

# Part No. P522304

## Broadband FR4 Embedded Cellular Antenna

850 / 900 / 1800 / 1900 / 2100 MHz

Supports: Broadband LTE (OCTA-BAND), LTE CAT-M, NB-IoT, SigFox, LoRa, Cellular LPWA, RPMA, Firstnet



### Broadband FR4 Embedded Cellular Antenna

Low Band 824 – 960 MHz

High Band 1710 - 2170 MHz

#### KEY BENEFITS

##### Reduced Costs and Time-to-Market

Standard antenna eliminates design fees and cycle time associated with a custom solution; getting products to market faster.

##### Greater Flexibility with Unique Form Factors

Ethertronics' technology helps you deliver more advanced ergonomic designs without adverse impact on product performance.

##### Reliability

Comply with latest RoHS requirements

#### APPLICATIONS

- Medical applications
- Home automation
- Smart metering
- M2M, Industrial devices
- IoT
- Firstnet
- Automotive
- Healthcare
- Point of Sale
- Tracking
- Cellular
- 3G Systems

Ethertronics' Broadband Embedded Cellular antenna utilizes Isolated Magnetic Dipole™ (IMD) technology which address the challenges facing today's product designers. IMD's high performance and isolation characteristics offer better connectivity and minimal interference.

#### Stays in Tune

IMD antenna technology provides superior RF field containment, resulting in less interaction with surrounding components. Ethertronics IMD antennas resist detuning; providing a robust radio link regardless of the usage position

Ethertronics antennas use patented IMD technology in many antenna configurations to provide high performance. IMD antennas requires a smaller design keep-out area, carry lower program development risk which yields a quicker time-to-market, without sacrificing RF performance.

#### Electrical Specifications

Typical Characteristics, on 50 x 110 mm PCB

Frequency	824 - 960 MHz	1710 - 2170 MHz
Efficiency	62%	55%
VSWR	2.5:1 max	2.7:1 max
Peak Gain	0 dBi	0.7 dBi
Polarization	Linear	
Power Handling	2 Watts CW	
Radiation Pattern	Omni-directional	
Feed Point Impedance	50 ohms unbalanced	

#### Mechanical Specifications & Ordering Part Number

Ordering Part #	P522304
Dimensions (mm)	35.0 x 9.0 x 3.2
Weight (grams)	2.1
Mounting	SMT (P&P)
Packaging	1,120 pcs/reel; 5,600 pcs/box
Demo Board	P522304-02

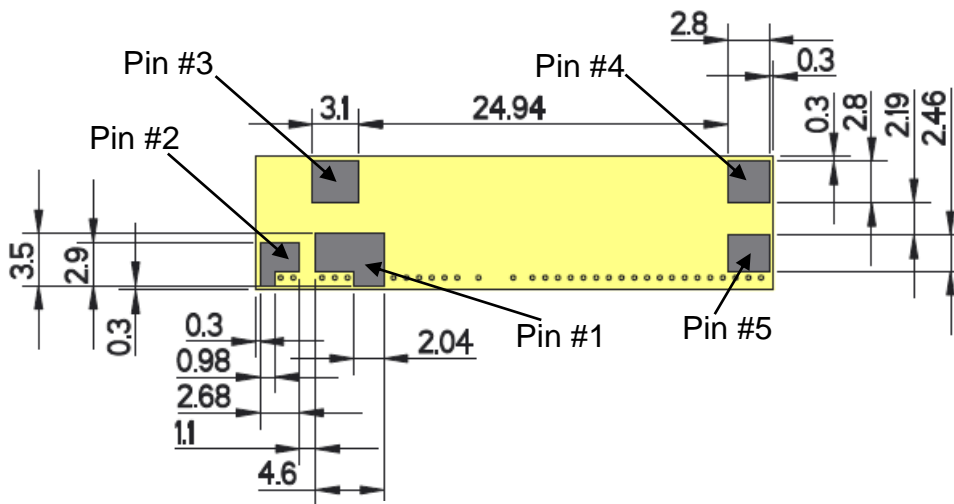
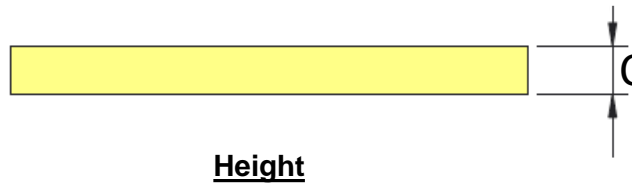
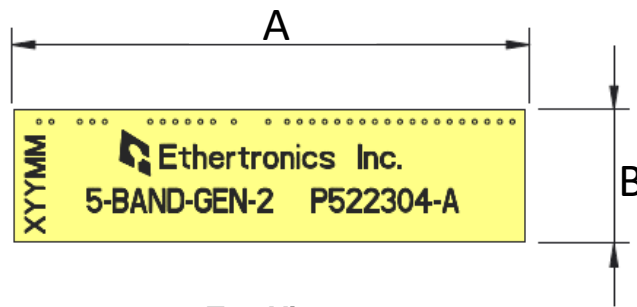


Cellular FR4 Ethertronics' Embedded Antenna Specifications.  
Ethertronics produces a wide variety of standard and custom antennas to meet user needs.

### Antenna Dimensions

Typical antenna dimensions (mm)

Part Number	A (mm)	B (mm)	C (mm)
P522304	35.0 ± 0.3	9.0 ± 0.2	3.2 ± 0.3



### Pin Descriptions

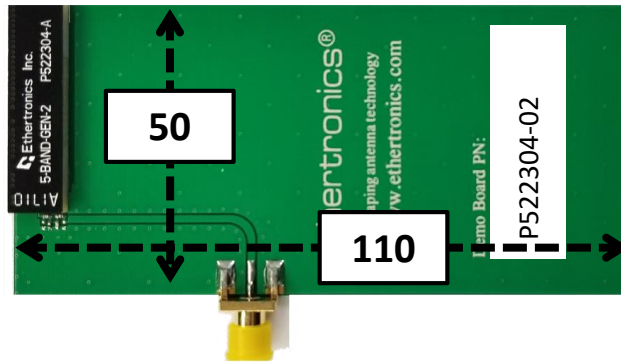
Pin#	Description
1	Feed
2	Ground
3	Dummy Pad
4	Dummy Pad
5	Low Band Tuning



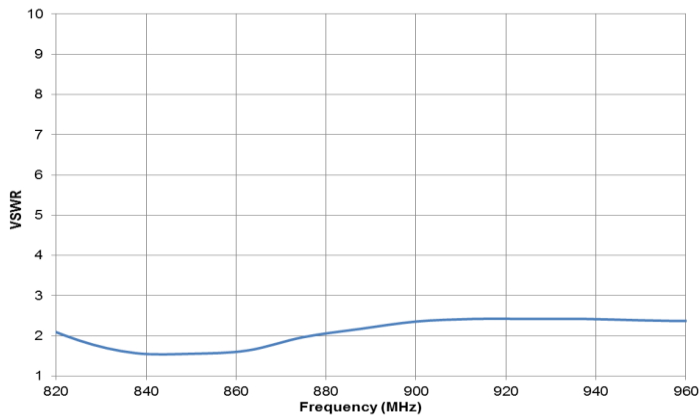
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### VSWR and Efficiency Plots (Off-Ground)

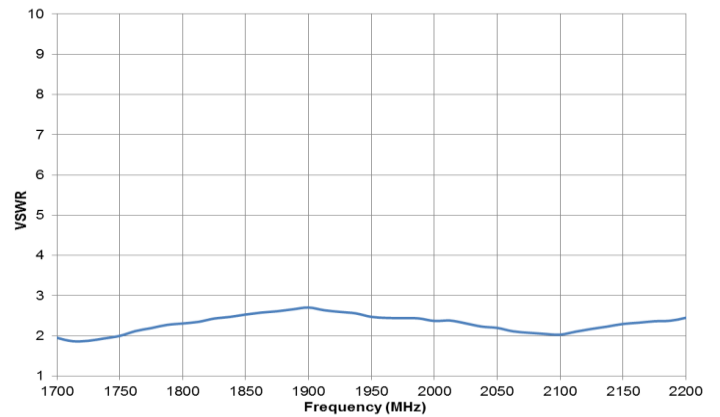
Typical Performance on 50 x 110 mm PCB



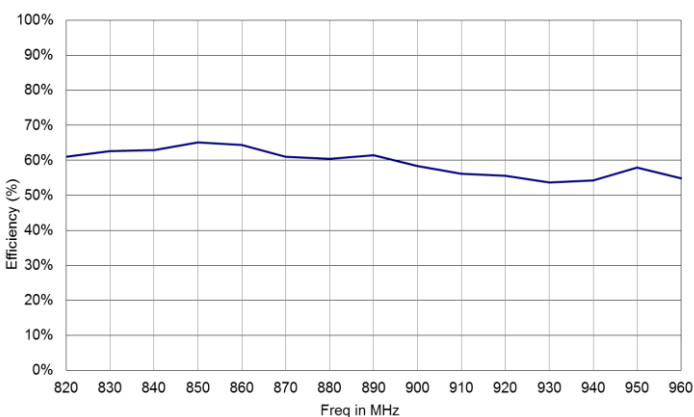
Low Band VSWR



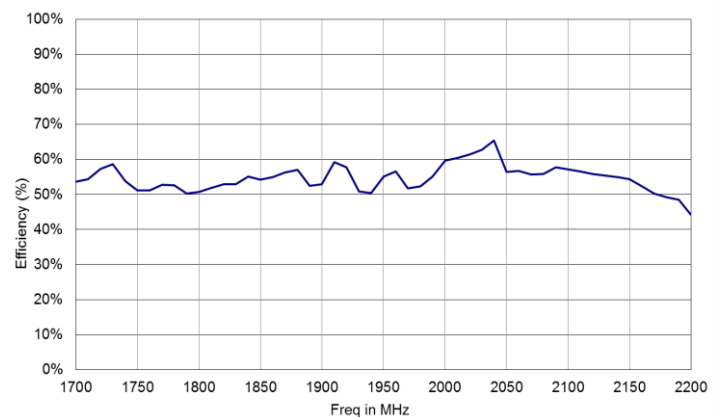
High Band VSWR



Low Band Efficiency



High Band Efficiency





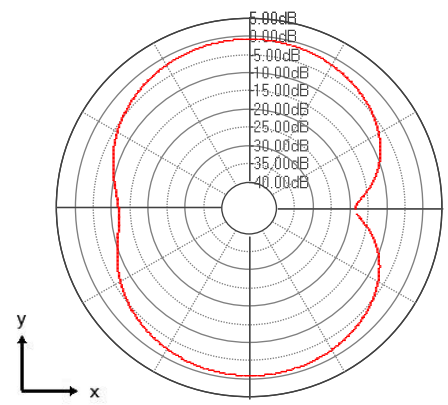
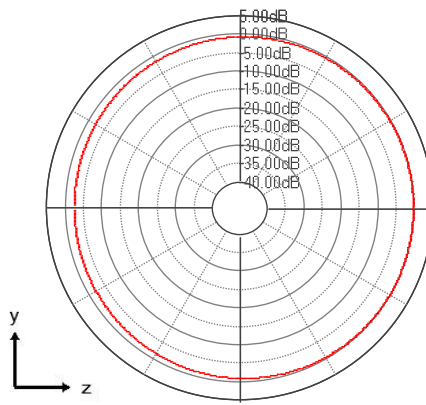
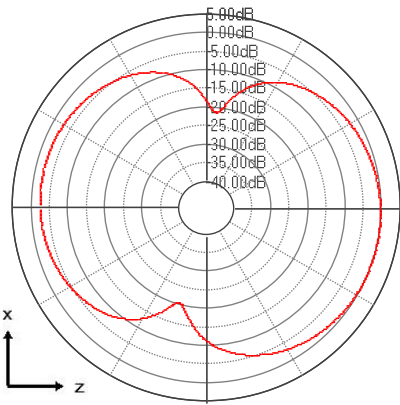
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**Antenna Radiation Patterns**

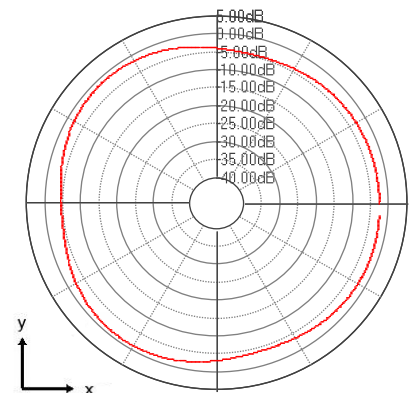
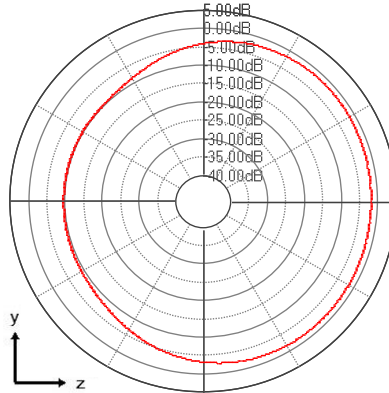
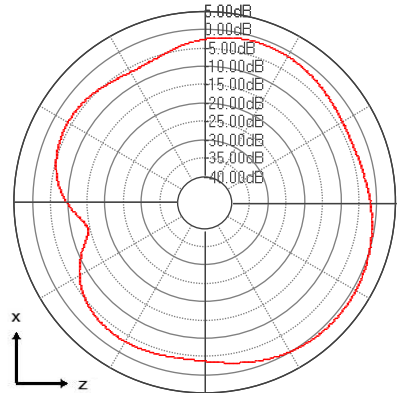
Typical Performance on 50 x 110 mm PCB  
Measured @ 910, 1870 MHz



Measured at 910 MHz



Measured at 1870 MHz

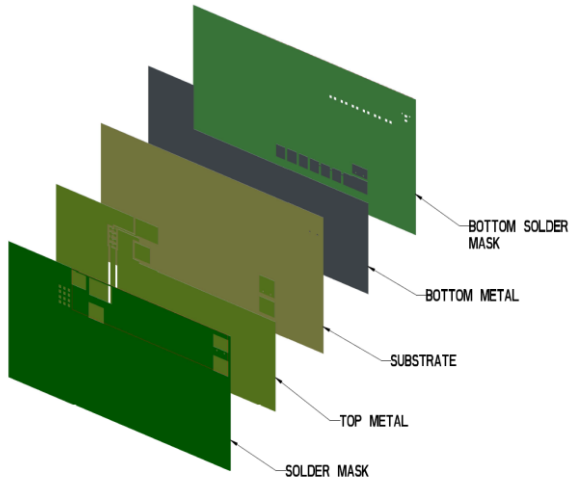




Cellular FR4 Ethertronics' Embedded Antenna Specifications.  
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Antenna Layout (On-Ground)

Typical layout dimensions (mm)



\* VIAS: Diam. 0.2mm, (no vias on transmission lines).  
Via holes must be covered by solder mask

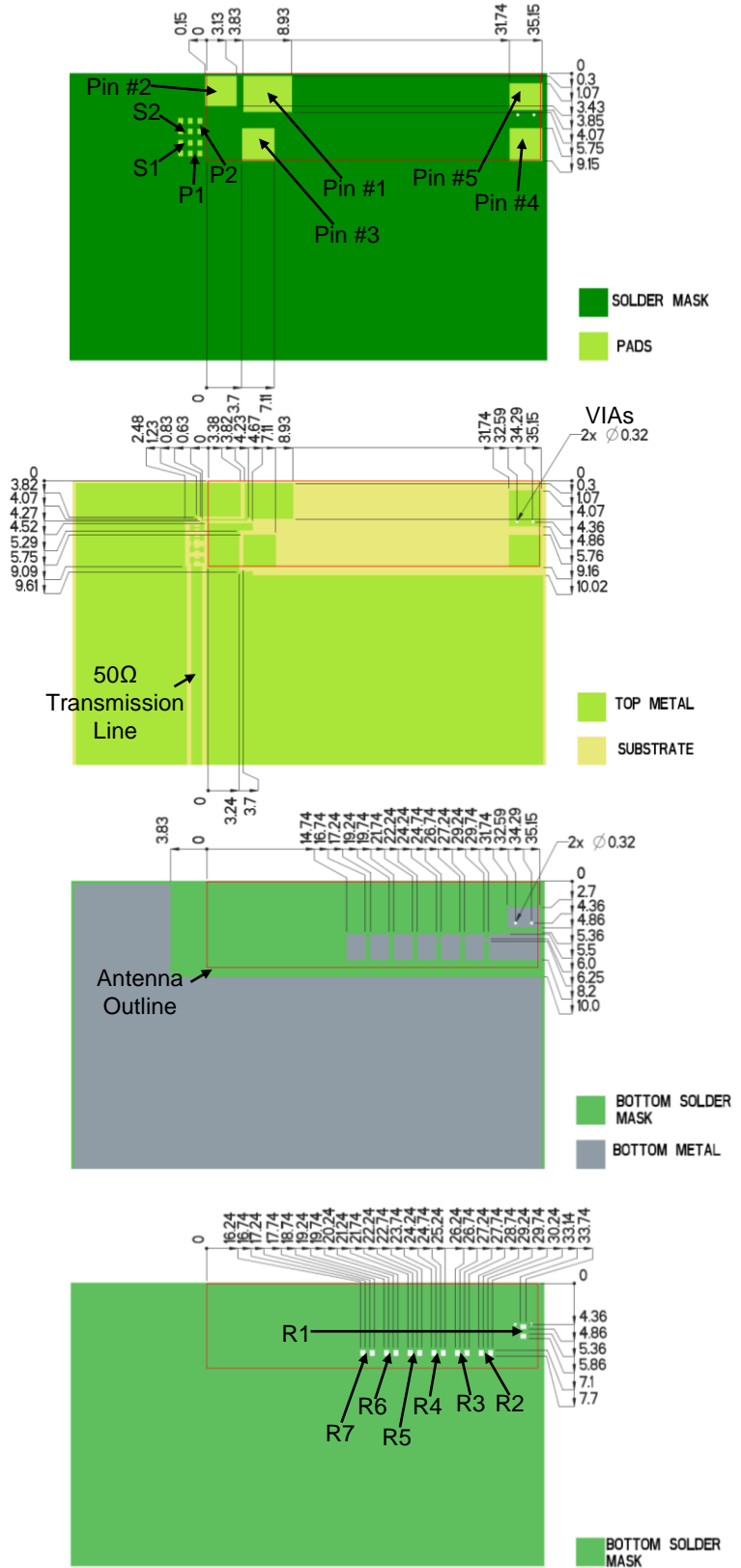
Pin Descriptions

Pin#	Description
1	Feed
2	Ground
3	Dummy Pad
4	Dummy Pad
5	Low Band Tuning

Matching & Tuning Component Values

Component	Value	Tolerance
P1	3.6nH	±0.05nH
S1	1.2pF	±0.05pF
S2	15nH	±0.3nH
P2	1.8pF	±0.05pF
R1 – R7	DNI	N/A

Default Pi Matching Network values and (R1- R7) tuning instructions can be found under Antenna Matching Structure..



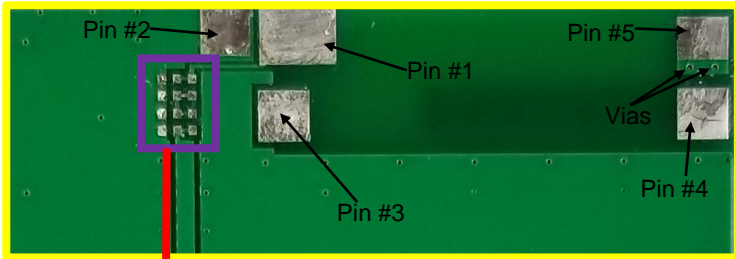


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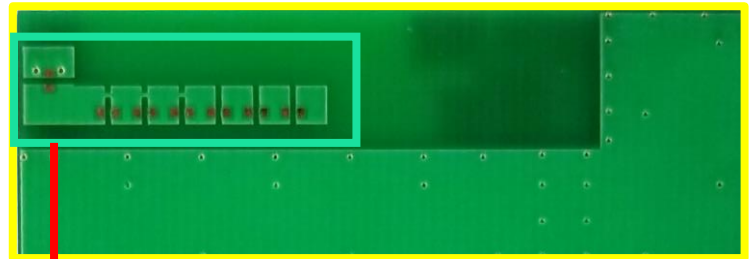
### Antenna Matching Structure

Typical matching values on 50 x 110 mm PCB

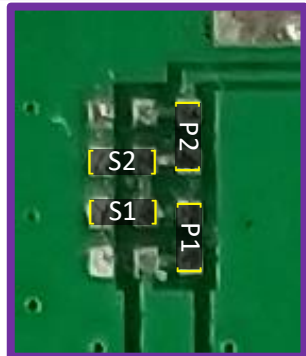
Demo Board Front View



Demo Board Back View



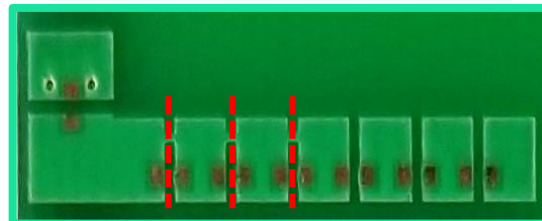
#### Antenna Matching



(Antenna Matching): pads are directly inline with the antenna feed trace.

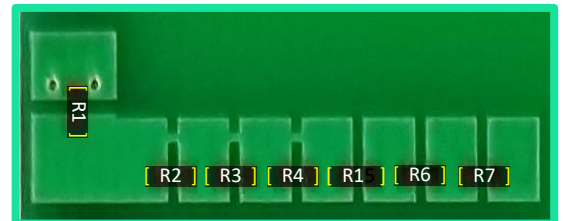
#### Low Band Tuning

Tune Low Band Higher  
(Cut Bridge Trace)



\*Cut Trace between pads shifts resonant frequency higher

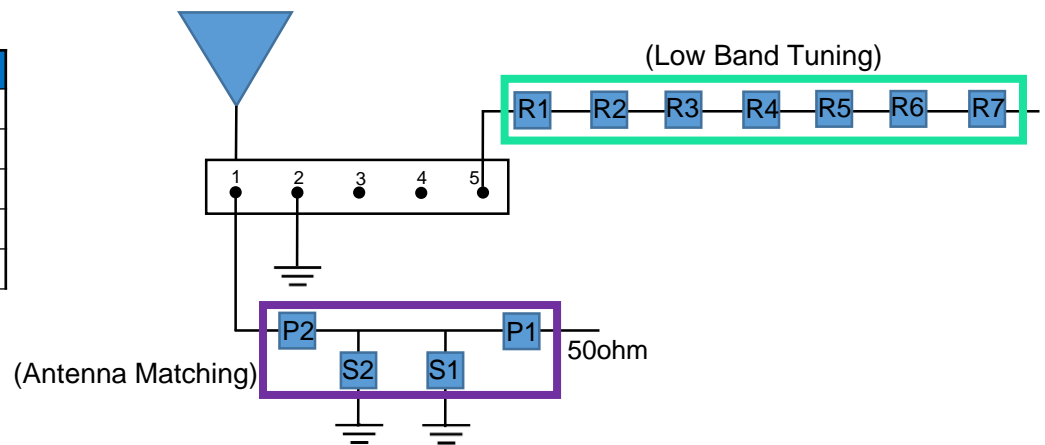
Tune Low Band Lower  
(Add 0Ω)



\*Bridging gaps with 0 ohm resistors shifts resonant frequency lower

#### Pin Descriptions

Pin#	Description
1	Feed
2	Ground
3	Dummy Pad
4	Dummy Pad
5	Low Band Tuning



	P1	S1	S2	P2	(R1 - R7)
<b>Default Matching</b>	3.6nH	1.2pF	15nH	1.8pF	DNI
<b>Tolerance</b>	±0.05nH	± 0.05pF	±0.3nH	± 0.05pF	N/A



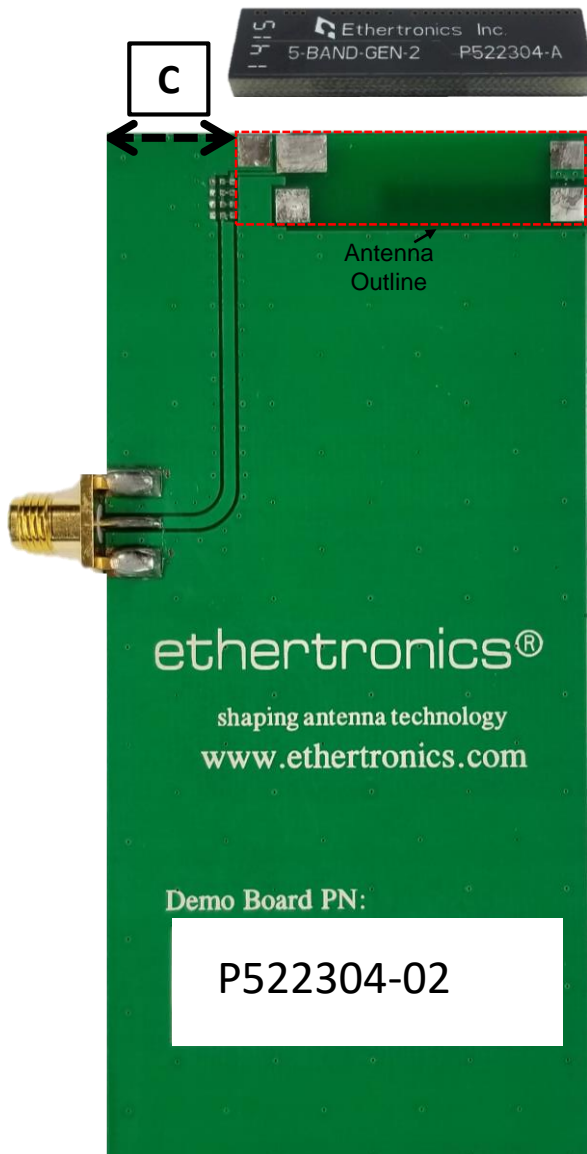


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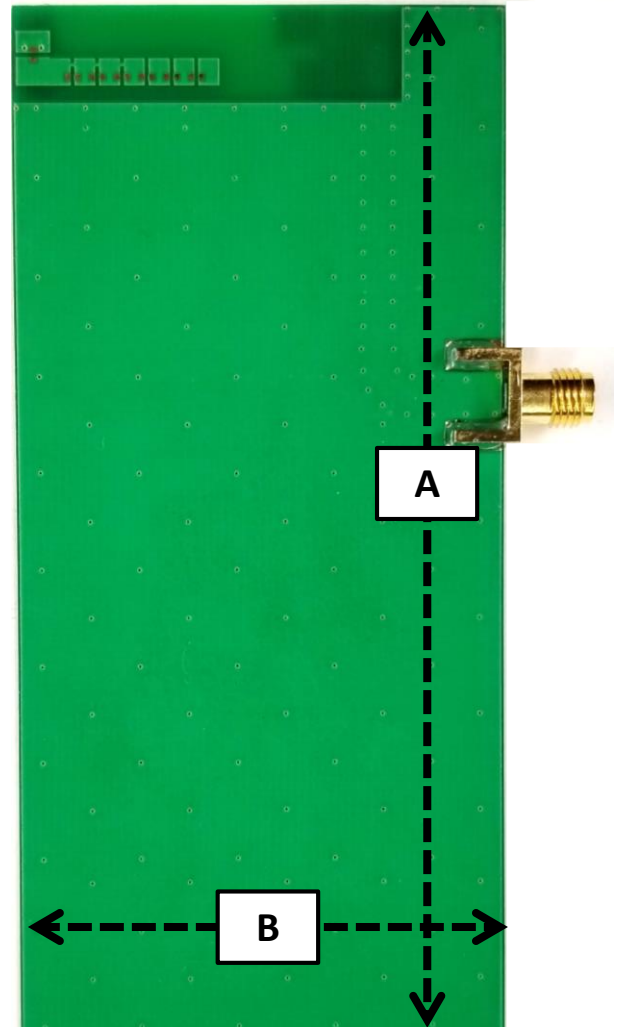
**Antenna Demo Board**

Demo Board Front View/Back View

Part Number	A (mm)	B (mm)	C (mm)
P522304-02	110	50.0	15.0



**Front View**



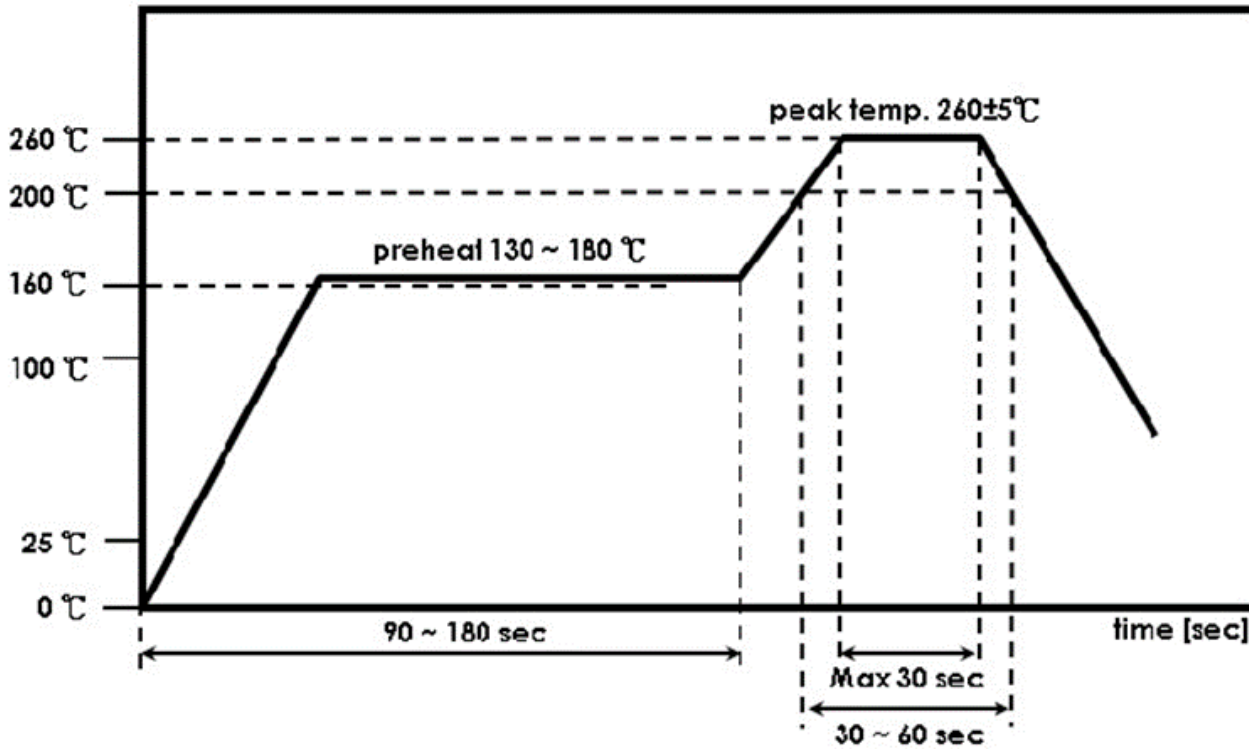
**Back View**



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### Recommended Reflow Soldering Profile

The recommended method for soldering the antenna to the board is forced convection reflow soldering. The following suggestions provide information on how to optimize the reflow process for the FR4 antenna:



\*Adjust the reflow duration to create good solder joints without raising the antenna temperature beyond the allowed maximum of 260° C.