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[CLASSIFICATION] APPLICATION NOTE

[DATE] 2022.06

[REVISION NO.] REV.1.1

[MEASURING INSTRUMENTS]

- NA_AGILENT E5071B
- SA_AGILENT N9020A
- SG_AGILENT 4438C
- SG_IFR 3416

# High Power Amp BMT332

# FR4 Application Note

# Contents



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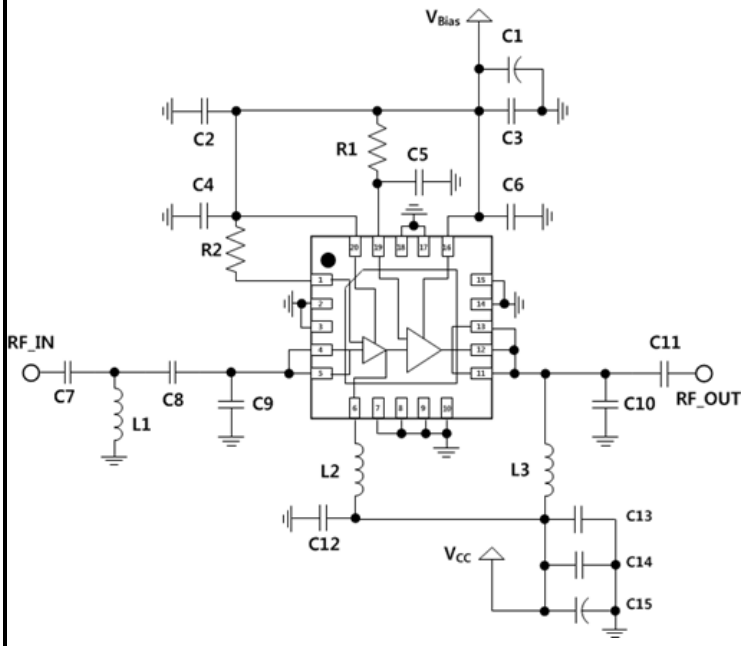
## 1. BT332 _ 850MHz Application Note

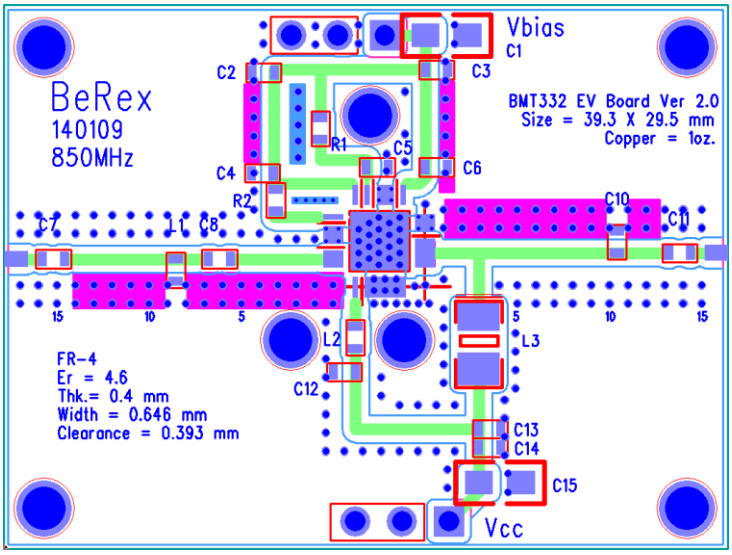
### Schematic Diagram




### BOM

| | | | Marks |
|---|---|---|---|
| C1 | 1206 | 10uF | Tantalum |
| C2 | 0603 | N/A | |
| C3 | 0603 | 68pF | |
| C4 | 0603 | 1nF | |
| C5 | 0603 | N/A | |
| C6 | 0603 | 3.3pF | |
| C7 | 0603 | 100pF | |
| C8 | 0603 | 5pF | |
| C9 | 0603 | N/A | |
| C10 | 0603 | 10pF | High Q |
| C11 | 0603 | 100pF | |
| C12 | 0603 | 1uF | |
| C13 | 0603 | 100pF | |
| C14 | 0603 | 1nF | |
| C15 | 1206 | 10uF | Tantalum |
| L1 | 0603 | 5.6nH | |
| L2 | 0603 | 22nH | |
| L3 | 1008 | 22nH | Coil |
| R1 | 0603 | 100 Ω | ±5% |
| R2 | 0603 | 270 Ω | ±5% |

### PCB Diagram




### Notice

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

| Reference | Object | Distance |
|---|---|---|
| Input pin | L1 | 7.8mm |
| Input pin | C8 | 5.3mm |
| Output pin | C10 | 8.8mm |
| Pin 16 | C3 | 7.2mm |
| Pin 16 | C6 | 2.0mm |
| Pin 20 | C4 | 5.0mm |

1. Pin 16 & 20 is used for Vce of the inner bias circuit. To eliminate bias line resonance you need above 10mm transmission line and adjust the position of C2, C3, C4 ,C5 and C6. Also you can adjust spectrum regrowth about bandwidth of signals which you want.

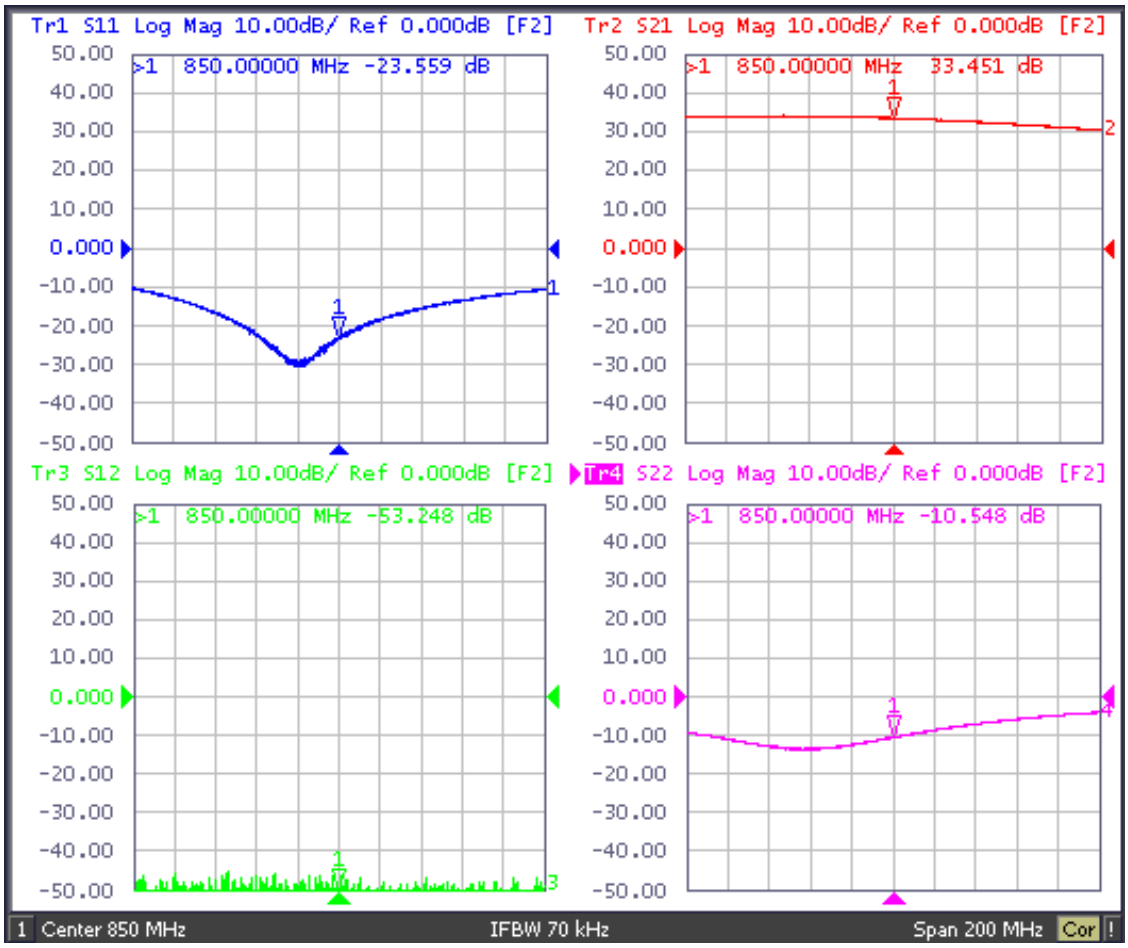
2. C10 : We recommend High-Q capacitor for better output power performance. In this document we used '10pF(251R14S100JV4, EIA 0603) of Johanson Technology.

3. You could change C7 from 100 pF to 0 Ω or a line if you have other DC block front of BMT332.

## 1.1 BMT332_850MHz Test Result

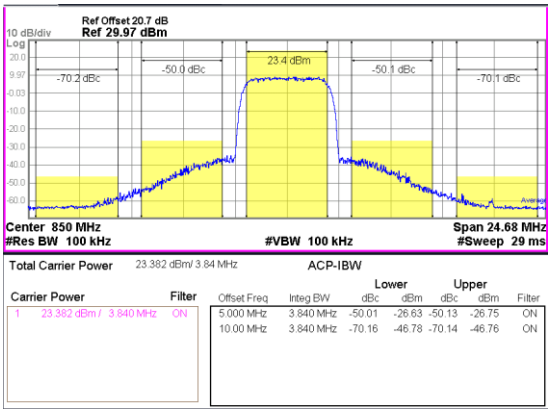
| Freq [MHz] | Vcc [V] | Iref [mA] | Icq [mA] | Gain [dB] | OIP3 [dBm](1) | P1dB [dBm] | IRL [dB] | ORL [dB] | NF [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 850 | 5 | 32 | 671 | 33.4 | 49 | 33 | 23.5 | 10.5 | 7.7 |

**(1) OIP3 was tested @Pout=23dBm/tone (CW) 1MHz offset**

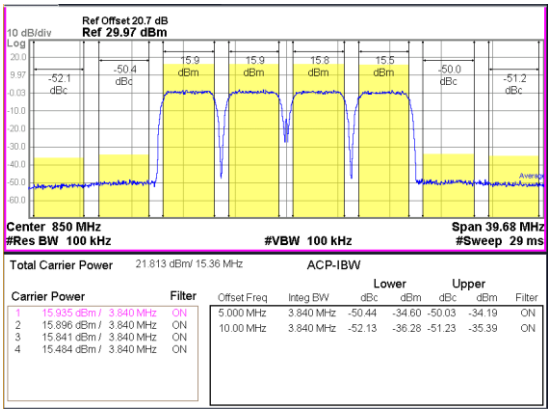


## 1.2 BT332_850MHz ACLR Test Result

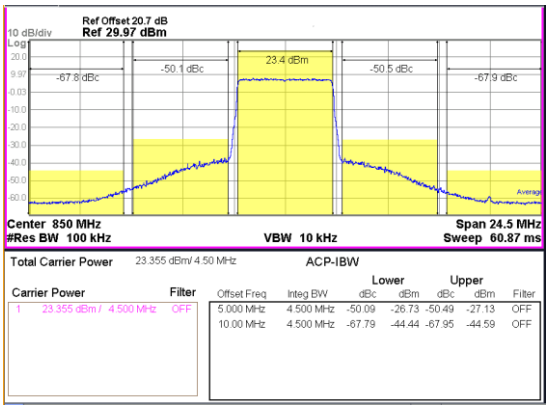
3GPP WCDMA TM1 +64DPCH 1FA



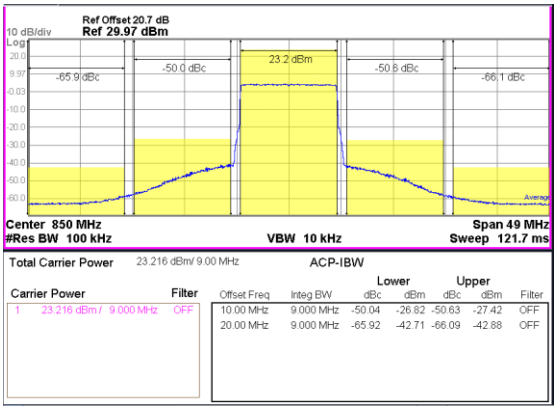

3GPP WCDMA TM1 +64DPCH 4FA



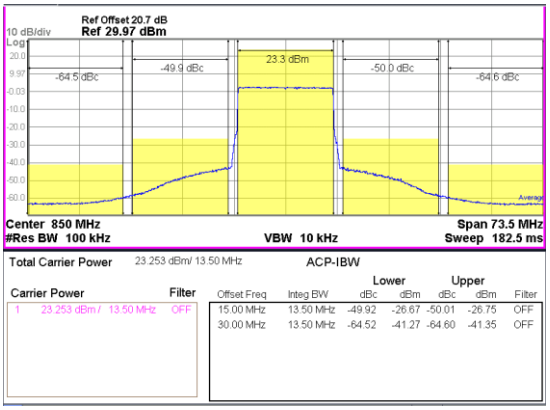

3GPP LTE E-TM3.1 5MHz



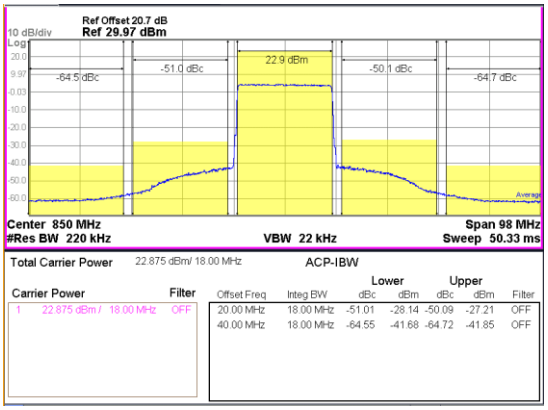

3GPP LTE E-TM3.1 10MHz




3GPP LTE E-TM3.1 15MHz

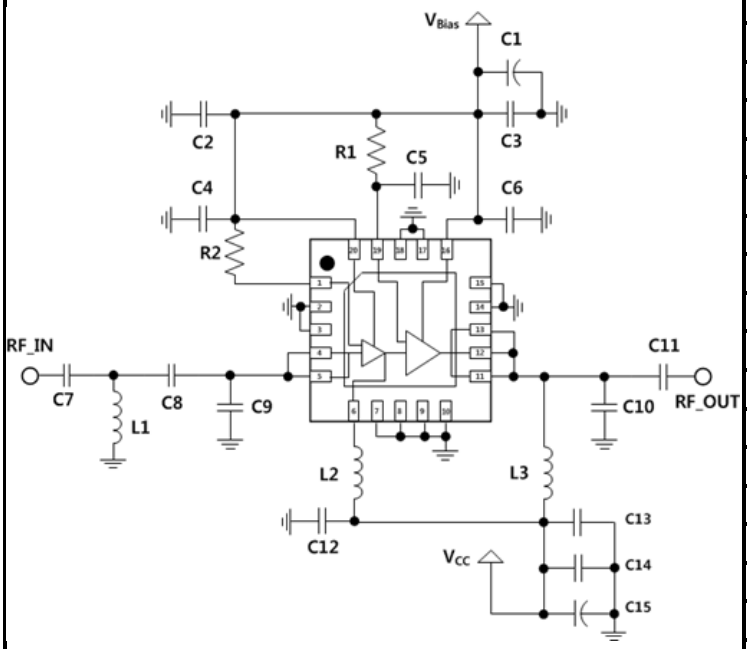



3GPP LTE E-TM3.1 20MHz



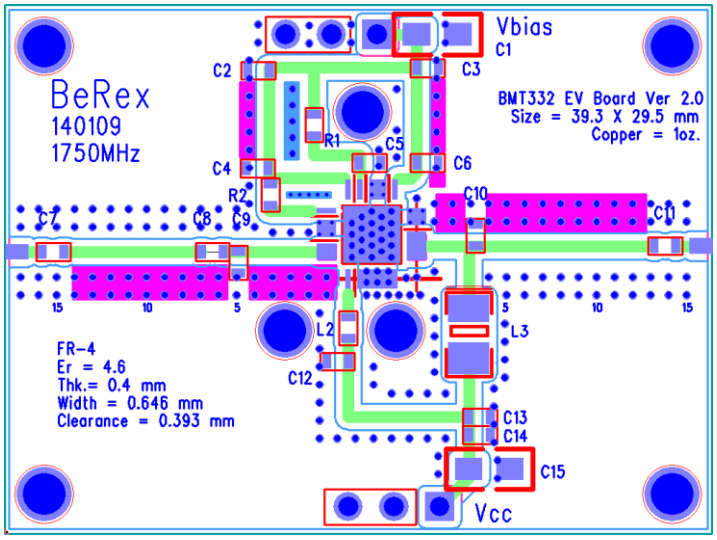
## 2. BMT332_1750MHz Application Note

**Schematic Diagram**




| BOM | | | Marks |
|---|---|---|---|
| C1 | 1206 | N/A | Tantalum |
| C2 | 0603 | 1nF | |
| C3 | 0603 | 1nF | |
| C4 | 0603 | N/A | |
| C5 | 0603 | 1nF | |
| C6 | 0603 | 2pF | |
| C7 | 0603 | 0 Ω | |
| C8 | 0603 | 3.3pF | |
| C9 | 0603 | 2.7pF | |
| C10 | 0603 | 4.3pF | High Q |
| C11 | 0603 | 3.9pF | |
| C12 | 0603 | 1uF | |
| C13 | 0603 | 100pF | |
| C14 | 0603 | 1nF | |
| C15 | 1206 | 10uF | Tantalum |
| L1 | 0603 | N/A | |
| L2 | 0603 | 12nH | |
| L3 | 1008 | 22nH | Coil |
| R1 | 0603 | 100 Ω | ±5% |
| R2 | 0603 | 270 Ω | ±5% |

**PCB Diagram**




**Notice**

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

| Reference | Object | Distance |
|---|---|---|
| Input pin | C8 | 5.8mm |
| Input pin | C9 | 3.9mm |
| Output pin | C10 | 2.8mm |
| Pin 16 | C3 | 7.2mm |
| Pin 16 | C6 | 2.0mm |
| Pin 16 | C5 | 1.0mm |
| Pin 20 | C2 | 10.6mm |

1. Pin 16 & 20 is used for Vce of the inner bias circuit. To eliminate bias line resonance you need above 10mm transmission line and adjust the position of C2, C3, C4 ,C5 and C6. Also you can adjust spectrum regrowth about bandwidth of signals which you want.

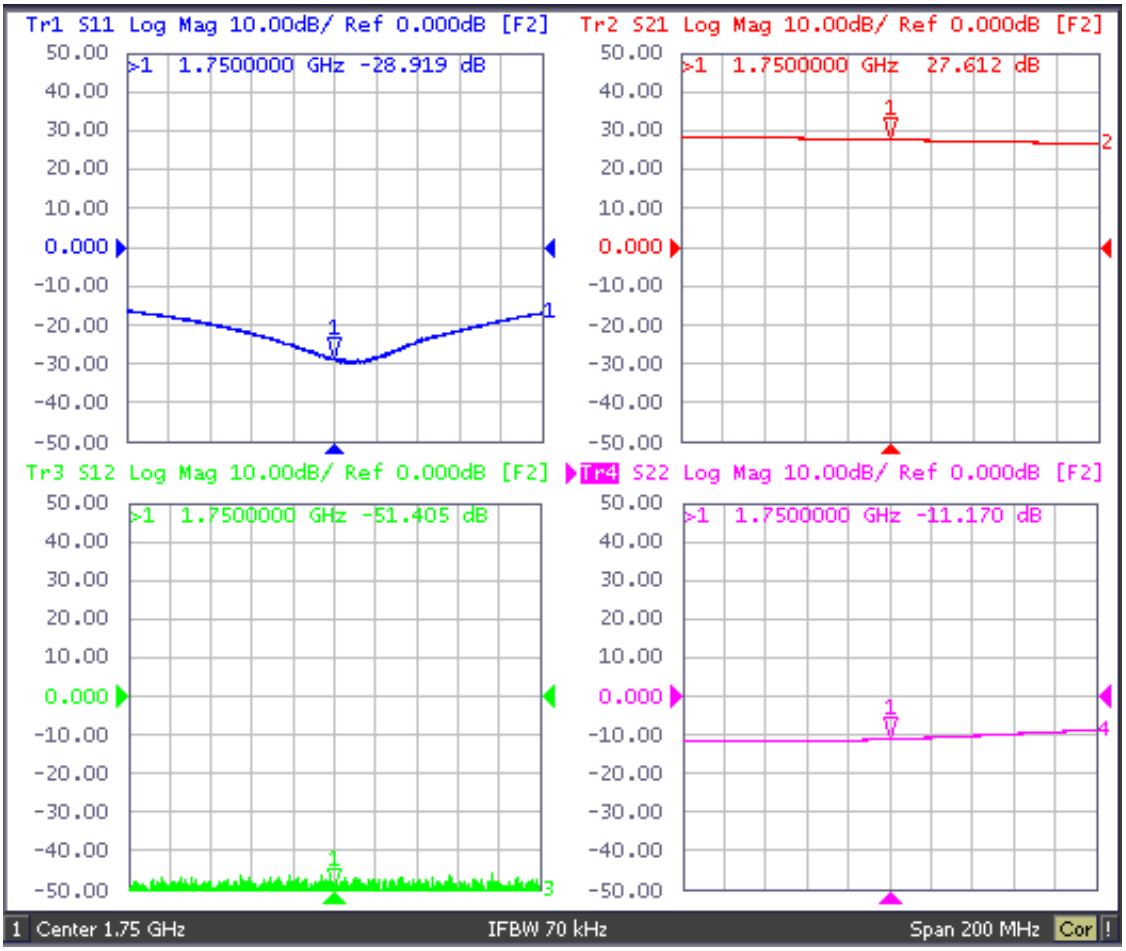
2. C10 : We recommend High-Q capacitor for better output power performance. In this document we used '4.3pF(251R14S4R3BV4, EIA 0603) of Johanson Technology.

3. C7 : Non-critical 0 Ω

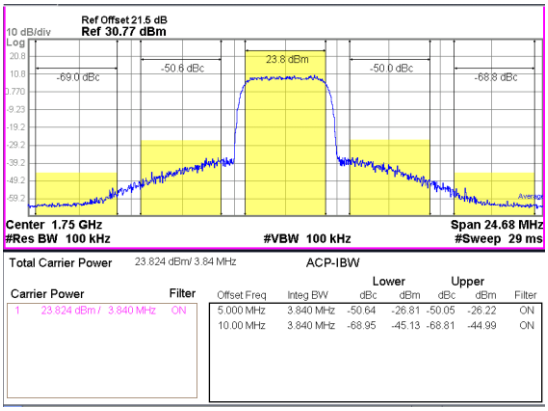
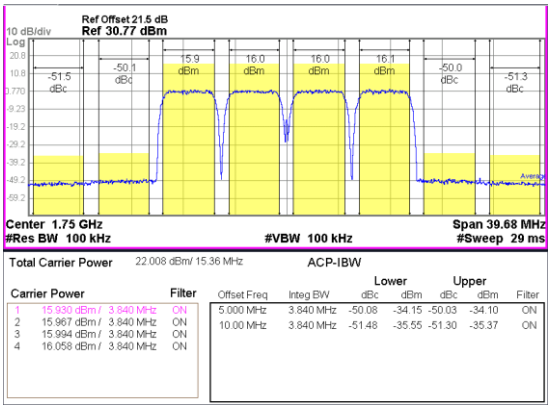
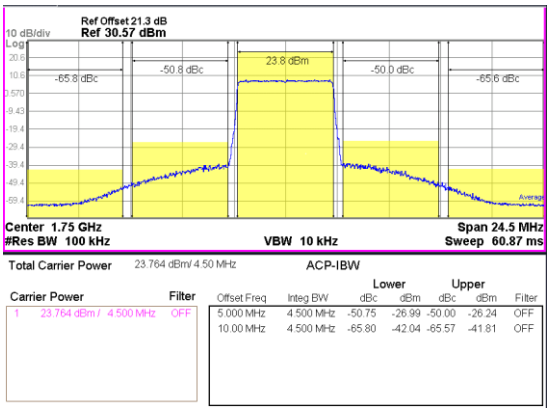
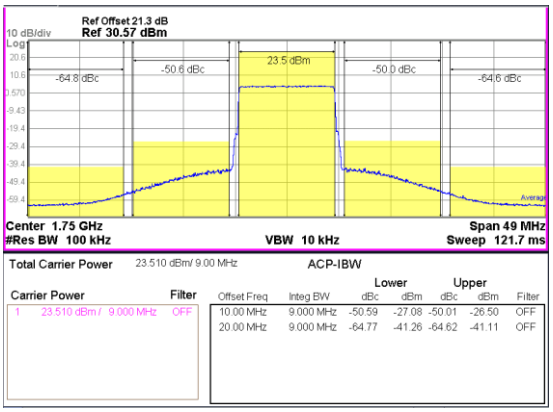
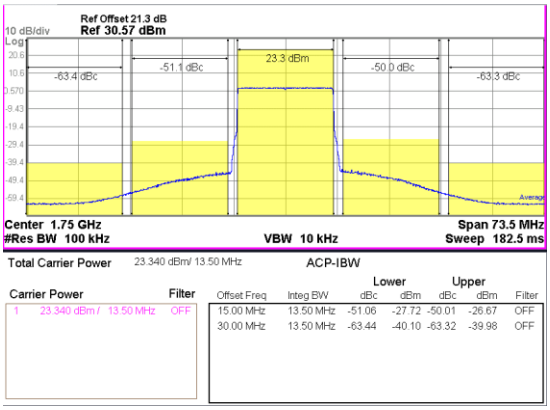
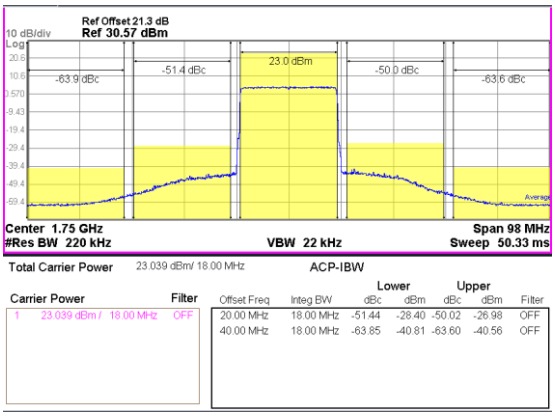
## 2.1 BMT332 1750MHz Test Result

| Freq [MHz] | Vcc [V] | Iref [mA] | Icq [mA] | Gain [dB] | OIP3 [dBm](1) | P1dB [dBm] | IRL [dB] | ORL [dB] | NF [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 1750 | 5 | 32 | 669 | 27.6 | 47 | 33.5 | 28.9 | 11.1 | 6.2 |

**(1) OIP3 was tested @Pout=23dBm/tone (CW) 1MHz offset**

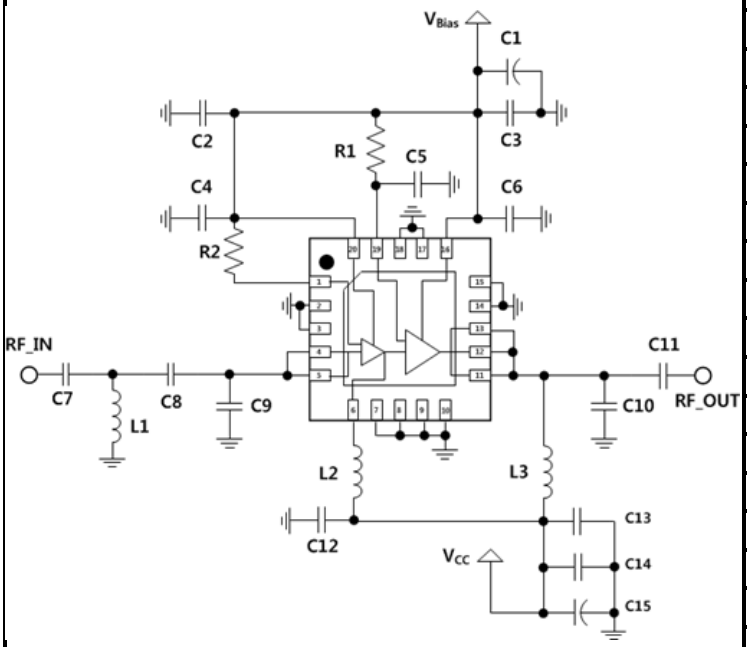


## 2.2 BMT332 1750MHz ACPR Test Result

| 3GPP WCDMA TM1 +64DPCH 1FA | 3GPP WCDMA TM1 +64DPCH 4FA |
|---|---|
|  |  |
| 3GPP LTE E-TM3.1 5MHz | 3GPP LTE E-TM3.1 10MHz |
|  |  |
| 3GPP LTE E-TM3.1 15MHz | 3GPP LTE E-TM3.1 20MHz |
|  |  |

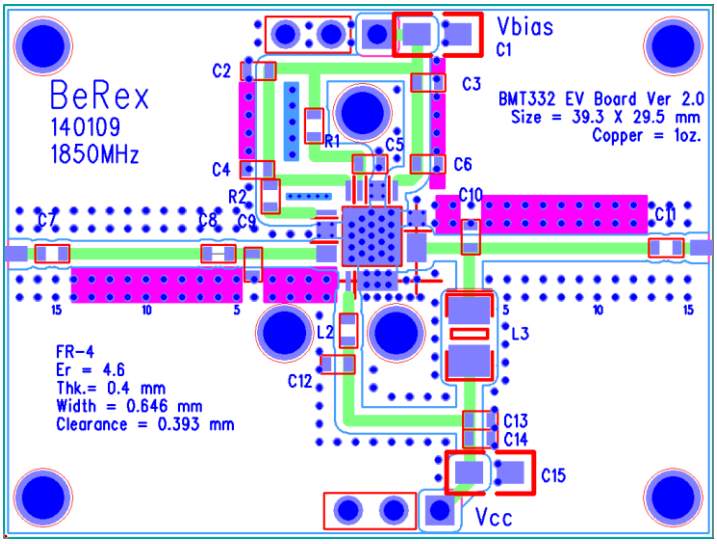
## 3. BMT332 1850MHz Application Note

**Schematic Diagram**




| BOM | | | Marks |
|---|---|---|---|
| C1 | 1206 | N/A | Tantalum |
| C2 | 0603 | 1nF | |
| C3 | 0603 | 1nF | |
| C4 | 0603 | N/A | |
| C5 | 0603 | 1nF | |
| C6 | 0603 | 3pF | |
| C7 | 0603 | 0 Ω | |
| C8 | 0603 | 3.3pF | |
| C9 | 0603 | 2.7pF | |
| C10 | 0603 | 4.3pF | High Q |
| C11 | 0603 | 3.9pF | |
| C12 | 0603 | 1uF | |
| C13 | 0603 | 100pF | |
| C14 | 0603 | 1nF | |
| C15 | 1206 | 10uF | Tantalum |
| L1 | 0603 | N/A | |
| L2 | 0603 | 12nH | |
| L3 | 1008 | 12nH | Coil |
| R1 | 0603 | 100 Ω | ±5% |
| R2 | 0603 | 270 Ω | ±5% |

**PCB Diagram**




**Notice**

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

| Reference | Object | Distance |
|---|---|---|
| Input pin | C8 | 5.0mm |
| Input pin | C9 | 3.5mm |
| Output pin | C10 | 2.4mm |
| Pin 16 | C3 | 5.5mm |
| Pin 16 | C6 | 2.0mm |
| Pin 19 | C5 | 1.0mm |
| Pin 20 | C2 | 10.6mm |

1. Pin 16 & 20 is used for Vce of the inner bias circuit. To eliminate bias line resonance you need above 10mm transmission line and adjust the position of C2, C3, C4 ,C5 and C6. Also you can adjust spectrum regrowth about bandwidth of signals which you want.

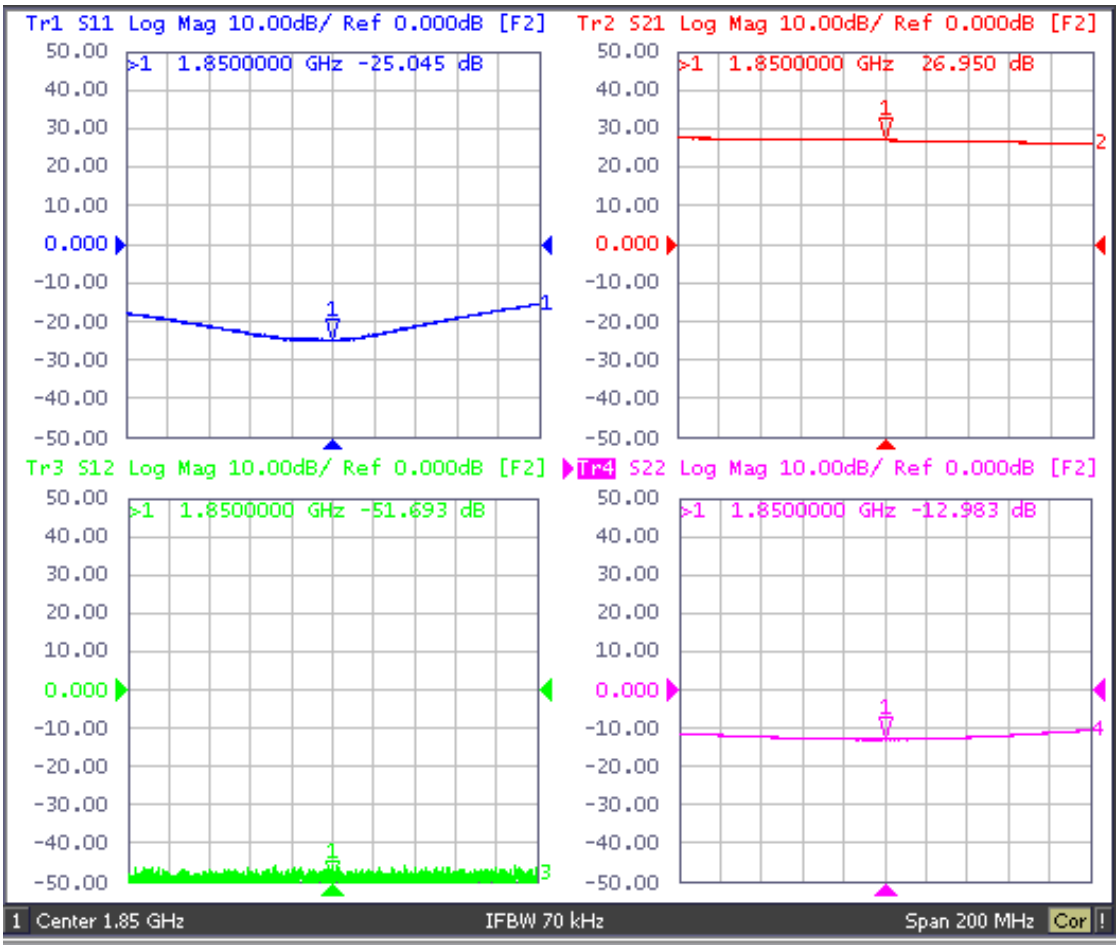
2. C10 : We recommend High-Q capacitor for better output power performance. In this document we used '4.3pF(251R14S4R3BV4, EIA 0603) of Johanson Technology.

3. C7 : Non-critical 0 Ω

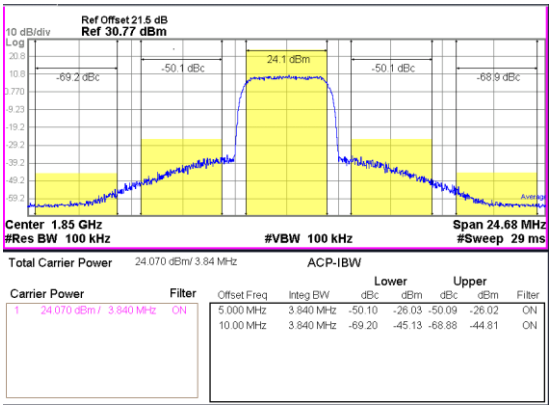
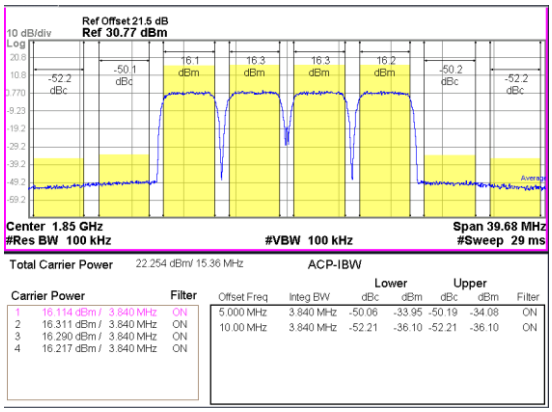
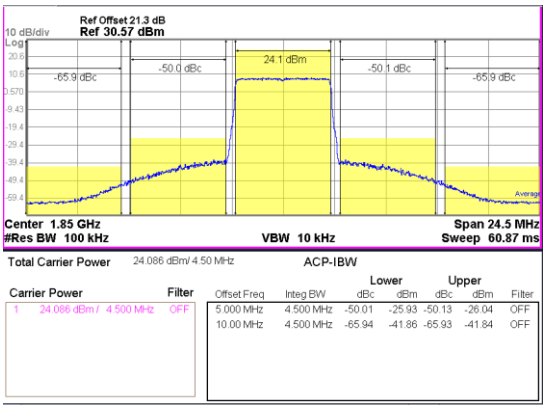
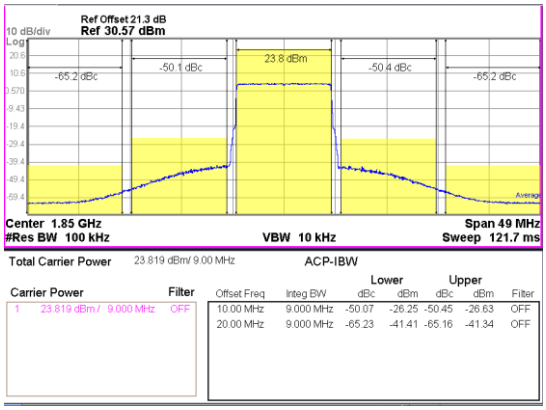
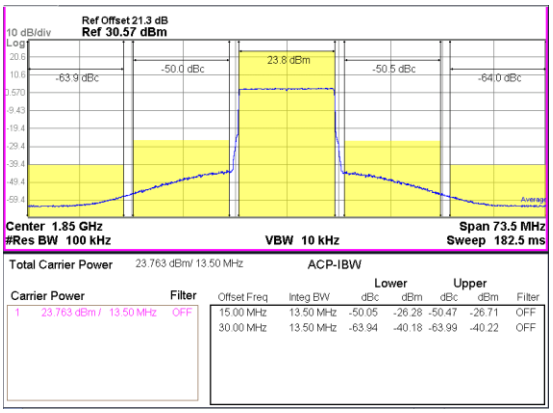
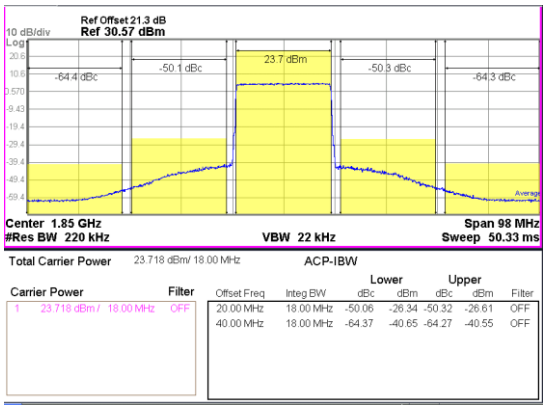
### 3.1 BMT332 1850MHz Test Result

| Freq [MHz] | Vcc [V] | Iref [mA] | Icq [mA] | Gain [dB] | OIP3 [dBm](1) | P1dB [dBm] | IRL [dB] | ORL [dB] | NF [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 1850 | 5 | 32 | 669 | 26.9 | 47 | 33.5 | 25 | 12.9 | 6.5 |

**(1) OIP3 was tested @Pout=23dBm/tone (CW) 1MHz offset**

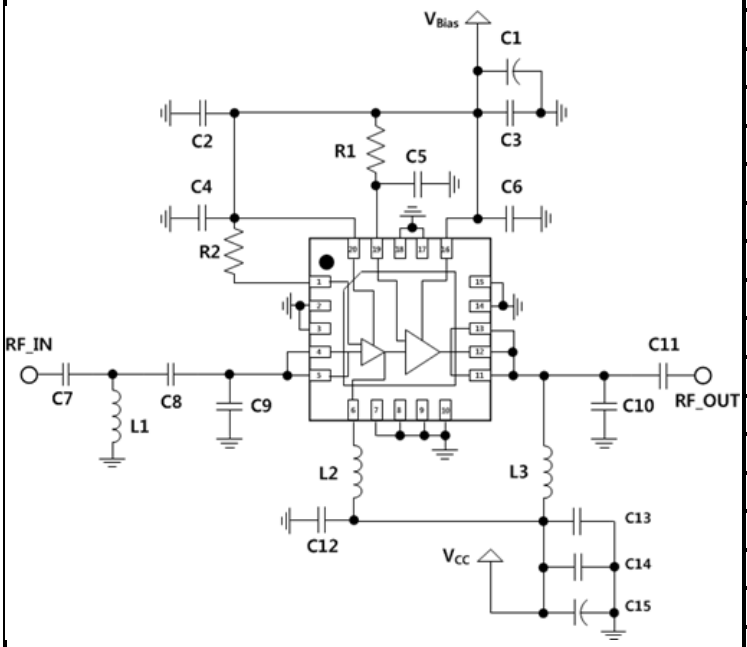


## 3.2 BMT332 1850MHz ACPR Test Result

| 3GPP WCDMA TM1 +64DPCH 1FA | 3GPP WCDMA TM1 +64DPCH 4FA |
|---|---|
|  |  |
| 3GPP LTE E-TM3.1 5MHz | 3GPP LTE E-TM3.1 10MHz |
|  |  |
| 3GPP LTE E-TM3.1 15MHz | 3GPP LTE E-TM3.1 20MHz |
|  |  |

## 4. BMT332 1960MHz Application Note

**Schematic Diagram**




**BOM**

| | | | Marks |
|---|---|---|---|
| C1 | 1206 | N/A | Tantalum |
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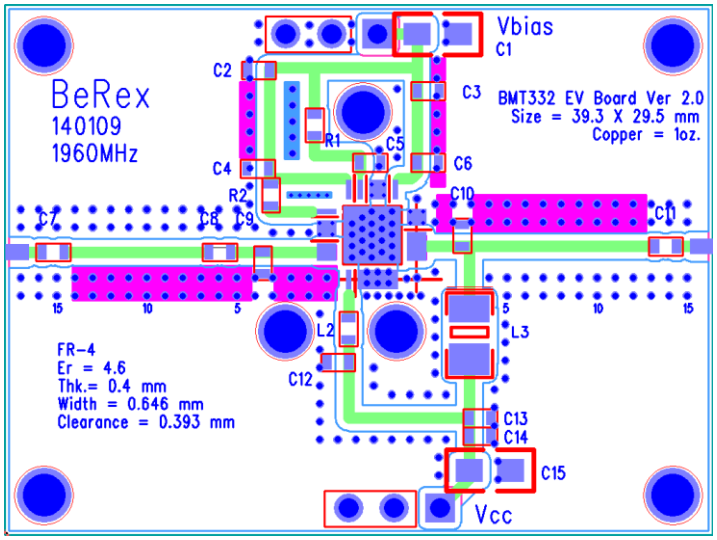
| C3 | 0603 | 1nF | |
| C4 | 0603 | N/A | |
| C5 | 0603 | 1nF | |
| C6 | 0603 | 2pF | |
| C7 | 0603 | 0 Ω | |
| C8 | 0603 | 3.3pF | |
| C9 | 0603 | 2.7pF | |
| C10 | 0603 | 4.3pF | High Q |
| C11 | 0603 | 3.9pF | |
| C12 | 0603 | 1uF | |
| C13 | 0603 | 100pF | |
| C14 | 0603 | 1nF | |
| C15 | 1206 | 10uF | Tantalum |
| L1 | 0603 | N/A | |
| L2 | 0603 | 12nH | |
| L3 | 1008 | 12nH | Coil |
| R1 | 0603 | 100 Ω | ±5% |
| R2 | 0603 | 270 Ω | ±5% |

**PCB Diagram**




**Notice**

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

| Reference | Object | Distance |
|---|---|---|
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| Input pin | C9 | 3.0mm |
| Output pin | C10 | 2.0mm |
| Pin 16 | C3 | 5.0mm |
| Pin 16 | C6 | 2.0mm |
| Pin 19 | C5 | 1.0mm |
| Pin 20 | C2 | 10.6mm |

1. Pin 16 & 20 is used for Vce of the inner bias circuit. To eliminate bias line resonance you need above 10mm transmission line and adjust the position of C2, C3, C4 ,C5 and C6. Also you can adjust spectrum regrowth about bandwidth of signals which you want.

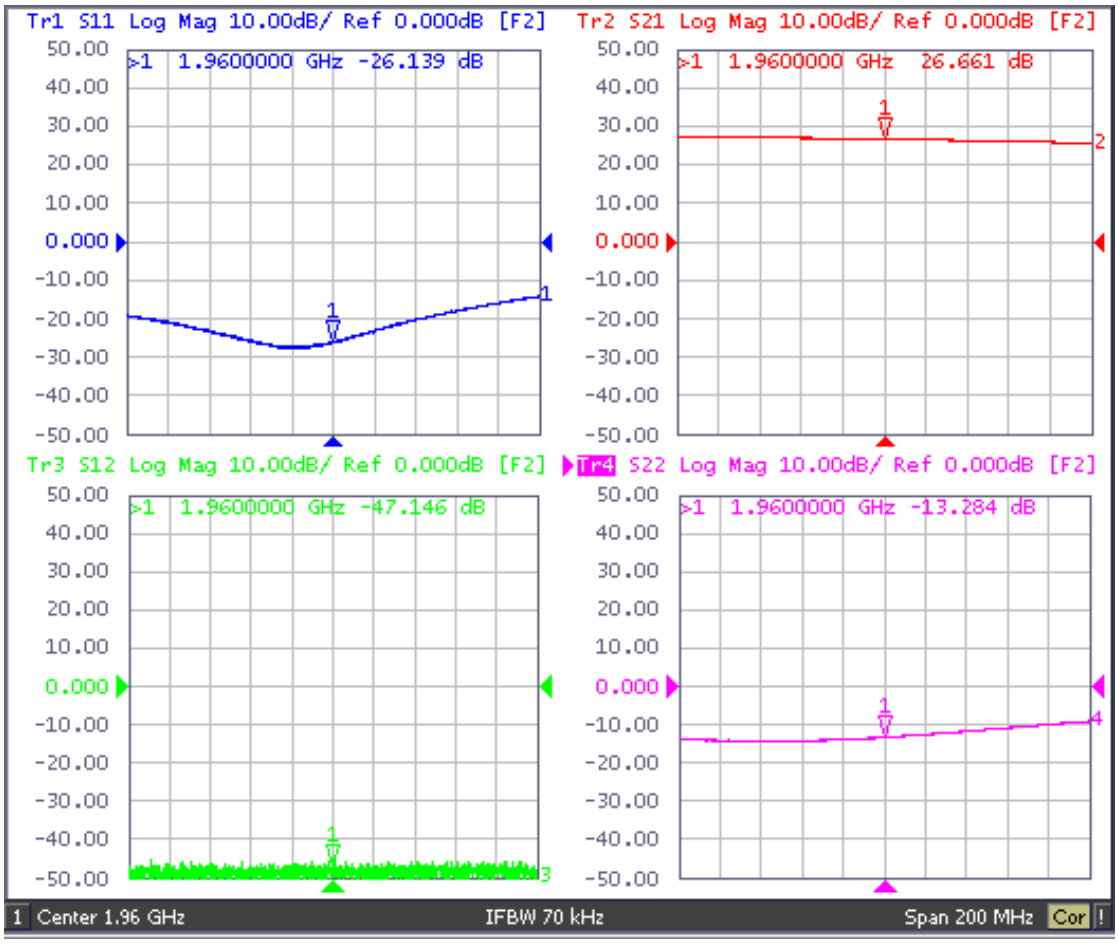
2. . C10 : We recommend High-Q capacitor for better output power performance. In this document we used '4.3pF(251R14S4R3BV4, EIA 0603) of Johanson Technology.

3. C7 : Non-critical 0 Ω

## 4.1 BMT332 1960MHz Test Result

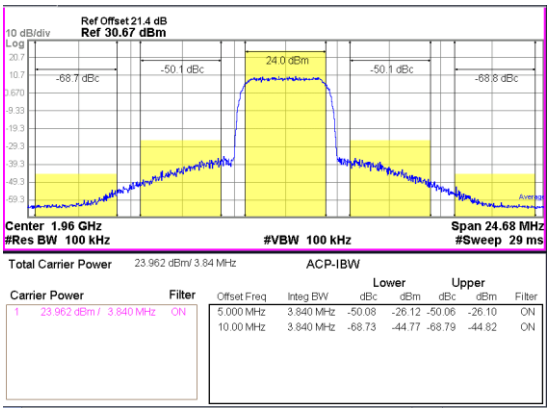
| Freq [MHz] | Vcc [V] | Iref [mA] | Icq [mA] | Gain [dB] | OIP3 [dBm](1) | P1dB [dBm] | IRL [dB] | ORL [dB] | NF [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 1960 | 5 | 32 | 663 | 26.6 | 47 | 33.5 | 26.1 | 13.2 | 6.4 |

**(1) OIP3 was tested @Pout=23dBm/tone (CW) 1MHz offset**

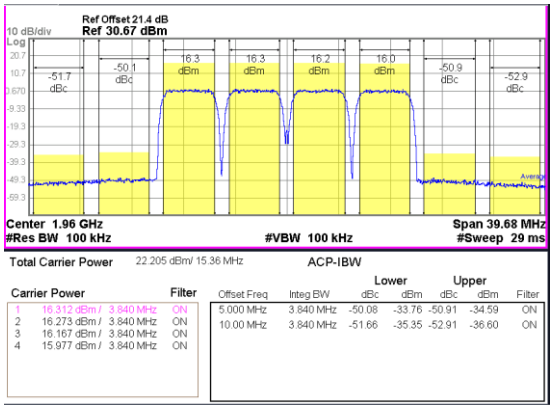


## 4.2 BMT332 1960MHz ACLR Test Result

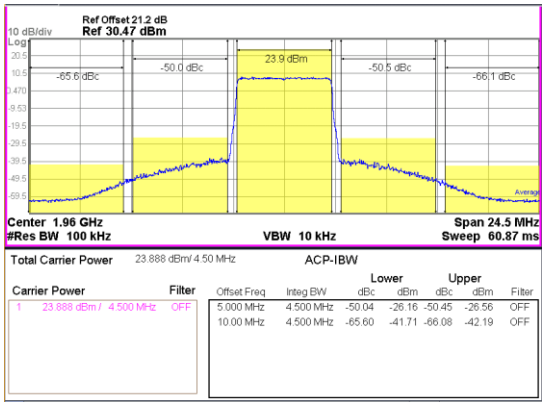
3GPP WCDMA TM1 +64DPCH 1FA



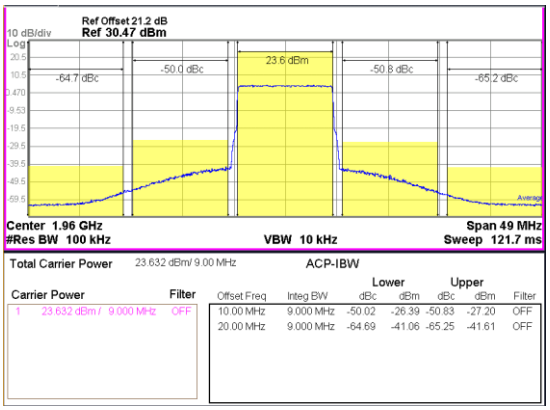

3GPP WCDMA TM1 +64DPCH 4FA



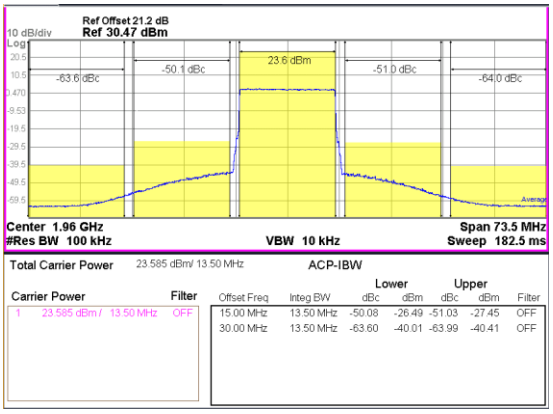

3GPP LTE E-TM3.1 5MHz



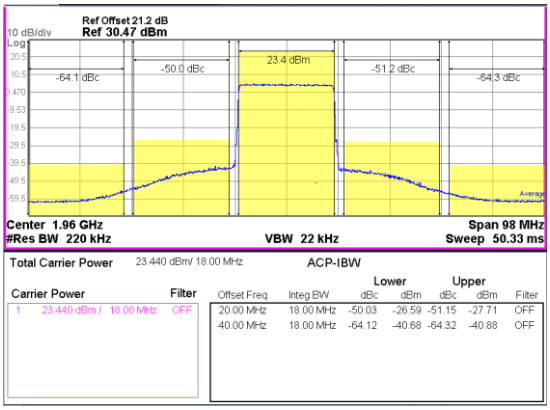

3GPP LTE E-TM3.1 10MHz




3GPP LTE E-TM3.1 15MHz

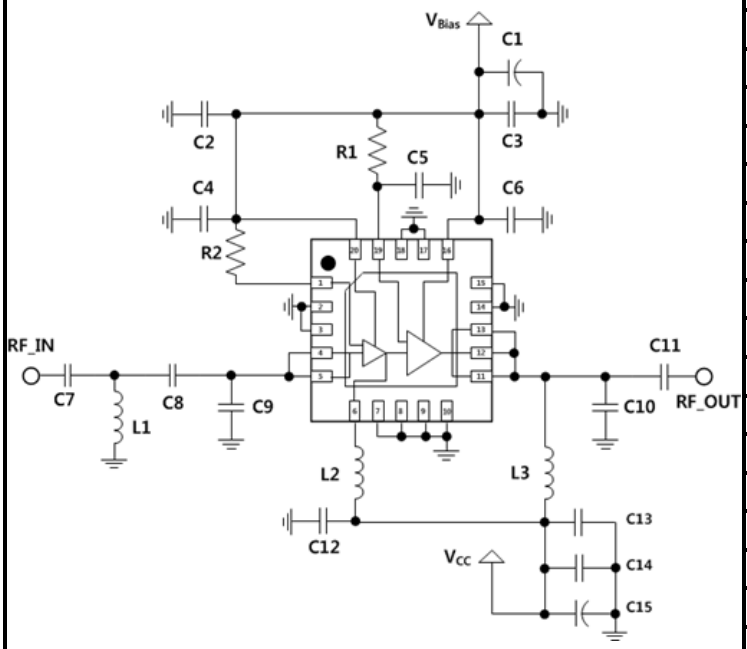



3GPP LTE E-TM3.1 20MHz



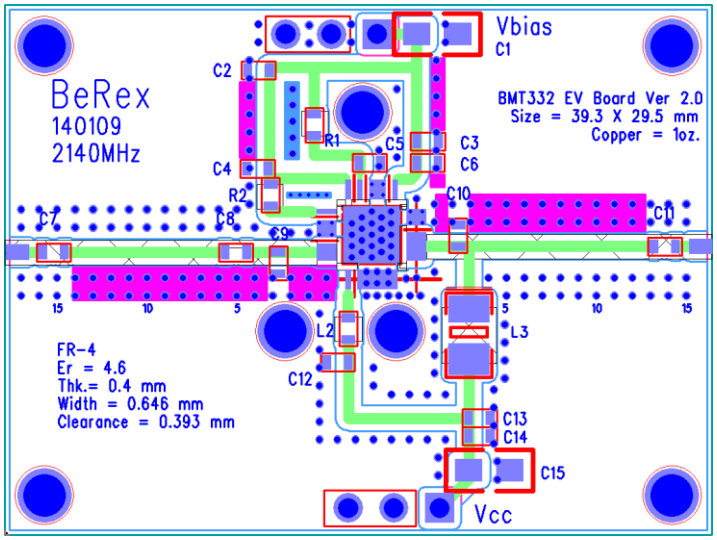
## 5. BMT332 2140MHz Application Note

**Schematic Diagram**




| BOM | | | Marks |
|---|---|---|---|
| C1 | 1206 | 10uF | Tantalum |
| C2 | 0603 | N/A | |
| C3 | 0603 | 1nF | |
| C4 | 0603 | 1nF | |
| C5 | 0603 | 1nF | |
| C6 | 0603 | 3pF | |
| C7 | 0603 | 0 Ω | |
| C8 | 0603 | 3pF | |
| C9 | 0603 | 2.7pF | |
| C10 | 0603 | 3.9pF | High Q |
| C11 | 0603 | 4.3pF | |
| C12 | 0603 | 1uF | |
| C13 | 0603 | 100pF | |
| C14 | 0603 | 1nF | |
| C15 | 1206 | 10uF | Tantalum |
| L1 | 0603 | N/A | |
| L2 | 0603 | 12nH | |
| L3 | 1008 | 10nH | Coil |
| R1 | 0603 | 100 Ω | ±5% |
| R2 | 0603 | 270 Ω | ±5% |

**PCB Diagram**




**Notice**

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

| Reference | Object | Distance |
|---|---|---|
| Input pin | C8 | 4.1mm |
| Input pin | C9 | 2.2mm |
| Output pin | C10 | 1.9mm |
| Pin 16 | C3 | 3.0mm |
| Pin 16 | C6 | 2.0mm |
| Pin 19 | C5 | 1.0mm |
| Pin 20 | C2 | 5.0mm |

1. Pin 16 & 20 is used for Vce of the inner bias circuit. To eliminate bias line resonance you need above 10mm transmission line and adjust the position of C2, C3, C4 ,C5 and C6. Also you can adjust spectrum regrowth about bandwidth of signals which you want.

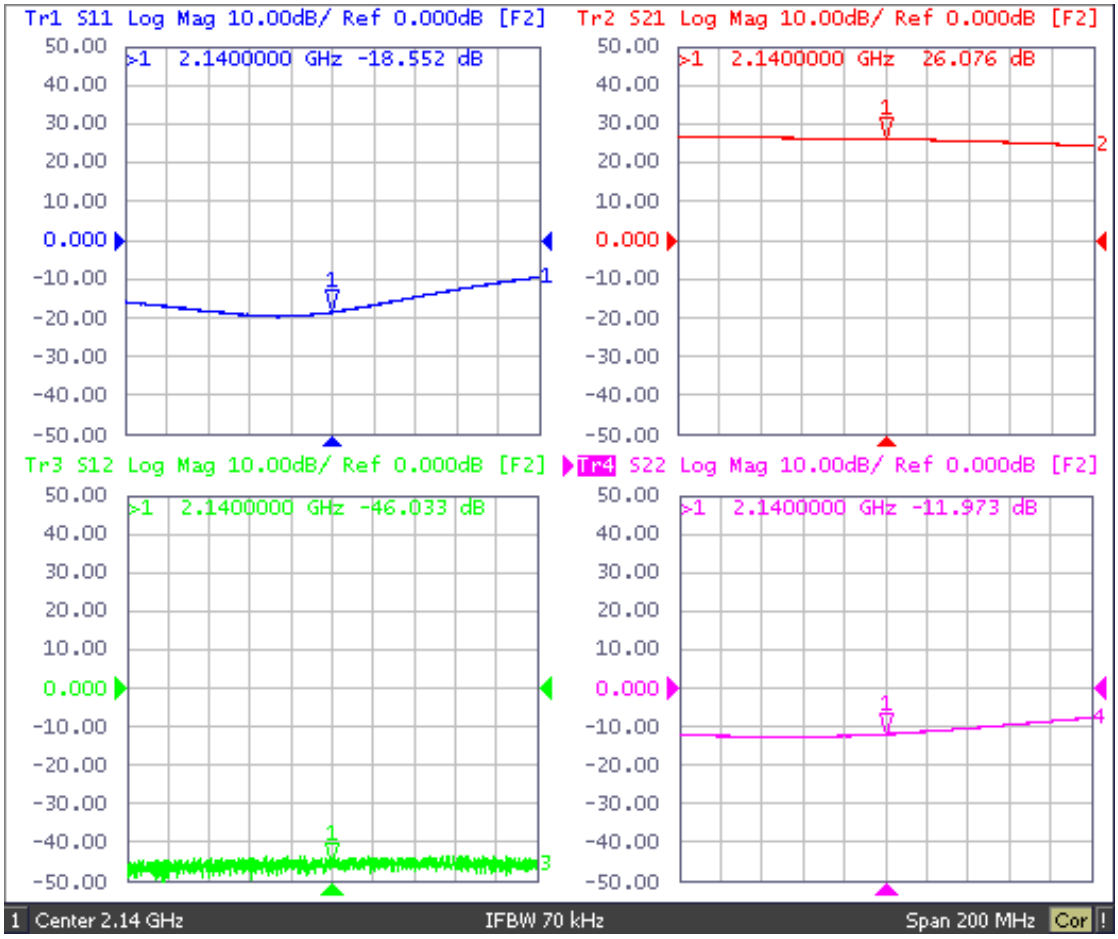
2.. C10 : We recommend High-Q capacitor for better output power performance. In this document we used '3.9pF(251R14S3R9BV4, EIA 0603) of Johanson Technology.

3. C7 : Non-critical 0 Ω

## 5.1 BMT332 2140MHz Test Result

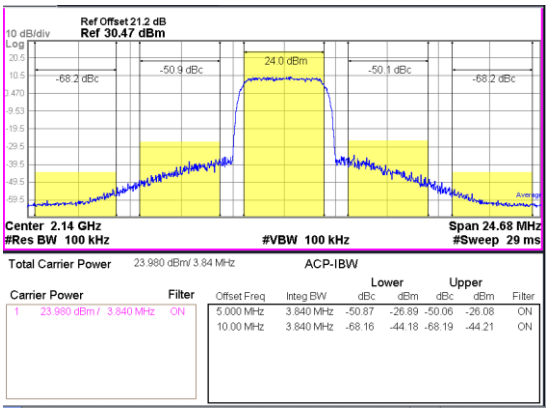
| Freq [MHz] | Vcc [V] | Iref [mA] | Icq [mA] | Gain [dB] | OIP3 [dBm](1) | P1dB [dBm] | IRL [dB] | ORL [dB] | NF [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 2140 | 5 | 32 | 667 | 26 | 47 | 33.2 | 18.5 | 11.9 | 6.8 |

**(1) OIP3 was tested @Pout=23dBm/tone (CW) 1MHz offset**

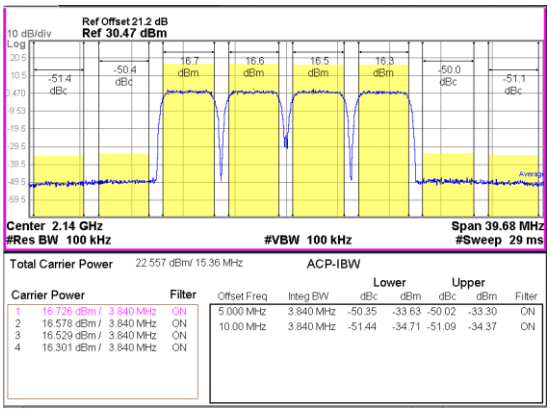


## 5.2 BMT332 2140MHz ACLR Test Result

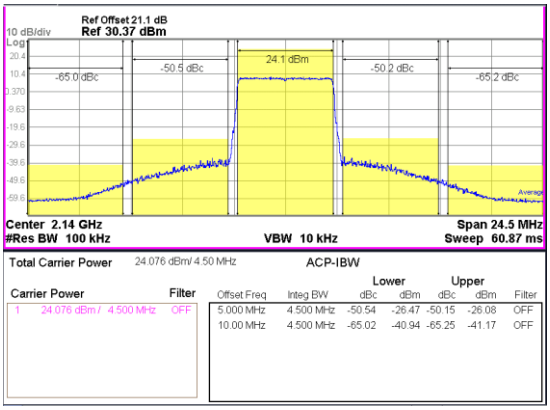
3GPP WCDMA TM1 +64DPCH 1FA



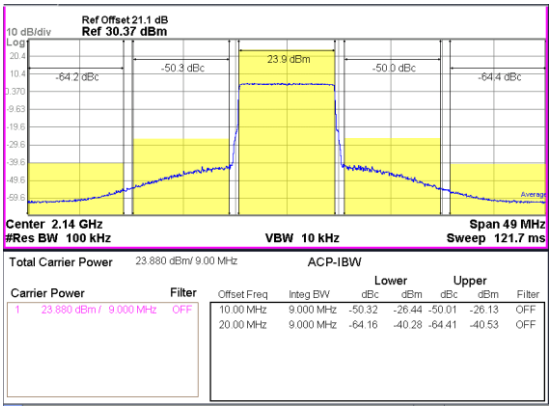

3GPP WCDMA TM1 +64DPCH 4FA



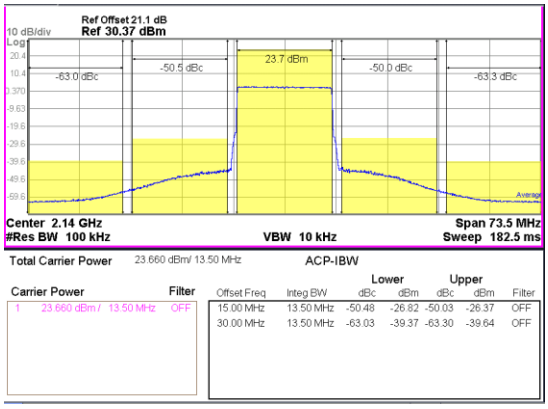

3GPP LTE E-TM3.1 5MHz



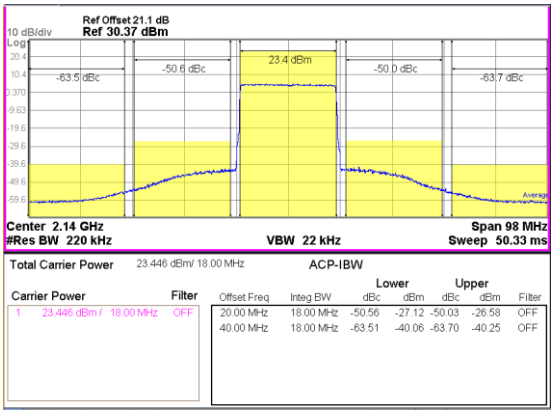

3GPP LTE E-TM3.1 10MHz




3GPP LTE E-TM3.1 15MHz

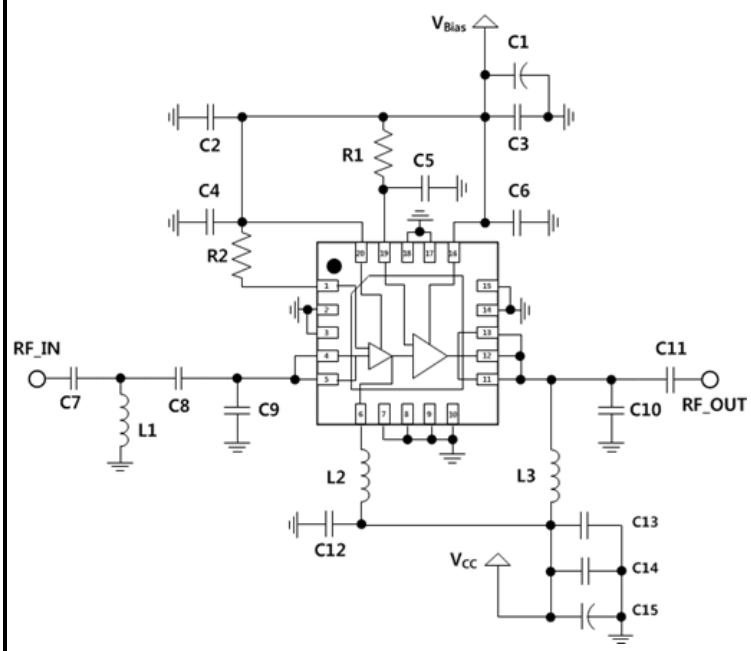



3GPP LTE E-TM3.1 20MHz



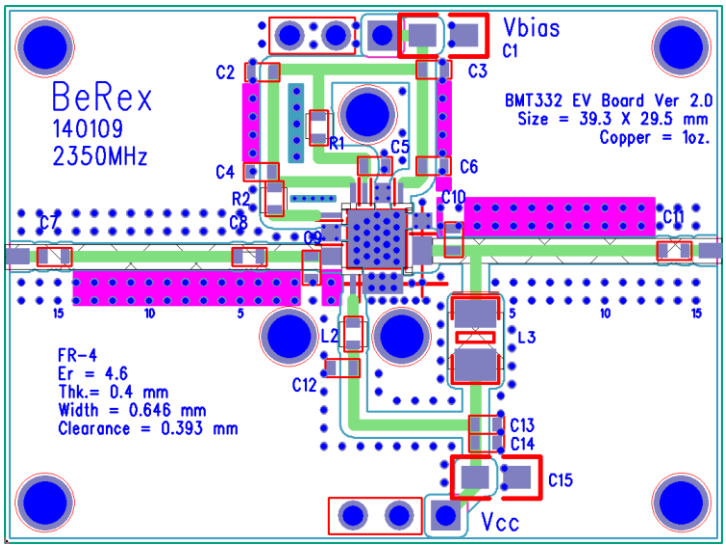
## 6. BMT332 2350MHz Application Note

**Schematic Diagram**




| BOM | | | Marks |
|---|---|---|---|
| C1 | 1206 | 10uF | Tantalum |
| C2 | 0603 | N/A | |
| C3 | 0603 | N/A | |
| C4 | 0603 | 0.75pF | |
| C5 | 0603 | 1nF | |
| C6 | 0603 | 1nF | |
| C7 | 0603 | 0 Ω | |
| C8 | 0603 | 2.2pF | |
| C9 | 0603 | 2.7pF | |
| C10 | 0603 | 3.3pF | High Q |
| C11 | 0603 | 22pF | |
| C12 | 0603 | 1uF | |
| C13 | 0603 | 100pF | |
| C14 | 0603 | 1nF | |
| C15 | 1206 | 10uF | Tantalum |
| L1 | 0603 | N/A | |
| L2 | 0603 | 15nH | |
| L3 | 1008 | 10nH | Coil |
| R1 | 0603 | 100 Ω | ±5% |
| R2 | 0603 | 270 Ω | ±5% |

**PCB Diagram**




**Notice**

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

| Reference | Object | Distance |
|---|---|---|
| Input pin | C8 | 3.6mm |
| Input pin | C9 | 0.8mm |
| Output pin | C10 | 1.4mm |
| Pin 16 | C6 | 2.0mm |
| Pin 19 | C5 | 1.0mm |
| Pin 20 | C4 | 5.0mm |

1. Pin 16 & 20 is used for Vce of the inner bias circuit. To eliminate bias line resonance you need above 10mm transmission line and adjust the position of C2, C3, C4 ,C5 and C6. Also you can adjust spectrum regrowth about bandwidth of signals which you want.

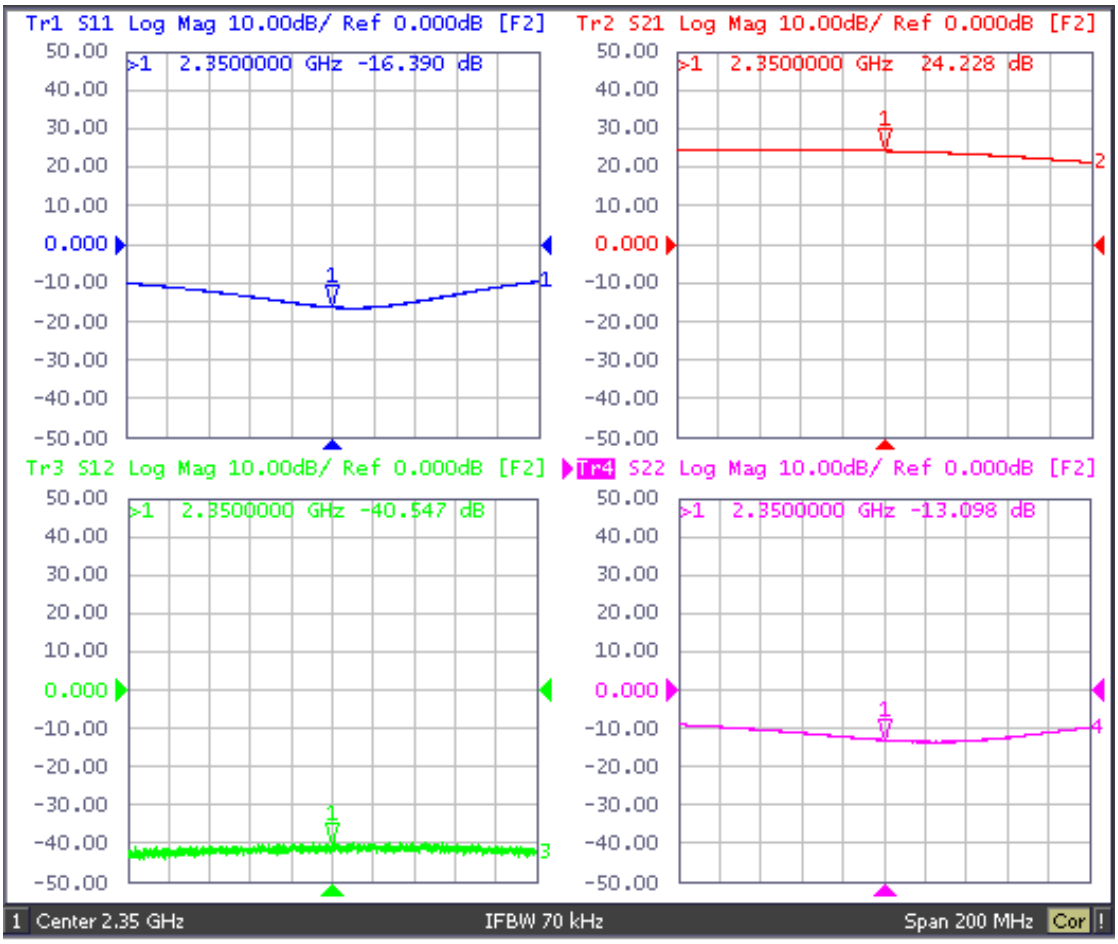
2.C10 : We recommend High-Q capacitor for better output power performance. In this document we used '3.3pF(251R14S3R3BV4, EIA 0603) of Johanson Technology.

3. C7 : Non-critical 0 Ω

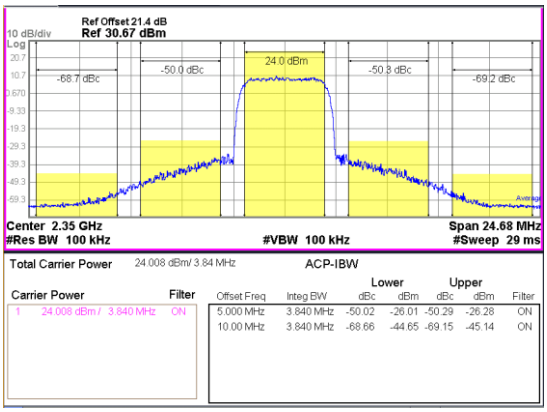
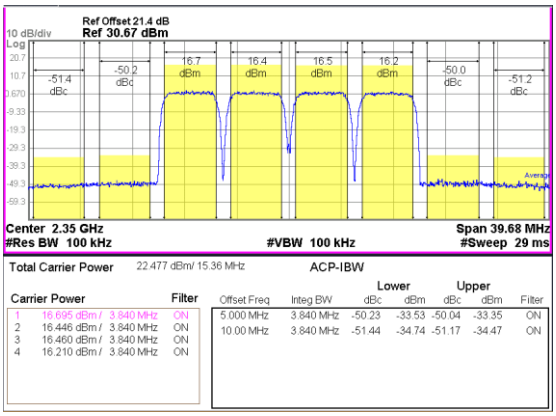
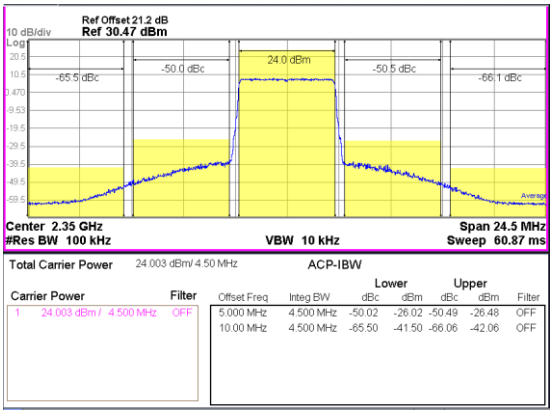
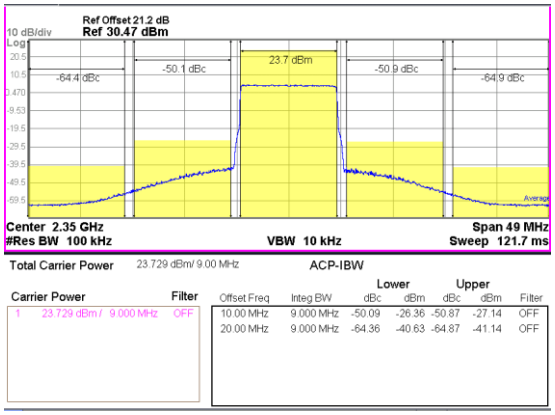
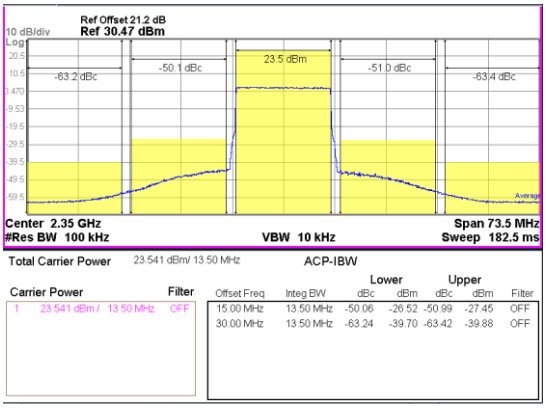
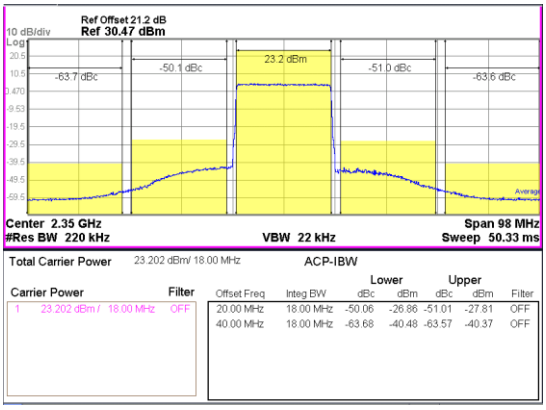
## 6.1 BMT332 2350MHz Test Result

| Freq [MHz] | Vcc [V] | Iref [mA] | Icq [mA] | Gain [dB] | OIP3 [dBm](1) | P1dB [dBm] | IRL [dB] | ORL [dB] | NF [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 2350 | 5 | 32 | 666 | 24.2 | 48 | 33.1 | 16.3 | 13 | 5.8 |

**(1) OIP3 was tested @Pout=23dBm/tone (CW) 1MHz offset**



## 6.2 BMT332 2350MHz ACLR Test Result

| 3GPP WCDMA TM1 +64DPCH 1FA | 3GPP WCDMA TM1 +64DPCH 4FA |
|---|---|
|  |  |
| 3GPP LTE E-TM3.1 5MHz | 3GPP LTE E-TM3.1 10MHz |
|  |  |
| 3GPP LTE E-TM3.1 15MHz | 3GPP LTE E-TM3.1 20MHz |
|  |  |