GSM Antenna Detection

Application Note

GSM/GPRS Module Series

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# About the document

## History

<table>
<thead>
<tr>
<th>Revision</th>
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<th>Author</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>
Contents

About the document ................................................................................................................................... 2
Contents ....................................................................................................................................................... 3
Table Index ................................................................................................................................................... 4
Figure Index ................................................................................................................................................. 5

1 Introduction .......................................................................................................................................... 6
2 For Antenna Assembly (Recommended) .......................................................................................... 7
3 For DC Short Antenna (e.g. PIFA Antenna) ....................................................................................... 9
4 For DC Open Antenna (e.g. MONO POLE Antenna) ........................................................................... 11
Table Index

TABLE 1: AN EXAMPLE OF COMPONENTS FOR ANTENNA ASSEMBLY DETECTION ........................ 7
TABLE 2: AN EXAMPLE OF COMPONENTS FOR DC SHORT ANTENNA .............................................. 9
TABLE 3: AN EXAMPLE OF COMPONENTS FOR DC OPEN ANTENNA DETECTION ......................... 11
Figure Index

FIGURE 1: REFERENCE CIRCUIT FOR ANTENNA ASSEMBLY .............................................................. 7
FIGURE 2: REFERENCE CIRCUIT FOR DC SHORT ANTENNA .............................................................. 9
FIGURE 3: REFERENCE CIRCUIT FOR DC OPEN ANTENNA ...............................................................11
1 Introduction

GSM antenna detection application notes will be provided in this document.

Antenna detection is performed by ADC measurement on the voltage of resistor brought by detection circuit, the voltage source can be VDD_EXT in the module or other external voltage. The value is reported by AT command: AT+QADC? (Refer to corresponding Quectel module AT Commands Manual).

The following reference circuits are suitable for all Quectel modules with ADC function, such as M10, M12, M50, M72, M80 etc.
2 For Antenna Assembly (Recommended)

It is recommended to use antenna assembly for antenna detection. The detection components are usually embedded in the antenna base. This kind of antenna assembly is often customized.

Table 1: An Example of Components for Antenna Assembly Detection

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommended Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC blocking capacitor</td>
<td>56pF</td>
</tr>
<tr>
<td>RF choke inductor</td>
<td>68nH</td>
</tr>
<tr>
<td>Vol_div resistor</td>
<td>10K Ohm</td>
</tr>
</tbody>
</table>
The response of “AT+QADC?” is:
+QADC: <status>, <value>

The parameter <status>=0 means ADC reports fail, <status>=1 means ADC reports success. The <value> indicates the report voltage with the unit mV.

Suppose: using the recommended components in the above table; VDD_EXT is 2.8V
Then:

- If antenna is normal, the response value will be 1400 ± 100;
- If antenna is removed, the response value will be 2800 ± 100.
3 For DC Short Antenna (e.g. PIFA Antenna)

If the DC impedance between antenna radiating element and ground is zero, the antenna is called DC short antenna, just like PIFA antenna which is often used and very popular now days. The recommended antenna detection circuit is given as Figure 2.

Table 2: An Example of Components for DC Short Antenna

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommended Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC blocking capacitor</td>
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<tr>
<td>RF choke inductor</td>
<td>68nH</td>
</tr>
<tr>
<td>Vol_div resistor</td>
<td>10K Ohm</td>
</tr>
</tbody>
</table>
The response of “AT+QADC?” is:

+QADC: <status>, <value>

The parameter <status>=0 means ADC reports fail, <status>=1 means ADC reports success. The <value> indicates the report voltage with the unit mV.

Suppose: using the recommended component in the above table; VDD_EXT is 2.8V

Then:

- if antenna is normal, the response value will be 1400±100;
- if antenna is removed, the response value will be 2800±100.
4 For DC Open Antenna (e.g. MONO POLE Antenna)

If the DC impedance between the antenna radiating element and ground is infinite, the antenna is called DC open antenna, just like MONOPOLE antenna and some vehicle antenna. The recommended antenna detection circuit is given as Figure 3.

Table 3: An Example of Components for DC Open Antenna Detection

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommended Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC blocking capacitor</td>
<td>56pF</td>
</tr>
<tr>
<td>RF choke inductor</td>
<td>68nH</td>
</tr>
<tr>
<td>Vol_div resistor</td>
<td>10K Ohm</td>
</tr>
</tbody>
</table>

Figure 3: Reference circuit for DC open antenna
The response of “AT+QADC?” is:

\[
+QADC: \langle status \rangle, \langle value \rangle
\]

The parameter \(<status>=0\) means ADC reports fail, \(<status>=1\) means ADC reports success. The \(<value>\) indicates the report voltage with the unit mV.

**Suppose:** using the recommended component in above table; VDD_EXT is 2.8V

Then:

- If antenna is normal, the response value will be \(1400 \pm 100\);
- If antenna is removed, the response value will be \(2800 \pm 100\).