High Frequency Ceramic Solutions

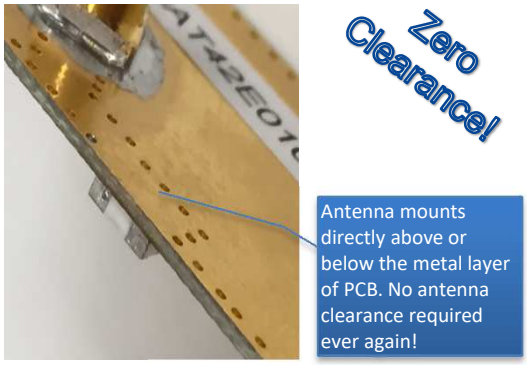
2.4 GHz SMD, Above Metal, Low Profile Mini Chip Antenna **P/N 2450AT42E010B**

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

Detail Specification: 7/15/2021

General Specifications

Part Number	2450AT42E010B	
Frequency (MHz)	2400 - 2480	
Return Loss (dB)	EVB1*	EVB2*
	2.7 min.	3.5 min.
Peak Gain (dBi typ.)	-1.0 (YZ-V)	-1.0 (YZ-V)
Average Gain (dBi typ.)	-3.5 (YZ-V)	-5.0 (YZ-V)
Impedance (Ω)	50	
Power Capacity (W)	2 max. (CW)	
Reel Quantity (pcs./reel)	2,000	
Operating Temp	-40 to +85°C	
Recommended Storage Conditions and Period for unused Product on T&R	+5 to +35°C Humidity 45 to 75% RH 18 months max.	



*Evaluation boards 1 and 2 are meant to demonstrate the difference in performance achievable with different substrate thicknesses.

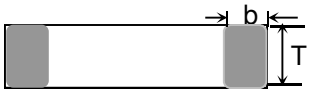
This antenna was designed in mind for small coin cell, wearable, IoT, 2.4 BLE, 802.11, ISM, Zigbee, etc. applications in close-range networks where metal or a battery/display covers the entire length or side of the PCB or encasement must be present directly under the antenna and there's no room for usual/typical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

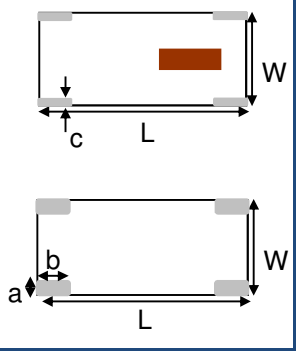
Part Number Explanation

P/N Suffix	**Packing Style**	Bulk (loose pcs.)	Suffix = S	e.g.. 2450AT42E010BS
		T & R	Suffix = E	e.g.. 2450AT42E010BE
	Evaluation Board 1	2450AT42E010B-EB1SMA (comes with 1 female SMA connector)		
	Evaluation Board 2	2450AT42E010B-EB2SMA (comes with 1 female SMA connector)		

Mechanical Specifications

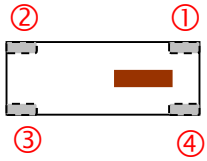
	In	mm
L	0.197 ± 0.008	5.00 ± 0.20
W	0.079 ± 0.008	2.00 ± 0.20
T	0.059 ± 0.008	1.50 ± 0.20
a	0.020 ± 0.008	0.50 ± 0.20
b	0.059 ± 0.008	1.50 ± 0.20
C	0.012 max	0.30 max





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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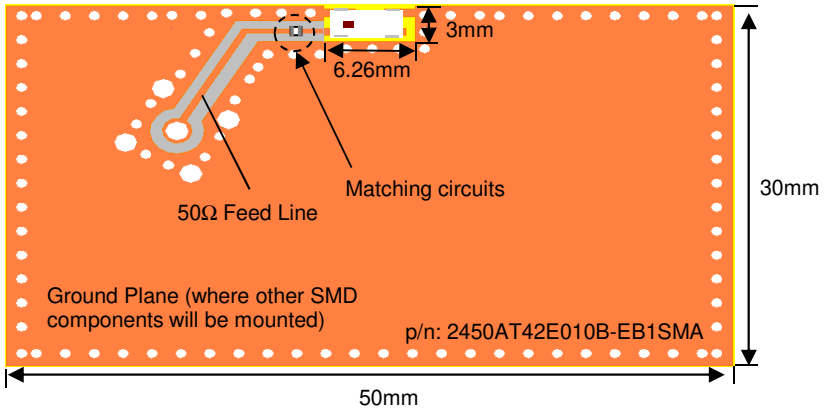
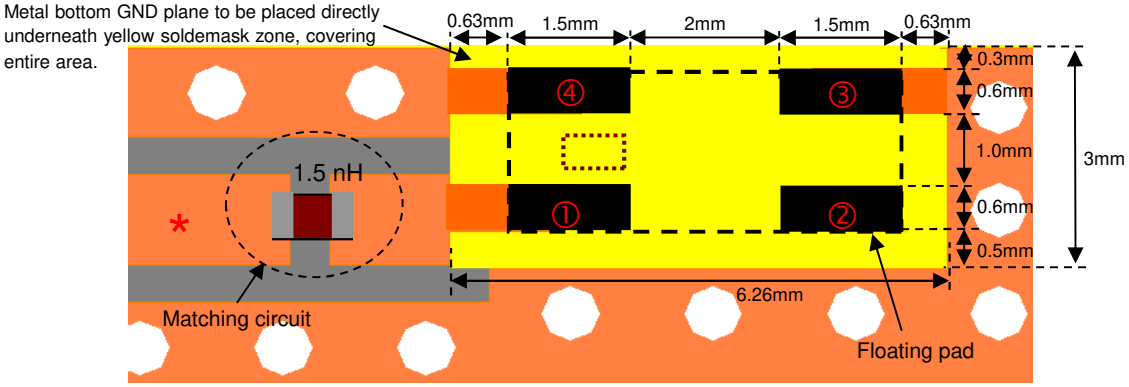
Mounting Consideration 1: Evaluation Board 1 (Thickness = 1.5mm)



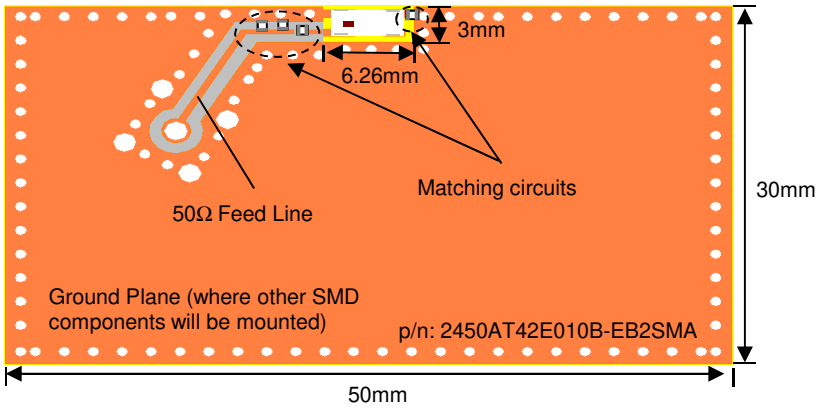


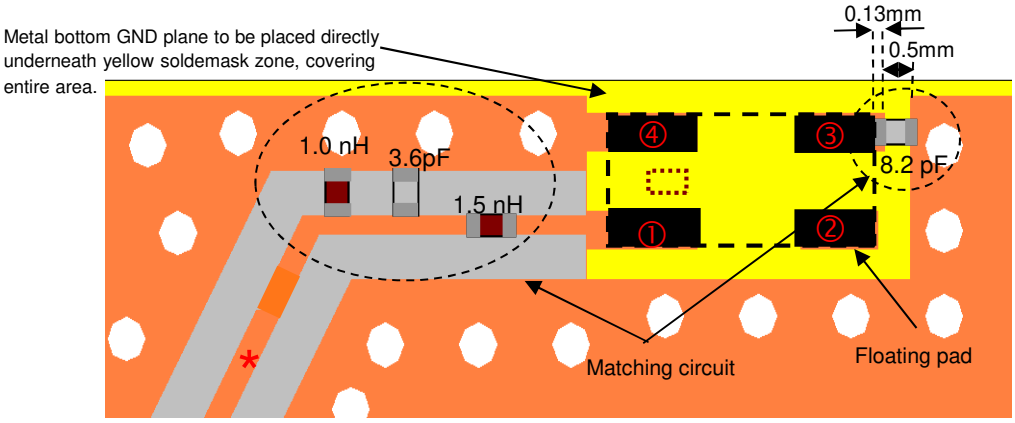
*Line width should be designed to match 50ohm characteristic impedance, depending on PCB material and thickness. A coplanar waveguide trace is recommended for best results.

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: 2450AT42E010B-EB1SMA

Mounting Consideration 1: Evaluation Board 2 (Thickness = 2.5mm)





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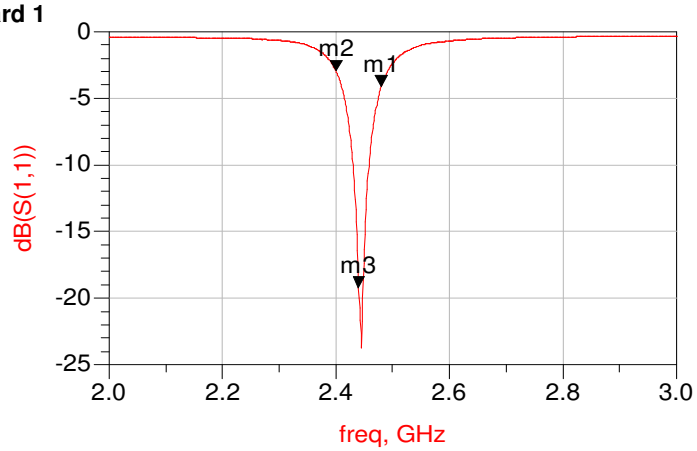
Reference p/n: 2450AT42E010B-EB2SMA

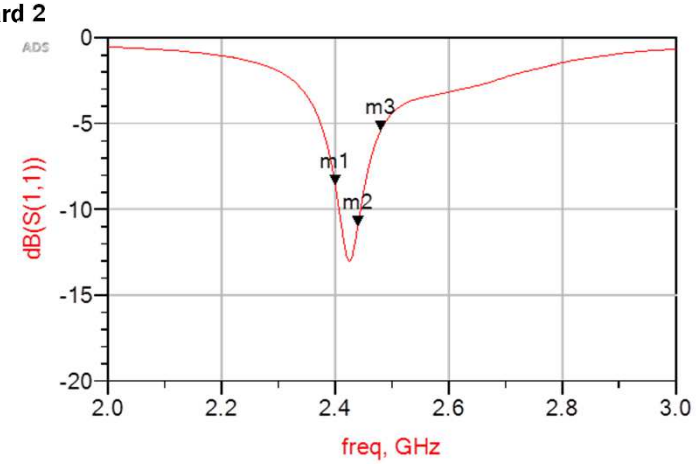
Typical Electrical Characteristics (T=25 °C)

Evaluation Board 1
Return Loss



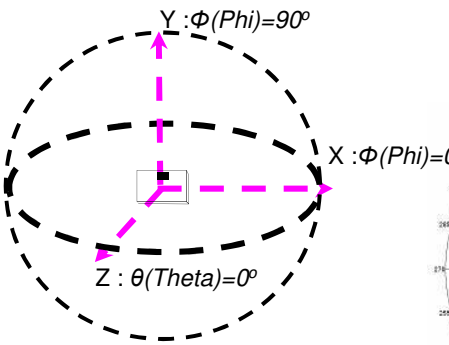
m2	m3	m1
freq=2.400GHz	freq=2.440GHz	freq=2.480GHz
dB(S(1,1))=-2.951	dB(S(1,1))=-19.219	dB(S(1,1))=-4.100

Evaluation Board 2
Return Loss



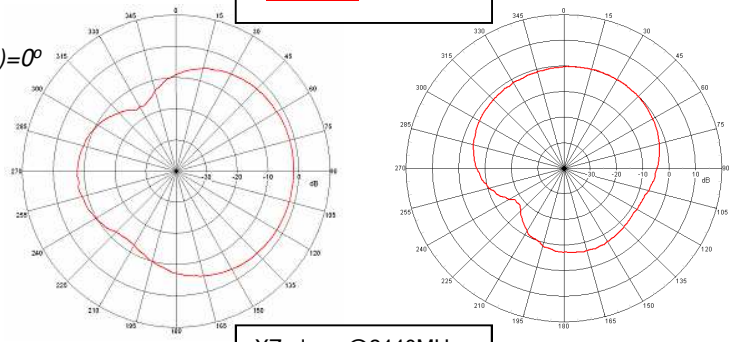
m1	m2	m3
freq=2.400GHz	freq=2.440GHz	freq=2.480GHz
dB(S(1,1))=-8.572	dB(S(1,1))=-10.958	dB(S(1,1))=-5.426

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

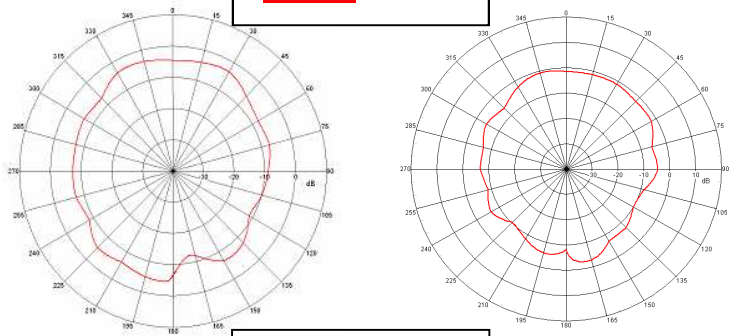


Evaluation Board 1 **Evaluation Board 2**

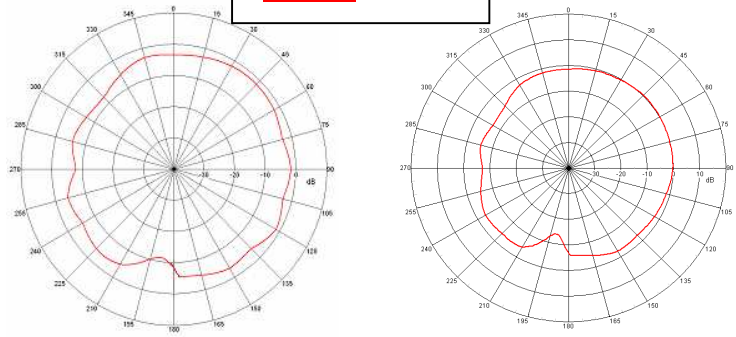
XY-plane @2440MHz



XZ-plane @2440MHz



YZ-plane @2440MHz



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	2450AT42E010**0**
≥ 1.0mm	2450AT42E010**B**

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

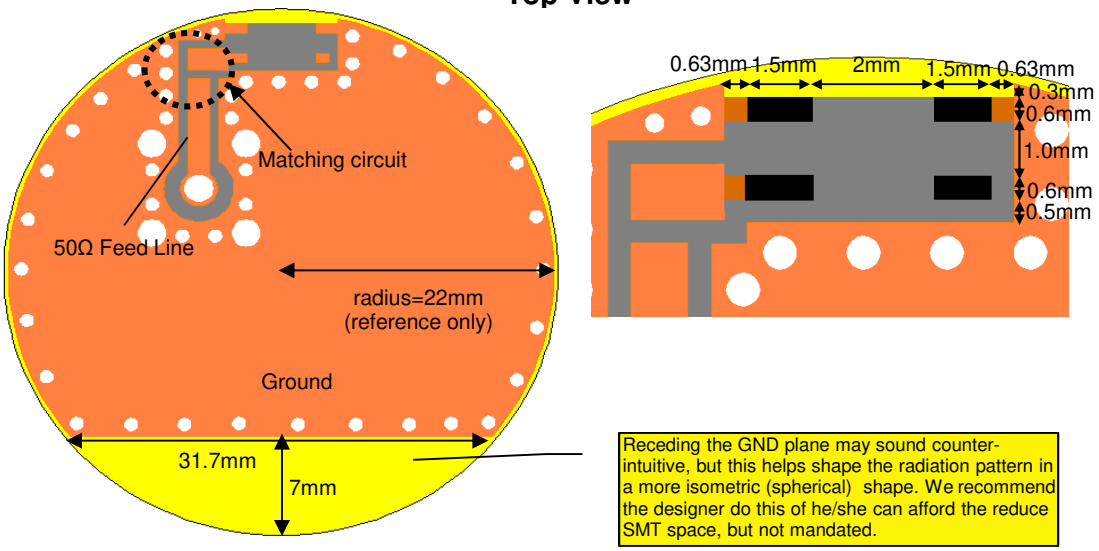
The following efficiency values represent performance on a 30x50mm EVB like on page 2. Please note that antenna efficiency varies widely with board layout, size and surroundings.

PCB Substrate Thickness (H)	Antenna Efficiency(%) @ 2.44GHz	
	2450AT42E0100	2450AT42E010B
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.

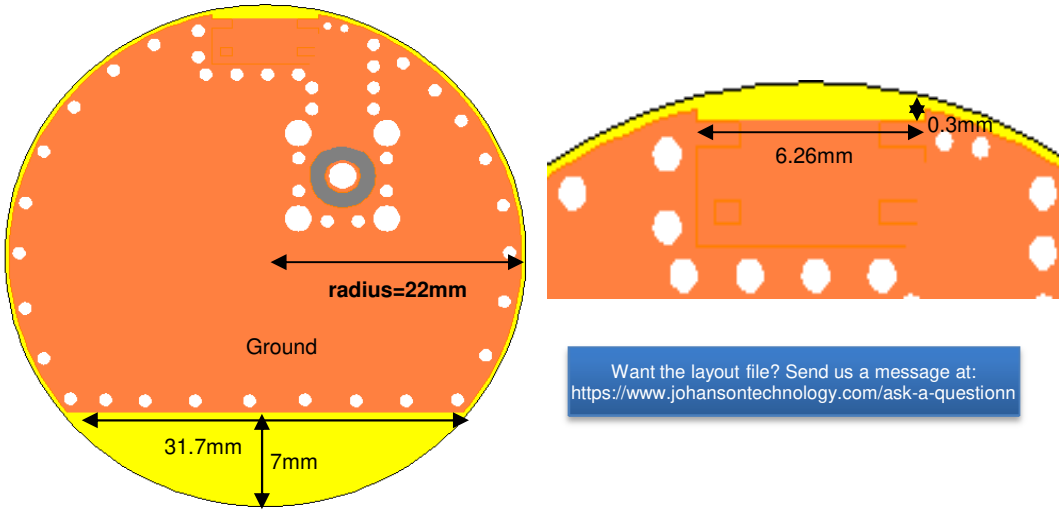
Mounting Considerations 2 - Circular PCB Environments (coin cell type)

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

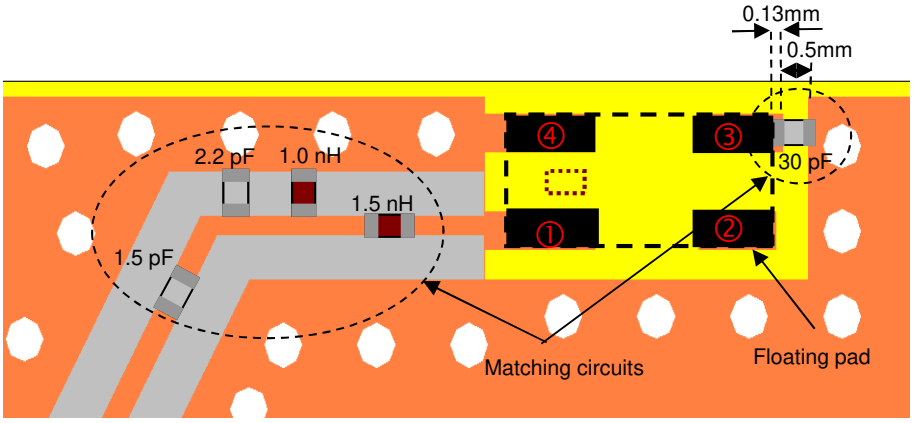


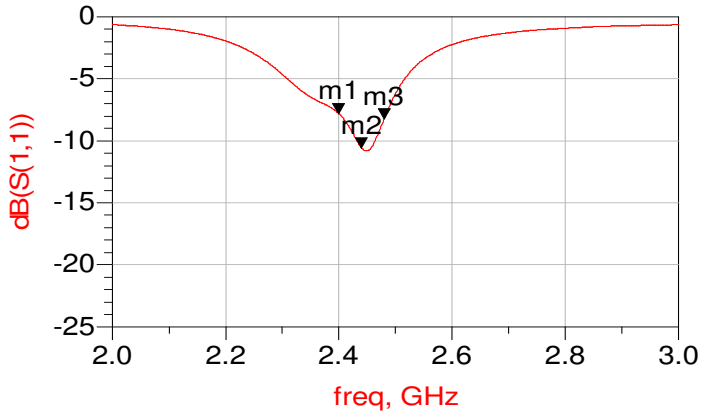
Want the layout file? Send us a message at:
https://www.johansontechnology.com/ask-a-questionn

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

Wider Tuning Example

By re-tuning our Evaluation Board 1, return loss can be improved over the bandwidth as a whole. An additional tuning element is placed between antenna pin 3 and GND.





m1	m2	m3
freq=2.400GHz	freq=2.440GHz	freq=2.480GHz
dB(S(1,1))=-7.785	dB(S(1,1))=-10.579	dB(S(1,1))=-8.225

This only serves as an example and is not an order-able evaluation board.

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

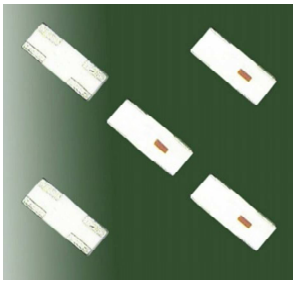
Antenna layout and tuning techniques (How to obtain the new antenna matching values)
https://www.johansontechnology.com/tuning

Packaging information
http://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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