This antenna **must** have metal underneath in order to function properly.

### General Specifications

<table>
<thead>
<tr>
<th><strong>Part Number</strong></th>
<th>2450AT42E0100E-AEC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency (MHz)</strong></td>
<td>2400 - 2480</td>
</tr>
<tr>
<td><strong>Peak Gain</strong></td>
<td>-2.0 dBi typ. (YZ-V)</td>
</tr>
<tr>
<td><strong>Impedance</strong></td>
<td>50Ω</td>
</tr>
<tr>
<td><strong>Return Loss</strong></td>
<td>5.6dB Typ. (4.5 dB min.)</td>
</tr>
<tr>
<td><strong>Power Capacity</strong></td>
<td>2W max. (CW)</td>
</tr>
<tr>
<td><strong>Q'nty/Reel (pcs)</strong></td>
<td>2,000 pcs</td>
</tr>
<tr>
<td><strong>Operating Temp</strong></td>
<td>-40 to +105°C</td>
</tr>
<tr>
<td><strong>Storage Temp</strong></td>
<td>-40 to +105°C</td>
</tr>
<tr>
<td><strong>Storage Period</strong></td>
<td>18 months max.</td>
</tr>
</tbody>
</table>

Total average radiated efficiency on PCB feature on "Mounting Considerations 1" (orderable EVB p/n: 2450AT42E0100-EB1SMA) is ~30%

This antenna was designed in mind for small coin cell, wearable, IoT, 2.4 BLE, 802.11, ISM, Zigbee, etc. applications in close-range networks where metal or a battery/display covers the entire length or side of the PCB or encasement must be present directly under the antenna and there's no room for usual/typical antenna metal clearance.

This antenna is specifically designed for PCBs that have 0.5-1mm of total thickness.

### Part Number Explanation

<table>
<thead>
<tr>
<th>P/N Suffix</th>
<th>Packing Style</th>
<th>Suffix</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bulk</td>
<td>= S</td>
<td>2450AT42E0100S</td>
</tr>
<tr>
<td></td>
<td>T &amp; R</td>
<td>= E</td>
<td>2450AT42E0100E</td>
</tr>
<tr>
<td>EVB p/n</td>
<td></td>
<td></td>
<td>2450AT42E0100-EB1SMA (comes with 1 female SMA connector)</td>
</tr>
</tbody>
</table>

### Mechanical Specifications

<table>
<thead>
<tr>
<th></th>
<th><strong>In</strong></th>
<th><strong>mm</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L</strong></td>
<td>0.197 ± 0.008</td>
<td>5.00 ± 0.20</td>
</tr>
<tr>
<td><strong>W</strong></td>
<td>0.079 ± 0.008</td>
<td>2.00 ± 0.20</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td>0.059 ± 0.008</td>
<td>1.50 ± 0.20</td>
</tr>
<tr>
<td><strong>a</strong></td>
<td>0.020 ± 0.008</td>
<td>0.50 ± 0.20</td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>0.059 ± 0.008</td>
<td>1.50 ± 0.20</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>0.012 max</td>
<td>0.30 max</td>
</tr>
</tbody>
</table>

### Terminal Configuration

1. **Feeding Point**
2. **NC**
3. **GND**
4. **GND**

1. Make sure to have Pin 2 soldered to its PCB land pad but **not** connected to GND or input, it must be NC (or floating).
2.4 GHz Surface Mount, Above Metal, Low Profile Mini Chip Antenna

This antenna must have metal underneath in order to function properly

Detail Specification: 12/21/2017

Mounting Considerations 1

Want the layout file of this? Send us a message at: www.johansontechnology.com/ask-a-question

To order a pre-tuned 50Ω EVB with a female SMA connector you see here Click here: www.johansontechnology.com/request-a-sample

Reference p/n: 2450AT42E0100-EB1SMA

Mounting Considerations on EVB 1 - Detail

The exact geometry of the detail below on your PCB is crucial for the proper performance of the antenna.

Metal bottom GND plane to be placed directly underneath yellow solderness zone, covering entire area.

Component values of matching circuit will be different, depending on PCB layout, but the matching circuit's type has to be "Series-Shunt-Shunt" shown as above

*Line width should be designed to match 50ohm characteristic impedance, depending on PCB material and thickness., A coplanar waveguide trace is recommended for best results.

For this particular antenna It is recommended that the designer leave available slots for a shunt-shunt-series network, even if all slots won't be used, this will prepare the PCB for the unpredictable final mass production version of the matching circuit. The antenna matching network values above are used when antenna is mounted on Johanson's evaluation board. The matching values on client's PCB will be different.
This antenna must have metal underneath in order to function properly.

**Mounting Considerations 2 - Circular PCB Environments (coin cell type)**

**Top View**

- 50Ω Feed Line
- radius=22mm (reference only)
- Ground
- 31.7mm
- 7mm

**Bottom View**

- Ground
- radius=22mm
- 31.7mm
- 7mm

Note: There's no orderable EVB available for the above “Mounting Considerations 2” reference design.

Receding the GND plane may sound counter-intuitive, but this helps shape the radiation pattern in a more isometric (spherical) shape. We recommend the designer do this if he/she can afford the reduce SMT space, but not mandated.

Want the layout file? Send us a message at: www.johansontechnology.com/ask-a-question

Johanson Technology, Inc. reserves the right to make design changes without notice. Please confirm the specifications and delivery conditions when placing your order. All sales are subject to Johanson Technology, Inc. terms and conditions.

"High Frequency Ceramic Solutions"
Typical Electrical Characteristics (T=25 °C) Return Loss

The designer should not be highly concerned of the fact that the antenna only demonstrates a -5dB S11 level at the band edges. The antenna has sufficient gain at the band edges to satisfy the applications and uses a high dielectric constant ceramic giving it some detuning resilience to capacitive loading effects. This antenna is designed for close proximity applications such as the ones mentioned on page 1.
This antenna must have metal underneath in order to function properly.

Typical Electrical Characteristics (T=25 °C) Radiation Patterns@2.44GHz

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How To Choose The Correct Antenna Variant

We offer 2 other resonating variants of this antenna since the antenna’s efficiency is largely affected by the thickness of the PCB’s substrate. This allows a more robust design to fit your PCB. The disparity between antenna variations are internal only; variations are identical in dimension and solder footprint.

Refer to the diagram below to understand what is meant by substrate thickness.

![Diagram showing substrate thickness (H)](image)

* For PCBs consisting of multiple layers, the thickness (H) is limited only to the metal layer immediately below 'Top Metal Layer.'

The below plot demonstrates the effect that substrate thickness has on the antenna's performance.

![Plot showing frequency vs. substrate thickness](image)

As you can see, there is a direct correlation between substrate thickness (H) and the resonant frequency. This is, in part, due to the natural capacitive loading effect and resonating frequency of the PCB itself. Our antenna variants were developed to counter this effect.

Note: "H" substrate thickness of <0.25mm (10mil) is not recommended. The component will still work and radiate, just not optimally.
2.4 GHz Surface Mount, Above Metal, Low Profile Mini Chip Antenna
P/N 2450AT42E0100E-AEC
This antenna must have metal underneath in order to function properly

Detail Specification: 12/21/2017

How To Choose The Correct Antenna Variant

Refer to the table below for substrate thickness and the corresponding antenna variation.

<table>
<thead>
<tr>
<th>PCB Substrate Thickness</th>
<th>Recommended JTI PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 1.0mm</td>
<td>2450AT42E0100</td>
</tr>
<tr>
<td>1.0mm - 2.0mm</td>
<td>2450AT42E010B</td>
</tr>
<tr>
<td>≥ 2.0mm</td>
<td>2450AT42E010C</td>
</tr>
</tbody>
</table>

-40 to +105°C

Typical Efficiency Values @ 2.44GHz for various scenarios for a 30x50mm PCB

The following efficiency values represent performance on a 30x50mm EVB like on page 2. Please note that antenna efficiency varies widely with board layout, size and surroundings.

<table>
<thead>
<tr>
<th>PCB Substrate Thickness (H)</th>
<th>Simulated Antenna Efficiency(%) @ 2.44GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2450AT42E0100</td>
</tr>
<tr>
<td>H = 0.12 mm</td>
<td>1.95%</td>
</tr>
<tr>
<td>H = 0.7 mm</td>
<td>29.20%</td>
</tr>
<tr>
<td>H = 1.5 mm</td>
<td>23.30%</td>
</tr>
<tr>
<td>H = 2.5 mm</td>
<td>21.60%</td>
</tr>
</tbody>
</table>

We encourage you to use a relatively thick dielectric layer below antenna, as we have seen a direct correlation between substrate thickness and antenna performance.

Note: "H" substrate thickness of <0.25mm (10mil) is not recommended. The component will still work and radiate, just not optimally.
Mounting Considerations 3 - Recommendations when using 2450AT42E010B

Recommendations when using the 2450AT42E010B

We have found that the best performance can be gained when using the 2450AT42E010B with a 4-layer PCB with a total thickness approximately 1.5mm thick.

The 2450AT42E010B 4-layer evaluation board has the following stackup:

- 6 mil
- 41 mil
- 6 mil

To order a pre-tuned 50Ω EVB with a female SMA connector, click here: www.johansontechnology.com/request-a-sample

Reference p/n: 2450AT42E010B-EB1SMA
### 2.4 GHz Surface Mount, Above Metal, Low Profile Mini Chip Antenna

This antenna must have metal underneath in order to function properly

**Detail Specification:** 12/21/2017

- **P/N:** 2450AT42E0100E-AEC

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### Antenna layout review, tuning, and characterization services

- [www.johansontechnology.com/ipc-antenna-services](http://www.johansontechnology.com/ipc-antenna-services)

### More SMD Chip Antennas at:

- [www.johansontechnology.com/antennas](http://www.johansontechnology.com/antennas)

### Soldering Information

- [www.johansontechnology.com/ipcsoldering-profile](http://www.johansontechnology.com/ipcsoldering-profile)

  -40 to +105°C

### Antenna layout and tuning techniques (How to obtain the new antenna matching values)

- [www.johansontechnology.com/tuning](http://www.johansontechnology.com/tuning)

### Packaging information


### RoHS Compliance

- [www.johansontechnology.com/rohs-compliance](http://www.johansontechnology.com/rohs-compliance)

### MSL Info

- [www.johansontechnology.com/msl-rating](http://www.johansontechnology.com/msl-rating)

### P/N Explanation and Breakdown

- [www.johansontechnology.com/ipc-pn-explained](http://www.johansontechnology.com/ipc-pn-explained)

### Recommended Storage Conditions of uninstalled product still on T&R

<table>
<thead>
<tr>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40 ~ +85 °C, Humidity 45~75%RH, 18 mos. Max</td>
</tr>
</tbody>
</table>

---

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