About this document

Scope and purpose
This application note describes Infineon’s BGA729N6 for portable and mobile applications and FM radio application in the range of 70 – 1000 MHz.

1. The BGA729N6 is a Silicon Germanium broadband Low Noise Amplifier (LNA).
2. It supports the portable and mobile TV applications and the FM radio application.
3. In this application note, the performance of BGA729N6 is presented. The circuit requires no external components for matching. The performance is measured on a FR4 board.
4. Key performance parameters at 2.8V, 470 MHz
   a) High Gain Mode:
      Noise Figure = 1.05 dB
      Insertion Gain = 16.5 dB
      Input return loss = 9.7 dB
      Output return loss = 17.7 dB
      Input P1dB = -15.8 dBm
   
   b) Bypass Mode:
      Noise figure = 5.0 dB
      Insertion Loss = 4.2 dB
      Input return loss = 15.5 dB
      Output return loss = 12.9 dB
      Input P1dB = 5.9 dBm
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1) The graphs are generated with the simulation program AWR Microwave Office®.
1 Introduction of Mobile TV and FM Radio Applications

1.1 Mobile TV application overview

Mobile phones today are all-in-one devices. They have not only wireless functions for voice and data but also entertainment features. Mobile TV is one of the most fascinating features. It brings live news and entertainment programs onto the phone display and enables people not to miss their favorite programs.

Figure 1 Application Diagram: Mobile TV and FM Reception in Mobile Phones with Band Selection Switch

1.2 Infineon’s devices for the Mobile TV application

Infineon’s mobile TV LNA BGA729N6 is especially designed for the mobile TV reception with 50-Ohm interfaces, while our RF transistors offer cost-effective solutions to improve the signal-to-noise ratio and therefore the quality of the TV reception. Those LNAs together with Infineon’s ESD protection diode from the ESD108-B1-CSP0201 and ESD103-B1-02EL/02ELS series improve systems’ ESD performance up to 8 kV contact discharge (IEC61000-4-2) at the antenna input. The parasitic capacitance is only 0.2 pF.

Infineon’s SP3T switch series can be used to switch between the mobile TV tuner IC and the FM tuner IC.

1.3 Requirement of the Mobile TV application on the Low Noise Amplifier

Low Noise Figure & High Gain

An external LNA or LNA module boosts the sensitivity of the system by reducing the overall NF. In addition due to the size constraint, the modem antenna and the receiver FE cannot always be placed close to the transceiver Integrated Circuit (IC). The path loss in front of the integrated LNA on the transceiver IC increases the system NF significantly. An external LNA physically close to the antenna can help to eliminate
the path loss and reduce the system NF. The sensitivity can be improved by several dB, which means a significant increase in the connectivity range.

*High Linearity (1-dB compression point P1dB and 3rd-order intercept point IP3):* An increased number of bands at the receiver input create strong interference, leading to high requirements in linearity characteristics such as high input 1-dB compression point, 2nd intermodulation (IMD2) products and input IP3 performance.

*Stable Gain:*

The portable and mobile TV application ranges from 170 MHz to 960 MHz, a stable gain over this broad frequency range is a key requirement to the mobile TV LNA.

1.4 **FM Radio application overview**

Frequency Modulation (FM) radio has a long history, starting from its development in 1933. Today, FM radio is an integral part of almost all mobile phones. The headset cable can serve as an antenna for FM reception. Its size (~75 cm) is ideal to have good reception. Nevertheless, no FM reception is possible when the headset is not available.

There is a clear market trend to be able to use FM radio without the headset cable, meaning that the antenna has to be integrated inside the phone. However, there are space constraints on the antenna design. Shrinking the size of the antenna introduces a high loss in the system which reduces the receiver's sensitivity.

1.5 **BGA729N6 as Low Noise Amplifier for the FM Radio application**

The BGA729N6 also covers the FM radio frequencies, and is a potential solution as low noise amplifier for FM radio application. The LNA is prematched as a 50 Ohm solution, it solves the problem of the short FM antenna in mobile phones through better impedance match between the FM antenna and the FM receiver. Therefore, it can keep the system signal-to-noise ratio as good as with a headset.
2 BGA729N6 Overview

2.1 Features

- Insertion power gain: 16.3 dB
- Insertion Loss in bypass mode: -4.2 dB
- Low noise figure: 1.05 dB / 4.3 dB in high gain / bypass mode
- Low current consumption: 6.3 mA
- Power off function
- Operating frequency: 70 -1000 MHz
- Three-state control: OFF-, Bypass- and High gain-Mode
- Supply voltage: 1.5 V to 3.3 V
- Ultra small TSNP-6-2 leadless package (footprint: 0.7 x 1.1 mm²)
- B7HF Silicon Germanium technology
- No external matching inductor required
- RF input and output internally matched to 50Ω
- Only 2 external SMD components necessary
- 2kV HBM ESD protection (including AI-pin)
- Pb-free (RoHS compliant) package

2.2 Key Applications of BGA729N6

The BGA729N6 is a broadband low power low noise amplifier (LNA) MMIC for portable and mobile TV applications and FM radio application.

2.3 Description

The BGA729N6 is a broadband low power low noise amplifier (LNA) MMIC for portable and mobile TV applications and FM radio application which covers a wide frequency range from 70 MHz to 1000 MHz. The LNA provides 16.3 dB gain and 1.05 dB noise figure at a current consumption of 6.3 mA in the application configuration described in Chapter 3. In bypass mode, the LNA provides an insertion loss of -4.2 dB. The bypass mode with much higher linearity enables this LNA to work with much lower current consumption than commonly used TV LNAs. The BGA729N6 is based upon Infineon Technologies's B7HF Silicon Germanium technology. It operates from 1.5 V to 3.3 V supply voltage.
Broadband LNA for Mobile TV and FM Radio Applications

BGA729N6 Overview

Please visit the product page of BGA729N6 for more information.

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![Equivalent Circuit of BGA729N6](image)

**Figure 3** Equivalent Circuit of BGA729N6

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Marking</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGA729N6</td>
<td>M</td>
<td>TSNP-6-2</td>
</tr>
</tbody>
</table>

**Table 1** Pin Assignment of BGA729N6

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GS</td>
<td>High gain / bypass control</td>
</tr>
<tr>
<td>2</td>
<td>VCC</td>
<td>DC supply</td>
</tr>
<tr>
<td>3</td>
<td>AO</td>
<td>LNA output</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>5</td>
<td>AI</td>
<td>LNA input</td>
</tr>
<tr>
<td>6</td>
<td>PON</td>
<td>Power on / off control</td>
</tr>
</tbody>
</table>

**Table 2** Gain Mode Selection Truth Table

<table>
<thead>
<tr>
<th>Control Voltage ( V_{PON} )</th>
<th>Control Voltage ( V_{GS} )</th>
<th>Gain Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Low</td>
<td>High Gain</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
<td>Bypass</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td>Bypass</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
<td>Off</td>
</tr>
</tbody>
</table>
3 Application Circuit and Performance Overview

In this chapter the performance of the application circuit, the schematic and bill-on-materials are presented.

Device: BGA729N6
Application: Broadband LNA for Mobile TV and FM Radio Applications
PCB Marking: M150831
EVB Order No.: AN441

3.1 Summary of Measurement Results

The performance of BGA729N6 for Mobile TV and FM Radio Applications is summarized in the following table.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
<th>Comment/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application System</td>
<td>Sys</td>
<td>FM</td>
<td>MobileTV</td>
<td>MobileTV</td>
</tr>
<tr>
<td>DC Voltage</td>
<td>Vcc</td>
<td>2.8</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>DC Current</td>
<td>Icc</td>
<td>6.4</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Frequency Range</td>
<td>Freq</td>
<td>88 (^1)</td>
<td>470</td>
<td>860</td>
</tr>
<tr>
<td>Insertion Power Gain</td>
<td>G</td>
<td>17.2</td>
<td>16.5</td>
<td>15.8</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>NF</td>
<td>1.00</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>RLin</td>
<td>9.1</td>
<td>9.7</td>
<td>8.8</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>RLOut</td>
<td>21.3</td>
<td>17.7</td>
<td>13.6</td>
</tr>
<tr>
<td>Reverse Isolation</td>
<td>IRev</td>
<td>27.5</td>
<td>28.0</td>
<td>28.8</td>
</tr>
<tr>
<td>Input IP1dB</td>
<td>IP1dB</td>
<td>-18.2</td>
<td>-15.8</td>
<td>-14.8</td>
</tr>
<tr>
<td>Output IP1dB</td>
<td>OP1dB</td>
<td>-2.0</td>
<td>-0.3</td>
<td>0</td>
</tr>
<tr>
<td>Input IP3</td>
<td>IIP3</td>
<td>-5.1</td>
<td>-4.5</td>
<td>-3.3</td>
</tr>
<tr>
<td>Output IP3</td>
<td>OIP3</td>
<td>11.8</td>
<td>11.7</td>
<td>12.5</td>
</tr>
<tr>
<td>Stability</td>
<td>k</td>
<td>&gt;1</td>
<td></td>
<td>--</td>
</tr>
</tbody>
</table>

Note: 1) Globally the FM radio frequencies are allocated between 66 – 108 MHz.

\( V_{PON} = 2.8 \text{ V}, V_{BP} = 0 \text{ V} \)
2) To view the performance in VHF III band (174 MHz -230 MHz), please refer to application note AN505.

Table 4  Electrical Characteristics (at room temperature) at 2.8 V for Bypass Mode

$V_{PON} = 2.8 \text{ V}, \ V_{BP} = 2.8 \text{ V}$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
<th>Comment/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application System</td>
<td>Sys</td>
<td>FM</td>
<td>MobileTV</td>
<td>MobileTV UHF</td>
</tr>
<tr>
<td>DC Voltage</td>
<td>Vcc</td>
<td>2.8</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>DC Current</td>
<td>Icc</td>
<td>0.6</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Frequency Range</td>
<td>Freq</td>
<td>88(1)</td>
<td>470</td>
<td>860</td>
</tr>
<tr>
<td>Gain</td>
<td>G</td>
<td>-6.7</td>
<td>-4.2</td>
<td>-4.9</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>NF</td>
<td>7.9</td>
<td>5.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>RLin</td>
<td>5.2</td>
<td>15.5</td>
<td>13.0</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>RLOut</td>
<td>11.1</td>
<td>12.9</td>
<td>11.4</td>
</tr>
<tr>
<td>Reverse Isolation</td>
<td>IRev</td>
<td>6.8</td>
<td>4.2</td>
<td>4.5</td>
</tr>
<tr>
<td>Input P1dB</td>
<td>IP1dB</td>
<td>6.1</td>
<td>5.9</td>
<td>6.3</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>OP1dB</td>
<td>-1.6</td>
<td>0.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Input IP3</td>
<td>IIP3</td>
<td>21.1</td>
<td>21.2</td>
<td>23.7</td>
</tr>
<tr>
<td>Output IP3</td>
<td>OIP3</td>
<td>14.2</td>
<td>17.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Stability</td>
<td>k</td>
<td>&gt;1</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: 1) Globally the FM radio frequencies are allocated between 66 – 108 MHz.

2) To view the performance in VHF III band (174 MHz -230 MHz), please refer to application note AN505.
**Table 5**  Electrical Characteristics (at room temperature) at 1.8 V for High Gain Mode

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
<th>Comment/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application System</td>
<td>Sys</td>
<td>FM</td>
<td>MobileTV</td>
<td>MobileTV</td>
</tr>
<tr>
<td>DC Voltage</td>
<td>Vcc</td>
<td>1.8</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>DC Current</td>
<td>Icc</td>
<td>6.3</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Frequency Range</td>
<td>Freq</td>
<td>88(^1)</td>
<td>470</td>
<td>860</td>
</tr>
<tr>
<td>Insertion Power Gain</td>
<td>G</td>
<td>17.1</td>
<td>16.4</td>
<td>15.7</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>NF</td>
<td>0.95</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>RLin</td>
<td>8.9</td>
<td>9.5</td>
<td>8.6</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>RLout</td>
<td>21.0</td>
<td>17.3</td>
<td>13.5</td>
</tr>
<tr>
<td>Reverse Isolation</td>
<td>IRev</td>
<td>27.4</td>
<td>27.8</td>
<td>28.3</td>
</tr>
<tr>
<td>Input P1dB</td>
<td>IP1dB</td>
<td>-18.1</td>
<td>-16.3</td>
<td>-15.5</td>
</tr>
<tr>
<td>Output P1dB</td>
<td>OP1dB</td>
<td>-2.0</td>
<td>-0.9</td>
<td>-0.8</td>
</tr>
<tr>
<td>Input IP3</td>
<td>IIP3</td>
<td>-4.7</td>
<td>-4.0</td>
<td>-4.5</td>
</tr>
<tr>
<td>Output IP3</td>
<td>OIP3</td>
<td>11.9</td>
<td>12.0</td>
<td>11.2</td>
</tr>
<tr>
<td>Stability</td>
<td>k</td>
<td>&gt;1</td>
<td>--</td>
<td>Measured up to 10 GHz</td>
</tr>
</tbody>
</table>

Note: 1) Globally the FM radio frequencies are allocated between 66 – 108 MHz.

2) To view the performance in VHF III band (174 MHz -230 MHz), please refer to application note AN505.
## Table 6  Electrical Characteristics (at room temperature) at 1.8 V for Bypass Mode

\( V_{\text{PON}} = 1.8 \text{V} , V_{\text{BP}} = 1.8 \text{V} \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>FM Radio</th>
<th>MobileTV UHF</th>
<th>MobileTV UHF</th>
<th>Unit</th>
<th>Comment/Test Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application System</td>
<td>Sys</td>
<td></td>
<td></td>
<td></td>
<td>MHz</td>
<td></td>
</tr>
<tr>
<td>DC Voltage</td>
<td>Vcc</td>
<td></td>
<td></td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>DC Current</td>
<td>Icc</td>
<td></td>
<td></td>
<td></td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Frequency Range</td>
<td>Freq</td>
<td>88(^1)</td>
<td>470</td>
<td>860</td>
<td>MHz</td>
<td>Loss of input/output line of 0.01 dB @ 88MHz, 0.03 dB @ 470MHz, 0.05 dB @ 860 MHz are included</td>
</tr>
<tr>
<td>Insertion Power Gain</td>
<td>G</td>
<td>-6.9</td>
<td>-4.5</td>
<td>-4.8</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Noise Figure</td>
<td>NF</td>
<td>7.9</td>
<td>5.0</td>
<td>4.4</td>
<td>dB</td>
<td>Loss of input/output line of 0.01 dB @ 88MHz, 0.03 dB @ 470MHz, 0.05 dB @ 860 MHz are deembedded</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>RLin</td>
<td>5.1</td>
<td>15.1</td>
<td>12.3</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>RLOut</td>
<td>11.3</td>
<td>13.1</td>
<td>11.5</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Reverse Isolation</td>
<td>IRev</td>
<td>6.9</td>
<td>4.5</td>
<td>4.8</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Input P1dB</td>
<td>IP1dB</td>
<td>3.5</td>
<td>3.0</td>
<td>6.0</td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td>Output P1dB</td>
<td>OP1dB</td>
<td>-4.4</td>
<td>-2.5</td>
<td>0.2</td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td>Input IP3</td>
<td>IIP3</td>
<td>15.5</td>
<td>15.6</td>
<td>17.9</td>
<td>dBm</td>
<td>( f_1 = 88, 470, 860 \text{MHz} ) respectively, ( f_2 = f_1 + 1 \text{MHz} ) -10 dBm per tone</td>
</tr>
<tr>
<td>Output IP3</td>
<td>OIP3</td>
<td>8.5</td>
<td>11.1</td>
<td>13.1</td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td>Stability</td>
<td>k</td>
<td>&gt;1</td>
<td></td>
<td></td>
<td>--</td>
<td>Measured up to 10 GHz</td>
</tr>
</tbody>
</table>

Note: 1) Globally the FM radio frequencies are allocated between 66 – 108 MHz.
2) To view the performance in VHF III band (174 MHz -230 MHz), please refer to application note AN505.
3.2 BGA729N6 as 70 MHz – 1000 MHz Low Noise Amplifier for Mobile TV and FM Radio Applications

The BGA729N6 is a Silicon Germanium Low Noise Amplifier for mobile TV applications and FM radio application in the range from 70 MHz – 1000 MHz. In this application note, the performance of BGA729N6 for mobile TV and FM radio applications is investigated at 1.8 V and 2.8 V supply voltages. The circuit targets to use as few components as possible.

At 2.8V, 88 MHz, in the high gain mode the BGA729N6 achieves a noise figure of 1.0 dB and a gain of 17.2 dB. The input return loss is 9.1 dB and output return loss is 21.3 dB. It obtains the input 1dB Compression Point (IP1dB) at -18.2 dBm. Using two tones of –30 dBm spacing 1 MHz, the circuit achieves an input Third-order Intercept Point (IIP3) of -5.1 dBm.

At 2.8 V, 88 MHz, in the bypass mode the BGA729N6 achieves a noise figure of >3.0 dB and an insertion loss of 6.7 dB. The input return loss is 5.2 dB and output return loss is 11.1 dB. It obtains the input 1dB Compression Point (IP1dB) at 3.5 dBm. Using two tones of –10 dBm spacing 1 MHz, the circuit achieves an input Third-order Intercept Point (IIP3) of 15.5 dBm.

At 2.8V, 470 MHz, in the high gain mode the BGA729N6 achieves a noise figure of 1.2 dB and a gain of 16.5 dB. The input return loss is 9.7 dB and output return loss is 17.7 dB. It obtains the input 1dB Compression Point (IP1dB) at -15.8 dBm. Using two tones of –30 dBm spacing 1 MHz, the circuit achieves an input Third-order Intercept Point (IIP3) of -4.5 dBm.

At 2.8 V, 470 MHz, in the bypass mode the BGA729N6 achieves a noise figure of >3.0 dB and an insertion loss of 4.2 dB. The input return loss is 15.5 dB and output return loss is 12.9 dB. It obtains the input 1dB Compression Point (IP1dB) at 5.9 dBm. Using two tones of –10 dBm spacing 1 MHz, the circuit achieves an input Third-order Intercept Point (IIP3) of 21.2 dBm.

The circuit is unconditionally stable up to 10 GHz.
3.3 Schematics and Bill-of-Materials

The schematic of BGA729N6 for mobile TV and FM radio applications is presented in Figure 4 and its bill-of-materials is shown in Table 7.

![Schematics of the BGA729N6 Application Circuit](image)

**Figure 4** Schematics of the BGA729N6 Application Circuit

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
<th>Size</th>
<th>Manufacturer</th>
<th>Comment</th>
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<tr>
<td>C1</td>
<td>1</td>
<td>nF</td>
<td>0402</td>
<td>Various</td>
<td>DC block 1)</td>
</tr>
<tr>
<td>C2</td>
<td>1</td>
<td>nF</td>
<td>0402</td>
<td>Various</td>
<td>DC block 1)</td>
</tr>
<tr>
<td>C3</td>
<td>&gt;=1</td>
<td>nF</td>
<td>0402</td>
<td>Various</td>
<td>RF bypass2, Necessary in FM application, optional in mobile TV application</td>
</tr>
<tr>
<td>N1</td>
<td>BGA729N6</td>
<td></td>
<td></td>
<td>Infineon</td>
<td>SiGe LNA</td>
</tr>
</tbody>
</table>

**Table 7** Bill-of-Materials

*Note:* 1) DC block might be necessary due to internal LNA bias voltage @ AI (LNA Analog Input pin). The DC block can be realized pre-filter (e.g. SAW)

2) The RF bypass capacitor C3 at the DC power supply pin filters out the power supply noise and stabilizes the DC supply. The RF bypass capacitor C3 is not necessary if a clean and stable DC supply can be ensured.
4 Measurement Graphs

The performance of the application circuit is presented with the following graphs.

4.1 High Gain Mode (Selected Graphs)

Figure 5 Insertion Gain (Narrowband) of the BGA729N6 for Mobile TV and FM Radio Applications

Figure 6 Insertion Gain (Wideband) of the BGA729N6 for Mobile TV and FM Radio Applications
Figure 7  Noise Figure (SMA and connector loss deembedded) of the BGA729N6 for Mobile TV and FM Radio Applications

Figure 8  Input Return Loss of the BGA729N6 for Mobile TV and FM Radio Applications
Figure 9  Input Return Loss (Smith Chart) of the BGA729N6 for Mobile TV and FM Radio Applications

Figure 10  Output Return Loss of the BGA729N6 for Mobile TV and FM Radio Applications
Figure 11  Output Return Loss (Smith Chart) of the BGA729N6 for Mobile TV and FM Radio Applications

Figure 12  Reverse Isolation of the BGA729N6 for Mobile TV and FM Radio Applications
Figure 13  Stability Factor $k$ of the BGA729N6 for Mobile TV and FM Radio Applications

Figure 14  Stability Factor $\mu_1, \mu_2$ of the BGA729N6 for Mobile TV and FM Radio Applications
Figure 15  1 dB Compression Point of the BGA729N6 for Mobile TV and FM Radio Applications (88 MHz)

Figure 16  1 dB Compression Point of the BGA729N6 for Mobile TV and FM Radio Applications (470 MHz)
Figure 17  1 dB Compression Point of the BGA729N6 for Mobile TV and FM Radio Applications (860 MHz)

Figure 18  Third-Order Intercept Point of the BGA729N6 for Mobile TV and FM Radio Applications (2.8V, 88 MHz)
Figure 19  Third-Order Intercept Point of the BGA729N6 for Mobile TV and FM Radio Applications (2.8V, 470 MHz)

Figure 20  Third-Order Intercept Point of the BGA729N6 for Mobile TV and FM Radio Applications (2.8V, 860 MHz)
4.2 Bypass Mode (Selected Graphs)

**Figure 21** Insertion Gain (Wideband) of the BGA729N6 for Mobile TV and FM Radio Applications

**Figure 22** Insertion Gain (Wideband) of the BGA729N6 for Mobile TV and FM Radio Applications
Figure 23  Input Return Loss of the BGA729N6 for Mobile TV and FM Radio Applications

Figure 24  Output Return Loss of the BGA729N6 for Mobile TV and FM Radio Applications
**Stability Factor**

**Figure 25**  
Stability Factor $k$ of the BGA729N6 for Mobile TV and FM Radio Applications

**Figure 26**  
1 dB Compression Point of the BGA729N6 for Mobile TV and FM Radio Applications (88 MHz)
Figure 27  
1 dB Compression Point of the BGA729N6 for Mobile TV and FM Radio Applications (470 MHz)

Figure 28  
1 dB Compression Point of the BGA729N6 for Mobile TV and FM Radio Applications (860 MHz)
Figure 29  Third-Order Intercept Point of the BGA729N6 for Mobile TV and FM Radio Applications (2.8V, 88 MHz)

Figure 30  Third-Order Intercept Point of the BGA729N6 for Mobile TV and FM Radio Applications (2.8V, 470 MHz)
Figure 31  Third-Order Intercept Point of the BGA729N6 for Mobile TV and FM Radio Applications (2.8V, 860 MHz)
5 Evaluation Board and Layout Information

In this application note, the following PCB is used:

- PCB Marking: **M150831**
- PCB material: **<FR4>**
- $\varepsilon_r$ of PCB material: **<4.8>**

![Photo Picture of Evaluation Board (overview) (PCB Marking M150831 Rev.1.0)](image)

![Photo Picture of Evaluation Board (detailed view)](image)
Figure 34  PCB Layer Information

Copper 35µm

FR4, 0.2mm

FR4, 0.8mm

Vias

Vias
6 Authors
Xiang Li, Application Engineer of Business Unit “RF and Sensor Devices”

7 Reference

Revision History

Major changes since the last revision

<table>
<thead>
<tr>
<th>Page or Reference</th>
<th>Description of change</th>
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<tbody>
<tr>
<td>8 - 28</td>
<td>Removed the 1000 MHz measurement point, added the measurement point 860 MHz for mobile TV application, updated measurement results</td>
</tr>
<tr>
<td>7- 28</td>
<td>Measurement results updated with results from final samples</td>
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AN_201509_PL32_002

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