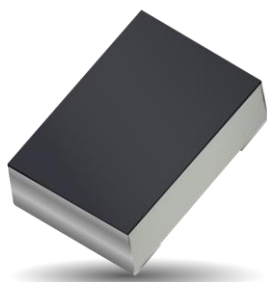


## Part No. A9001978

### Automotive Wi-Fi Dual Band or BT Chip Antenna or UWB Antenna

2.4 GHz, 5.0 GHz, 6.0 GHz - 8.5 GHz

Supports: Wi-Fi applications, Automotive, Bluetooth, Zigbee, WLAN, UWB



KYOCERA AVX A-Series automotive antennas deliver on the key needs of device designers for higher functionality.

KYOCERA AVX has completed rigorous testing to qualify the A series antennas for automotive applications. This antenna has been AEC-Q200 tested. Customers must provide additional quality requirements, if any, to drive additional compliance testing. The A9001978 is offered with dual band Wi-Fi functionality, single band 2.4 GHz, or UWB 6.0 GHz - 8.5 GHz.

#### Layout:

9001978-03: Wi-Fi Dual Band

9001978-01: BT

9001978-04:UWB

#### Electrical Specifications

Typical performance on 55 x 25 mm PCB

| Frequency (MHz)      | 2400 – 2485                               | 5150 – 5850 | 2400 – 2485 (BT ONLY) | 6000 – 8500 (UWB ONLY) |
|----------------------|-------------------------------------------|-------------|-----------------------|------------------------|
| Peak Gain            | 3.0 dBi                                   | 3.0 dBi     | Refer to Appendix 1   | Refer to Appendix 2    |
| Average Efficiency   | 65%                                       | 50%         |                       |                        |
| VSWR                 | 2.1:1 max                                 | 7:1 max     |                       |                        |
| Feed Point Impedance | 50 ohms unbalanced                        |             |                       |                        |
| Polarization         | Linear                                    |             |                       |                        |
| Power Handling       | 0.5 Watt CW                               |             |                       |                        |
| Additional resources | <a href="#">Download Simulation Files</a> |             |                       |                        |

#### KEY BENEFITS

##### Greater Flexibility with Unique Form Factors

KYOCERA AVX technology helps you deliver more advanced ergonomic designs without adverse impact on product performance.

##### Quicker Time-to-Market

By optimizing antenna size, performance and emissions, customer and regulatory specifications are more easily met.

##### Environmental Compliance

Comply with latest RoHS requirements

#### APPLICATIONS

- Telematics (TCU)
- WBMS (Wireless Battery Management System)
- Smart Entry / Key FOB
- TPMS (Tire Pressure Monitoring System)
- Other automotive applications

Wi-Fi Dual Band or BT Automotive KYOCERA AVX Embedded Chip Antenna Specification  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

## Mechanical Specifications & Ordering Part Number

| Ordering Part Number                     | A9001978                                                                                  |
|------------------------------------------|-------------------------------------------------------------------------------------------|
| Size (mm)                                | 1.00 x 0.55 x 0.40                                                                        |
| Mounting                                 | Surface mounted to the PCB                                                                |
| Weight (grams)                           | 0.003                                                                                     |
| Packaging                                | Tape & Reel<br>A9001978 – 5,000 pieces per reel                                           |
| Demo Board                               | 9001978-03 (Wi-Fi Dual Band)<br>9001978-01 (BT) Appendix 1<br>9001978-04 (UWB) Appendix 2 |
| Operational Temperature Range            | -55 °C to +125 °C                                                                         |
| Storage Temperature / Humidity Condition | 15 °C to +35 °C / ≤ 65%                                                                   |
| Temperature Cycle                        | MIL-STD-202F Method 107E<br>& MIL-STD-883D Method 1010.7                                  |
| Life (Endurance)                         | MIL-STD-202F Method 108                                                                   |
| Accelerated Damp<br>& Heat Steady State  | MIL-STD-202F Method 103B                                                                  |
| High Frequency Vibration                 | MIL-STD-202F Method 201A, 204D                                                            |
| Mechanical Shock                         | MIL-STD-202 Method 213                                                                    |
| Additional Resources                     | <a href="#">Download DXF</a>                                                              |
| IMDS and PPAP available                  |                                                                                           |

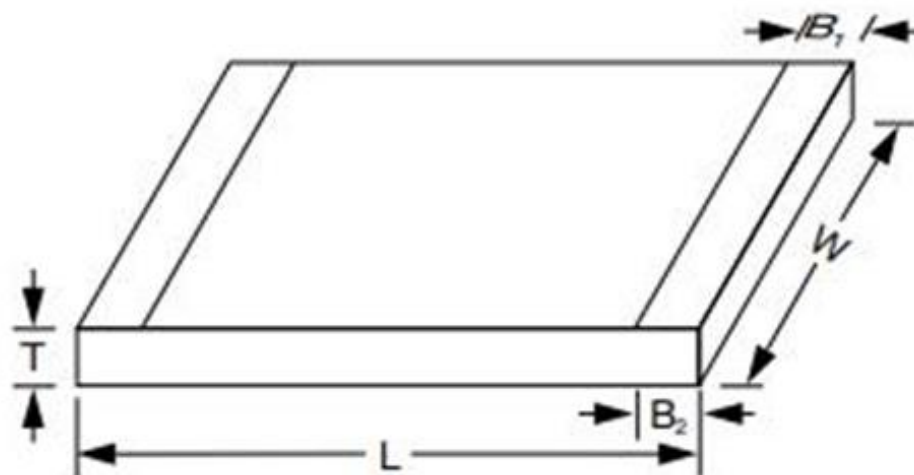
Wi-Fi Dual Band or BT Automotive KYOCERA AVX Embedded Chip Antenna Specification  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

## Antenna Dimensions

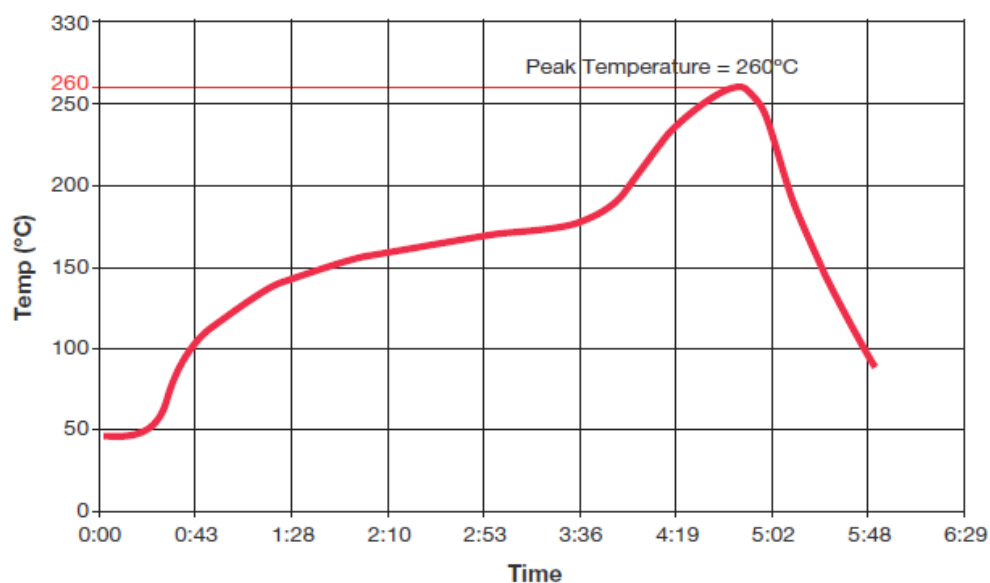
Typical antenna dimensions (mm)

| Part Number | L        | W         | T        | B <sub>1</sub> | B <sub>2</sub> |
|-------------|----------|-----------|----------|----------------|----------------|
| A9001978    | 1.00±0.1 | 0.55±0.07 | 0.40±0.1 | 0.00+0.1       | 0.20±0.1       |

\*Antenna can be mounted both ways.



## Lead Free Solder SMT Reflow Temperature Profile

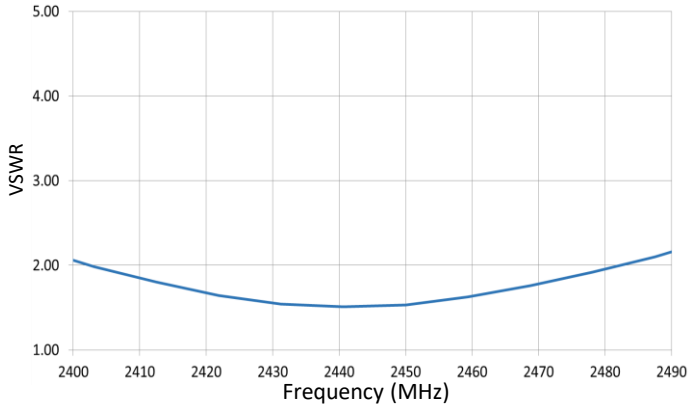


Wi-Fi Dual Band or BT Automotive KYOCERA AVX Embedded Chip Antenna Specification  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

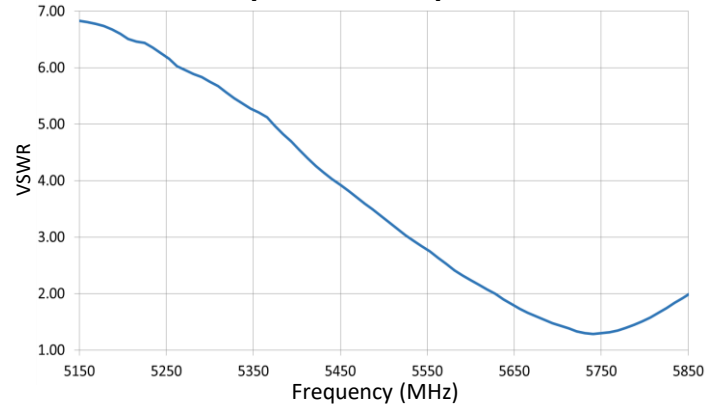
## VSWR, Efficiency, and Peak Gain Plots (9001978-03)

Typical Performance on 55 x 25 mm PCB

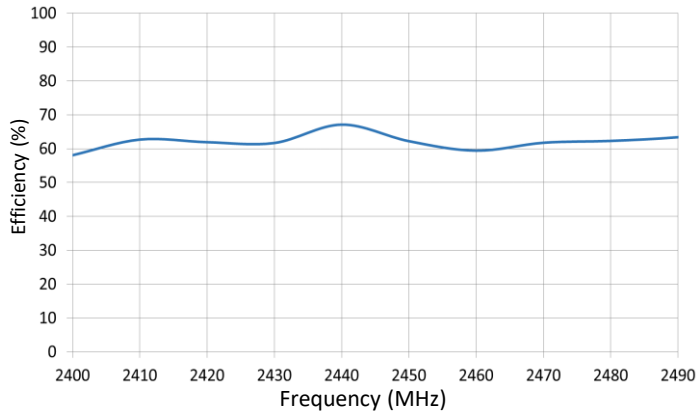
**VSWR**  
(2.400 – 2.490) GHz



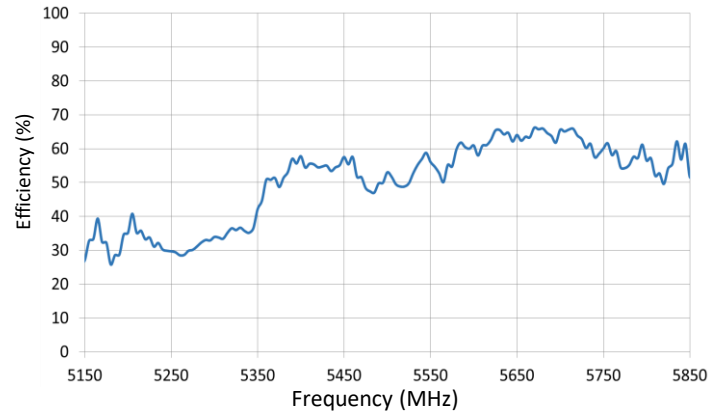
**VSWR**  
(5.150 – 5.850) GHz



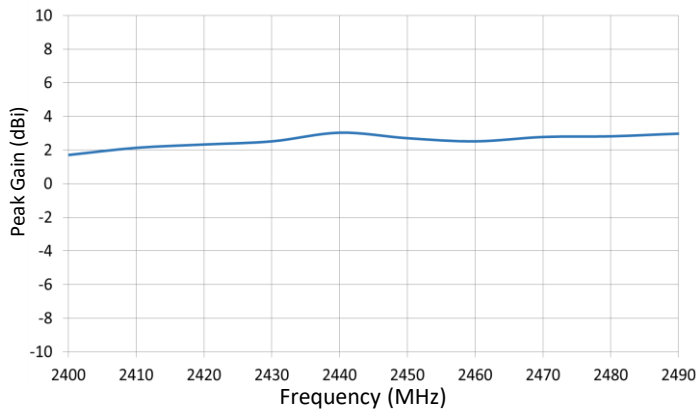
**Efficiency**  
(2.400 – 2.490) GHz



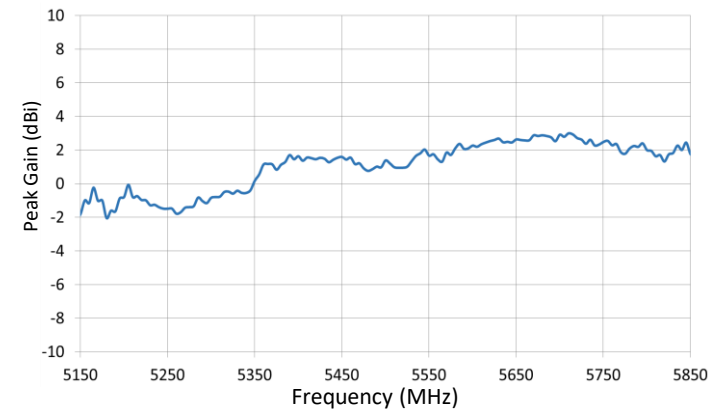
**Efficiency**  
(5.150 – 5.850) GHz



**Peak Gain**  
(2.400 – 2.490) GHz



**Peak Gain**  
(5.150 – 5.850) GHz

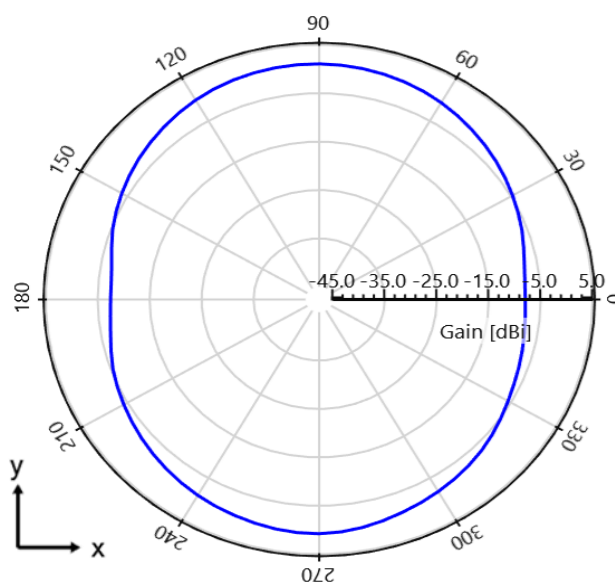
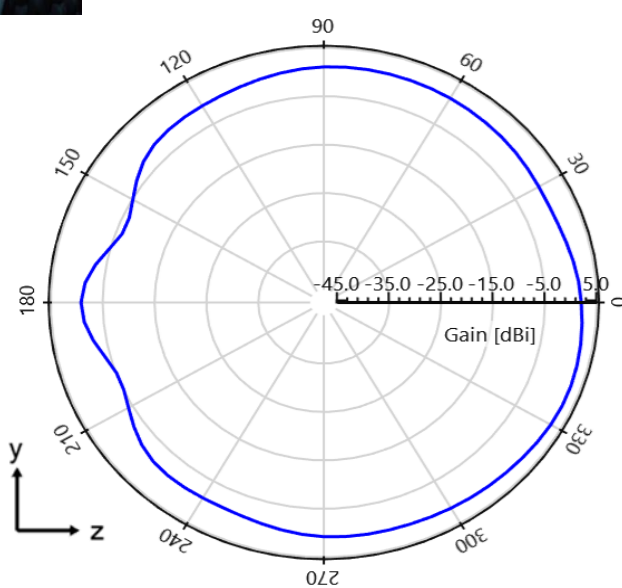
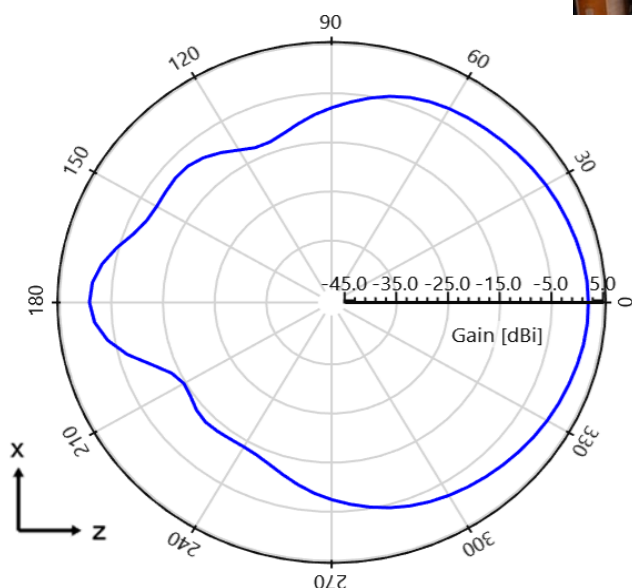


Wi-Fi Dual Band or BT Automotive KYOCERA AVX Embedded Chip Antenna Specification  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

### Antenna Radiation Patterns (9001978-03)

Typical Performance on 55 x 25 mm PCB

Measured @ 2.440 GHz

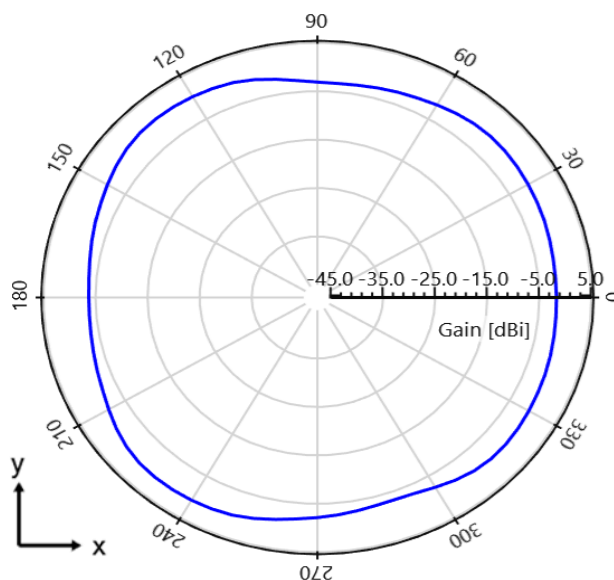
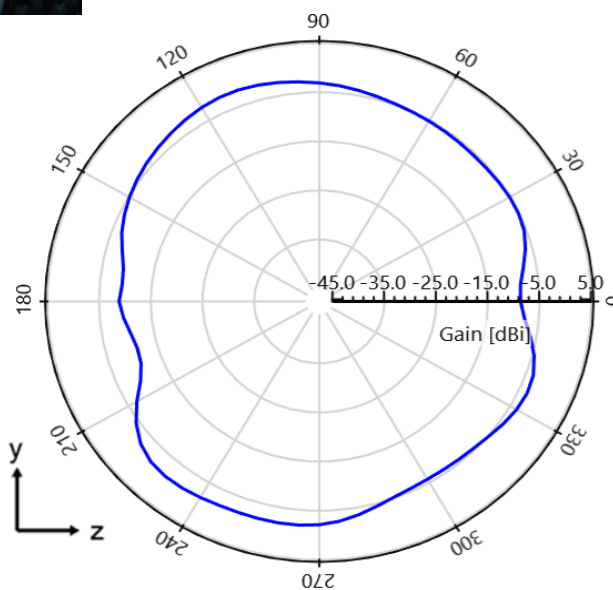
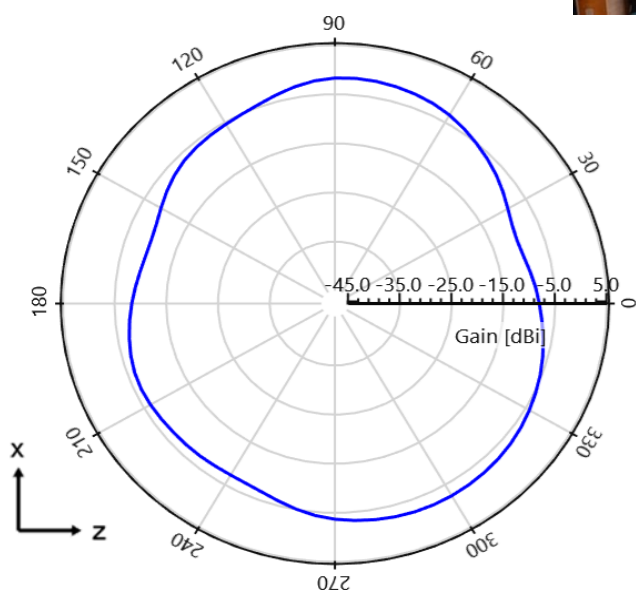


Wi-Fi Dual Band or BT Automotive KYOCERA AVX Embedded Chip Antenna Specification  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

### Antenna Radiation Patterns (9001978-03)

Typical Performance on 55 x 25 mm PCB

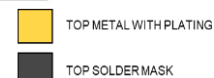
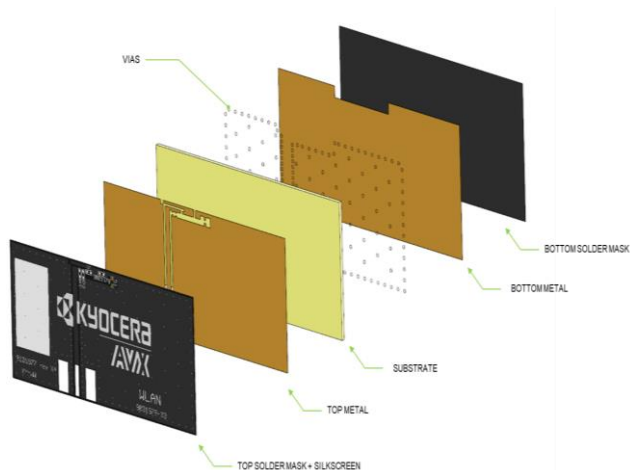
Measured @ 5.550 GHz



Wi-Fi Dual Band or BT Automotive KYOCERA AVX Embedded Chip Antenna Specification  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

## Antenna Layout (9001978-03)

Typical layout dimensions (mm)



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

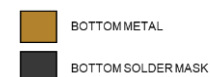
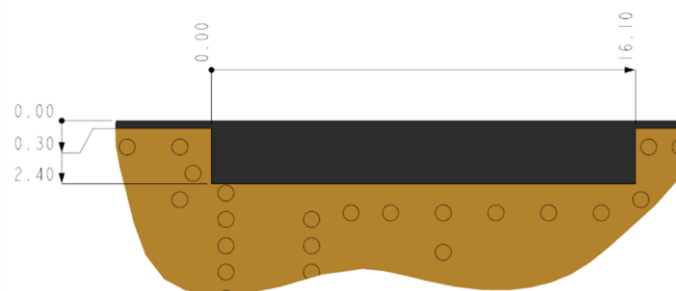
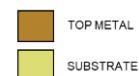
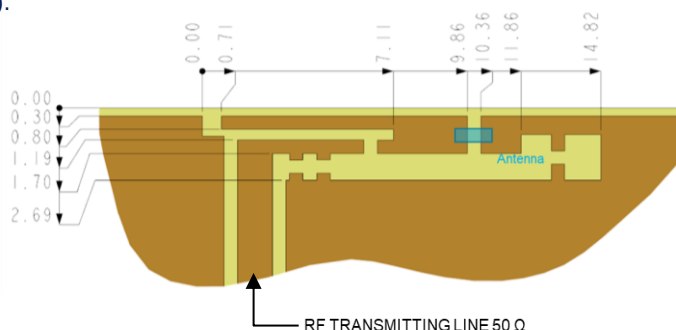
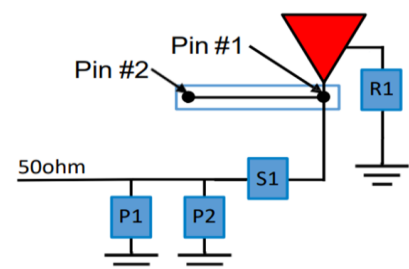
### Pin Description

| Pin# | Description |
|------|-------------|
| 1    | Feed        |
| 2    | Ground      |

### Matching Pi Network (Demo Board)

| Component | Value | Tolerance |
|-----------|-------|-----------|
| P1        | 1.8nH | ±0.05nH   |
| S1        | 2.4pF | ±0.1pF    |
| P2        | N/A   | N/A       |
| R1        | N/A   | N/A       |

\*Actual matching values depend on customer design



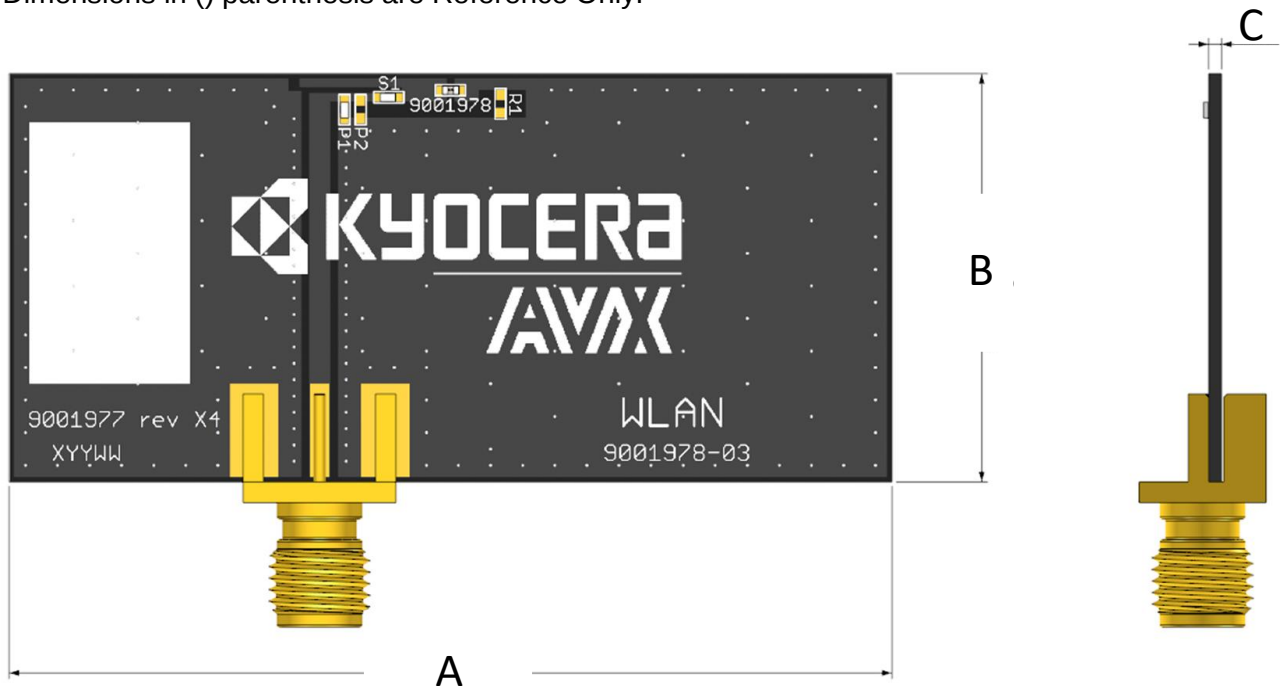
Wi-Fi Dual Band or BT Automotive KYOCERA AVX Embedded Chip Antenna Specification  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

### Antenna Demo Board (9001978-03)

Typical layout dimensions (mm)

| Part Number | A      | B      | C      |
|-------------|--------|--------|--------|
| 9001978-03  | (55.0) | (25.0) | (0.80) |

\*Dimensions in () parenthesis are Reference Only.



Appendix 1 BT Automotive KYOCERA AVX Embedded Chip Antenna Specifications  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

# Appendix 1

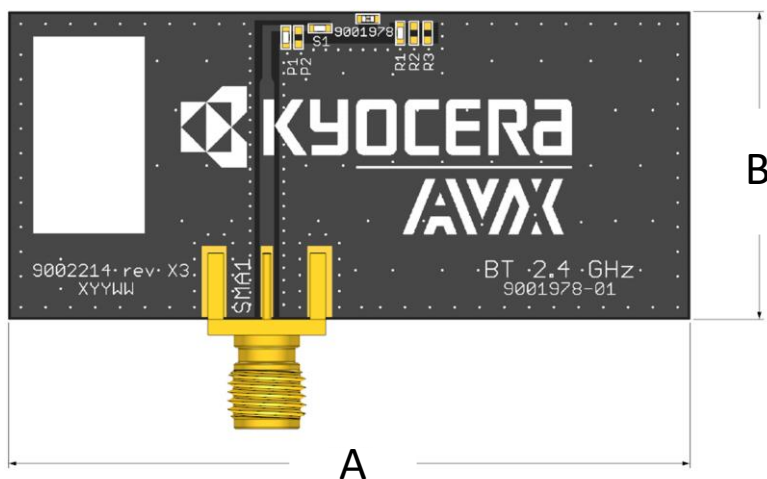
Appendix 1 gives instructions on how to match antenna through updated layout and impedance matching network for BT (2400-2485 MHz) only.

| Frequency (MHz)      | 2400-2485              |
|----------------------|------------------------|
| Peak Gain (dBi)      | 3.45                   |
| Efficiency (%)       | 68                     |
| VSWR                 | <2.5:1                 |
| Feed Point Impedance | 50 $\Omega$ unbalanced |

\*Data shown above has Appendix 1 matching applied on 55 x 25 mm pcb.

| Part Number | A (mm) | B (mm) |
|-------------|--------|--------|
| 9001978-01  | (55)   | (25)   |

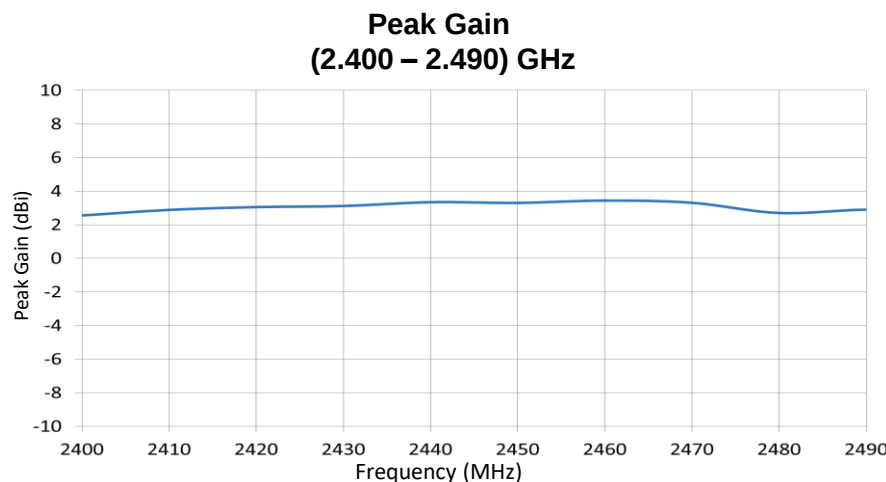
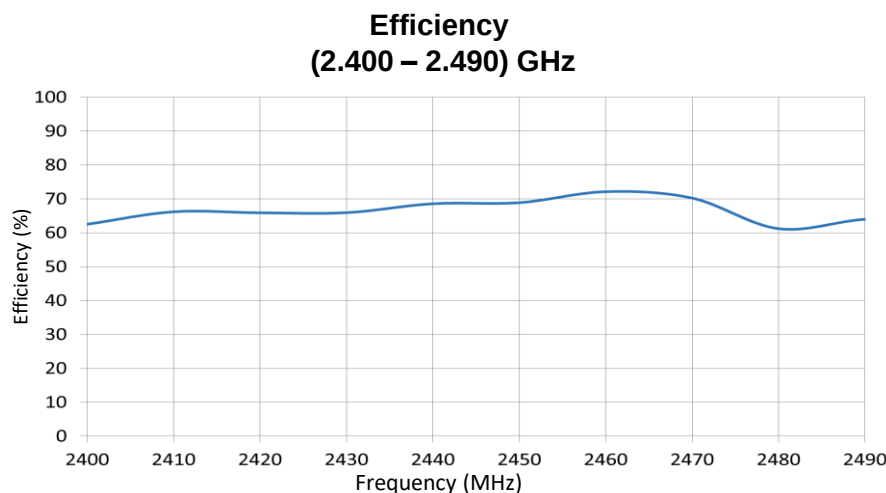
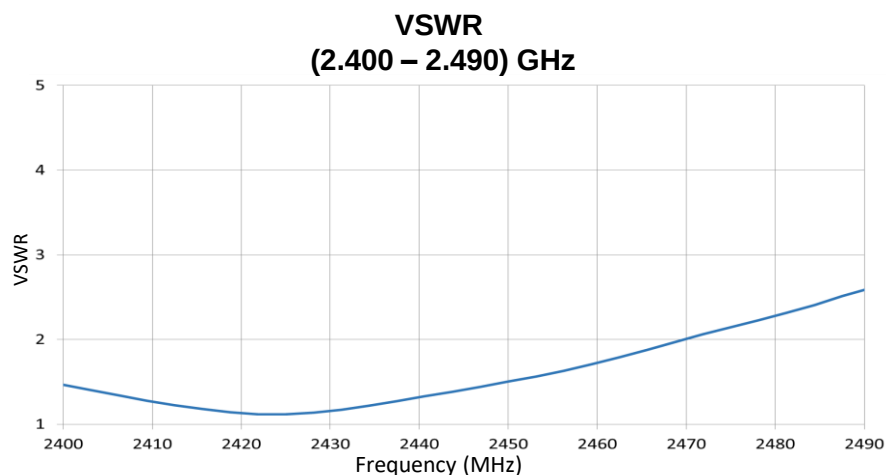
\*Dimensions in ( ) parenthesis are Reference Only.



Appendix 1 BT Automotive KYOCERA AVX Embedded Chip Antenna Specifications  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

**VSWR, Efficiency, and Peak Gain Plots (9001978-01)**

Typical Performance on 55 x 25 mm PCB

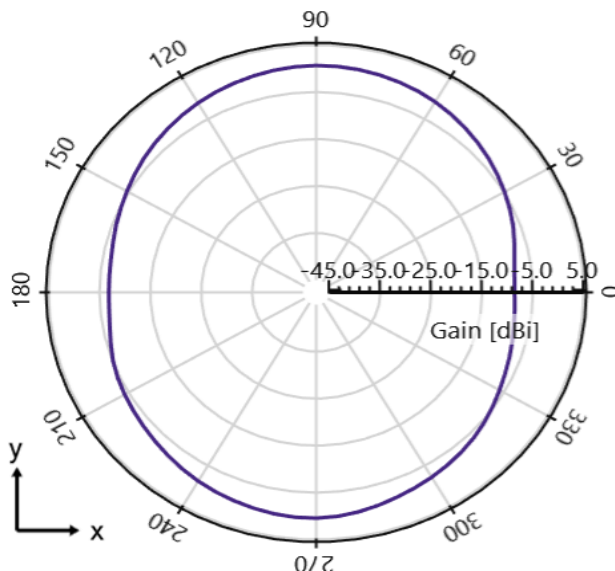
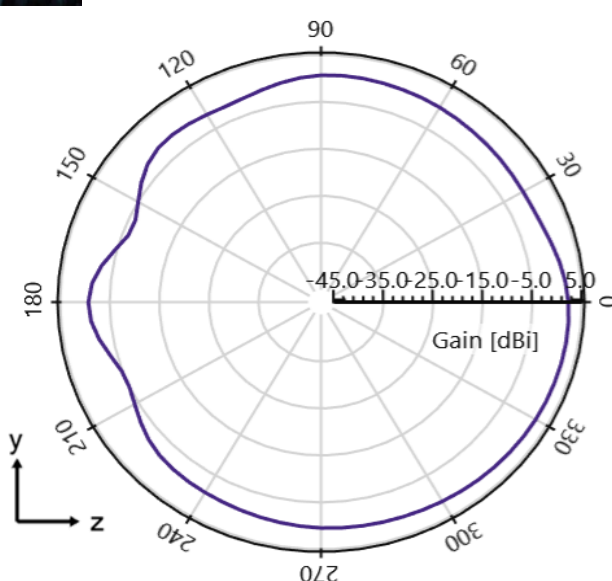
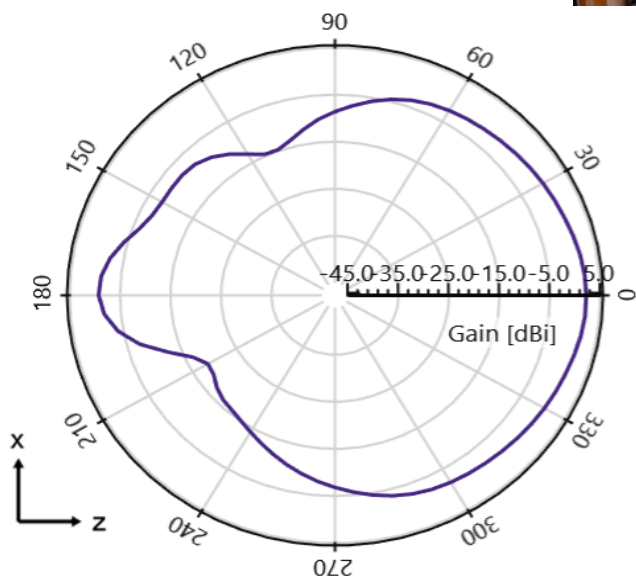


Appendix 1 BT Automotive KYOCERA AVX Embedded Chip Antenna Specifications  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

**Antenna Radiation Patterns (9001978-01)**

Typical Performance on 55 x 25 mm PCB

Measured @ 2.440 GHz

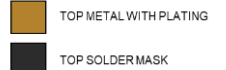
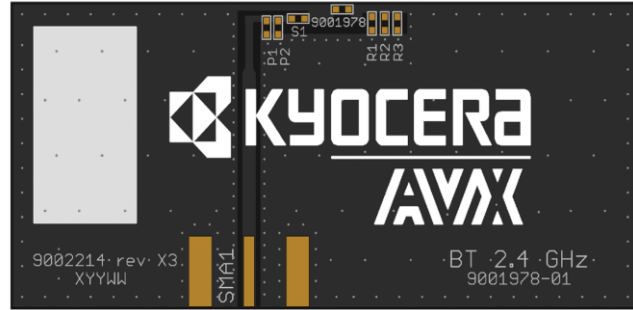
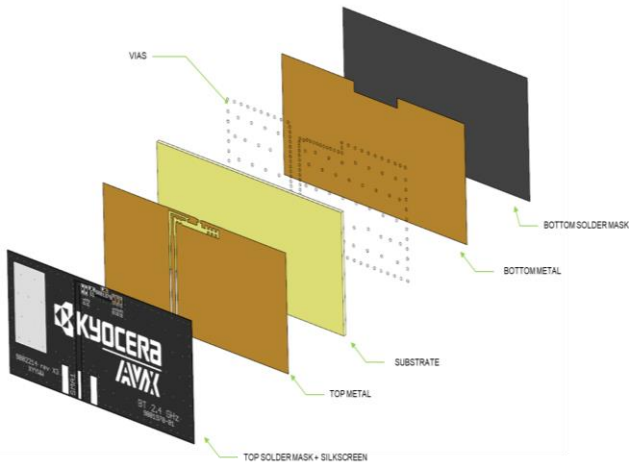


## Appendix 1 BT Automotive KYOCERA AVX Embedded Chip Antenna Specifications

KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

### Antenna Layout (9001978-01)

Typical layout dimensions (mm)



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

#### Pin Description

| Pin# | Description |
|------|-------------|
| 1    | Feed        |
| 2    | Ground      |

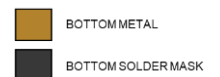
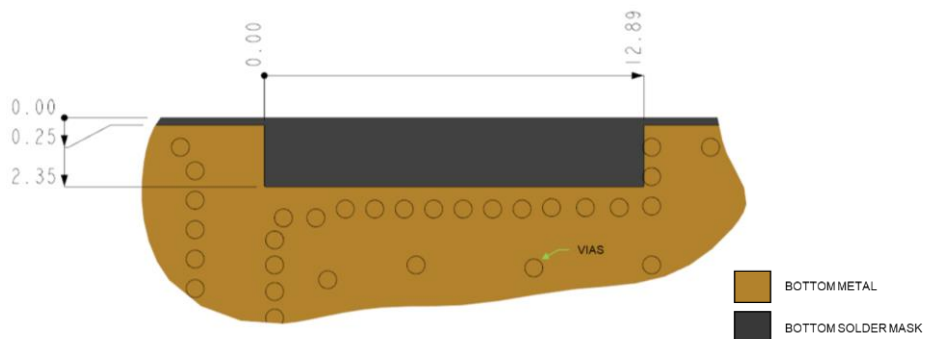
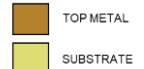
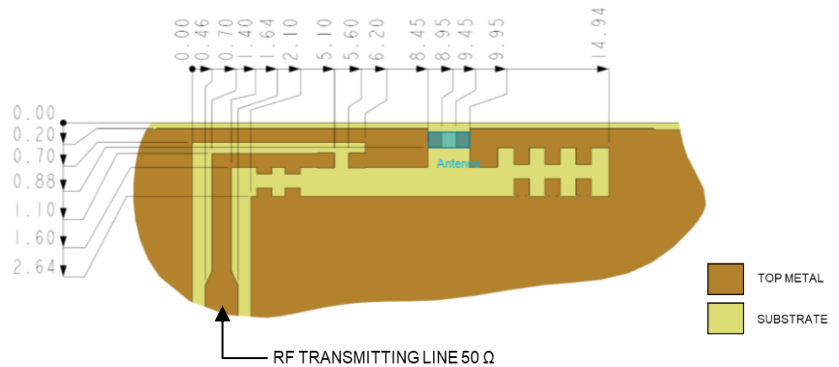
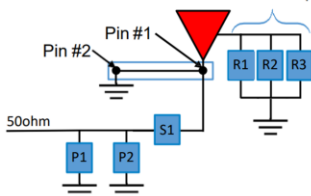
#### Matching Pi Network (Demo Board)

| Component | Value | Tolerance |
|-----------|-------|-----------|
| P1        | 4.7nH | ±0.1nH    |
| S1        | 0Ω    | N/A       |
| P2        | N/A   | N/A       |
| R1        | 0Ω    | N/A       |
| R2        | N/A   | N/A       |
| R3        | N/A   | N/A       |

\*Actual matching values depend on customer design



\*0Ω may be added to shift frequency higher



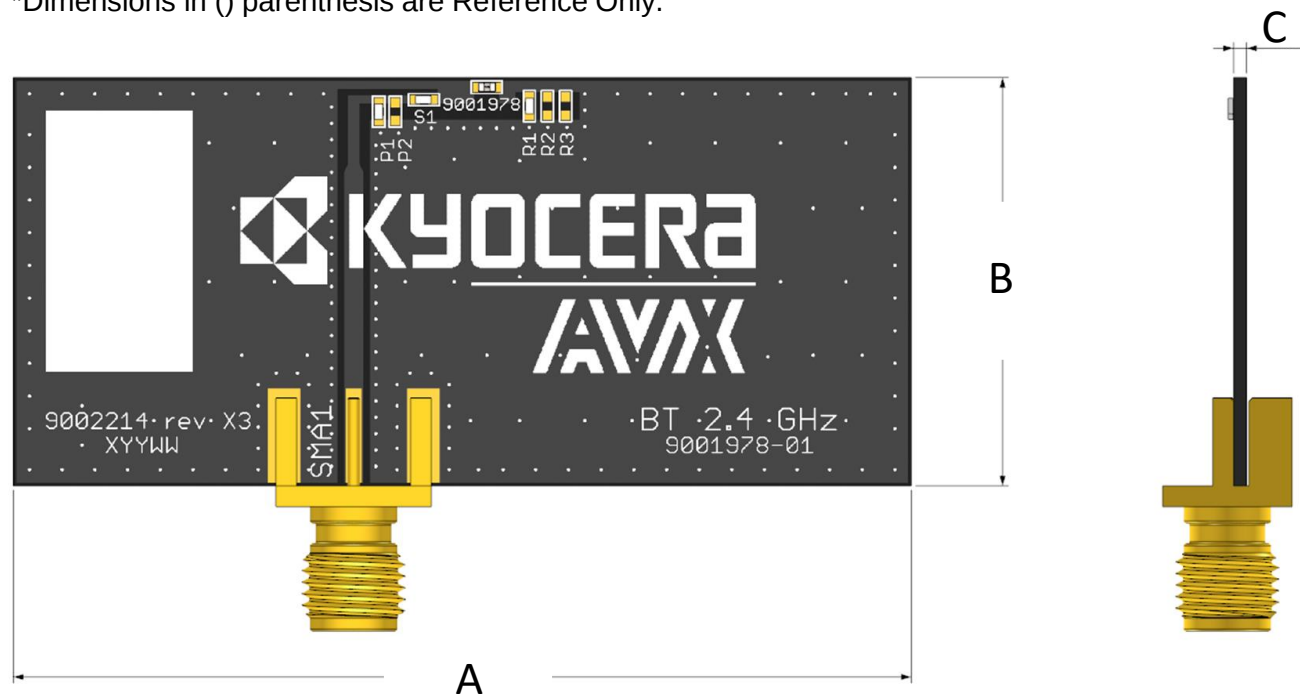
Appendix 1 BT Automotive KYOCERA AVX Embedded Chip Antenna Specifications  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

### Antenna Demo Board (9001978-01)

Typical layout dimensions (mm)

| Part Number | A      | B      | C      |
|-------------|--------|--------|--------|
| 9001978-01  | (55.0) | (25.0) | (0.80) |

\*Dimensions in () parenthesis are Reference Only.



Appendix 2 UWB Automotive KYOCERA AVX Embedded Chip Antenna Specifications  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

# Appendix 2

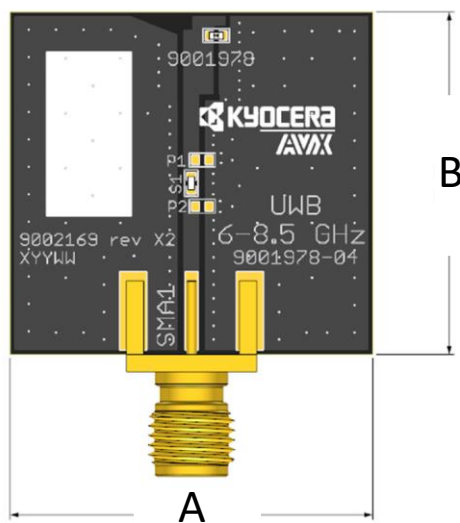
Appendix 2 gives instructions on how to match antenna through updated layout and impedance matching network for UWB (6000-8500 MHz) only.

| Frequency (MHz)      | 6000 - 8500            |
|----------------------|------------------------|
| Peak Gain (dBi)      | 5.7                    |
| Efficiency (%)       | 80                     |
| VSWR                 | <2.6:1                 |
| Feed Point Impedance | 50 $\Omega$ unbalanced |

\*Data shown above has Appendix 2 matching applied on 26.5 x 25.0 mm pcb.

| Part Number | A (mm) | B (mm) |
|-------------|--------|--------|
| 9001978-04  | (26.5) | (25.0) |

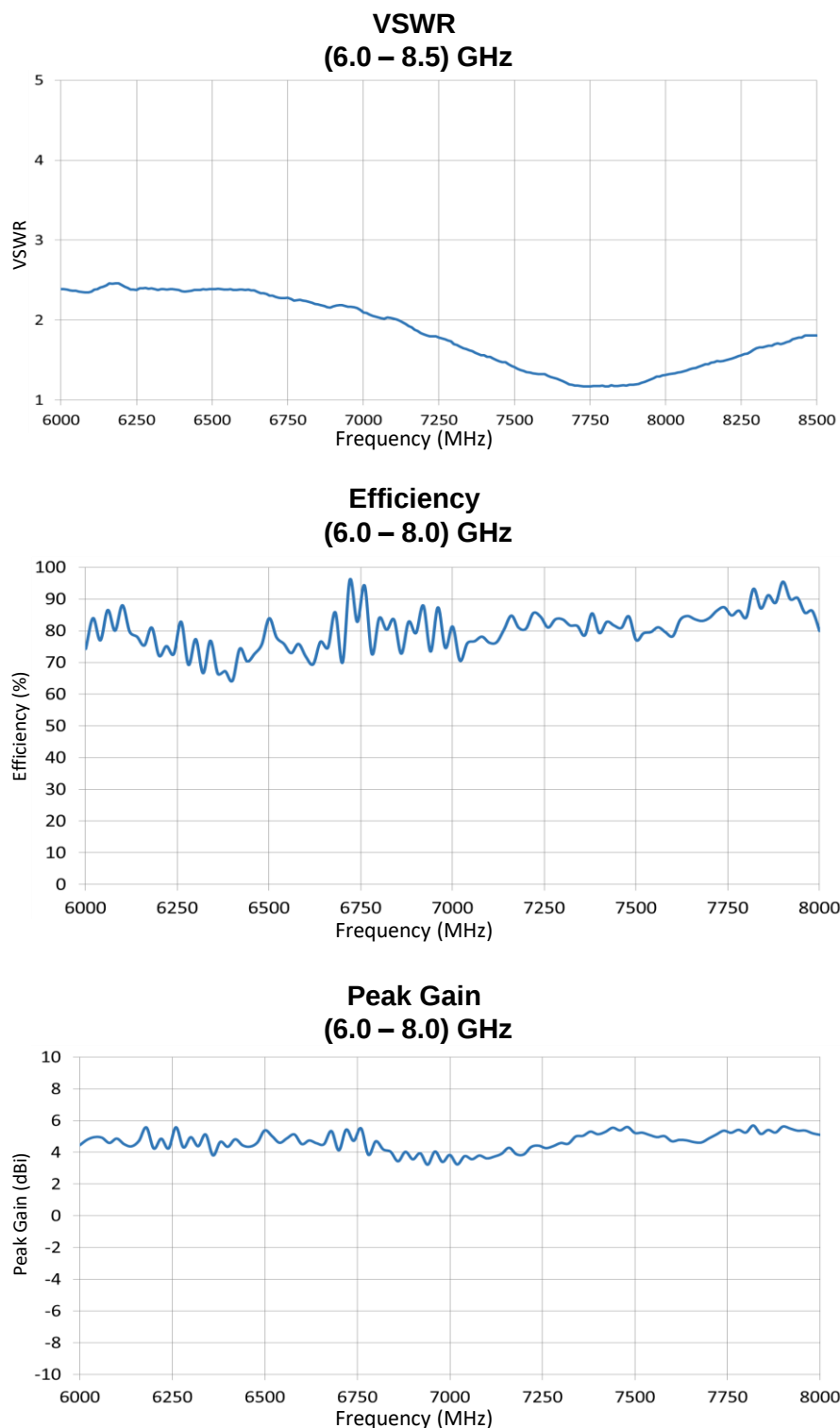
\*Dimensions in () parenthesis are Reference Only.



Appendix 2 UWB Automotive KYOCERA AVX Embedded Chip Antenna Specifications  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

**VSWR, Efficiency, and Peak Gain Plots (9001978-04)**

Typical Performance on 26.5 x 25.0 mm PCB

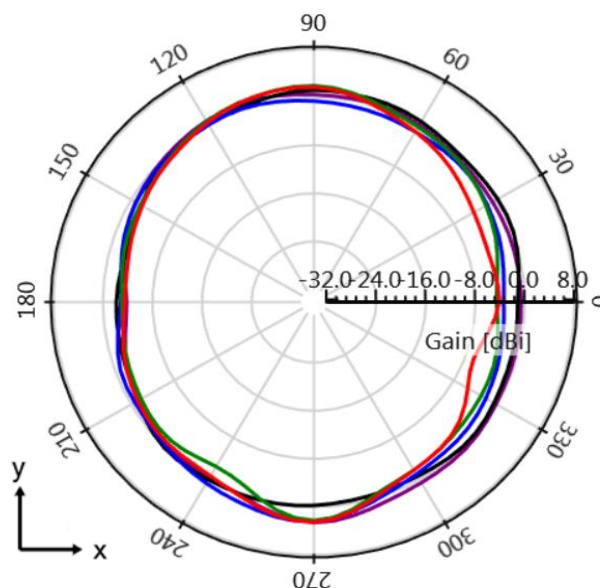
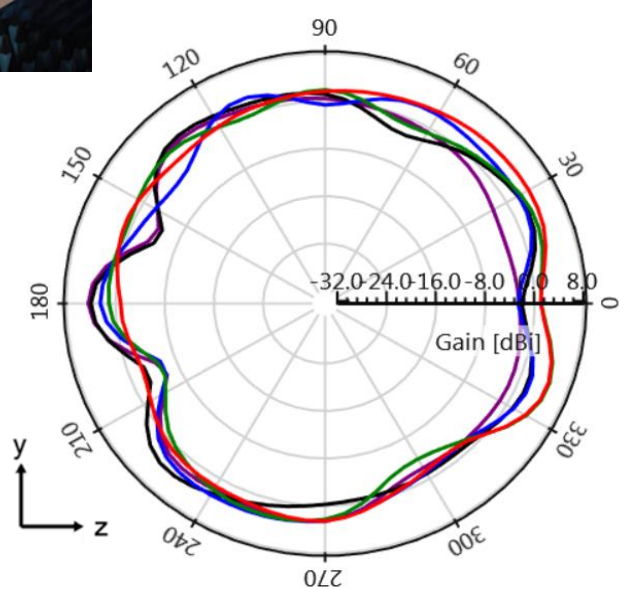
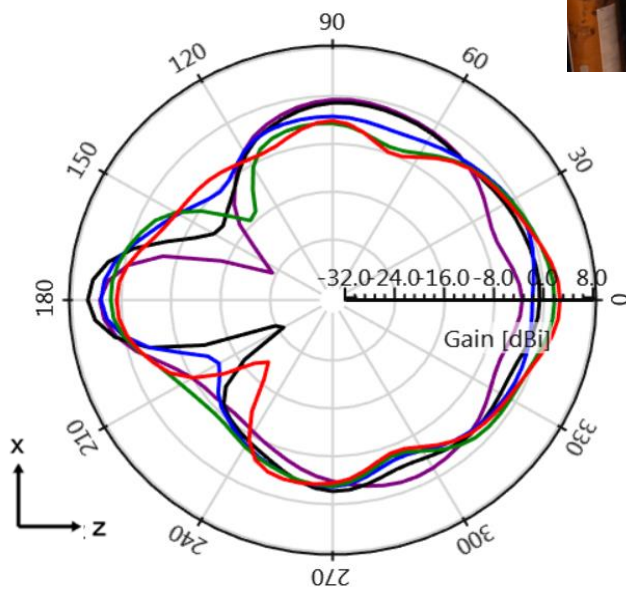
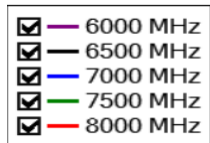


Appendix 2 UWB Automotive KYOCERA AVX Embedded Chip Antenna Specifications  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

### Antenna Radiation Patterns (9001978-04)

Typical Performance on 26.5 x 25.0 mm PCB

Measured @ 6000, 6500, 7000, 7500, 8000 MHz

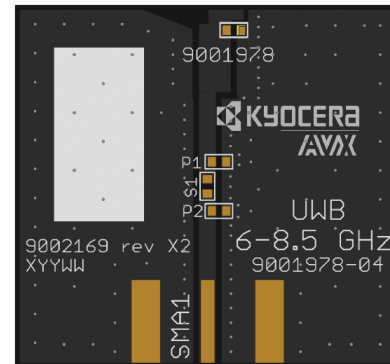
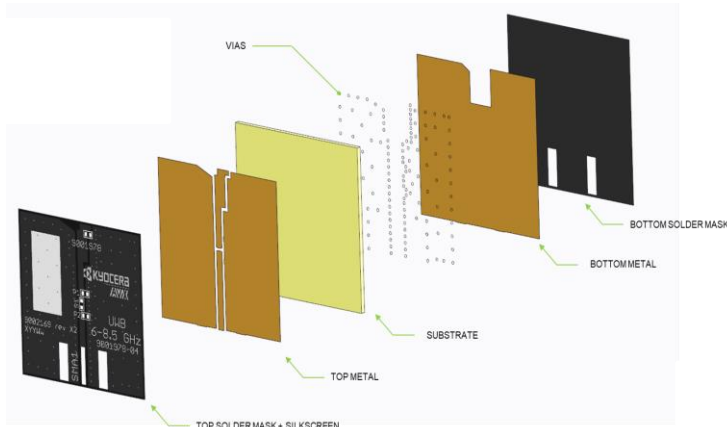


## Appendix 2 UWB Automotive KYOCERA AVX Embedded Chip Antenna Specifications

KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

### Antenna Layout (9001978-04)

Typical layout dimensions (mm)



TOP METAL WITH PLATING  
TOP SOLDER MASK

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

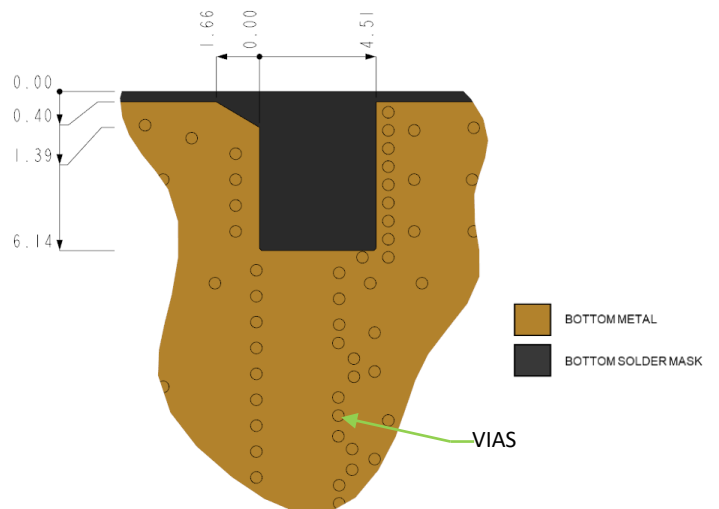
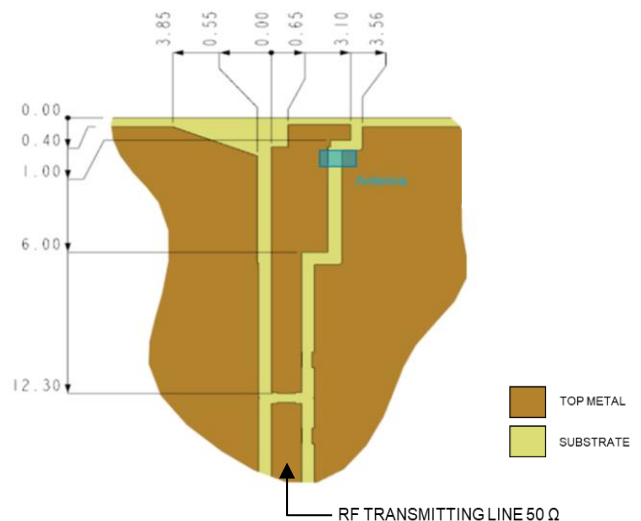
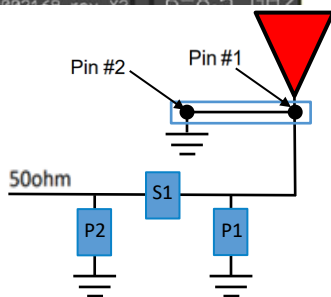
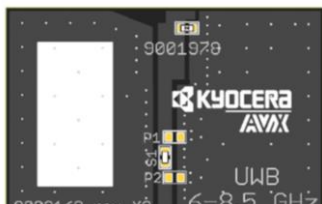
#### Pin Description

| Pin# | Description |
|------|-------------|
| 1    | Feed        |
| 2    | Ground      |

#### Matching Pi Network (Demo Board)

| Component | Value | Tolerance |
|-----------|-------|-----------|
| P1        | DNI   | N/A       |
| S1        | 0Ω    | N/A       |
| P2        | DNI   | N/A       |

\*Actual matching values depend on customer design



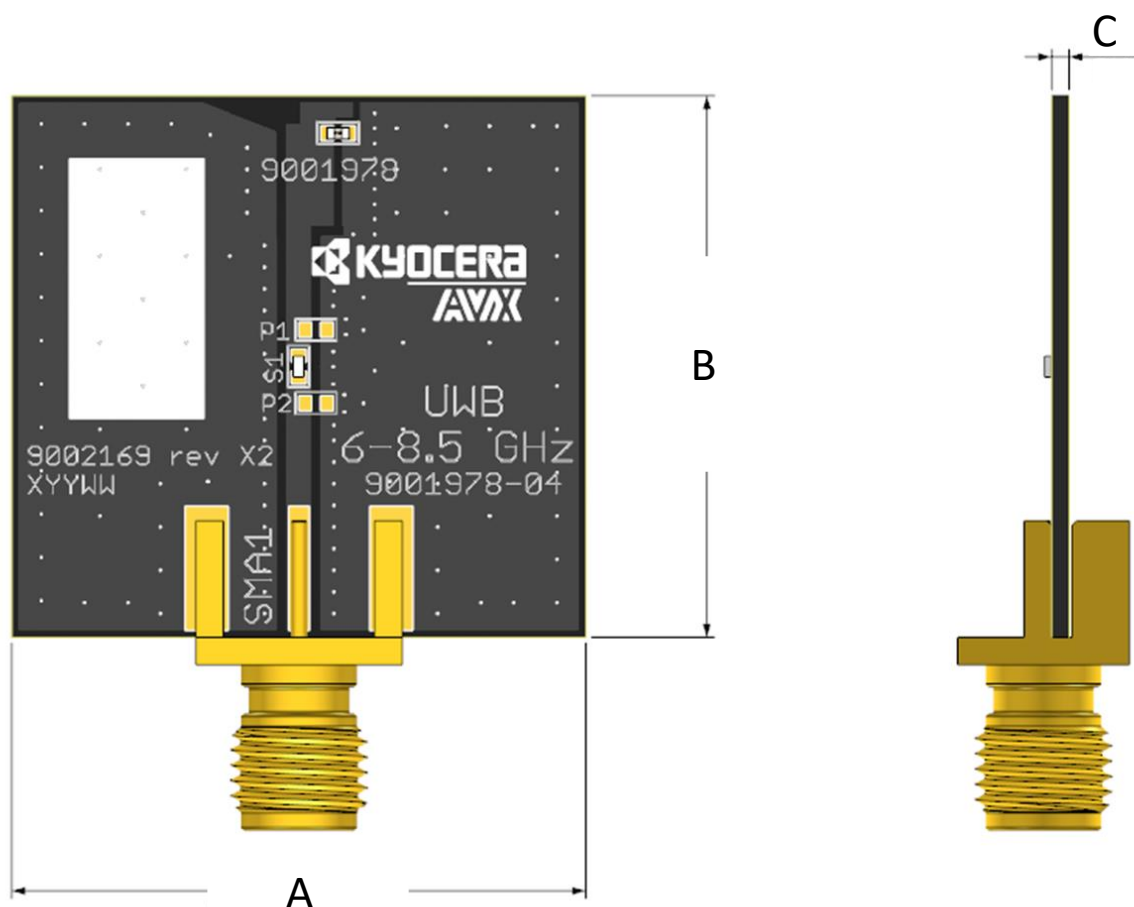
Appendix 2 UWB Automotive KYOCERA AVX Embedded Chip Antenna Specifications  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

### Antenna Demo Board (9001978-04)

Typical layout dimensions (mm)

| Part Number | A      | B      | C      |
|-------------|--------|--------|--------|
| 9001978-04  | (26.5) | (25.0) | (0.80) |

\*Dimensions in () parenthesis are Reference Only.



Appendix 2 UWB Automotive KYOCERA AVX Embedded Chip Antenna Specifications  
KYOCERA AVX produces a wide variety of standard and custom antennas to meet user needs

### Additional Resources – A9001978 Automotive Ultra-Small Wi-Fi Dual-Band Chip Antenna

**DXF File:**

[https://www.kyocera-avx.com/download/antennas/3D-DXF/9001978-03-WLAN\\_3D-DXF.zip](https://www.kyocera-avx.com/download/antennas/3D-DXF/9001978-03-WLAN_3D-DXF.zip)

### Additional Resources – A9001978 Automotive Ultra-Small UWB Chip Antenna

**DXF File:**

[https://www.kyocera-avx.com/download/antennas/3D-DXF/9001978-04-UWB\\_3D-DXF.zip](https://www.kyocera-avx.com/download/antennas/3D-DXF/9001978-04-UWB_3D-DXF.zip)

### Additional Resources – A9001978 Automotive Ultra-Small Bluetooth Chip Antenna

**Simulation Files:**

HFSS (19R3-22R2): [https://www.kyocera-avx.com/download/antennas/ansys-hfss/22r2/9001978\\_01052024\\_22R2.zip](https://www.kyocera-avx.com/download/antennas/ansys-hfss/22r2/9001978_01052024_22R2.zip)

HFSS (22R2): [https://www.kyocera-avx.com/download/antennas/ansys-hfss/22r2/9001978-01\\_EVB\\_01052024\\_22R2.zip](https://www.kyocera-avx.com/download/antennas/ansys-hfss/22r2/9001978-01_EVB_01052024_22R2.zip)

**DXF File:**

[https://www.kyocera-avx.com/download/antennas/3D-DXF/9001978-01-BT\\_3D-DXF.zip](https://www.kyocera-avx.com/download/antennas/3D-DXF/9001978-01-BT_3D-DXF.zip)