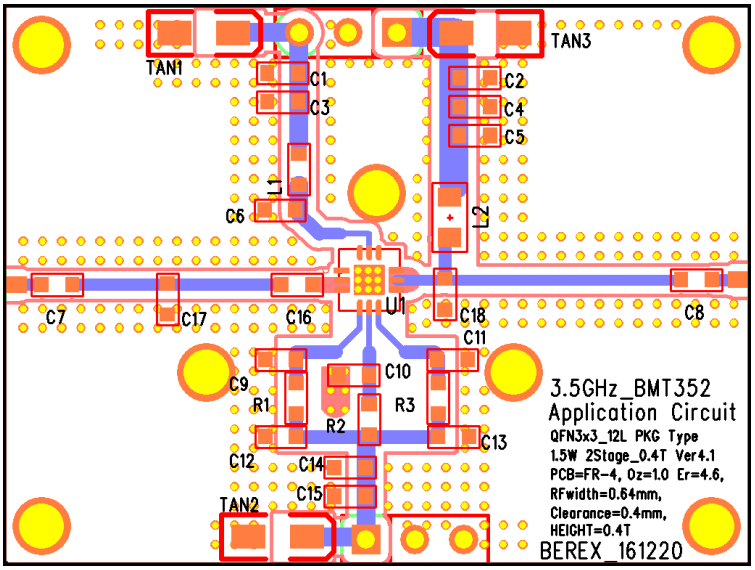
Application Circuit: 3500 MHz

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	0 Ω	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 sub-strate conditions

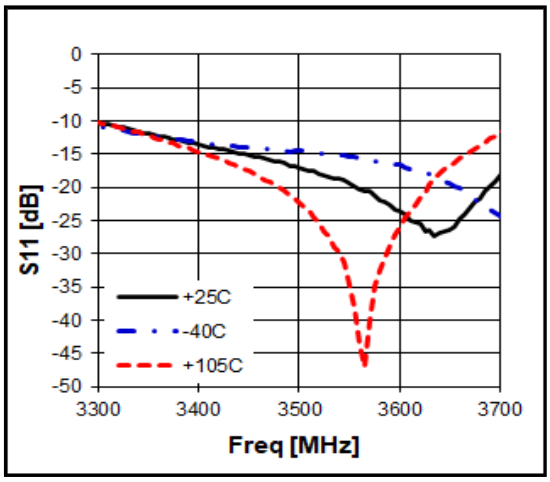
Reference	Object	Distance
Input pin	C17	9.1mm
Input pin	C16	1.5mm
Output pin	C18	2.0mm

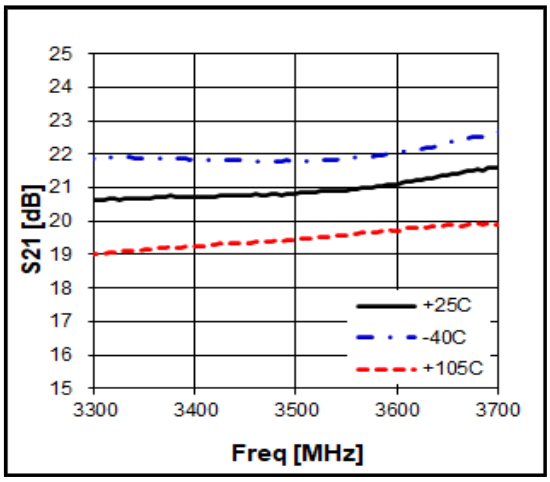
1. C8 & C17 & C16 & C18 : We recommend High-Q capacitor for better output power performance. We used Johanson Tech's capacitor .

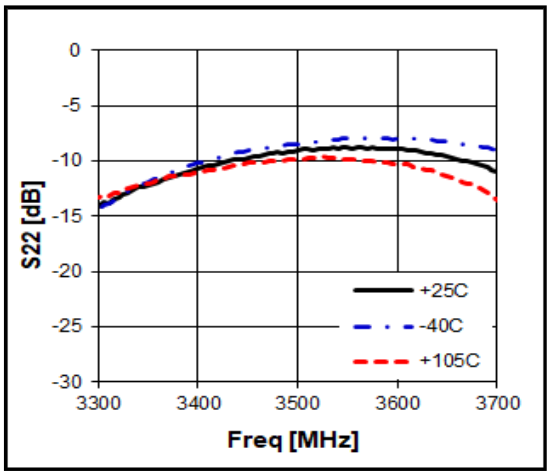
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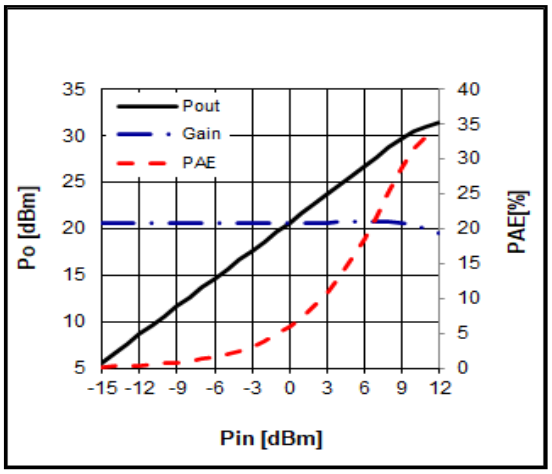
Typical Performance

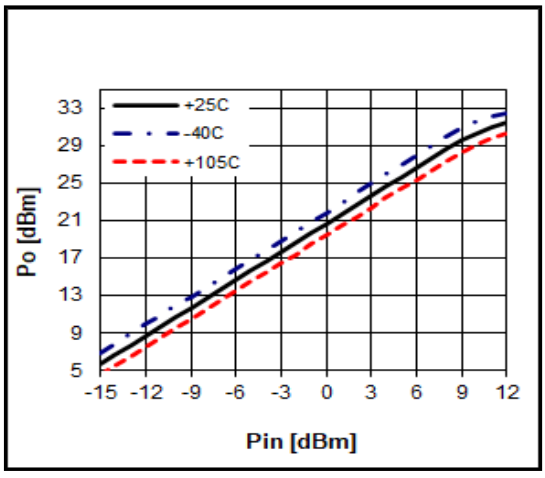
(V_{cc} & V_{Bias} = +5V, I_{cq} = 330mA, T_a= 25 °C)

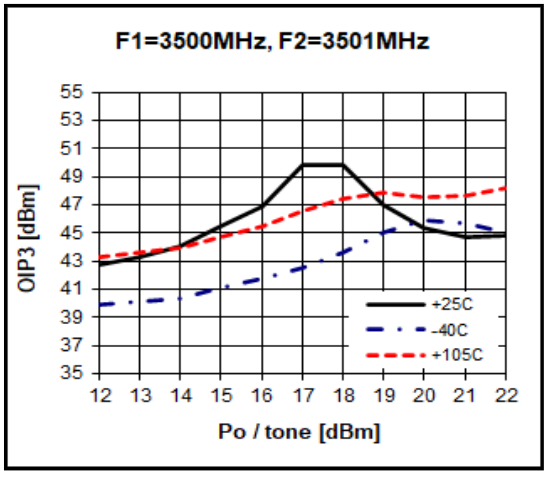






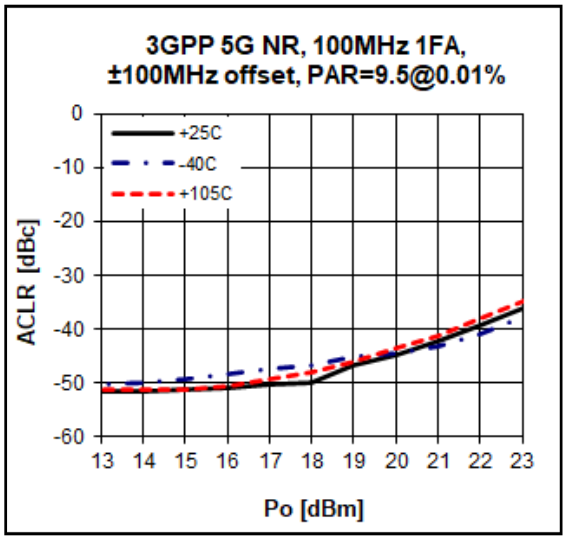




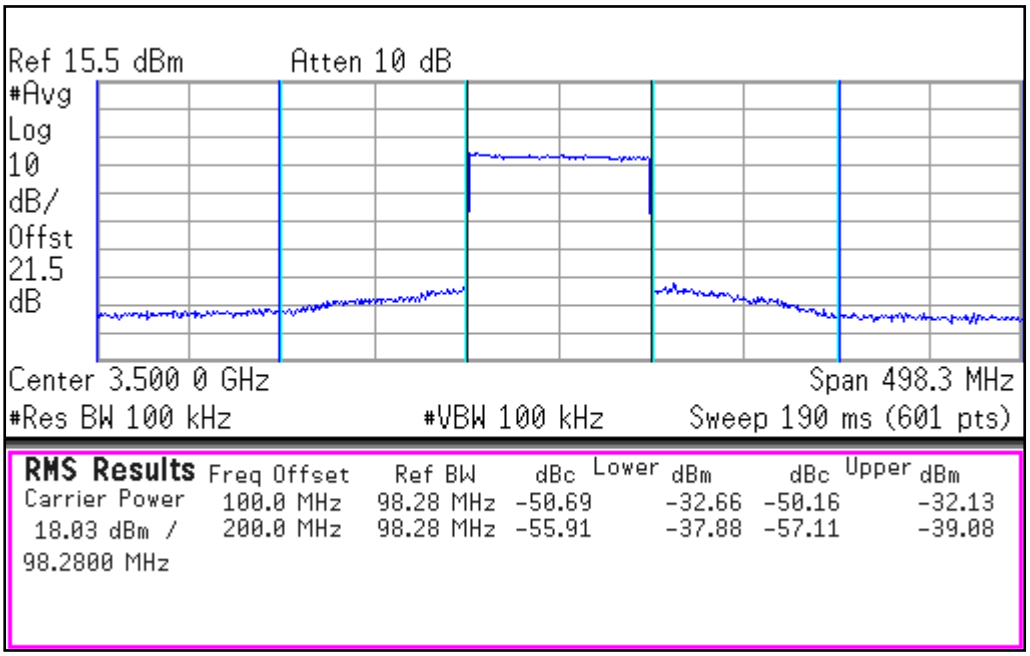


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3GPP 5G NR 1FA ACLR 3.5GHz



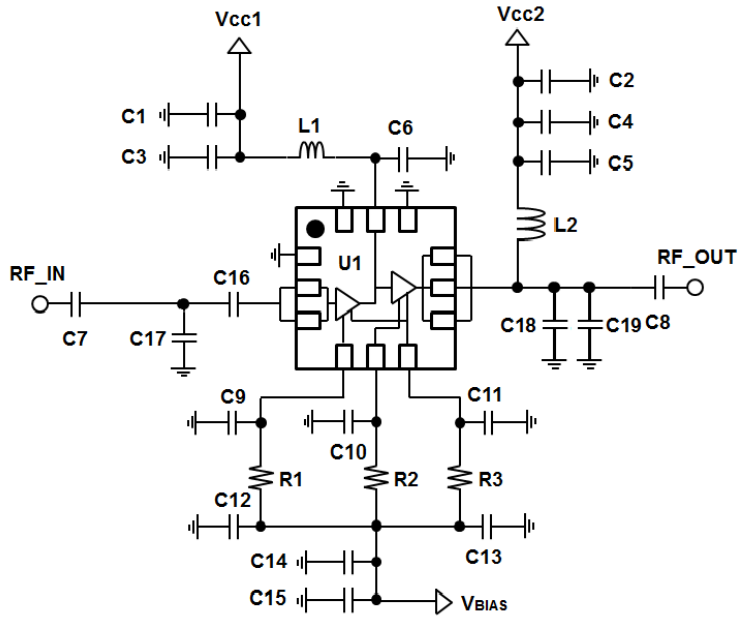
3GPP 5G NR 1FA ACLR (-50dBc)



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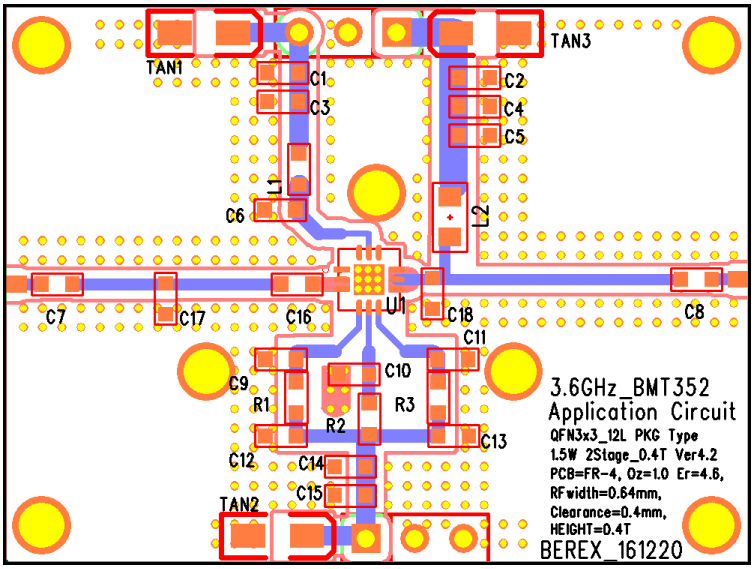
Application Circuit: 3600 MHz

Schematic Diagram



BOM			Marks
C1	0603	1uF	
C2	0603	10uF	
C3	0603	20pF	
C4	0603	1uF	
C5	0603	20pF	
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
C19	0603	0.3pF	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 sub-strate conditions

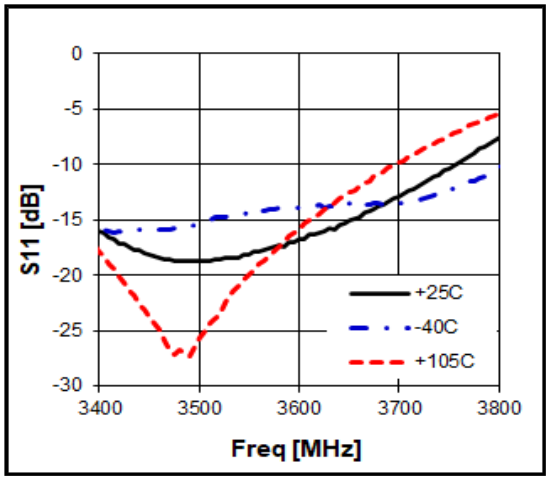
Reference	Object	Distance
Input pin	C17	8.7mm
Input pin	C16	1.5mm
Output pin	C18	1.6mm
Output pin	C19	3.5mm

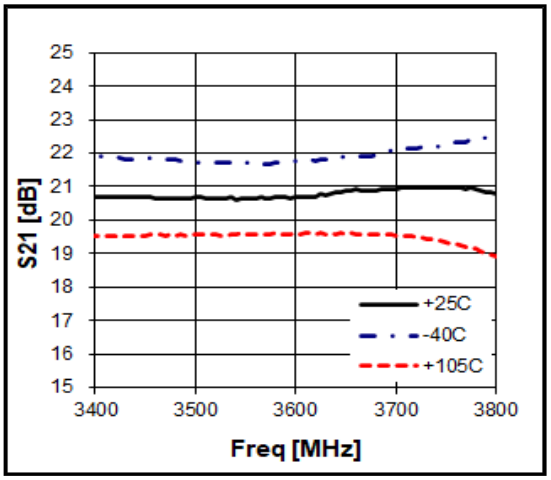
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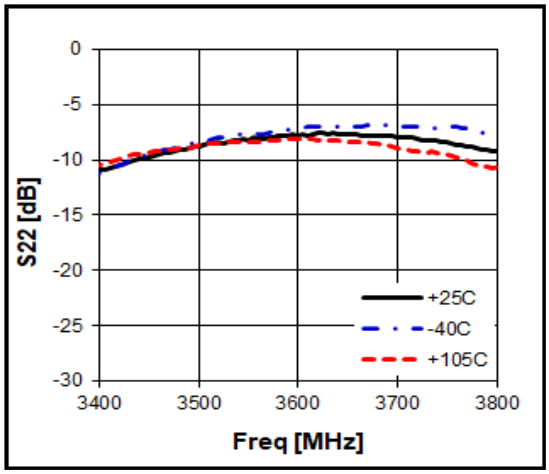
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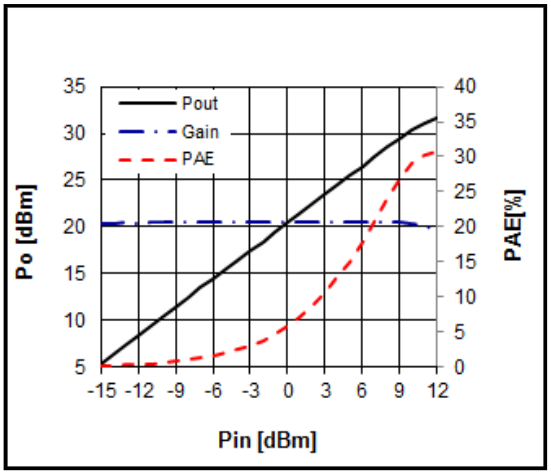
Typical Performance

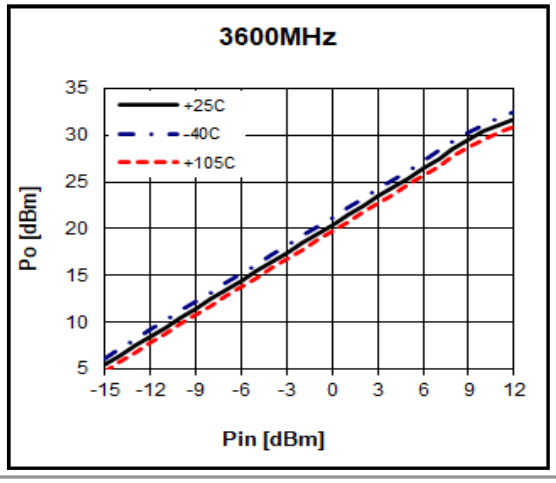
(V_{cc} & V_{Bias} = +5V, I_{cq} = 330mA, T_a= 25 °C)

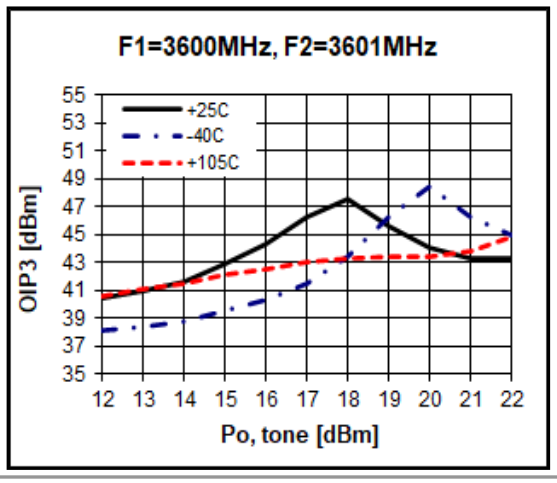






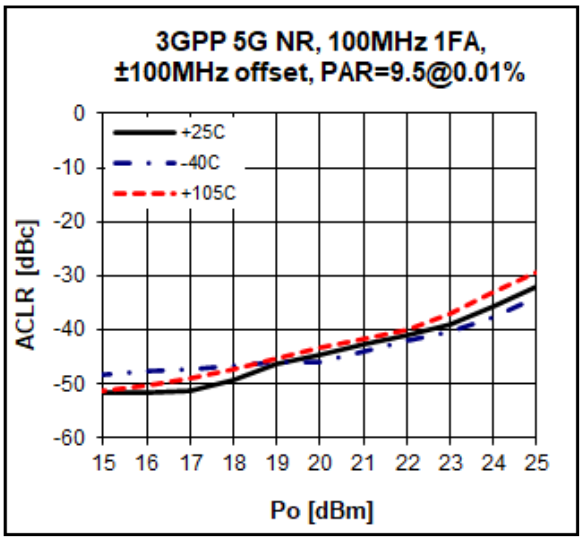




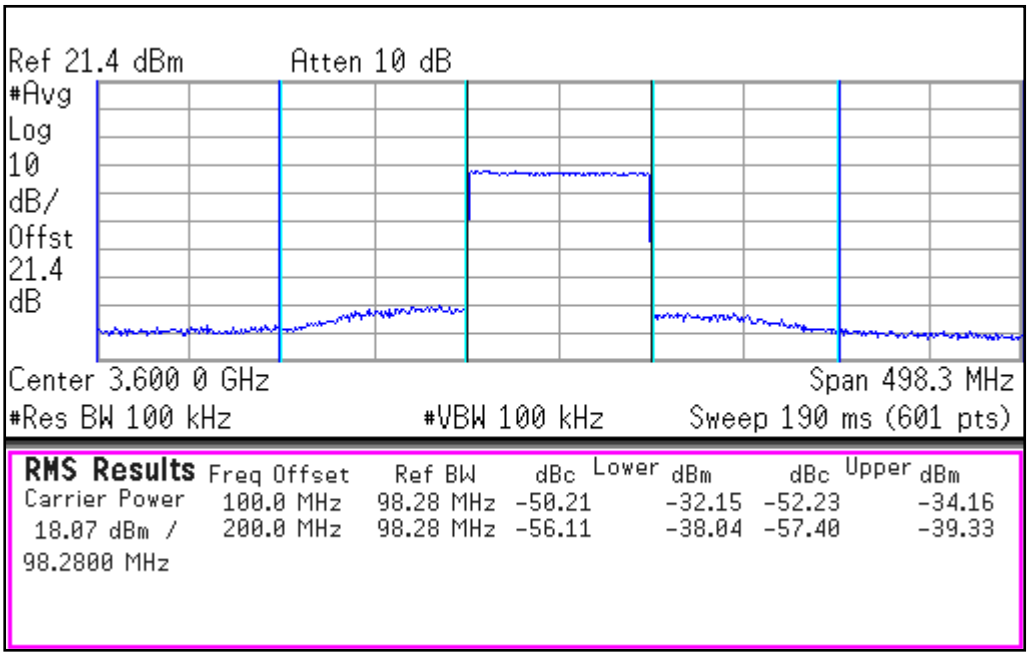


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3GPP 5G NR 1FA ACLR 3.6GHz



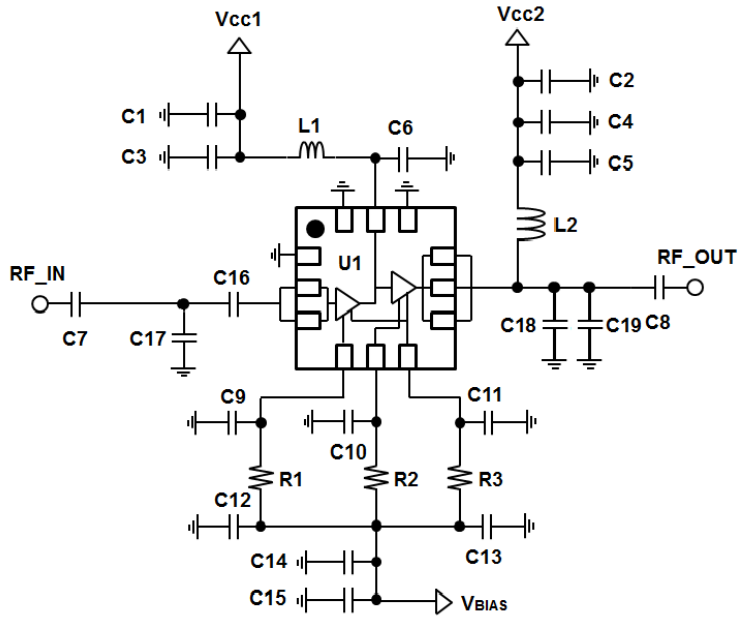
3GPP 5G NR 1FA ACLR (-50dBc)



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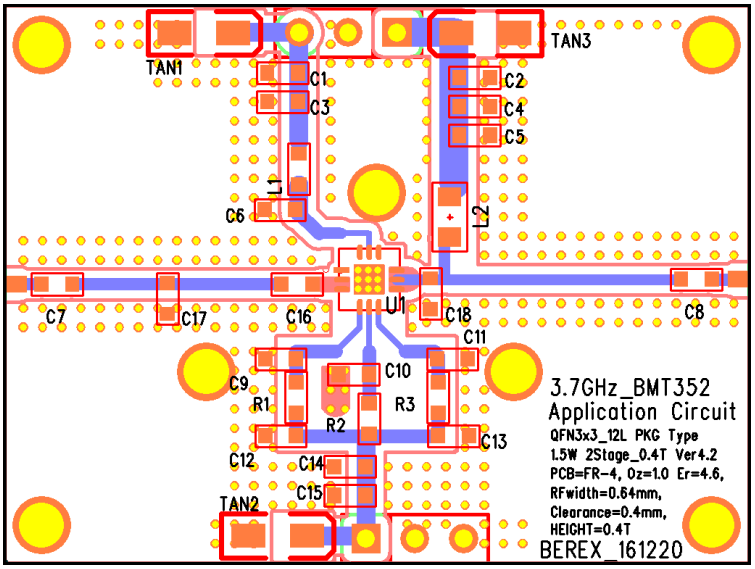
Application Circuit: 3700 MHz

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
C19	0603	0.2pF	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 sub-strate conditions

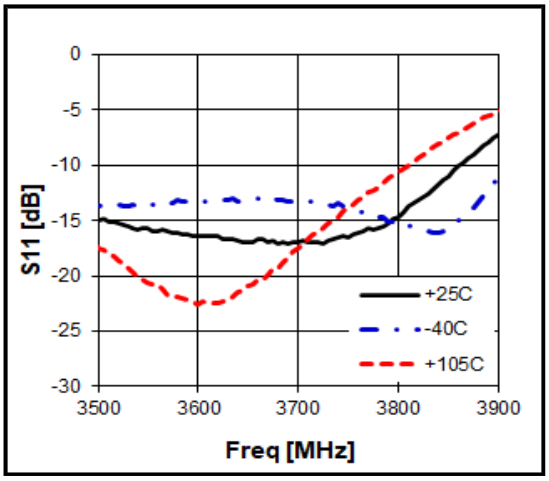
Reference	Object	Distance
Input pin	C17	8.3mm
Input pin	C16	1.5mm
Output pin	C18	1.4mm
Output pin	C19	2.9mm

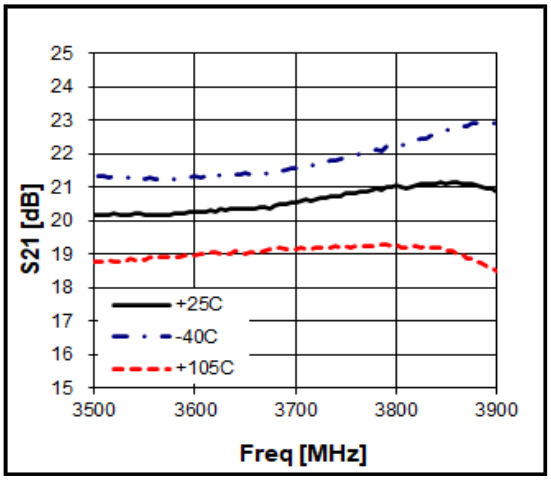
1. C8 & C17 & C16 & C18 & C19 : We recommend High-Q capacitor for better output power performance. We used Johanson Tech's capacitor .

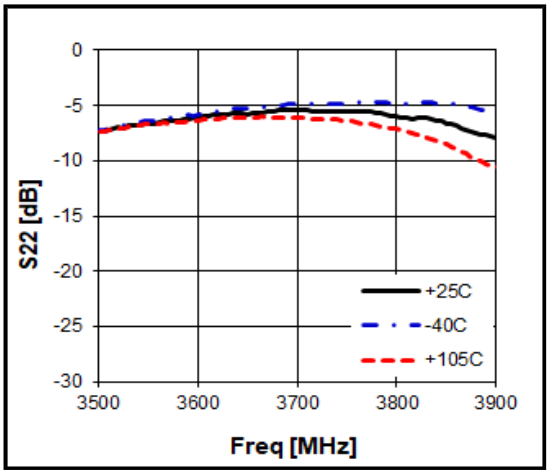
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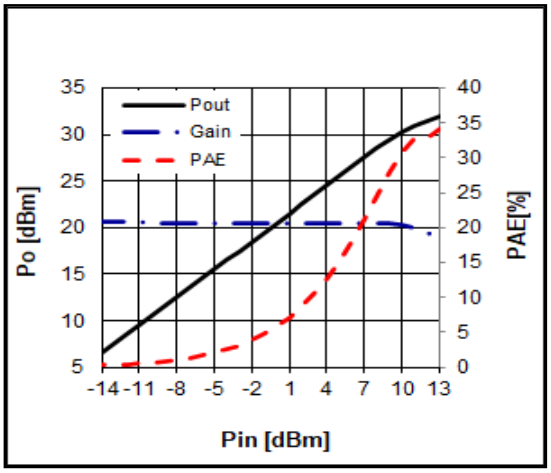
Typical Performance

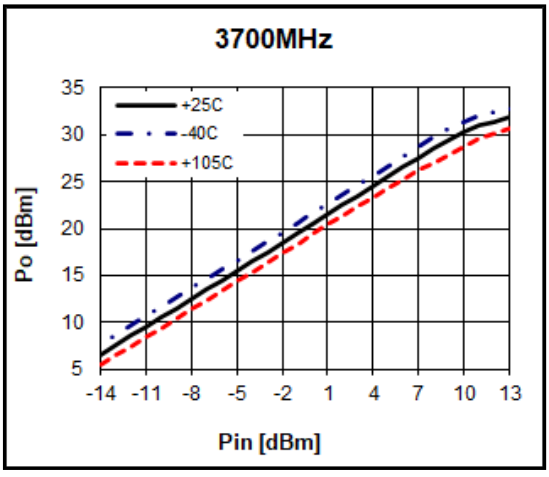
(V_{cc} & V_{Bias} = +5V, I_{cq} = 330mA, T_a= 25 °C)

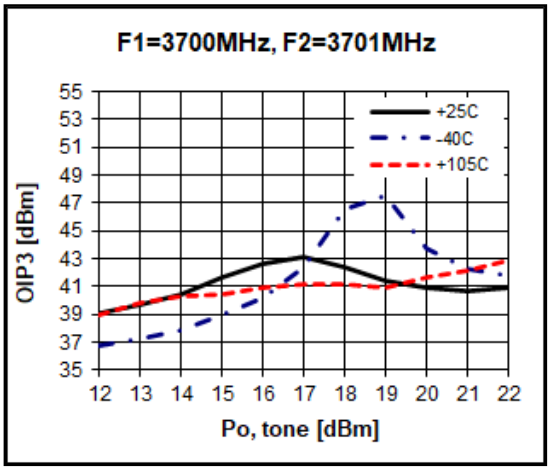






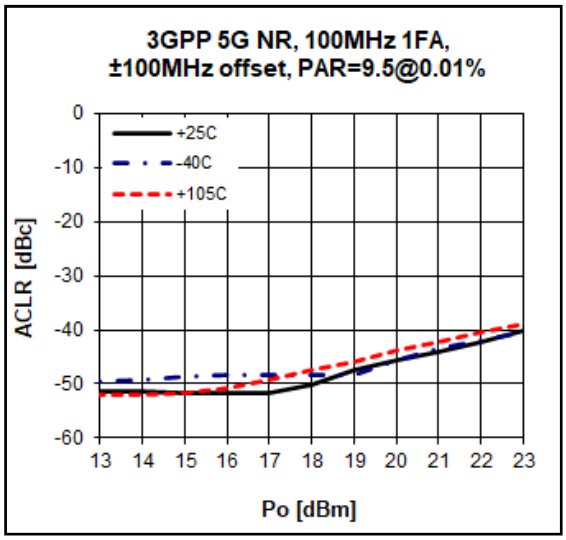




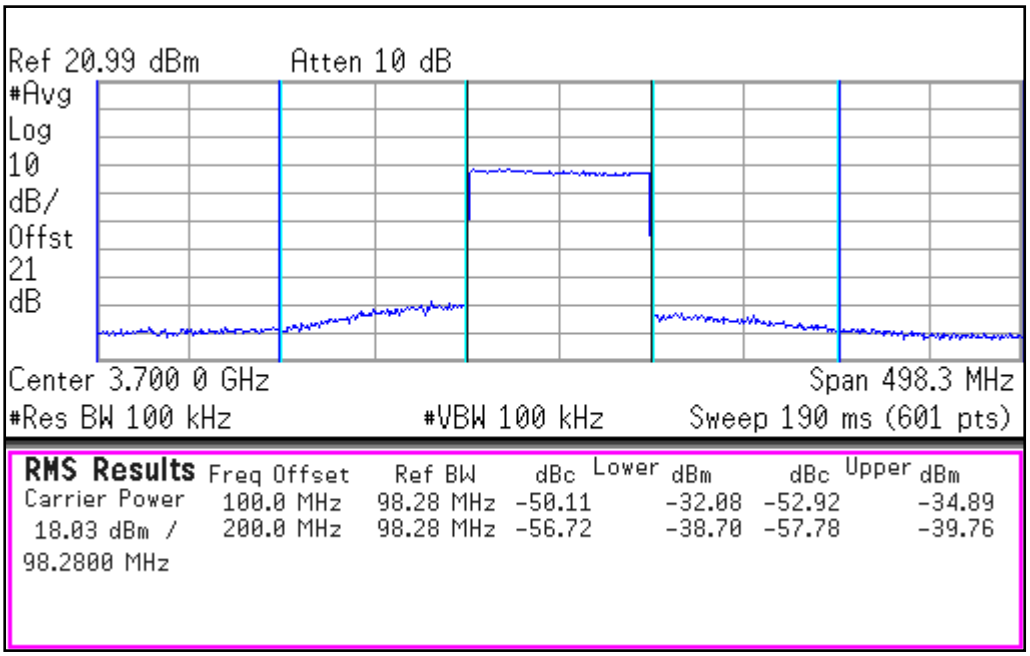


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3GPP 5G NR 1FA ACLR 3.7GHz



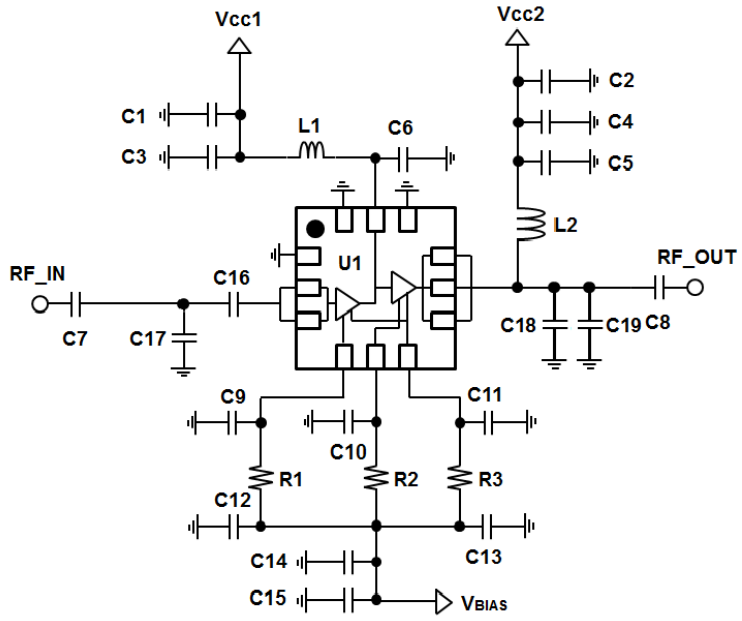
3GPP 5G NR 1FA ACLR (-50dBc)



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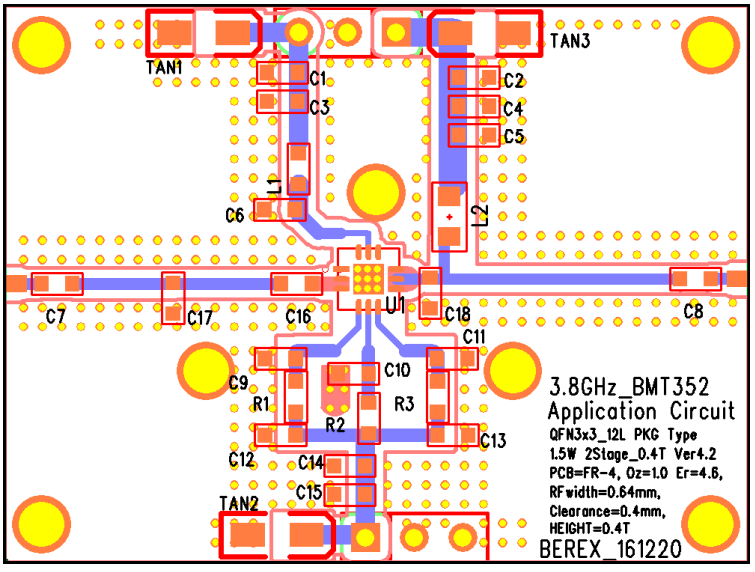
Application Circuit: 3800 MHz

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
C19	0603	0.2pF	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 sub-strate conditions

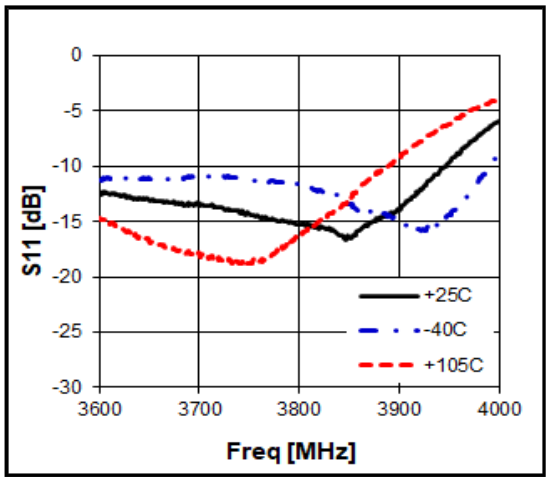
Reference	Object	Distance
Input pin	C17	8.0mm
Input pin	C16	1.5mm
Output pin	C18	1.2mm
Output pin	C19	2.0mm

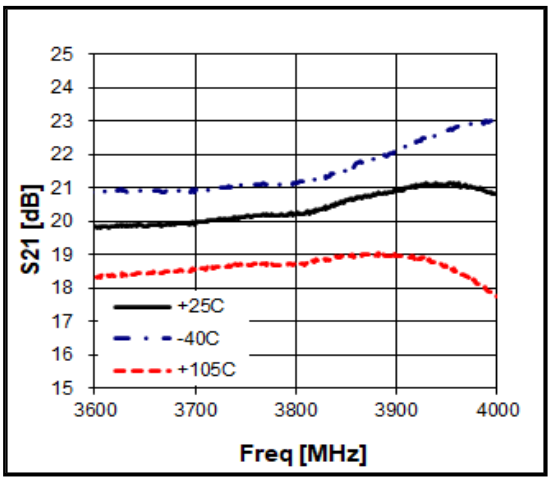
1. C8 & C17 & C16 & C18 & C19 : We recommend High-Q capacitor for better output power performance. We used Johanson Tech's capacitor .

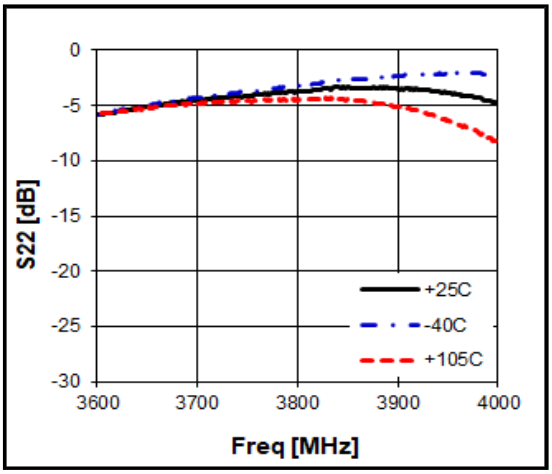
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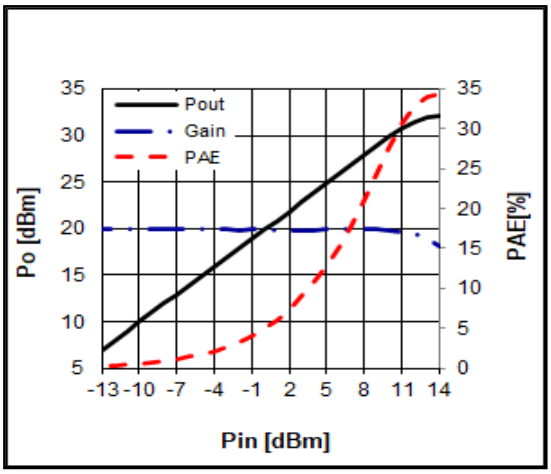
Typical Performance

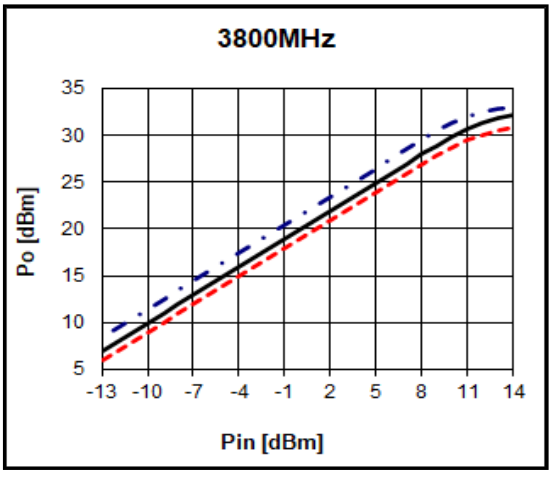
(V_{cc} & V_{Bias} = +5V, I_{cq} = 330mA, T_a= 25 °C)

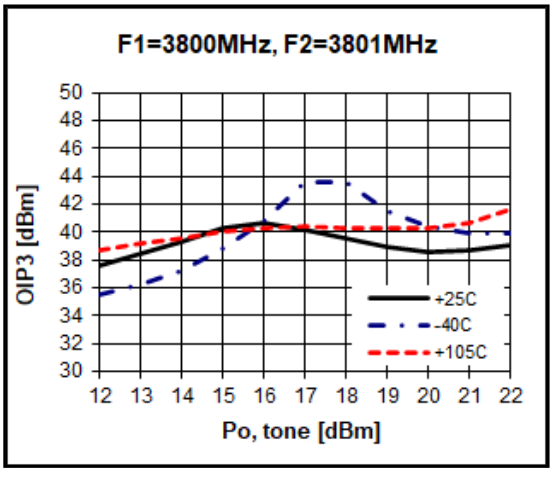






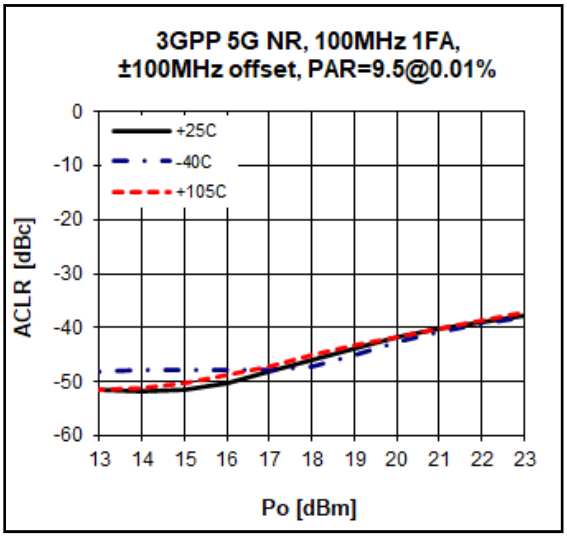




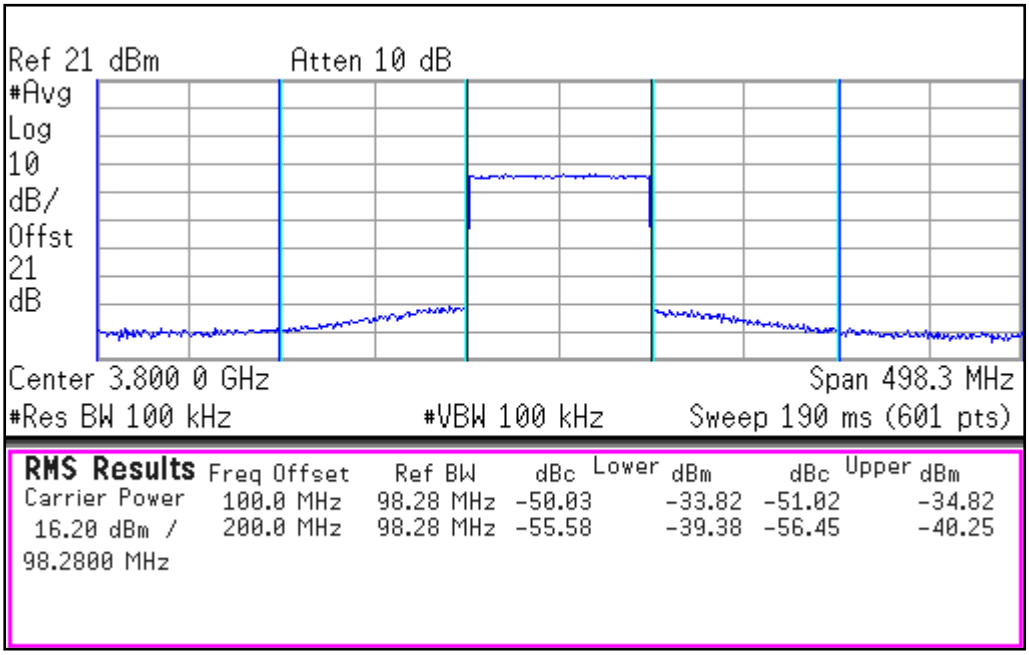


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3GPP 5G NR 1FA ACLR 3.8GHz

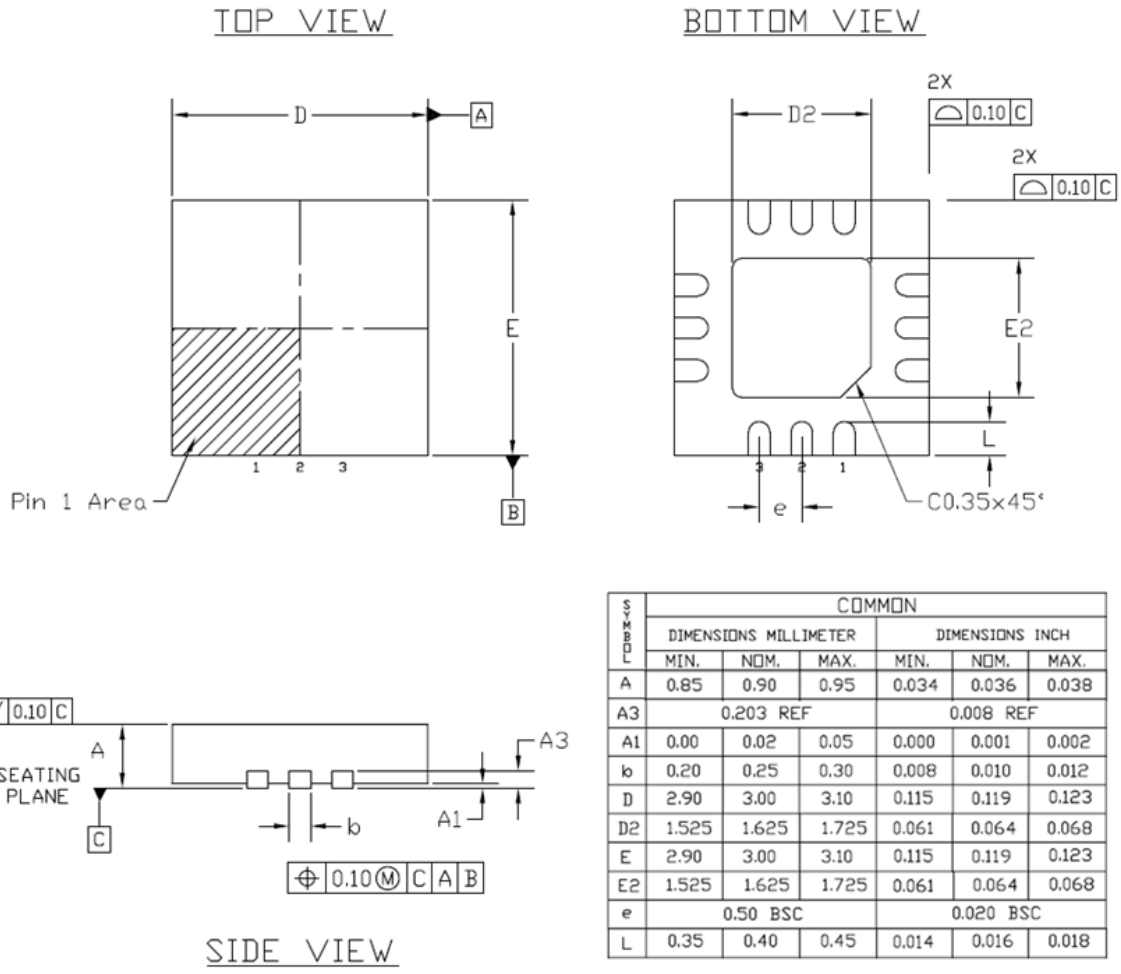


3GPP 5G NR 1FA ACLR (-50dBc)



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Package Outline Dimension



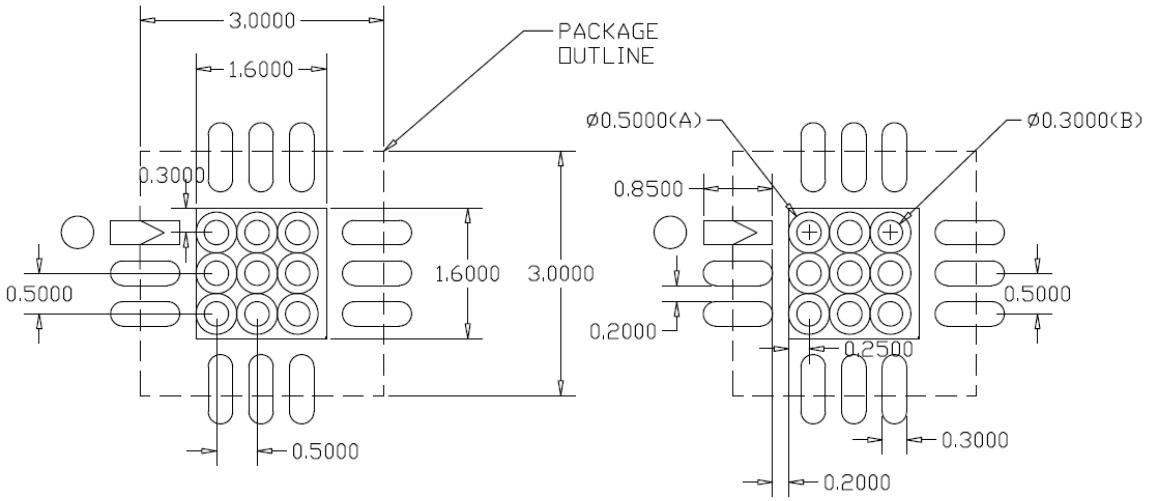
SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.85	0.90	0.95	0.034	0.036	0.038
A3	0.203 REF			0.008 REF		
A1	0.00	0.02	0.05	0.000	0.001	0.002
b	0.20	0.25	0.30	0.008	0.010	0.012
D	2.90	3.00	3.10	0.115	0.119	0.123
D2	1.525	1.625	1.725	0.061	0.064	0.068
E	2.90	3.00	3.10	0.115	0.119	0.123
E2	1.525	1.625	1.725	0.061	0.064	0.068
e	0.50 BSC			0.020 BSC		
L	0.35	0.40	0.45	0.014	0.016	0.018

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.

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Suggested PCB Land Pattern and PAD Layout

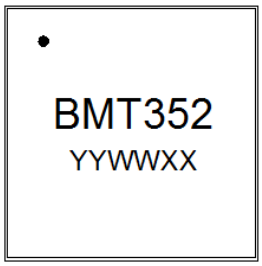


Unit : mm

• Notes

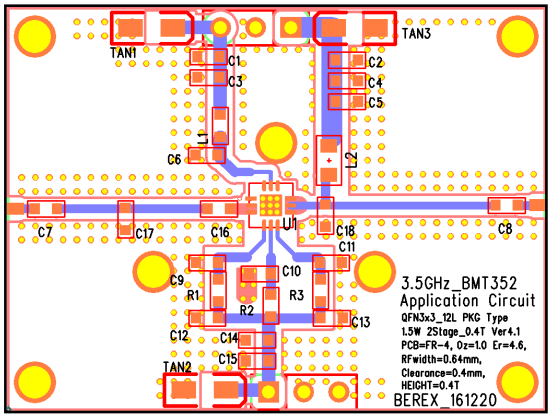
1. Use 1 oz. copper minimum for top and bottom layer metal.
2. A heatsink underneath the area of the PCB for the mounted device is required for proper thermal operation.
3. Ground / thermal vias are critical for the proper performance of this device.

Package Marking



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

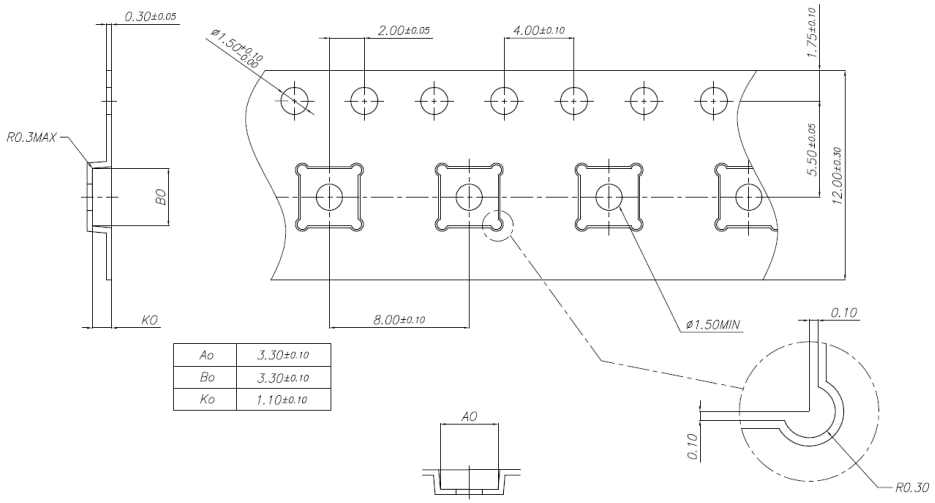
PCB Mounting



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Tape & Reel

QFN 3x3



Ao	3.30±0.10
Bo	3.30±0.10
Ko	1.10±0.10

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-001-2014
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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