ethertronics
AN AVX GROUP COMPANY

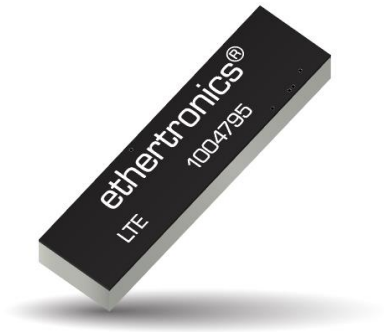
DATASHEET
Part No. 1004795/1004796
Product: Embedded FR4
Broadband LTE antenna

Part No. 1004795 / 1004796

Universal Broadband FR4 Embedded LTE / LPWA Antenna

600 – 960 MHz / 1710 - 2690 MHz

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



*Mirrored version offered as 1004796

Universal Broadband FR4 Embedded LTE Antenna

Low Band: 600 – 1000 MHz
High Band: 1700 - 2400 MHz
Band 7: 2500 - 2700 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
- Wearables
- Smart metering
- M2M, Industrial devices
- IoT
- Firstnet
- Automotive
- Healthcare
- Point of Sale
- Tracking
- NB-IoT
- Sigfox
- LoRa
- Cellular LPWA
- RPMA
- LTE CAT-M

Ethertronics' Universal Broadband Embedded LTE/LPWA antennas utilize IMD technology, which offers a reduced electrical footprint on any circuit board and independent tuning capabilities for performance optimization. This low profile FR4 antenna encapsulates IMD's high performance and isolation characteristics offering better connectivity and minimal interference

High Performance LTE in Small form factor

The 1004795/1004796 LTE antenna is designed to support CAT-M and Narrowband-IoT applications. This antenna is the perfect solution CAT-M and NB-IoT enabled devices, offering high efficiency and peak gain in a miniature form factor, and with a reduced ground plane size requirement. The 1004795/1004796 LTE CAT-M/NB-IoT antenna allows wideband coverage, supporting all US and Worldwide major carriers.

Electrical Specifications

Typical 1004795 performance 125 x 45 mm PCB

Frequency (MHz)	600-698	698-960	1710-2400	2500-2700
Peak Gain	1.5 dBi	1.6 dBi	3.1 dBi	1.7 dBi
Average Efficiency	61%	64%	55%	53%
VSWR Match	<5.5:1	< 2.5:1		< 3.0:1
Polarization	Linear			
Power Handling	2 Watt CW			
Feed Point Impedance	50 Ω unbalanced			

Mechanical Specifications & Ordering Part Number

Ordering Part #	1004795	1004796
Dimensions (mm)	36.0 x 9.0 x 3.2	36.0 x 9.0 x 3.2
Mounting Type	SMT (P&P)	
Variant	1004796 : Mirrored version of 1004795	
Weight (grams)	2.1	
Packaging	Tape and Reel	
Storage Temperature/ Humidity (Sealed shipping package)	+5°C to +35°C 45~75%	
Operating Temperature	-40 to +85 C	
Demo Board	1004795-01 (1004795) 1004796-01 (1004796)	

1004795 / 1004796 Universal Broadband Embedded LTE Antenna Specifications.
Ethertronics produces a wide variety of standard and custom antennas to meet user needs.

LTE Bands covered by (1004795/1004796)

LTE Band	Frequency Band (MHz)	Uplink (UL) (MHz)	Downlink (DL) (MHz)	Region	Covered
1	2100	1920 - 1980	2110 - 2170	Global	Yes
2	1900	1850 - 1910	1930 - 1990	NAM	
3	1800	1710 - 1785	1805 - 1880	Global	
4	1700	1710 - 1755	2110 - 2155	NAM	
5	850	824 - 849	869 - 894	NAM	
6	850	830 - 840	875 - 885	APAC	
7	2600	2500 - 2570	2620 - 2690	EMEA	
8	900	880 - 915	925 - 960	Global	
9	1800	1749.9 - 1784.9	1844.9 - 1879.9	APAC	
10	1700	1710 - 1770	2110 - 2170	NAM	
11	1500	1427.9 - 1447.9	1475.9 - 1495.9	Japan	No
12	700	699 - 716	729 - 746	NAM	Yes
13	700	777 - 787	746 - 756	NAM	
14	700	788 - 798	758 - 768	NAM	
17	700	704 - 716	734 - 746	NAM	
18	850	815 - 830	860 - 875	Japan	
19	850	830 - 845	875 - 890	Japan	
20	800	832 - 862	791 - 821	EMEA	
21	1500	1447.9 - 1462.9	1495.9 - 1510.9	Japan	No
22	3500	3410 - 3490	3510 - 3590	EMEA	
23	2000	2000 - 2020	2180 - 2200	NAM	Yes
24	1600	1626.5 - 1660.5	1525 - 1559	NAM	No
25	1900	1850 - 1915	1930 - 1995	NAM	Yes
26	850	814 - 849	859 - 894	NAM	
27	850	807 - 824	852 - 869	NAM	
28	700	703 - 748	758 - 803	APAC,EU	
29	700	N/A	717 - 728	NAM	
30	2300	2305 - 23151	2350 - 2360	NAM	
31	450	452.5 - 457.5	462.5 - 467.5	Global	No
32	1500	N/A	1452 - 1496	EMEA	
33	1900	1900 - 1920			Yes
34	2000	2010 - 2025			
35	1850	1850 - 1910			
36	1900	1930 - 1990			
37	1900	1910 - 1930			
38	2600	2570 - 2620			
39	1900	1880 - 1920			
40	2300	2300 - 2400			
41	2500	2496 - 2690			
42	3500	3400 - 3600			No
43	3700	3600 - 3800			

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1004795 / 1004796 Universal Broadband Embedded LTE Antenna Specifications.
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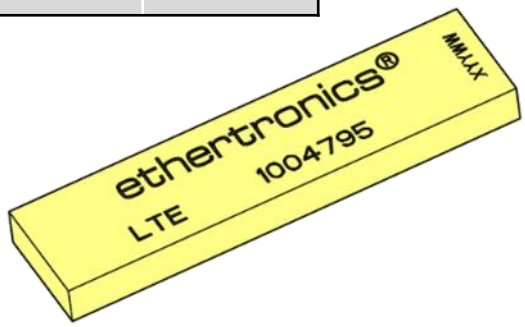
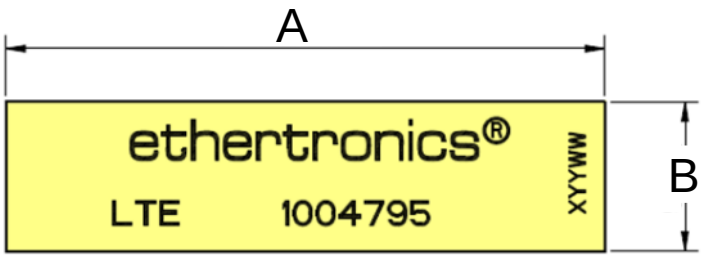
Antenna Dimensions (1004795)

Typical antenna dimensions (mm)

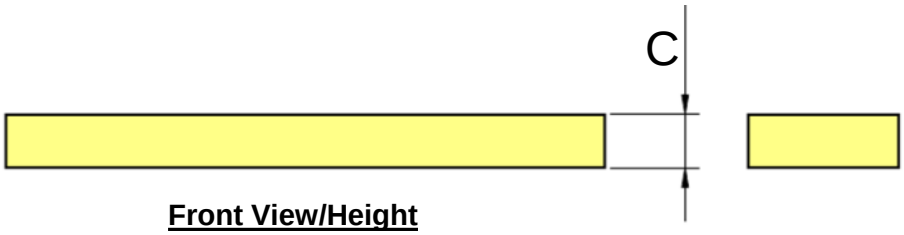
Part Number	A (mm)	B (mm)	C (mm)
1004795	36.0 ± 0.3	9.0 ± 0.2	3.2 ± 0.3



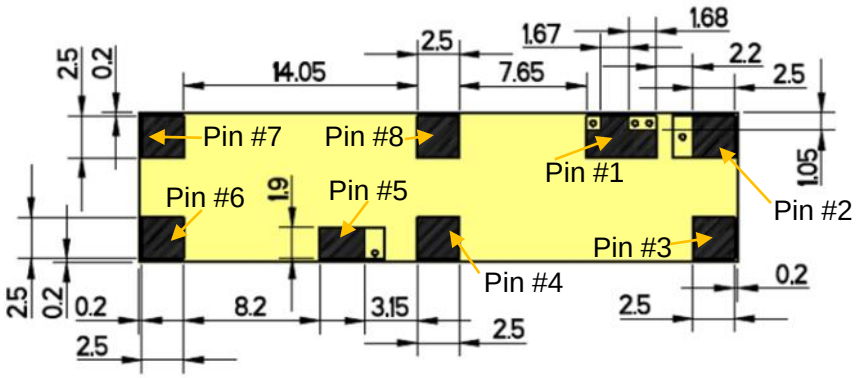


Top View

Pin#	Description
1	Feed
2	Antenna Tuning
3	Dummy Pad
4	Dummy Pad
5	Antenna Tuning
6	Dummy Pad
7	Dummy Pad
8	Dummy Pad



Front View/Height



Bottom View

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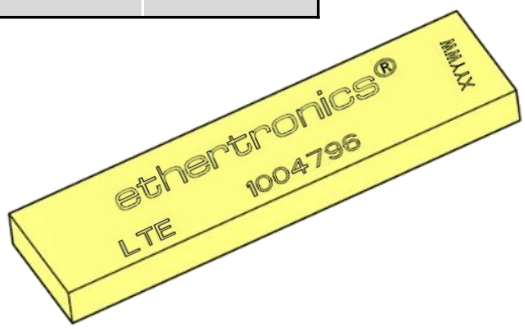
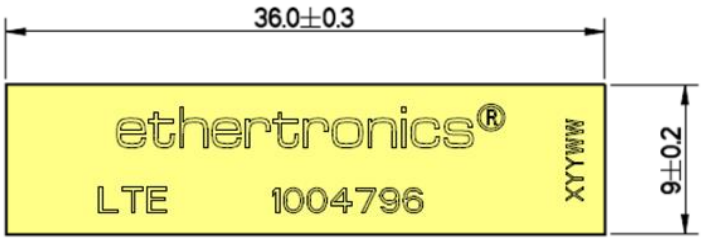
Antenna Dimensions (1004796)

Typical antenna dimensions (mm)

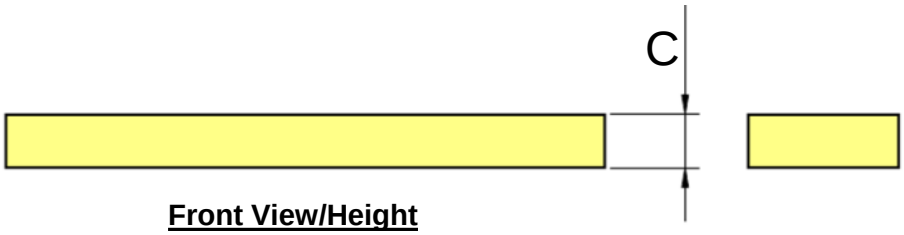
Part Number	A (mm)	B (mm)	C (mm)
1004796	36.0 ± 0.3	9.0 ± 0.2	3.2 ± 0.3



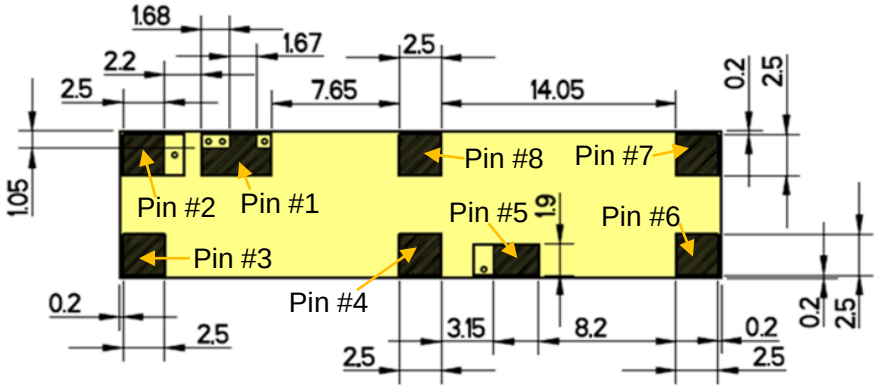


Top View

Pin#	Description
1	Feed
2	Antenna Tuning
3	Dummy Pad
4	Dummy Pad
5	Antenna Tuning
6	Dummy Pad
7	Dummy Pad
8	Dummy Pad



Front View/Height



Bottom View

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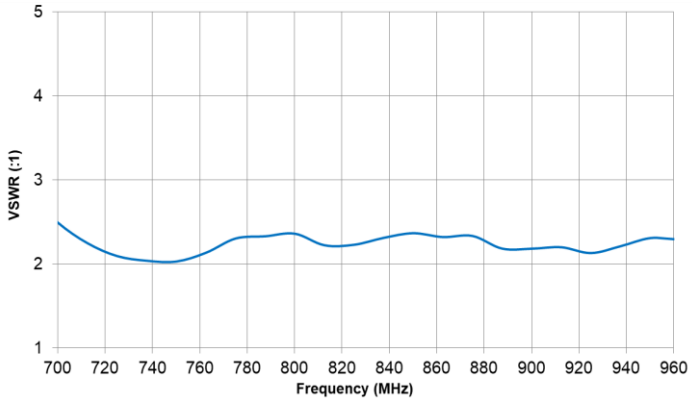
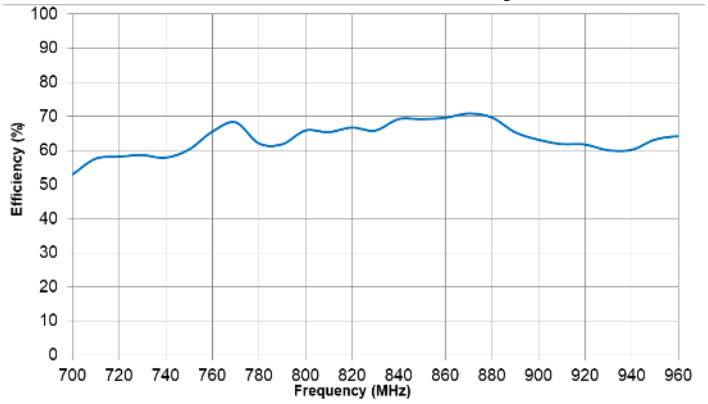
VSWR and Efficiency Plots

Typical 1004795/1004796 performance 125 x 45 mm PCB

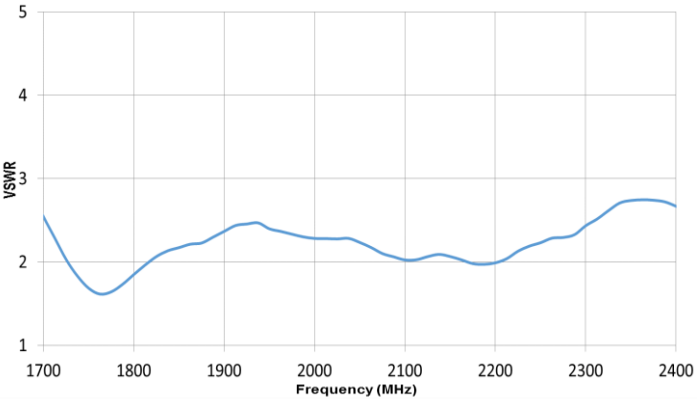
Low Band VSWR



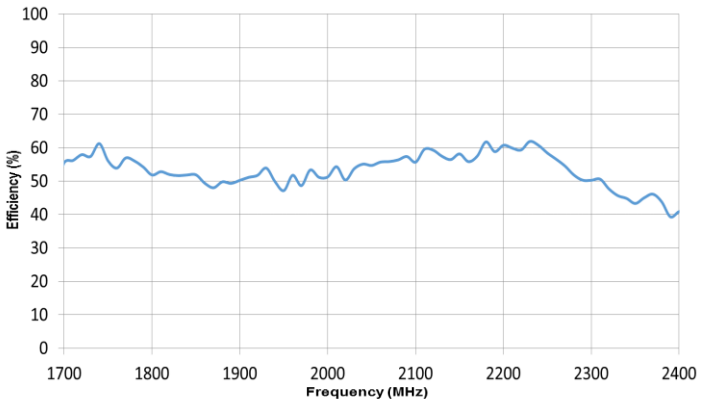
Low Band Efficiency



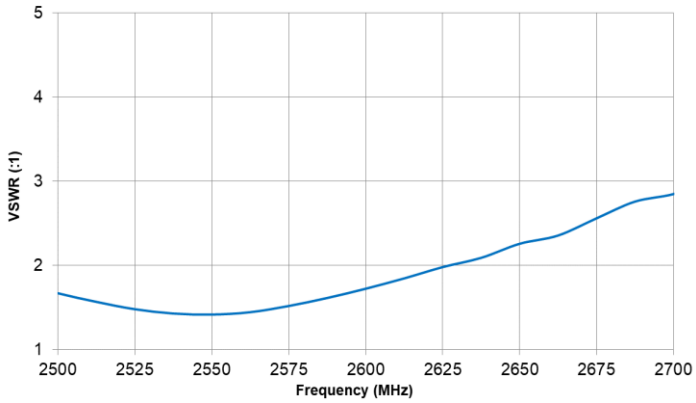
High Band VSWR



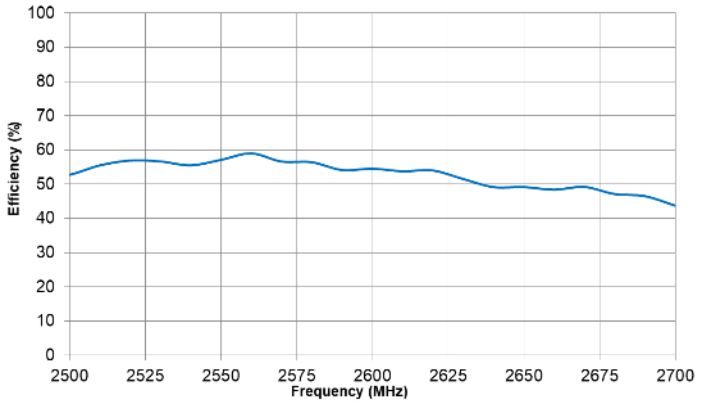
High Band Efficiency



Band 7 VSWR



Band 7 Efficiency



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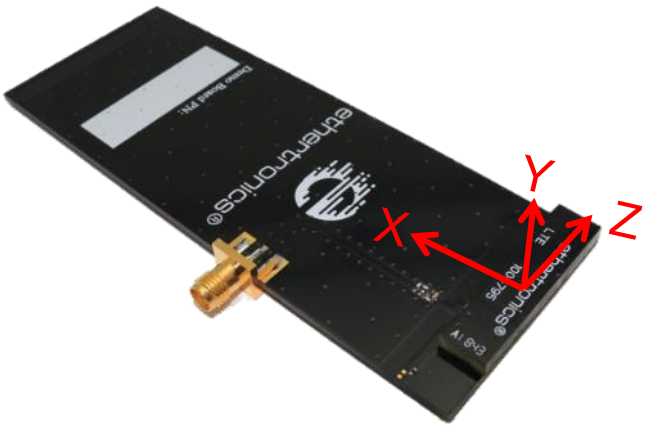
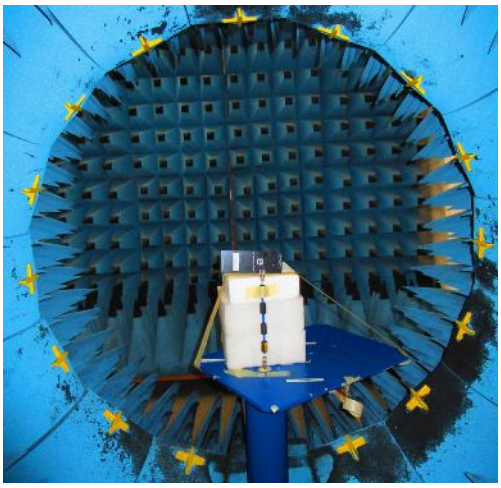
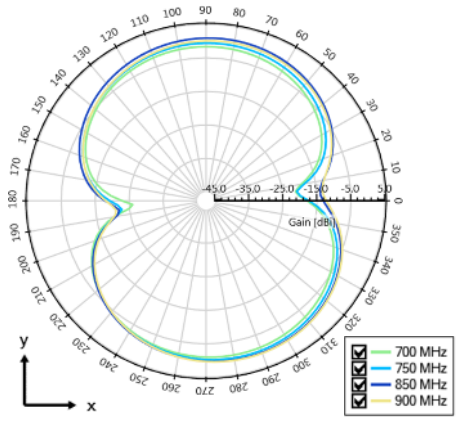
Antenna Radiation Patterns – Low / High Band

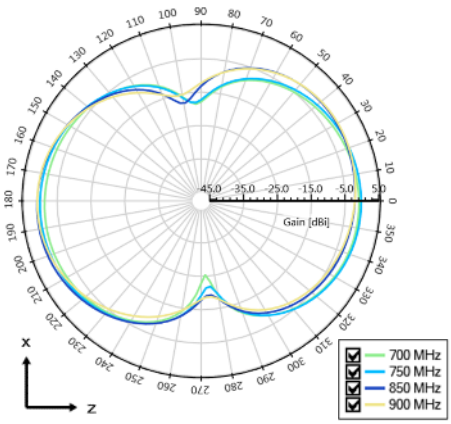
Typical 1004795/1004796 performance 125 x 45 mm PCB

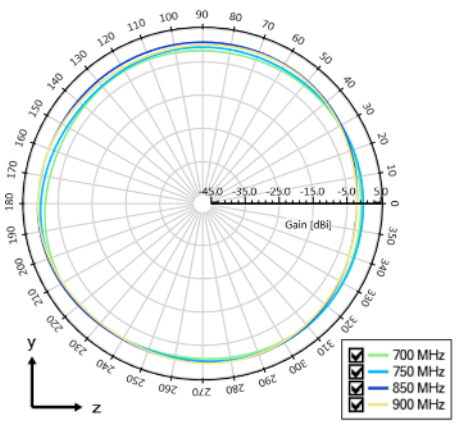




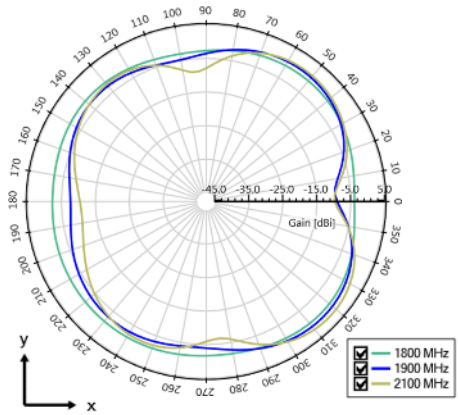
Low Band measured at 700, 750, 850, 900 MHz

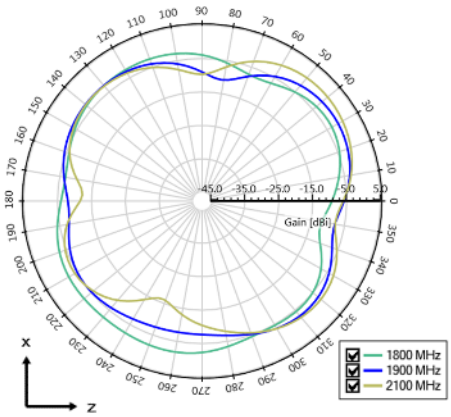


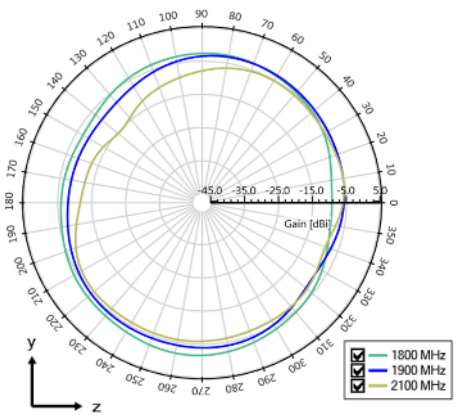




High Band measured at 1800, 1900, 2100 MHz







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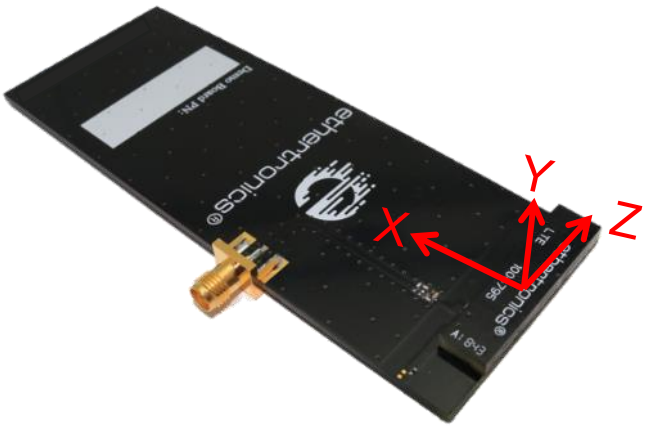
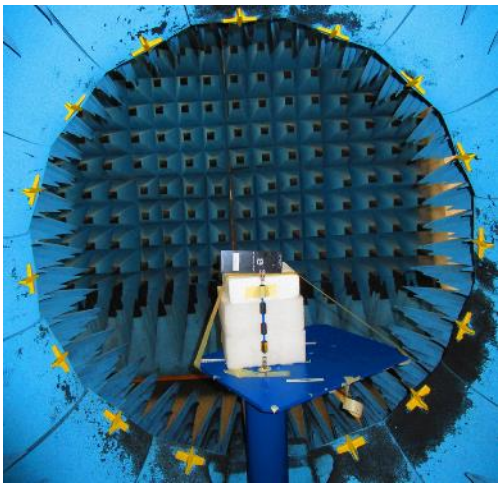
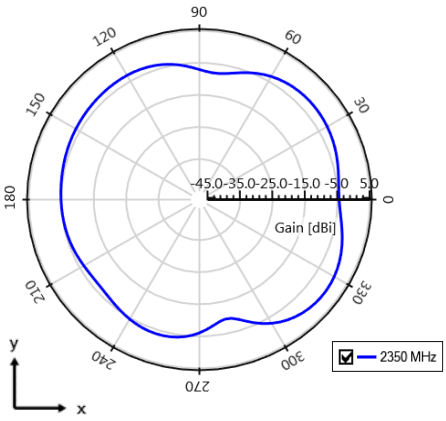
Antenna Radiation Patterns – High Band, Band 7

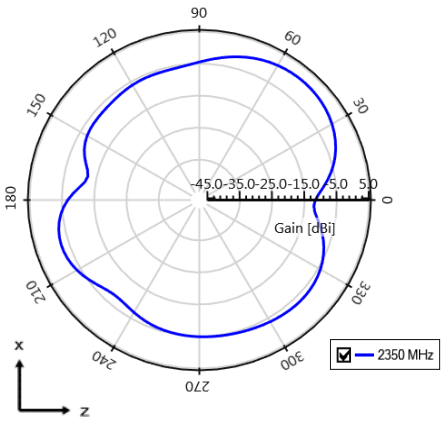
Typical 1004795/1004796 performance 125 x 45 mm PCB

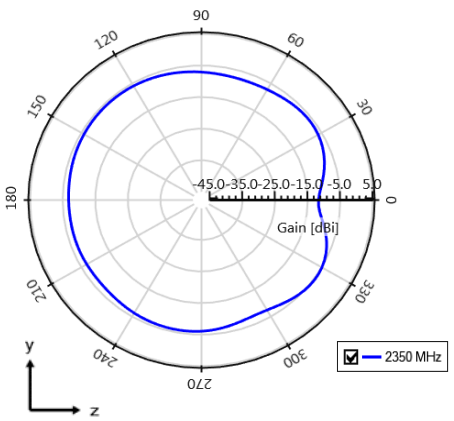




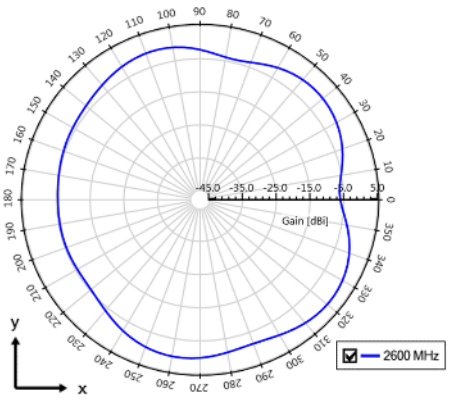
High Band measured at 2350 MHz

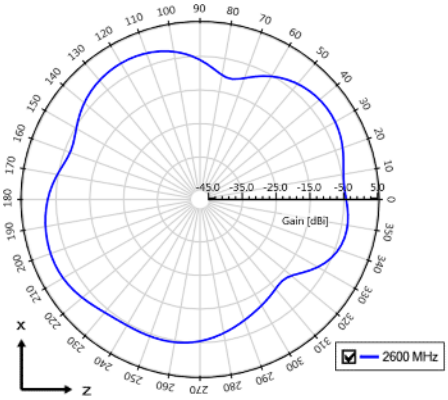


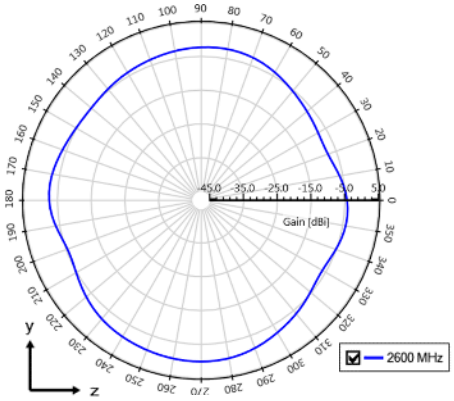




Band 7 measured at 2600 MHz







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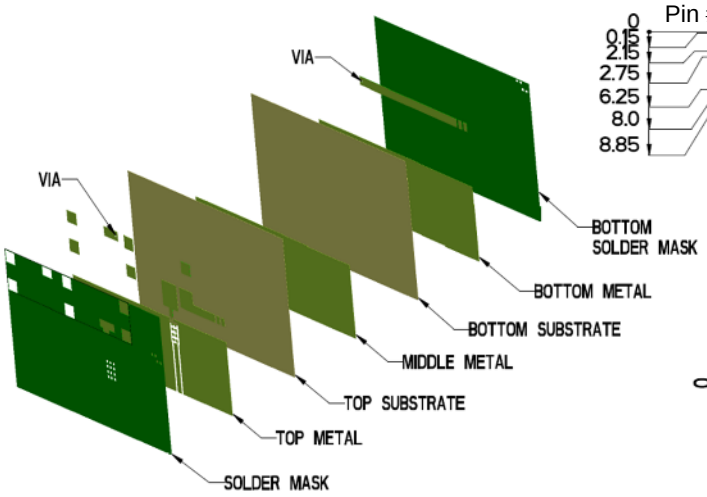
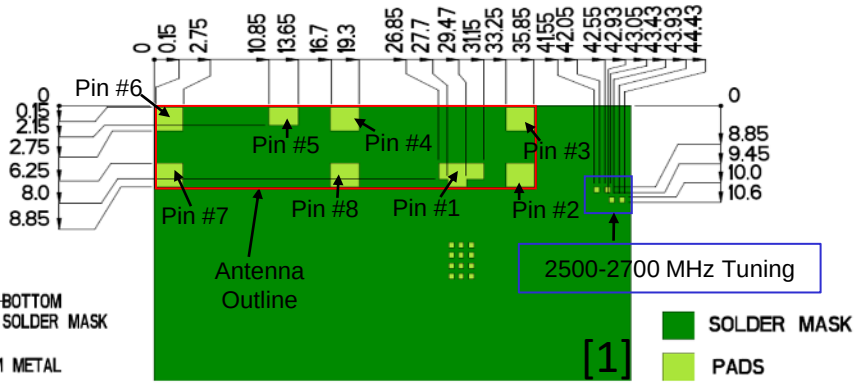
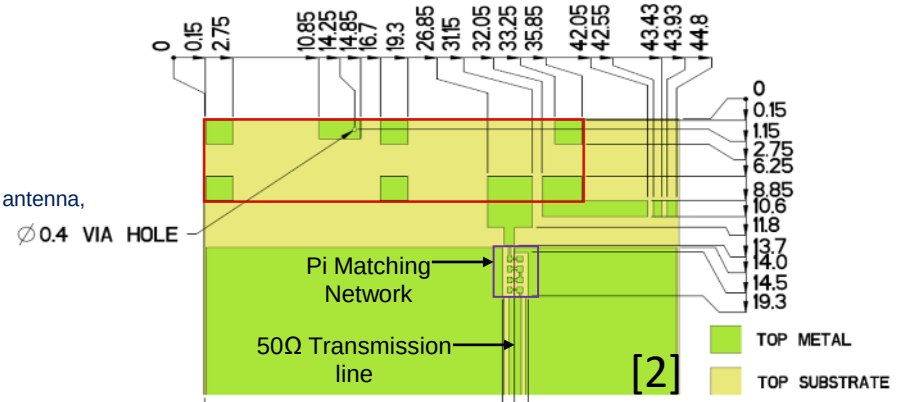
Antenna Layout (1004795)

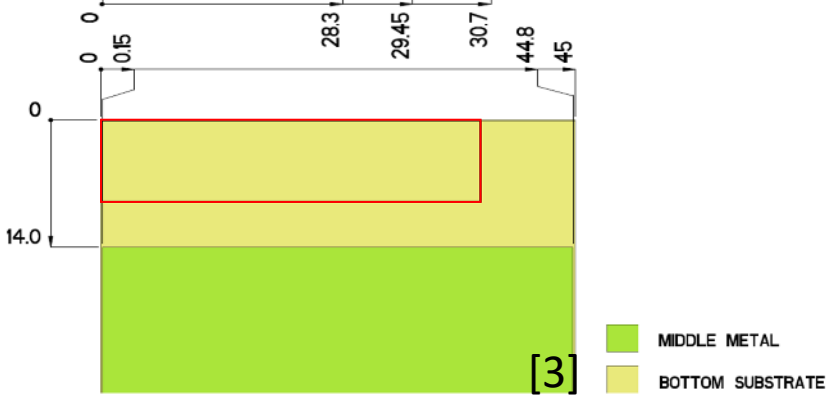
Typical layout dimensions (mm)





- Additional VIAS: Diam. 0.4mm to be placed around antenna, (no vias on transmission lines).
- Via holes must be covered by solder mask



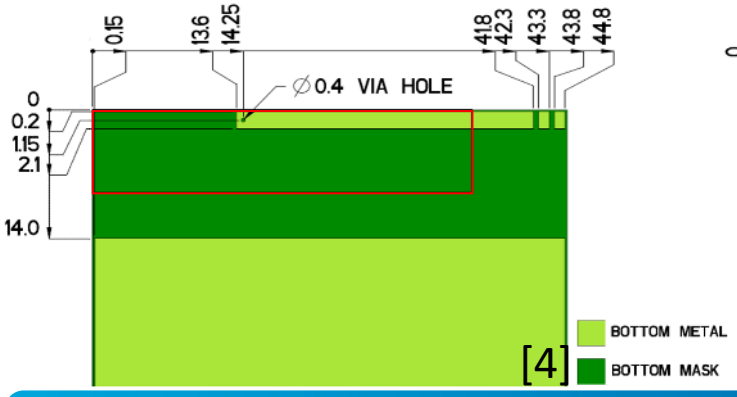


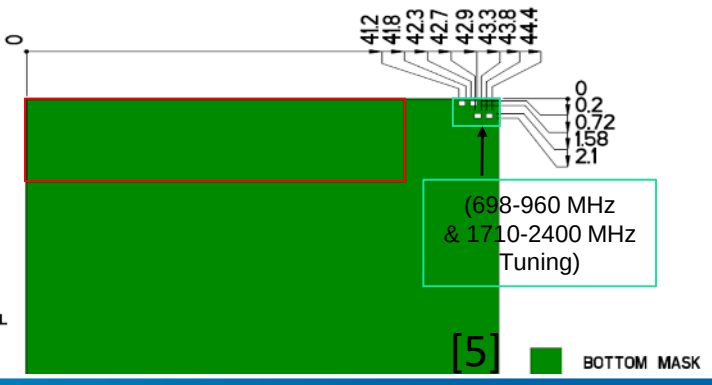
Pin Descriptions

Pin#	Description
1	Feed
2	Antenna Tuning
3	Dummy Pad
4	Dummy Pad
5	Antenna Tuning
6	Dummy Pad
7	Dummy Pad
8	Dummy Pad

*1004796 uses the same layout but mirrored.

Default Pi Matching Network values with instructions can be found under Antenna Matching Network.





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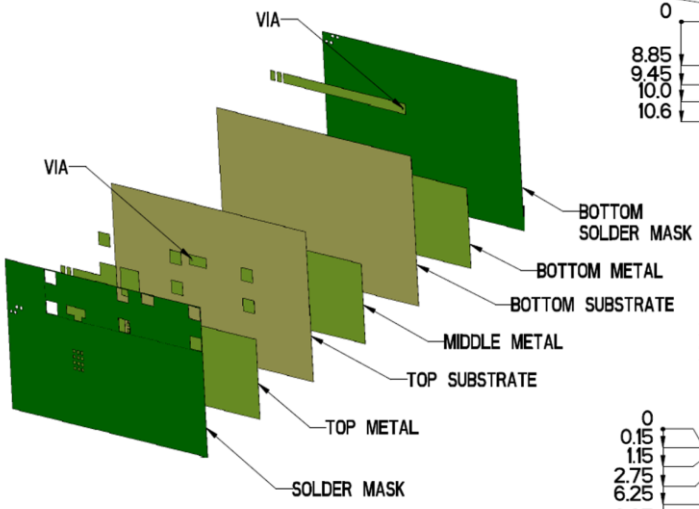
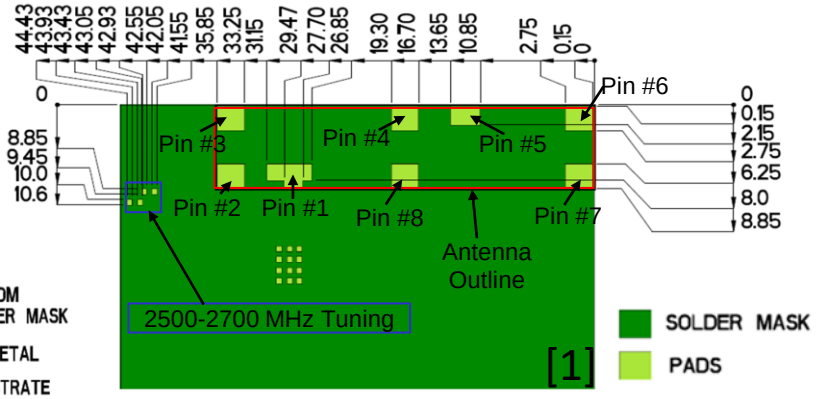
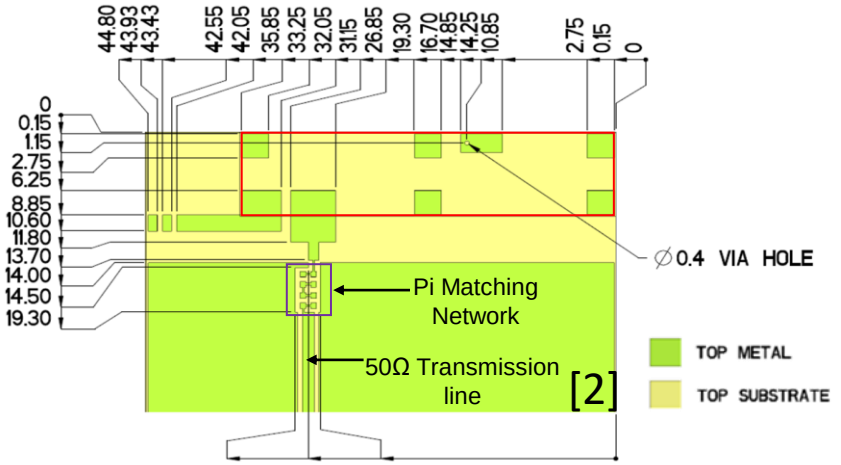
Antenna Layout (1004796)

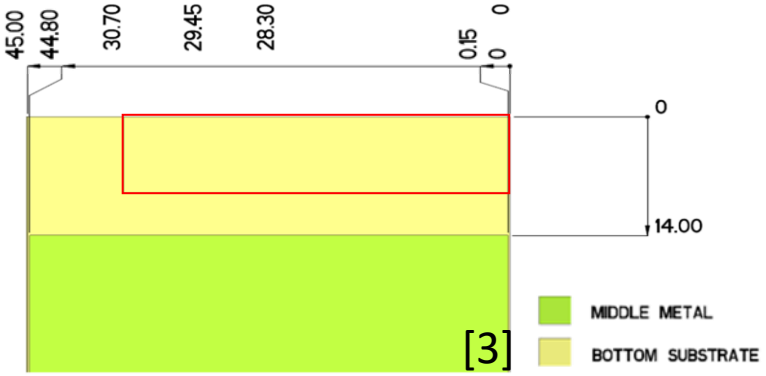
Typical layout dimensions (mm)



- Additional VIAS: Diam. 0.4mm to be placed around antenna, (no vias on transmission lines).
- Via holes must be covered by solder mask



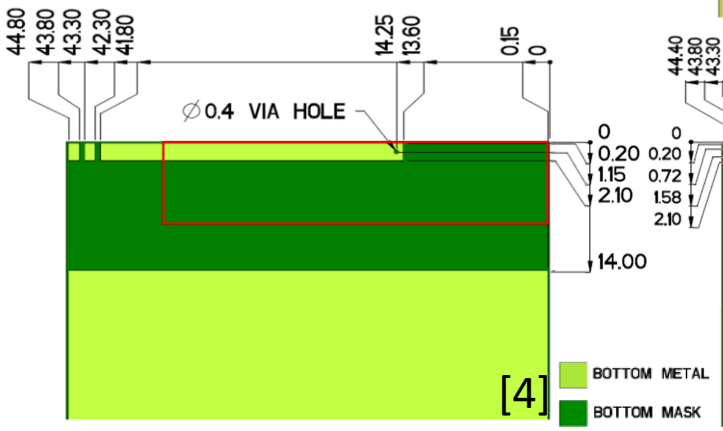


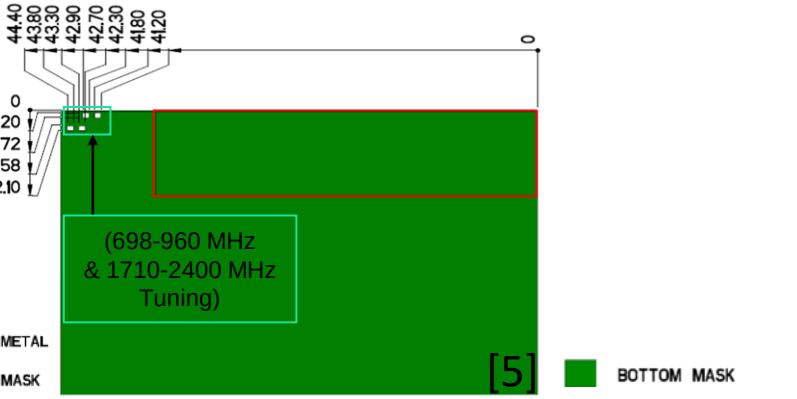


Pin Descriptions

Pin#	Description
1	Feed
2	Antenna Tuning
3	Dummy Pad
4	Dummy Pad
5	Antenna Tuning
6	Dummy Pad
7	Dummy Pad
8	Dummy Pad

*1004795 uses the same layout but mirrored.
Default Pi Matching Network values with instructions can be found under Antenna Matching Network.





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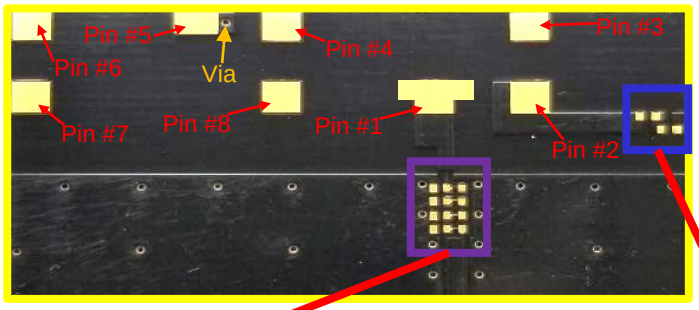
Ethertronics produces a wide variety of standard and custom antennas to meet user needs.

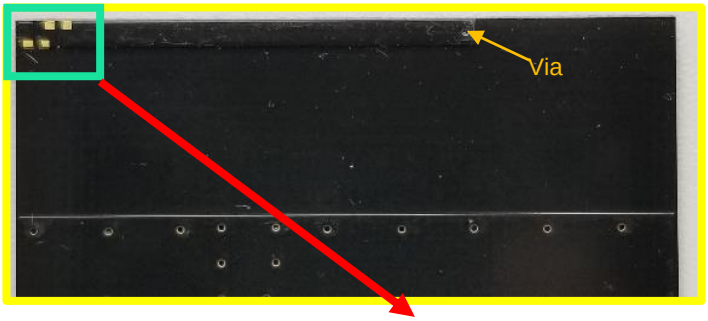
Antenna Matching Structure (1004795)

Typical matching values on 125 x 45 mm PCB
*Also applies to mirrored layout 1004796

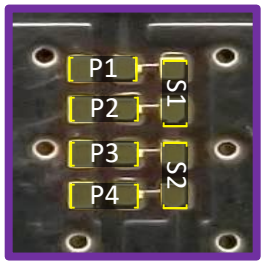
Demo Board Front View



Demo Board Back View

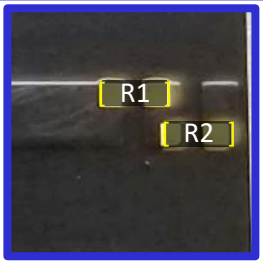


Antenna Matching



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

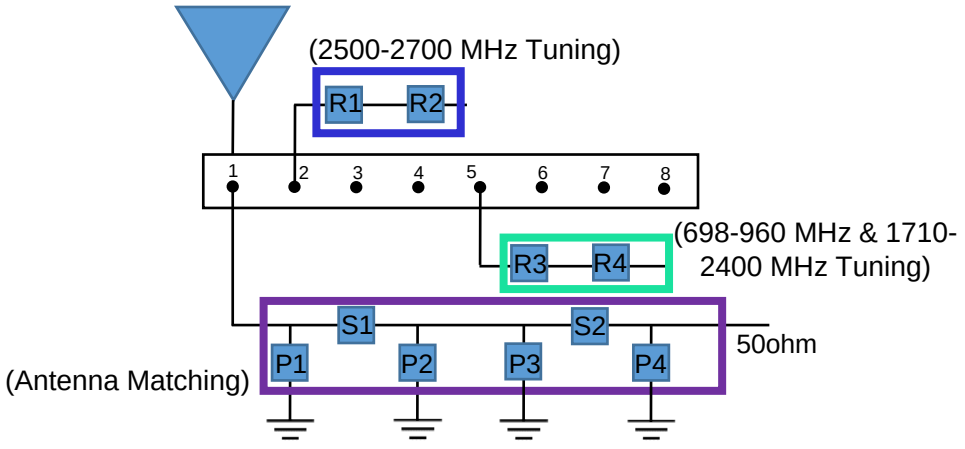
2500-2700 MHz Tuning



698-960 MHz & 1710-2400 MHz Tuning

Pin Descriptions

Pin#	Description
1	Feed
2	Antenna Tuning
3	Dummy Pad
4	Dummy Pad
5	Antenna Tuning
6	Dummy Pad
7	Dummy Pad
8	Dummy Pad



	P1	S1	P2	P3	S2	P4	R1	R2	R3-R4
Default Matching	8.2nH	4.7pF	0.3pF	DNI	0 Ohm	0.5pF	0 Ohm	DNI	0 Ohm
Tolerance	± 0.1nH	± 0.05pF	± 0.05pF	N/A		± 0.05pF		N/A	

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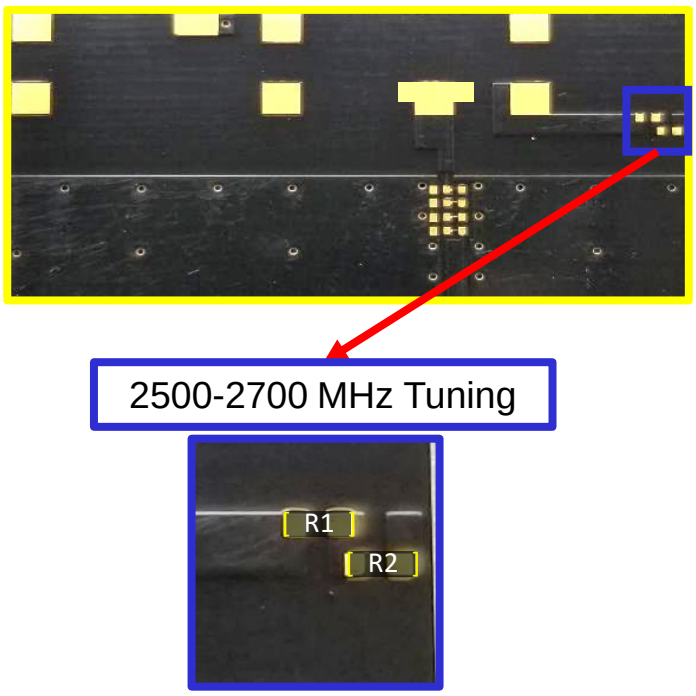
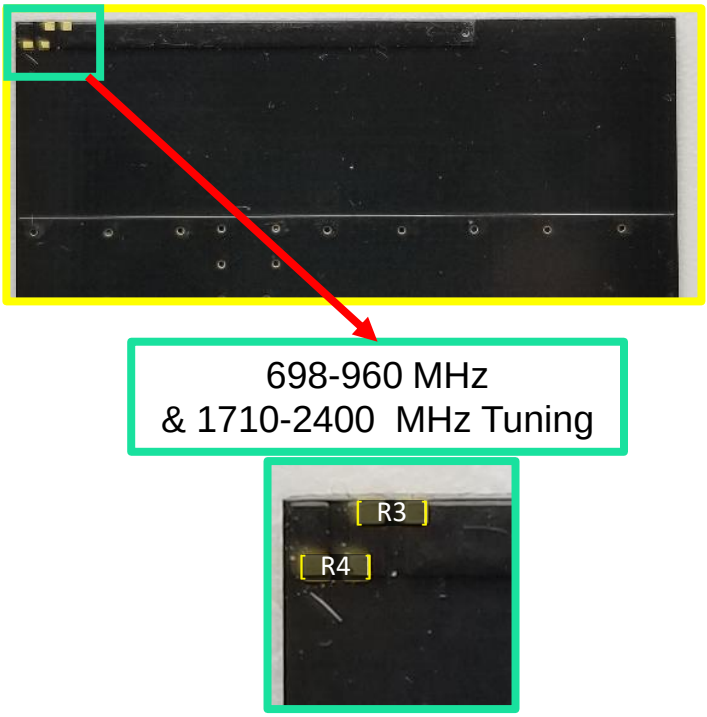
Antenna Tuning Options (1004795)

Typical matching values on 125 x 45 mm PCB
*Also applies to mirrored layout 1004796

Demo Board Front View



Demo Board Back View



Options for Tuning: "698-960 MHz & 1710-2400 MHz"

MODE	T1	T2		T3	
PADS	Connect: R3 & R4	Remove: R4		Remove: R4 & R3	
Outcome: (Ref: Baseline)	BASELINE	(698-960 MHz) ~20 MHz shift high	(1710-2400 MHz) ~20 MHz shift high	(698-960 MHz) ~30 MHz shift high	(1710-2400 MHz) ~35 MHz shift high

*R= 0 Ohm

Options for Tuning: "2500-2700 MHz"

MODE	T4	T5	T6
PADS	Connect: R1	Connect: R1 & R2	Remove: R1 & R2
Outcome: (Ref: Baseline)	BASELINE	~60 MHz shift low	~70 MHz shift high

*R= 0 Ohm

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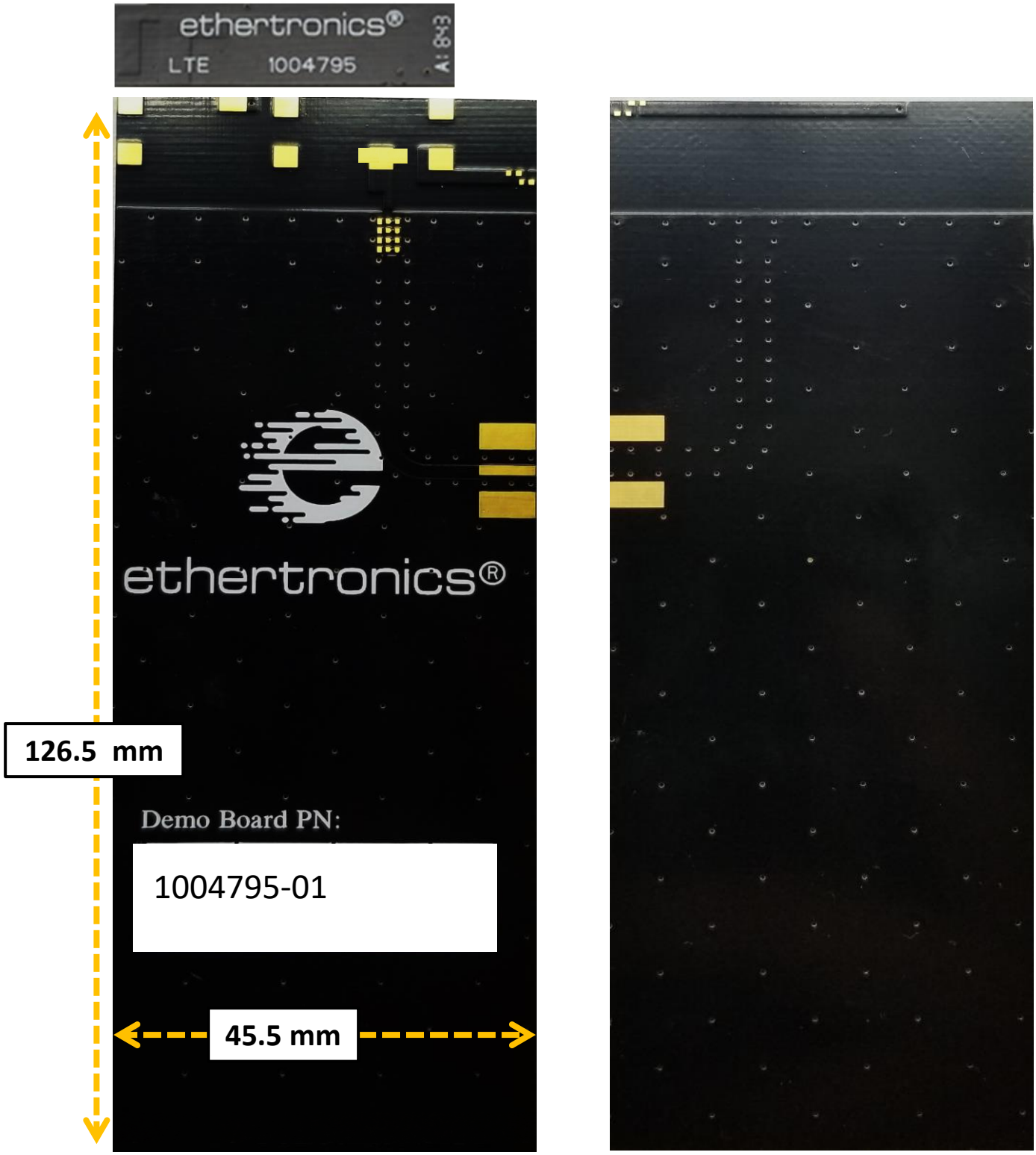
Antenna Demo Board (1004795)

Demo Board Front/Back View (mm)



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Appendix 1

Appendix 1 gives instructions on how to achieve increased bandwidth to cover 600-960 MHz through impedance matching network.

(600-960 MHz)
(1710-2400 MHz)
(2500-2700 MHz)

Frequency (MHz)	600-698	698-960	1710-2400	2500-2700
Peak Gain	1.5 dBi	1.2 dBi	2.4 dBi	0.9 dBi
Average Efficiency	61%	55%	52%	48%
VSWR Match	< 5.5:1	< 3.7:1	< 2.5:1	< 3.0:1
Polarization	Linear			
Power Handling	2 Watt CW			
Feed Point Impedance	50 Ω unbalanced			

*Data shown above has Appendix 1 matching applied on 125 x 45 mm pcb.

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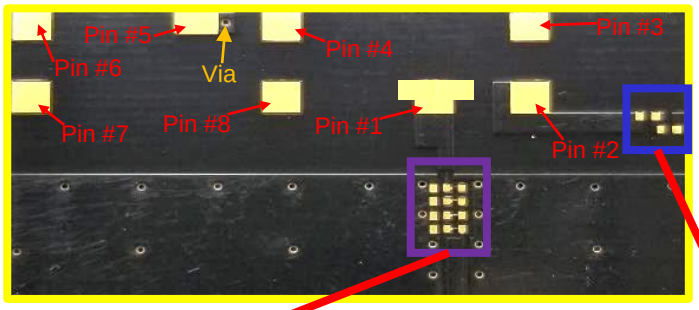
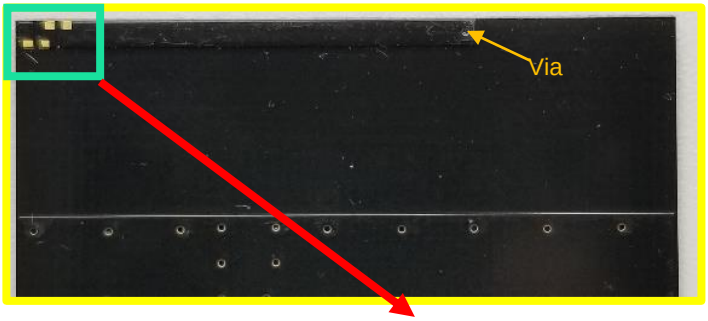
Appendix 1: Antenna Matching Structure (1004795)

Typical matching values on 125 x 45 mm PCB
*Also applies to mirrored layout 1004796

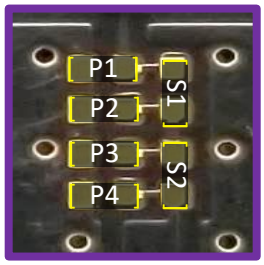
Demo Board Front View



Demo Board Back View

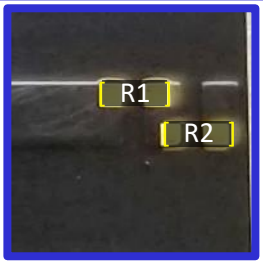


Antenna Matching



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

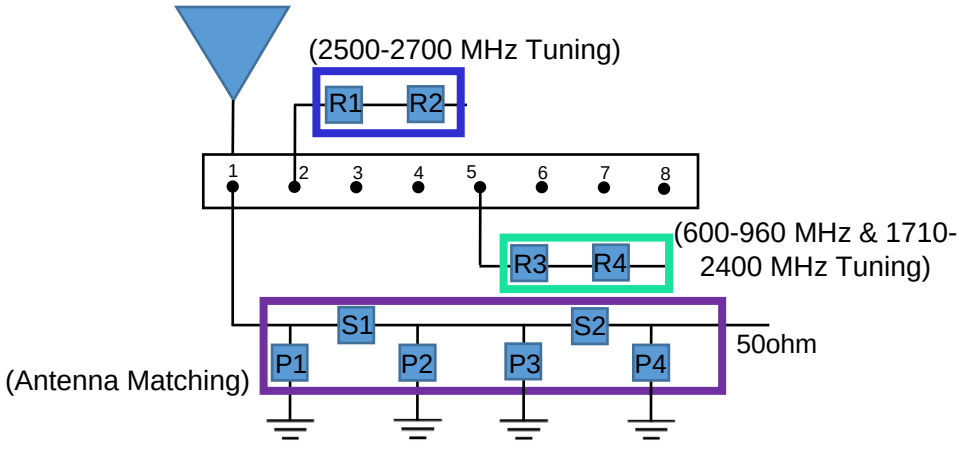
2500-2700 MHz Tuning



600-960 MHz & 1710-2400 MHz Tuning

Pin Descriptions

Pin#	Description
1	Feed
2	Antenna Tuning
3	Dummy Pad
4	Dummy Pad
5	Antenna Tuning
6	Dummy Pad
7	Dummy Pad
8	Dummy Pad



	P1	S1	P2	P3	S2	P4	R1	R2	R3-R4
Default Matching	10nH	3.3pF	DNI	DNI	0 Ohm	DNI	0 Ohm	DNI	0 Ohm
Tolerance	± 0.1nH	± 0.1pF	N/A	N/A		N/A		N/A	

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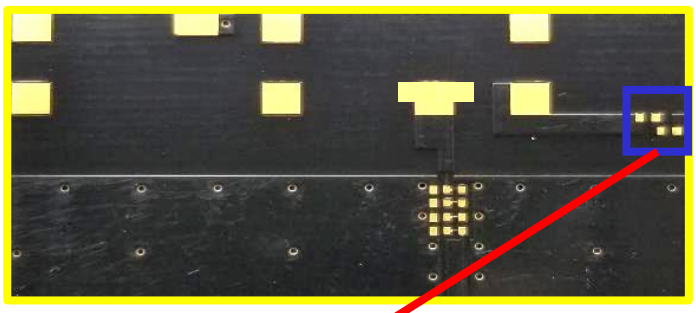
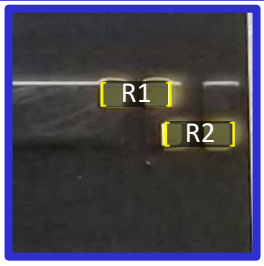
Appendix 1: Antenna Tuning Options (1004795)

Typical matching values on 125 x 45 mm PCB
*Also applies to mirrored layout 1004796

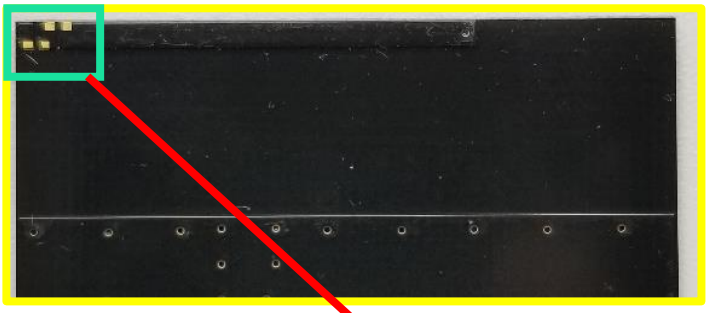
Demo Board Front View



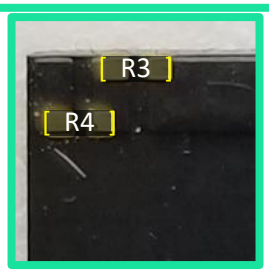
2500-2700 MHz Tuning



Demo Board Back View



600-960 MHz
& 1710-2400 MHz Tuning



Options for Tuning: "600-960 MHz & 1710-2400 MHz"

MODE	T1	T2		T3	
PADS	Connect: R3 & R4	Remove: R4		Remove: R4 & R3	
Outcome: (Ref: Baseline)	BASELINE	(600-960 MHz) ~20 MHz shift high	(1710-2400 MHz) ~20 MHz shift high	(600-960 MHz) ~30 MHz shift high	(1710-2400 MHz) ~35 MHz shift high

*R= 0 Ohm

Options for Tuning: "2500-2700 MHz"

MODE	T4	T5	T6
PADS	Connect: R1	Connect: R1 & R2	Remove: R1 & R2
Outcome: (Ref: Baseline)	BASELINE	~60 MHz shift low	~70 MHz shift high

*R= 0 Ohm

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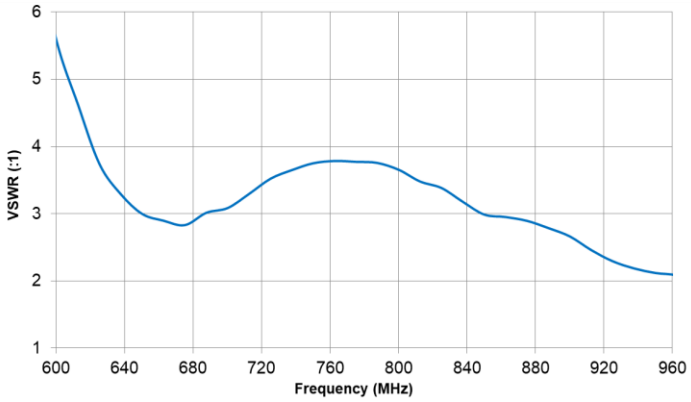
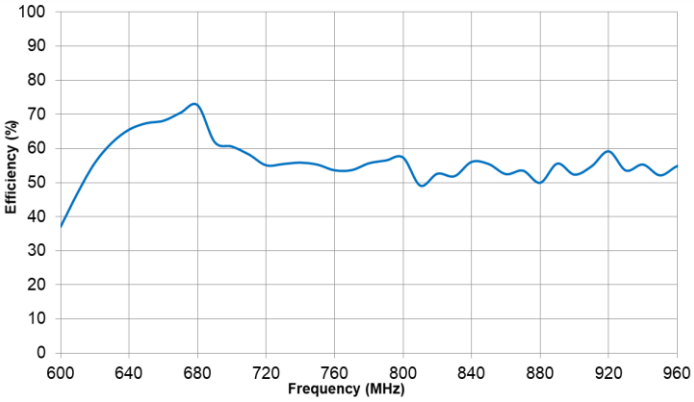
Appendix 1: VSWR and Efficiency Plots

Typical 1004795/1004796 performance 125 x 45 mm PCB

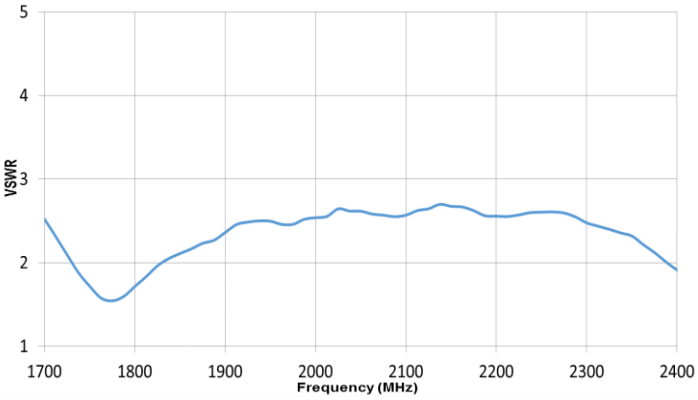
Low Band VSWR



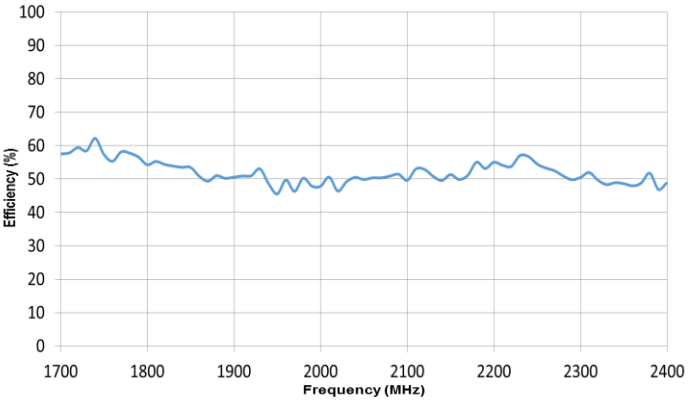
Low Band Efficiency



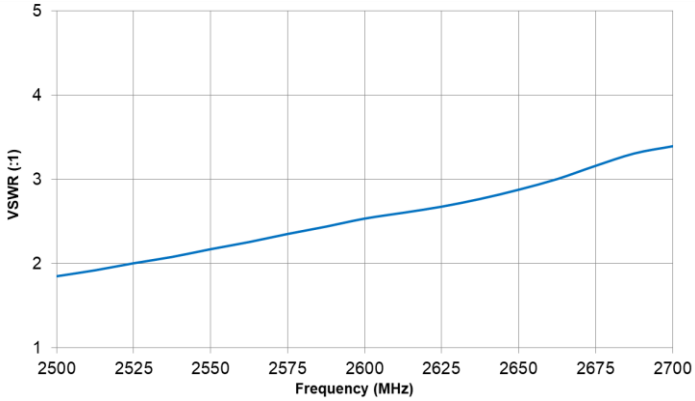
High Band VSWR



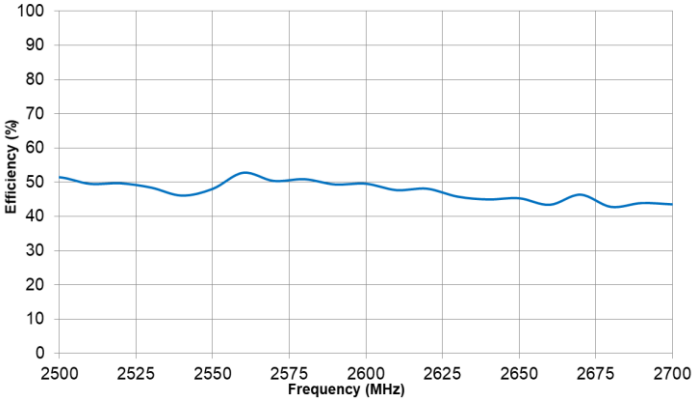
High Band Efficiency



Band 7 VSWR



Band 7 Efficiency



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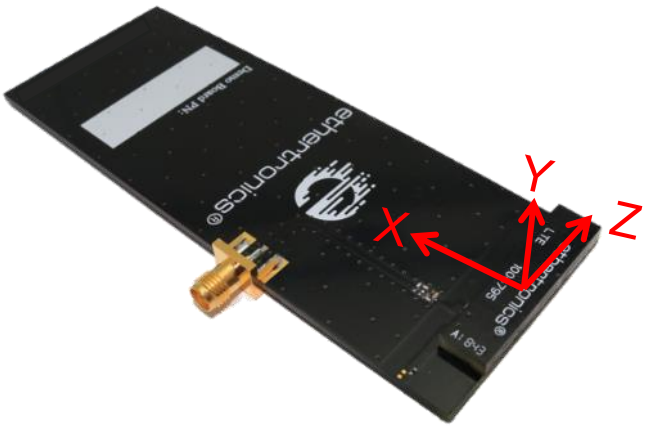
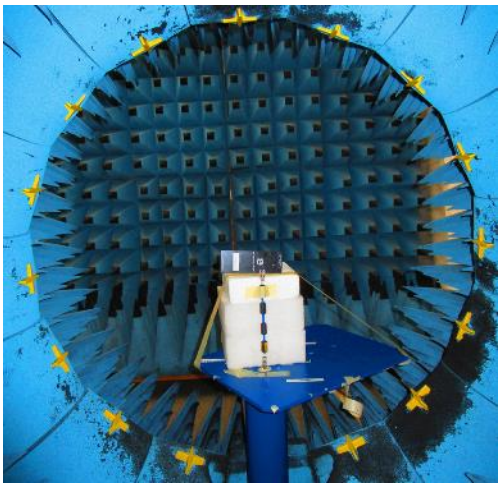
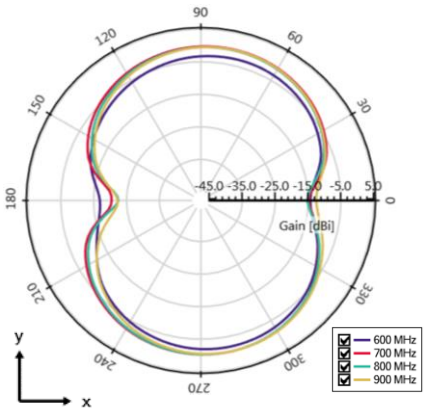
Appendix 1: Antenna Radiation Patterns – Low / High Band

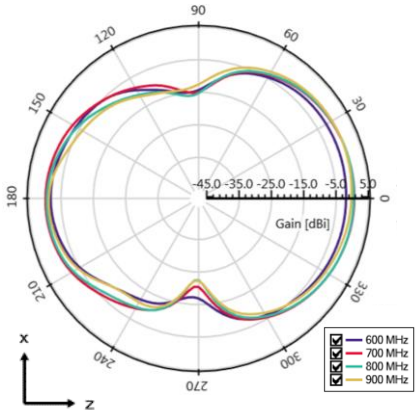
Typical 1004795/1004796 performance 125 x 45 mm PCB

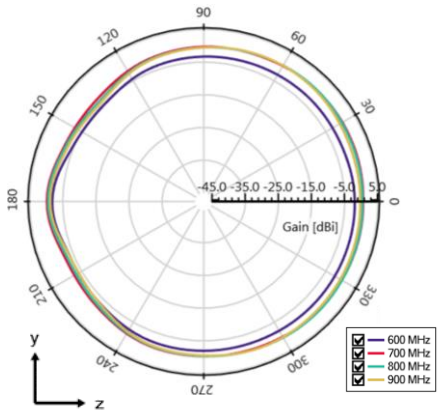




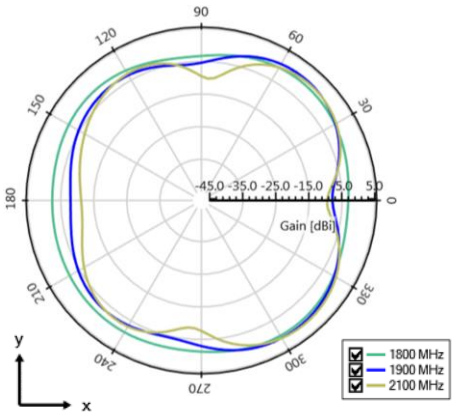
Low Band measured at 600, 700 800, 900 MHz

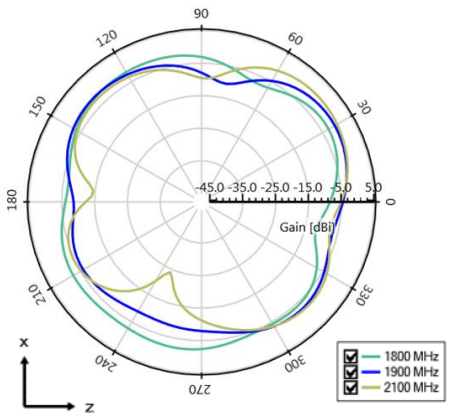


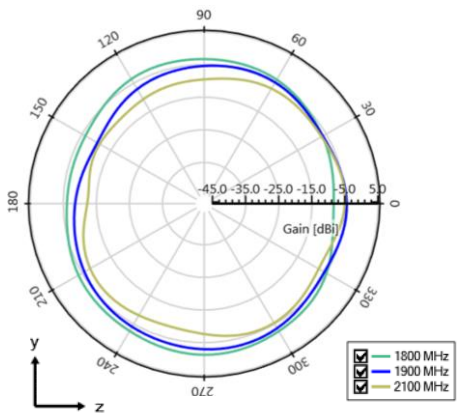




High Band measured at 1800, 1900, 2100 MHz







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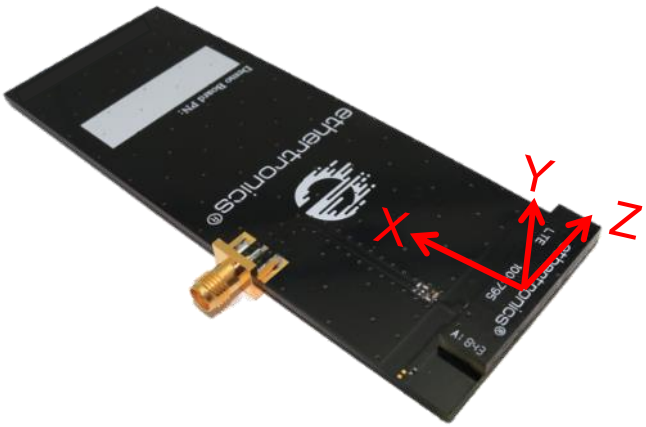
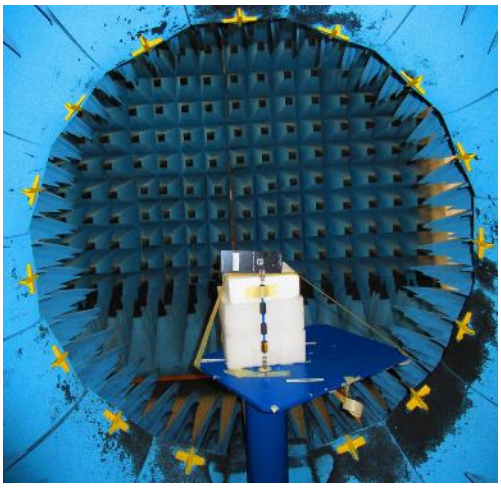
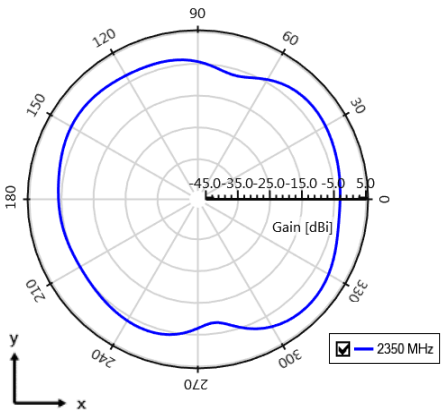
Appendix 1: Antenna Radiation Patterns – High Band, Band 7

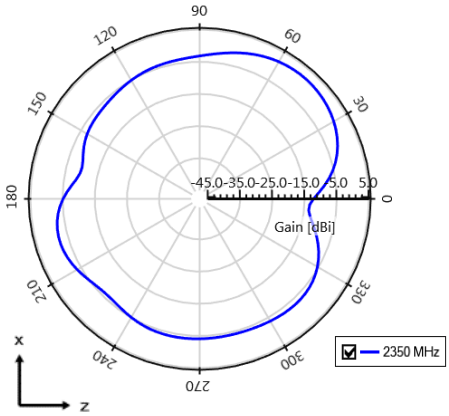
Typical 1004795/1004796 performance 125 x 45 mm PCB

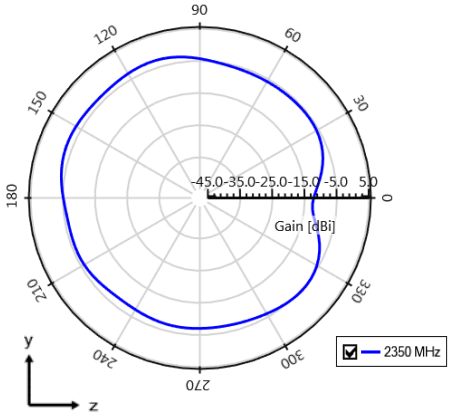




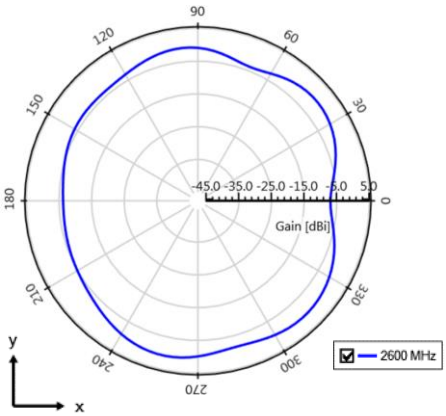
High Band measured at 2350 MHz

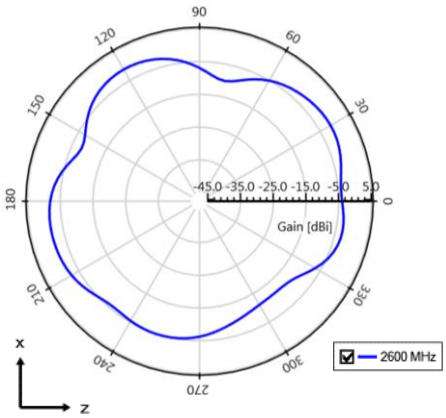


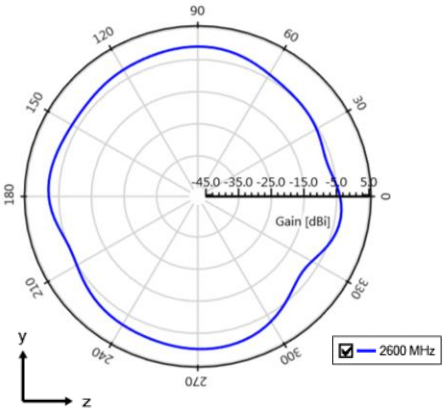




Band 7 measured at 2600 MHz







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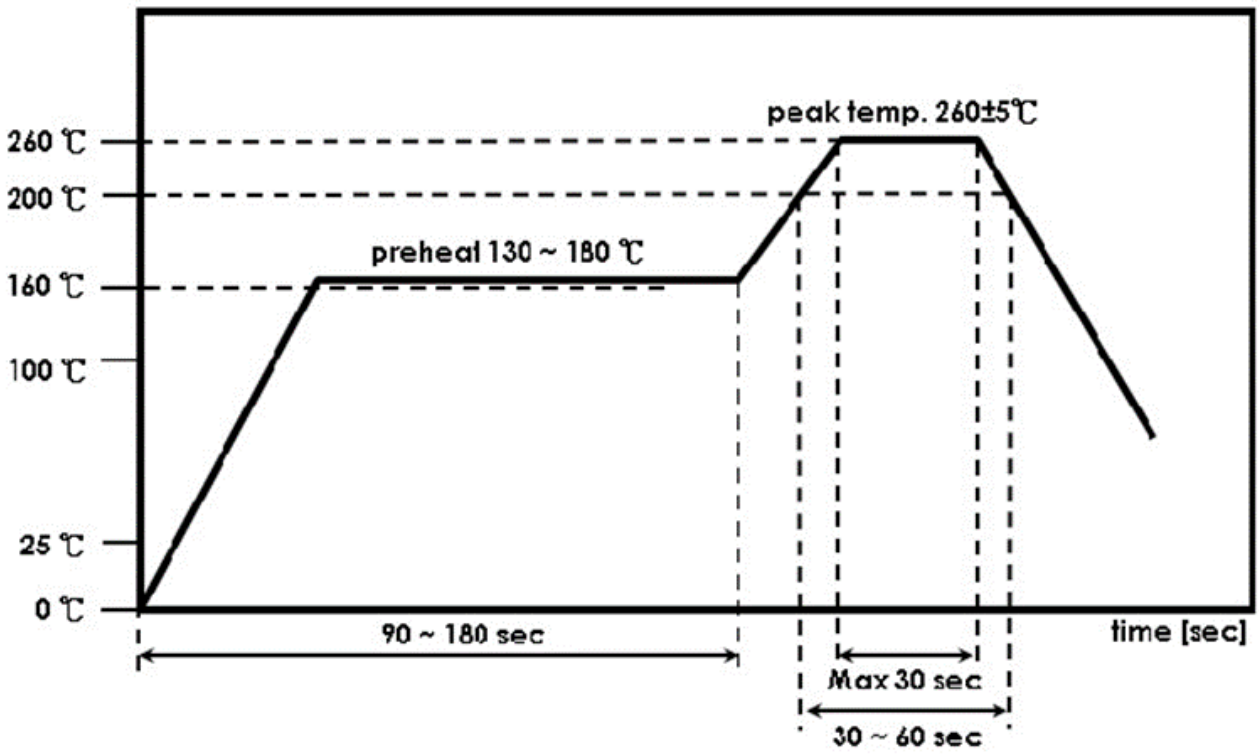
Ethertronics produces a wide variety of standard and custom antennas to meet user needs.

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.

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