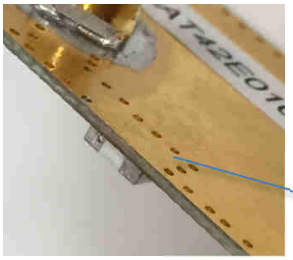
"High Frequency Ceramic Solutions"

2.4 GHz Surface Mount, Above Metal, Low Profile Mini Chip Antenna **P/N 2450AT42E0100**

This antenna must have metal underneath in order to function properly

Detail Specification: 10/17/2016

General Specifications	
Part Number	2450AT42E0100
Frequency (MHz)	2400 - 2480
Peak Gain	-2.0 dBi typ. (YZ-V)
Impedance	50Ω
Return Loss	5.6dB Typ. (4.5 dB min.)
Power Capacity	2W max. (CW)
Q'ty/Reel (pcs)	2,000 pcs
Operating Temp	-40 to +85°C
Storage Temp	-40 to +85°C
Storage Period	18 months max.



Zero Clearance!

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

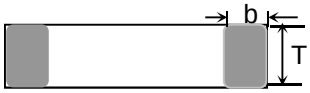
Total average radiated efficiency on PCB feature on "Mounting Considerations 1" (orderable EVB p/n: 2450AT42E0100-EB1SMA) is ~30%

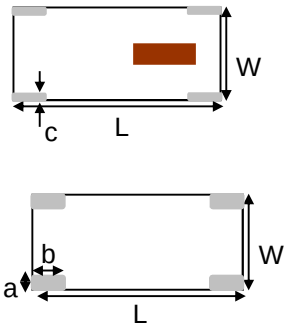
This antenna was designed in mind for small coin cell, wearable, IoT, 2.4 BLE, 802.11, ISM, Zigbee, etc. applications in close-range networks where metal or a battery/display covers the entire length or side of the PCB or encasement must be present directly under the antenna and there's no room for usual/typical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

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

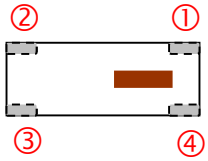
Part Number Explanation				
P/N Suffix	**Packing Style**	Bulk	Suffix = S	e.g.. 2450AT42E0100S
		T & R	Suffix = E	e.g.. 2450AT42E0100E
	EVB p/n	2450AT42E0100-EB1SMA (comes with 1 female SMA connector)		

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).

JOHANSON TECHNOLOGY

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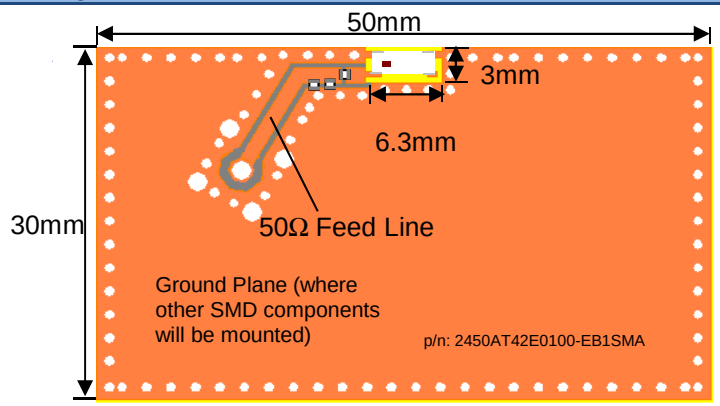
Mounting Considerations 1



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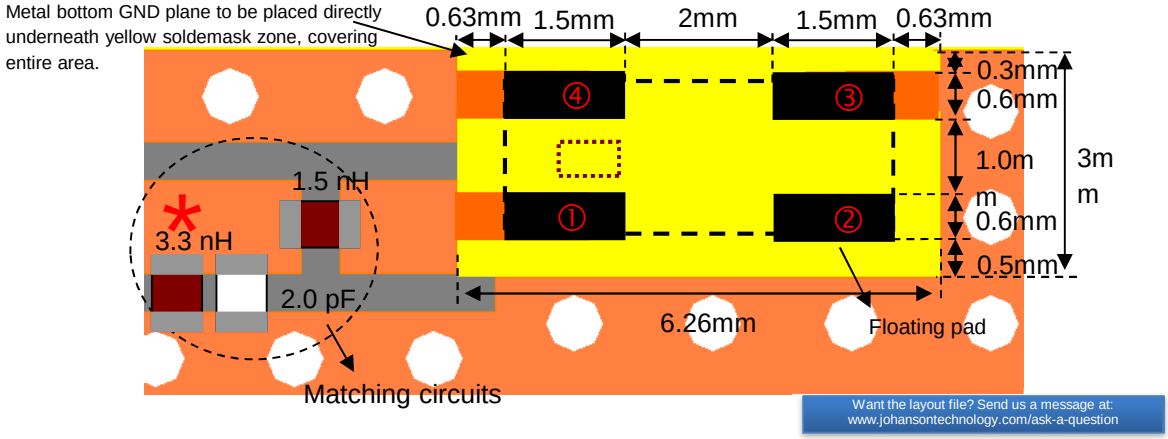
To order a pre-tuned 50Ω EVB with a female SMA connector you see here Click here: www.johansontechnology.com/request-a-sample
Reference p/n: 2450AT42E0100-EB1SMA

Need help designing the antenna in? Use our antenna design services! www.johansontechnology.com/ipc-antenna-services
2 Free layout reviews and if you need us to tune and characterize the antenna on your design (anechoic chamber) we can do that too (lab fee may apply for the latter).

Mounting Considerations on EVB 1 - Detail

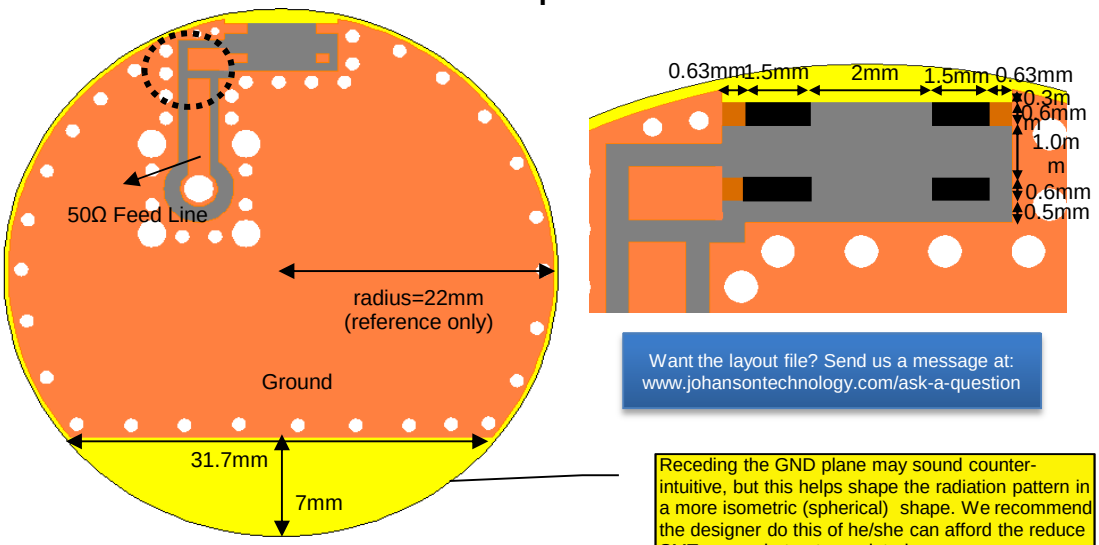
The exact geometry of the detail below on your PCB is crutial for the proper performance of the antenna.



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.

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

Top View



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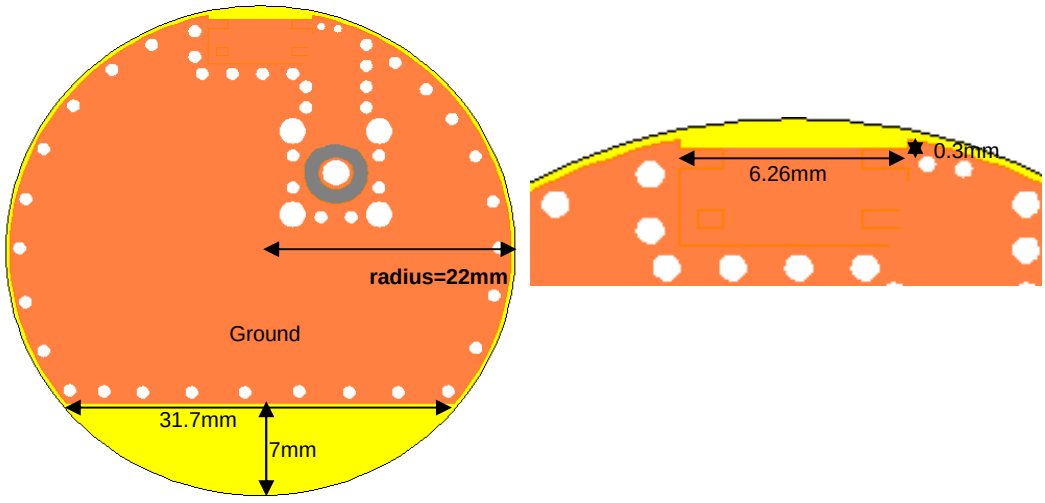
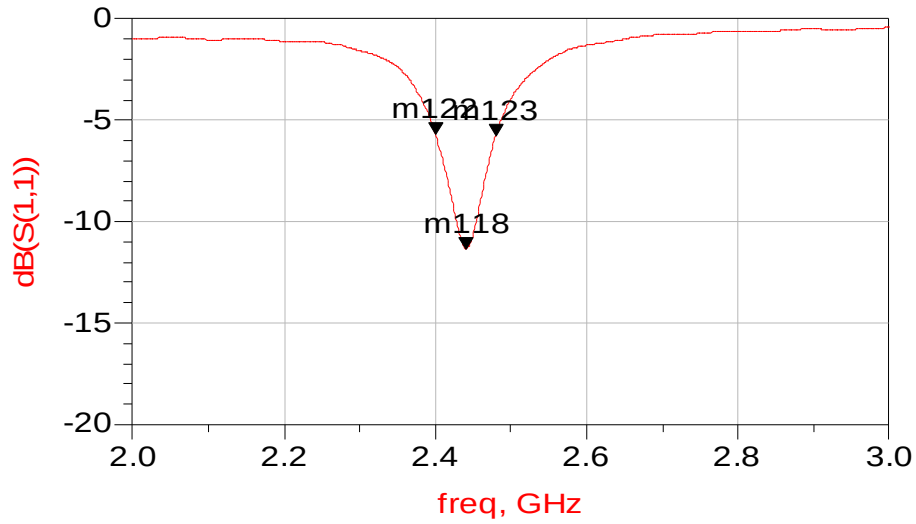
Receding the GND plane may sound counter-intuitive, but this helps shape the radiation pattern in a more isometric (spherical) shape. We recommend the designer do this of he/she can afford the reduce SMT space, but not mandated.

Bottom View



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

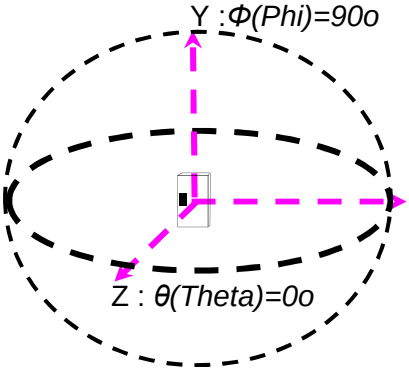
Typical Electrical Characteristics (T=25 °C) Return Loss



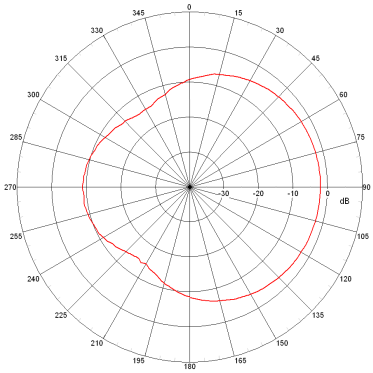
m122 freq=2.400GHz dB(S(1,1))=-5.691	m118 freq=2.440GHz dB(S(1,1))=-11.343	m123 freq=2.480GHz dB(S(1,1))=-5.746

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.

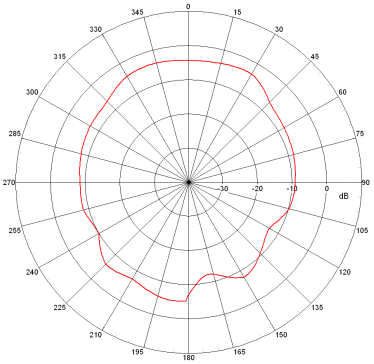
Typical Electrical Characteristics (T=25 °C) Radiation Patterns@2.44GHz



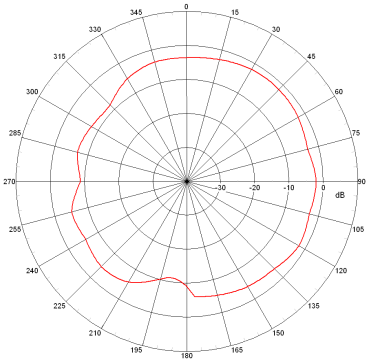
XY-plane @2440MHz
Total



XZ-plane @2440MHz
Total



YZ-plane @2440MHz
Total



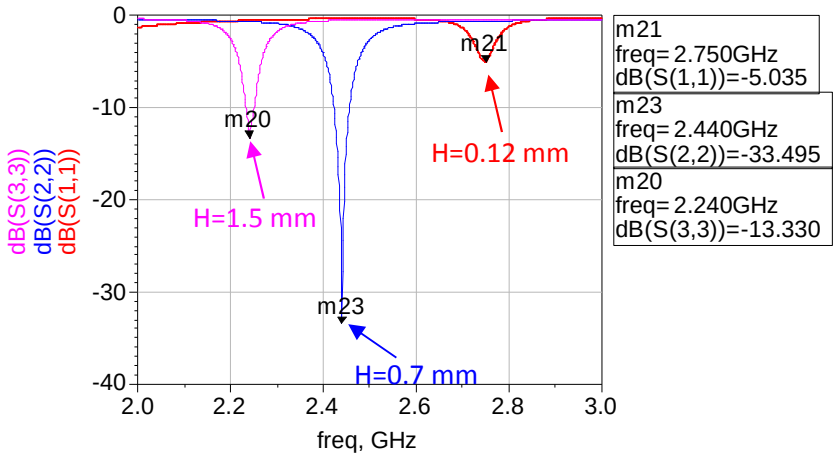
How To Choose The Correct Antenna Variant

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 robist 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.

* 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.



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.

How To Choose The Correct Antenna Variant

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

PCB Substrate Thickness	Recommended JTI PN
≤ 1.0mm	2450AT42E0100
1.0mm - 2.0mm	2450AT42E010**B**
≥ 2.0mm	2450AT42E010**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.

PCB Substrate Thickness (H)	Simulated Antenna Efficiency(%) @ 2.44GHz		
	2450AT42E0100	2450AT42E010B	2450AT42E010C
H = 0.12 mm	1.95%	1.02%	0.93%
H = 0.7 mm	29.20%	9.30%	2.30%
H = 1.5 mm	23.30%	41.90%	13.80%
H = 2.5 mm	21.60%	34.20%	38.40%

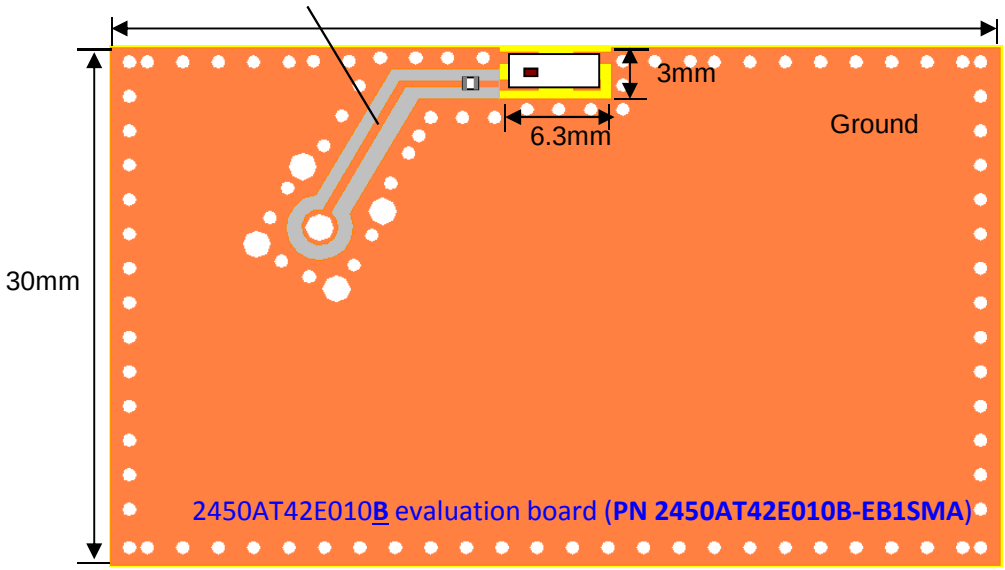
We encourage you to use a relatively thick dielectric layer below antenna, as we have seen a direct correlation between substrate thickness and antenna performance.

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.



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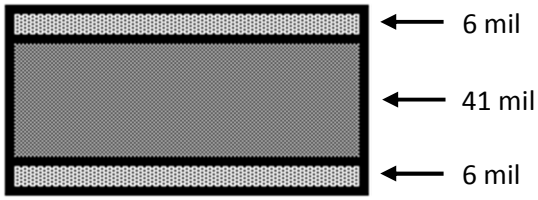
The 2450AT42E010B 4-layer evaluation board has the following stackup:



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Reference p/n: **2450AT42E010B-EB1SMA**

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www.johansontechnology.com/antennas

Soldering Information
www.johansontechnology.com/ipcsoldering-profile

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

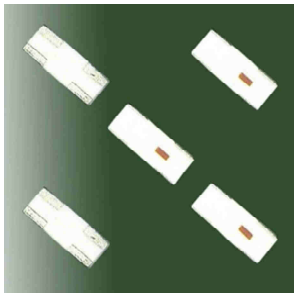
Packaging information
http://www.johansontechnology.com/tape-reel-packaging

RoHS Compliance
www.johansontechnology.com/rohs-compliance

MSL Info
www.johansontechnology.com/msl-rating

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

Recommended Storage Conditions of <u>uninstalled</u> product still on T&R	-40 ~ +85 °C, Humidity 45~75%RH, 18 mos. Max



Technical Author: Manuel Carmona