Specification

Part No. : NCS.5820

Product Name : Extensis NCS Series Embedded NB-IoT SMD Antenna covering Bands 5, 8 & 20

Features : Low Profile, Small Footprint SMD Antenna
Global NB-IoT Coverage for:
- Band 5, 824-894MHz
- Band 8, 880-960MHz
- Band 20, 791-862MHz

High Efficiency across each Band
Dimensions: 20 x 11 x 1.6mm
RoHS compliant
1. Introduction

The evolution of IoT connectivity has seen an urgent need for a low power way to connect thousands of devices. The Extensis NCS series of NB-IoT embedded antennas are the smallest form factor antennas on the market to facilitate this demand.

This part no. the NCS.5820 supports **Bands 5** (824-894MHz), **8** (880-960MHz) and **20** (791-862MHz) and demonstrates excellent efficiency in providing global NB-IoT coverage. This antenna will allow the device manufacturer to enjoy mobilization between all bands so that the device can be used in more than one region with more than one carrier. On the contrary, an antenna covering only one band will have less mobility and will not be suitable for international roaming over Low Power Wide Area networks.

With a super low profile height of 1.6 mm and a footprint of just 11 x 20mm, the surface mount antenna can be easily integrated into even the smallest of devices. It allows device designers to take advantage of all of the benefits of NB-IoT technology, including reduced power consumption and increased battery life; increased system capacity and spectrum efficiency; and extended coverage in both rural and deep indoors environments all with a very small form factor. For testing, it can be supplied on the NCSD.5820 evaluation board, see section 5.2.

Typical applications include **Remote monitoring / Smart meters, Network devices, Smart cities & buildings, Manufacturing automation, Agriculture / Environment and asset tracking**.

Ease of integration and exceptional performance of this antenna make it the perfect starting point for any NB-IoT device design. It is also an ideal choice for cost-sensitive
applications considering also that the material used for this antenna is lower cost than the traditional ceramic NB-IoT antenna. Overall, this antenna is suitable for applications that need to meet the following requirements:

- Small footprint, low profile design factors
- Long battery life of up to 10 years is required
- Deep indoor penetration with +20dB link budget compared with GSM is required
- Low cost, with an industry target of < $5 per radio module. The material used for this antenna is lower cost than the traditional ceramic NB-IoT antenna
- High security from proven LTE-based security mechanisms
- A worldwide 3GPP industry standard on operator-managed networks in licensed spectrum
- Possibility of up to 100x more devices per cell compared with GSM

For more information or support with integrating this antenna into your device, please contact your regional Taoglas sales office.
2. Specification

<table>
<thead>
<tr>
<th></th>
<th>Band 5</th>
<th>Band 8</th>
<th>Band 20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency (MHz)</strong></td>
<td>824~894</td>
<td>880~960</td>
<td>791~862</td>
</tr>
<tr>
<td><strong>Peak Gain (dBi)</strong></td>
<td>0.1</td>
<td>0.1</td>
<td>-0.8</td>
</tr>
<tr>
<td><strong>Average Gain (dBi)</strong></td>
<td>-3.8</td>
<td>-3.6</td>
<td>-4.1</td>
</tr>
<tr>
<td><strong>Efficiency (%)</strong></td>
<td>42</td>
<td>44</td>
<td>39</td>
</tr>
<tr>
<td><strong>Return Loss (dB)</strong></td>
<td>&lt;-6</td>
<td>&lt;-7</td>
<td>&lt;-7</td>
</tr>
<tr>
<td><strong>Polarization</strong></td>
<td>Linear</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impedance</strong></td>
<td>50 Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maximum Input Power</strong></td>
<td>5W</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Antenna Dimensions</strong></td>
<td>20mm x 11mm x 1.6mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>FR4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>0.74 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Soldering Type</strong></td>
<td>SMT through Reflow</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operation Temperature</strong></td>
<td>-40°C ~ +85°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>-40°C ~ +85°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>Non-condensing 65°C 95% RH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: All measurements were conducted with SMT on a 115*35mm evaluation board with 100mm length ground plane and matching circuit. See EVB drawing and matching circuit diagram in Section 5.
3. Antenna Characteristics

All data was measured on the evaluation board illustrated in Section 5, with the documented matching circuit.

3.1 Return Loss

![Return Loss Graph]

3.2 Efficiency

![Efficiency Graph]
3.3 Average Gain

3.4 Peak Gain
4. Antenna Radiation Patterns

4.1 Antenna Setup (Antenna Test Setup in Anechoic Chamber)
4.2 2D Radiation Patterns

XY Plane

XZ Plane

YZ Plane
4.3 3D Radiation Patterns

- 791MHz
- 824MHz
- 862MHz
- 960MHz
5. Mechanical Drawing (Unit: mm)

5.1 Antenna Drawing

NOTE:
1. Au Plated area
2. Solder Mask area
3. Copper area
4. Paste area
5. Keepout Region area
6. Soldermask (Green_Pantone 377)

7. Ground keepout should extend through any inner PCB layers and any sides around the antenna till the board edge to minimize coupling from RF feed to ground, except the side facing system ground.
8. Any vias in pads should be either filled or tented to prevent solder from wicking away from the pad during reflow.
9. The dimension tolerances should follow standard PCB manufacturing guidelines.
5.2 Recommended PCB Layout

5.2.1 Top Copper

5.2.2 Top Solder Paste
5.2.3 Top Solder Mask

![Top Solder Mask Diagram]

5.2.4 Composite Diagram

![Composite Diagram]

NOTE:
1. Au Plated area
2. Solder Mask area
3. Copper area
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   (Green_Pantone 377)

7. Ground keepout should extend through any inner PCB layers and any sides around the antenna till the board edge to minimize coupling from RF feed to ground, except the side facing system ground.
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9. The dimension tolerances should follow standard PCB manufacturing guidelines.
5.3 Evaluation Board

<table>
<thead>
<tr>
<th>Name</th>
<th>Material</th>
<th>Finish</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 NCS.5820 PCB Antenna</td>
<td>Composite 1.5t</td>
<td>Black</td>
<td>1</td>
</tr>
<tr>
<td>2 NB-lot EVB PCB</td>
<td>Composite 0.7t</td>
<td>Black</td>
<td>1</td>
</tr>
<tr>
<td>3 2.7nH Inductor (0402)</td>
<td>Ceramic</td>
<td>Natural</td>
<td>1</td>
</tr>
<tr>
<td>4 1.2pF Capacitor (0402)</td>
<td>Ceramic</td>
<td>Natural</td>
<td>1</td>
</tr>
<tr>
<td>5 2.2nH Inductor (0402)</td>
<td>Ceramic</td>
<td>Natural</td>
<td>1</td>
</tr>
<tr>
<td>6 SMA(F) ST PCB</td>
<td>Brass</td>
<td>Au Plated</td>
<td>1</td>
</tr>
</tbody>
</table>
5.4 Evaluation Board Matching Circuit
6. Packaging

T.B.D.

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