High Frequency Ceramic Solutions

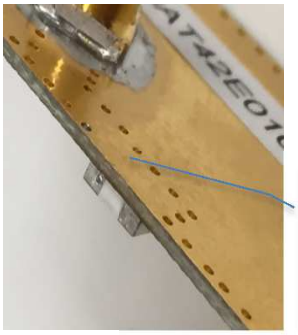
2.4 GHz SMD, Above Metal, Low Profile Mini Chip Antenna **P/N 2450AT42E0100E-AEC**

This antenna will generally have a metal layer directly underneath for proper operation, exceptions may apply.

Detail Specification: 7/15/2021

AEC-Q200 Qualified

General Specifications	
Part Number	2450AT42E0100E-AEC
Frequency (MHz)	2400 - 2480
Peak Gain (dBi typ.)	-2.0 (YZ-V)
Return Loss (dB)	5.6 typ. (4.5 min.)
Impedance (Ω)	50
Power Capacity (W)	2 max. (CW)
Reel Quantity (pcs./reel)	2,000
Operating Temp	-40 to +125°C
Recommended Storage Conditions and Period for unused Product on T&R	+5°C to +35°C Humidity 45 to 75% RH 18 months max.



Zero Clearance!

Antenna mounts directly above or below the metal layer of PCB. No antenna clearance required ever again!

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

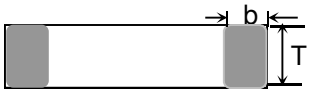
This antenna was designed in mind for small coin cell, wearable, IoT, 2.4 BLE, 802.11, ISM, Zigbee, etc. applications in close-range networks where metal or a battery/display covers the entire length or side of the PCB or encasement must be present directly under the antenna and there's no room for usual/typical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

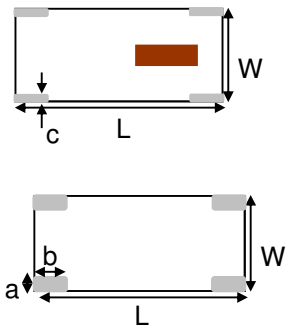
This antenna is specifically designed for PCBs that have 0.5-1mm of total thickness

Part Number Explanation				
P/N Suffix	**Packing Style**	Bulk (loose pcs.)	Suffix = S	e.g.. 2450AT42E0100S-AEC
		T & R	Suffix = E	e.g.. 2450AT42E0100E-AEC
	Evaluation Board	2450AT42E0100-EB1SMA (comes with 1 female SMA connector)		

Mechanical Specifications

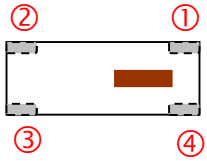
	In	mm
L	0.197 ± 0.008	5.00 ± 0.20
W	0.079 ± 0.008	2.00 ± 0.20
T	0.059 ± 0.008	1.50 ± 0.20
a	0.020 ± 0.008	0.50 ± 0.20
b	0.059 ± 0.008	1.50 ± 0.20
C	0.012 max	0.30 max





Terminal Configuration

1	Feeding Point
2	NC[1]
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).

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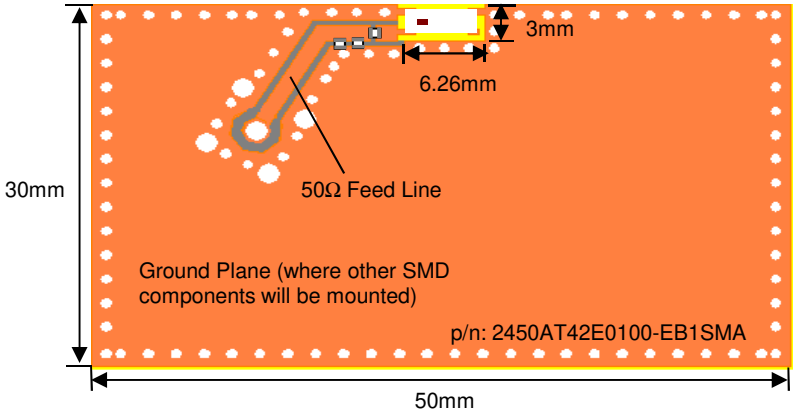
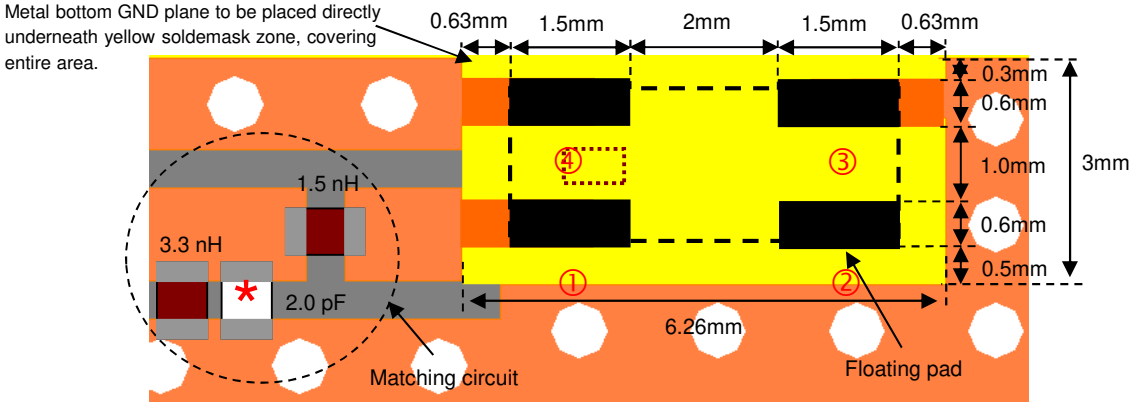
Mounting Considerations 1





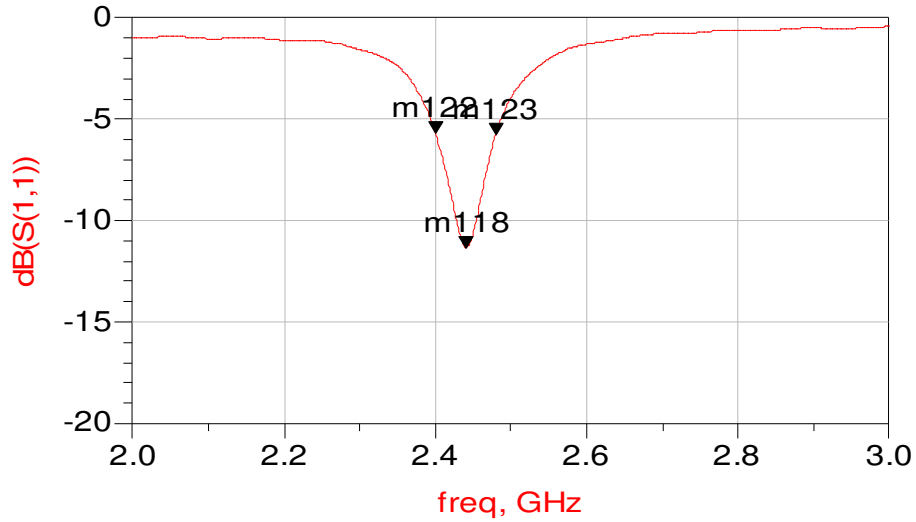
*Line width should be designed to match 50ohm characteristic impedance, depending on PCB material and thickness. A coplanar waveguide trace is recommended for best results.

For this particular antenna It is recommended that the designer leave available slots for the matching 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.

To order a pre-tuned 50Ω EVB with a female SMA connector you see here
Click here: https://www.johansontechnology.com/request-a-sample
Reference p/n: 2450AT42E0100-EB1SMA

Typical Electrical Characteristics (T=25 °C)

Return Loss



m122 freq=2.400GHz dB(S(1,1))=-5.691	m118 freq=2.440GHz dB(S(1,1))=-11.343	m123 freq=2.480GHz dB(S(1,1))=-5.746

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 capacitivel loading effects. This antenna is designed for close proximity applications such as the ones mentioned on page 1.

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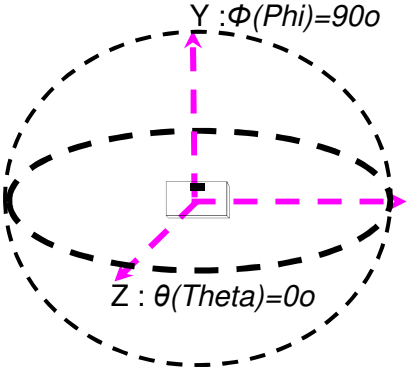
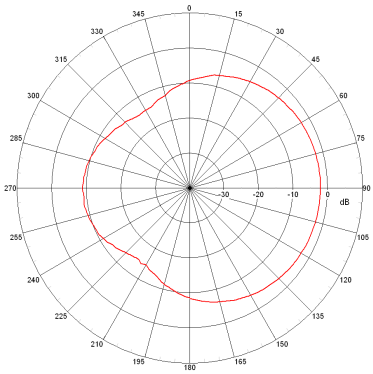
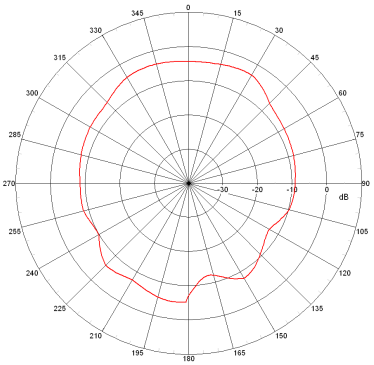
Typical Radiation Patterns @ 2.44GHz (T=25 °C)



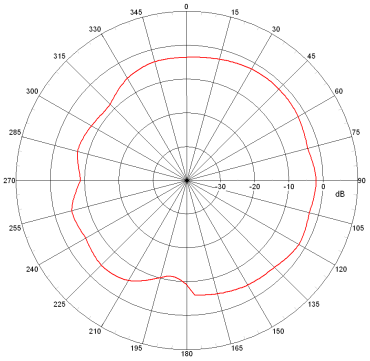
XY-plane @2440MHz
Total



XZ-plane @2440MHz
Total



YZ-plane @2440MHz
Total



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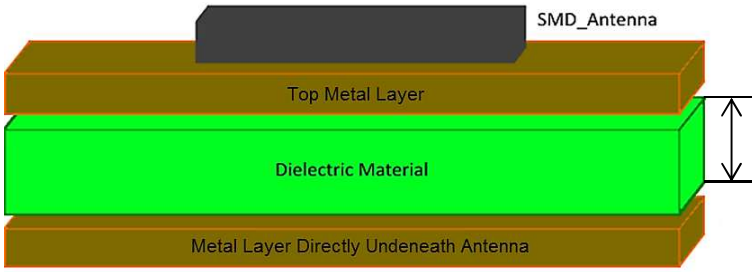
How To Choose The Correct Antenna Variant

Since the antenna's efficiency is largely affected by the thickness of the PCB's substrate, we offer another variant of this antenna. This allows a more robist design to fit your PCB. The disparity between antenna variations are internal only; variations are identical in dimension and footprint-compatible.

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



*For PCBs consisting of multiple layers, the thickness (H) is limited distance between the metal layer immediately below the antenna.

PCB Substrate Thickness	Recommended JTI PN
≤ 1.0mm	2450AT42E0100E-AEC
1.0mm - 2.0mm	2450AT42E010BE-AEC

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

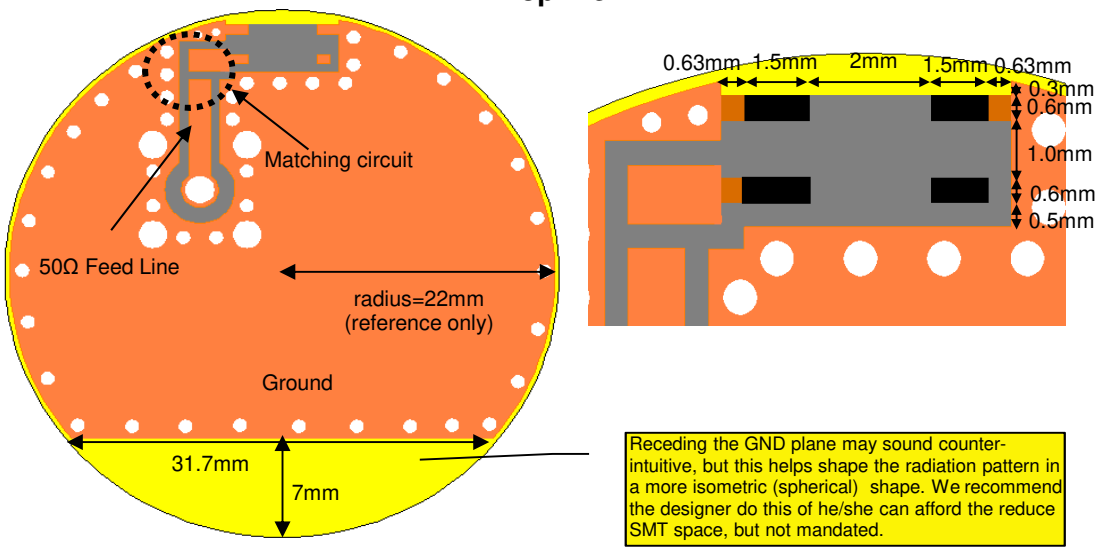
The following efficiency values represent performance on a 30x50mm EVB like on page 2. Please note that antenna efficiency varies widely with board layout, size and surroundings.

PCB Substrate Thickness (H)	Antenna Efficiency @ 2.44GHz	
	2450AT42E0100E-AEC	2450AT42E010BE-AEC
H = 0.12 mm	1.95%	1.02%
H = 0.7 mm	29.20%	9.30%
H = 1.5 mm	23.30%	38.00%
H = 2.5 mm	21.60%	42.00%

Note: "H" substrate thickness of <0.25mm(10mil) is not recommended. The component will still radiate however not optimally.

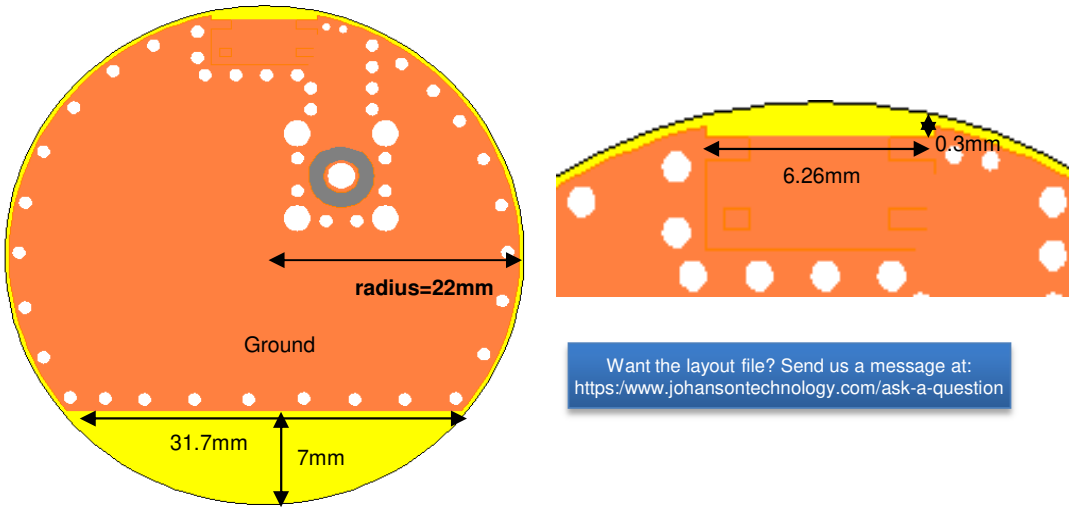
Mounting Considerations 2 - Circular PCB Environments (coin cell type)

Top View



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 of he/she can afford the reduce SMT space, but not mandated.

Bottom View

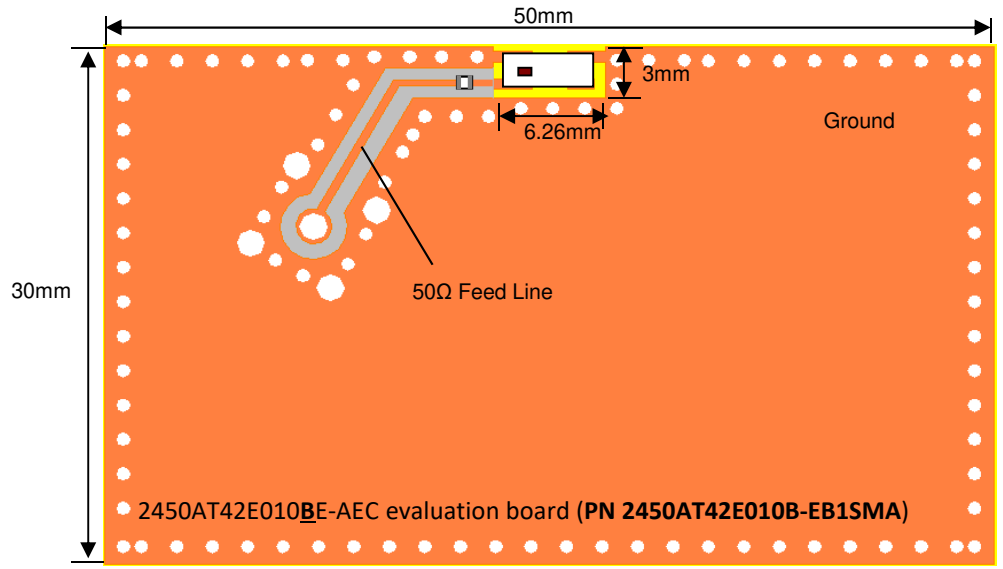


Want the layout file? Send us a message at:
https:/www.johansontechnology.com/ask-a-question

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

Mounting Considerations 3 - Recommendations when using 2450AT42E010BE-AEC

We have found that the best performance can be gained when using the 2450AT42E010**B**E-AEC with a 4-layer PCB with a total thickness approximately 1.5mm thick.



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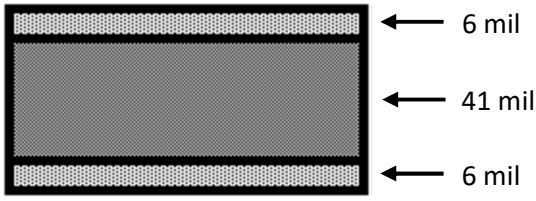
The 2450AT42E010**B**E-AEC 4-layer evaluation board has the following stackup:



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https://www.johansontechnology.com/request-a-sample
Reference p/n: **2450AT42E010B-EB1SMA**

Antenna layout review, tuning, and characterization services
https://www.johansontechnology.com/ipc-antenna-services

More SMD Chip Antennas at:
https://www.johansontechnology.com/antennas

Soldering Information
https://www.johansontechnology.com/ipcsoldering-profile

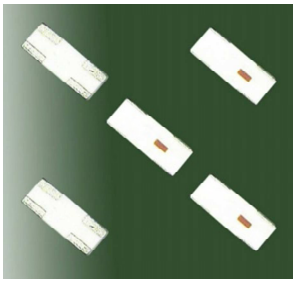
Antenna layout and tuning techniques (How to obtain the new antenna matching values)
https://www.johansontechnology.com/tuning

Packaging information
https://www.johansontechnology.com/tape-reel-packaging

RoHS Compliance
https://www.johansontechnology.com/rohs-compliance

MSL Info
https://www.johansontechnology.com/msl-rating

P/N Explanation and Breakdown
https://www.johansontechnology.com/ipc-pn-explained



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