Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

DPA 900B

Dielectric Antenna(31*6*3.3 mm)

This specification covers the dielectric antenna for 880~960MHz, 1710~2170MHz.

ROHS Compliant Product

Product Specifications

Working Frequency: 880~960 MHz , 1710~2170 MHz

Dimension: 31*6*3.3 mm max

VSWR: 3 max(depends on the special environment)

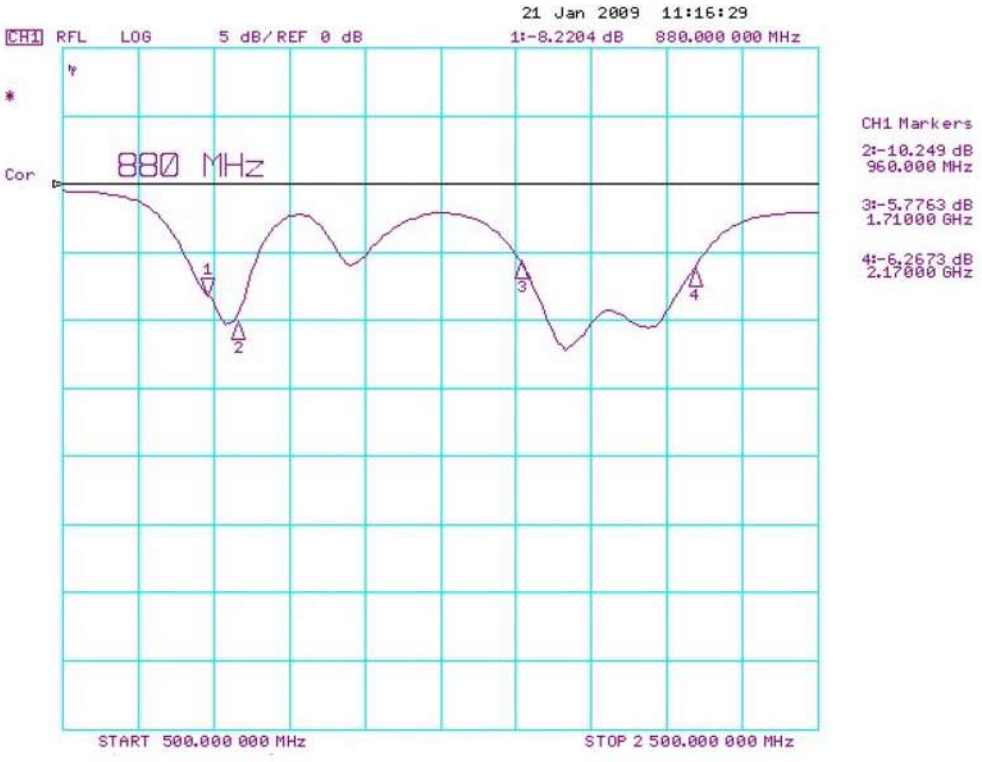
Polarization: Linear

Impedance: 50 Ω

Operating Temperature: -30~85°C

* Actual value will depend on customer ground plane size

Response Curve



Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

Gain and Efficiency

GSM900

Frequency (MHz)		Gain (dBi)	Efficiency (%)
TX	880.2	-4.86	13.56
	890.2	-4.04	16.84
	902.4	-3.36	21.49
	914.8	-3.03	25.34
RX	925.2	-2.86	28.15
	935.2	-3.48	26.97
	947.4	-4.03	26.58
	959.8	-4.13	25.96

GSM1800

Frequency (MHz)		Gain (dBi)	Efficiency (%)
TX	1710.2	-2.37	21.83
	1747.6	-1.24	26.58
	1784.8	0.30	35.56
RX	1805.2	0.08	35.66
	1842.6	0.64	42.69
	1879.8	1.95	54.14

GSM1900

Frequency (MHz)		Gain (dBi)	Efficiency (%)
TX	1850.2	0.74	45.08
	1880.0	1.96	54.15
	1909.8	2.19	52.97
RX	1930.2	2.59	56.90
	1960.0	3.23	65.51
	1989.8	3.37	68.75

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

WCDMA BAND I

Frequency (MHz)		Peak Gain (dBi)	Efficiency (%)
TX	1920.0	2.49	56.02
	1950.0	3.08	63.41
	1980.0	3.34	67.71
RX	2110.0	3.14	61.52
	2140.0	2.25	49.16
	2170.0	2.19	49.62

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

Power Average Gain

GSM900

Frequency (GHz)		Plane	Average Gain (dBi)
TX	**880.2**	XY plane	-9.287
		YZ plane	-11.033
		XZ plane	-7.586
	890.2	XY plane	-8.908
		YZ plane	-10.112
		XZ plane	-6.617
	902.4	XY plane	-6.725
		YZ plane	-9.069
		XZ plane	-5.530
	914.8	XY plane	-5.715
		YZ plane	-8.334
		XZ plane	-4.849
RX	**925.2**	XY plane	-5.003
		YZ plane	-7.868
		XZ plane	-4.469
	935.2	XY plane	-4.962
		YZ plane	-8.104

		XZ plane	-4.727
	947.4	XY plane	-4.743
		YZ plane	-8.156
		XZ plane	-4.924
	959.8	XY plane	-4.639
		YZ plane	-8.189
		XZ plane	-5.144

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

GSM1800

Frequency (GHz)		Plane	Average Gain (dBi)
TX	**1710.2**	XY plane	-7.043
		YZ plane	-8.732
		XZ plane	-5.841
	1747.6	XY plane	-6.152
		YZ plane	-7.859
		XZ plane	-4.855
	1784.8	XY plane	-4.967
		YZ plane	-6.257
		XZ plane	-3.583
RX	**1805.2**	XY plane	-5.167
		YZ plane	-6.076
		XZ plane	-3.721
	1842.6	XY plane	-4.654
		YZ plane	-5.008
		XZ plane	-3.330
	1879.8	XY plane	-4.226
		YZ plane	-3.645
		XZ plane	-2.678

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

GSM1900

Frequency (GHz)		Plane	Average Gain (dBi)
TX	1850.2	XY plane	-4.516
		YZ plane	-4.685
		XZ plane	-3.175
	1880.0	XY plane	-4.232
		YZ plane	-3.653
		XZ plane	-2.680
	1909.8	XY plane	-5.047
		YZ plane	-3.658
		XZ plane	-2.917
RX	1930.2	XY plane	-5.338
		YZ plane	-3.268
		XZ plane	-2.687
	1960.0	XY plane	-5.369
		YZ plane	-2.658
		XZ plane	-2.159
	1989.8	XY plane	-5.747
		YZ plane	-2.572
		XZ plane	-2.098

WCDMA BAND I

Frequency (GHz)		Plane	Average Gain (dBi)
TX	1920.0	XY plane	-5.133
		YZ plane	-3.368
		XZ plane	-2.719
	1950.0	XY plane	-5.289
		YZ plane	-2.782
		XZ plane	-2.263
	1980.0	XY plane	-5.640

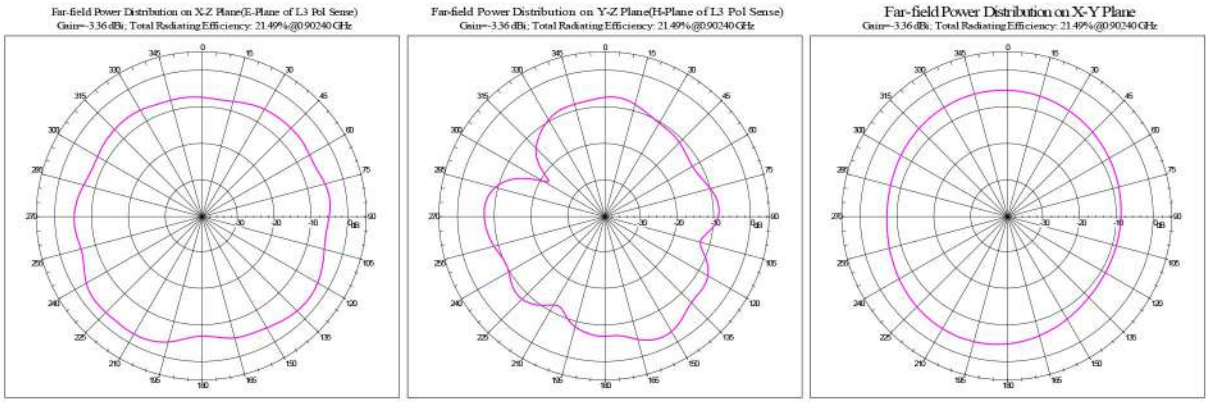
Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

		YZ plane	-2.590
		XZ plane	-2.125
RX	**2110.0**	XY plane	-5.833
		YZ plane	-2.788
		XZ plane	-2.789
	2140.0	XY plane	-6.159
		YZ plane	-3.663
		XZ plane	-4.043
	2170.0	XY plane	-5.415
		YZ plane	-3.527
		XZ plane	-4.304

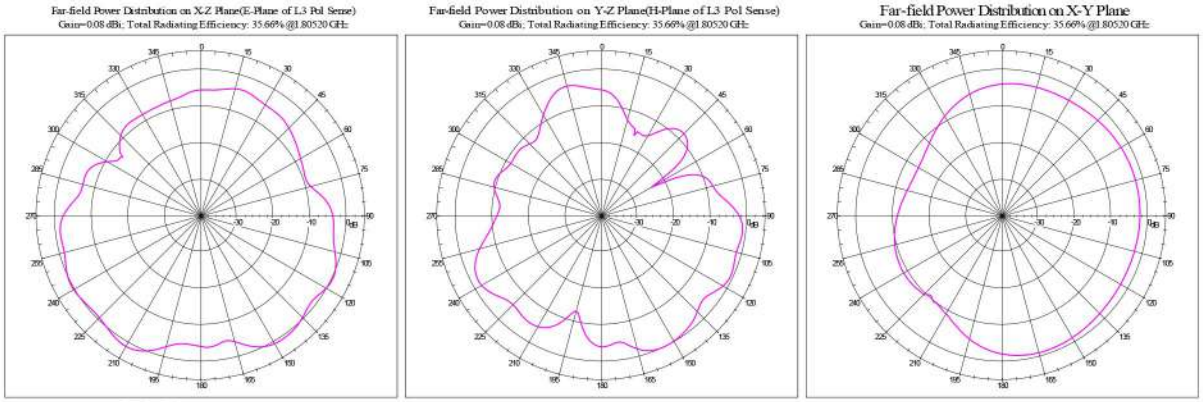
Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

Antenna Pattern for GSM

GSM900
Frequency :902.4MHz

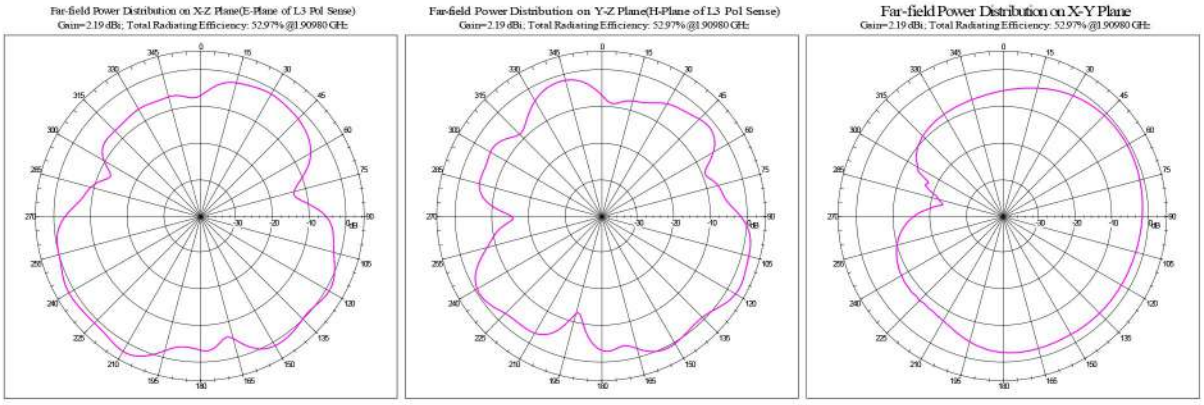


GSM1800
Frequency :1805.2 MHz

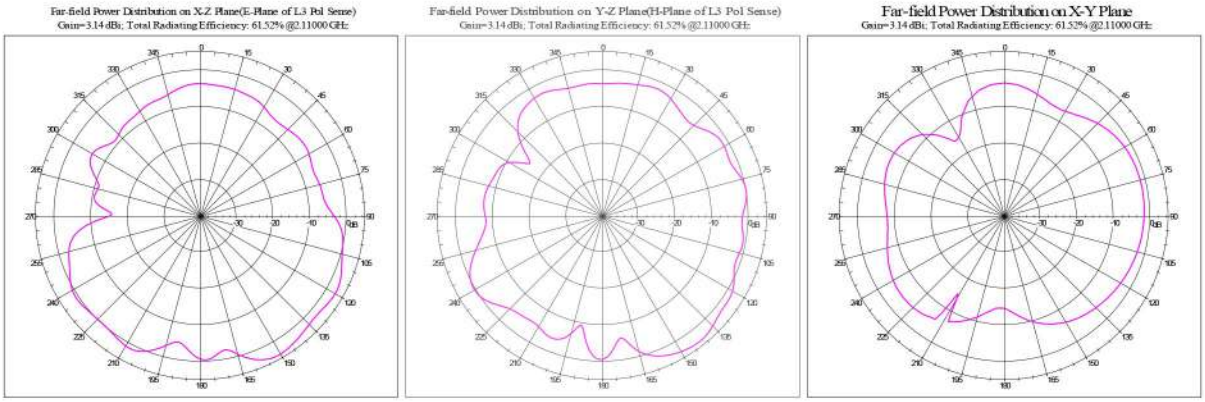


Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

GSM1900
Frequency :1909.8 MHz



WCDMA BAND I
Frequency :2110.0 MHz



Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

Environmental Conditions

Operating conditions

The antenna has the electrical characteristics given in Tables 1 in the temperature range of -30℃ to +85℃ and under the environmental conditions of +40℃ and 0-95 % r.h..

4-2 Storage temperature range

The storage temperature range of product is -30℃ to +85℃

Reliability Tests

Low-temperature test

Expose the specimen to -30 ℃ for 500 hours and then to normal temperature/humidity for 24 hours or more. After that examine the appearance and functions.

High-temperature test

Expose the specimen to +85 ℃ for 500 hours and then to normal temperature/humidity for 24 hours or more. After that examine the appearance and functions.

High-temperature/high-humidity test

Subject the object to the environmental conditions of +85℃ and 90-95% r.h. for 96 hours, then expose to normal temperature/humidity for 24 hours or more After this, check the appearance and functions.

Thermal shock test

Subject the object to cyclic temperature change (-30℃, 30 minutes ⟺ +85℃, 30 minutes) for 5 cycles, the expose to normal temperature/humidity for 24 hours or more.

Vibration test

Sinusoidal vibration test

Subject the object to vibrations of 5 to 200 to 5Hz swept in 10 minutes, 4.5G at maximum (2mm amplitude), in X and Y directions for two hours each and in Z direction for four hours. After this, check the appearance functions.

Vibration test in packaged condition

Subject the object, which is packaged as illustrated, to vibrations of 15 to 60 to 15Hz swept in 6 minutes, 4G at maximum (2mm amplitude at maximum), applied in X, Y and Z directions for two hours each, i.e. six hours in total. After this, check the appearance and functions.

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

Drop the object, which is packaged as illustrated, to a concrete surface from the height of 90 cm, on one comer, three edges and six faces once each, i.e. 10 times in total. After this, check the appearance and functions.

5-7. Soldering Heat Resistance Test:

After the lead pins of the unit are soaked in solder bath at 240 ±5℃ for 10± 0.5 seconds and then be left for more than 1 hour at 25±5℃ in less than 65% relative humidity.

5-8. Adhesion Test:

The device is subjected to be soldered on test PCB. Then apply 0.5Kg(5N) of force for 10±1 seconds in the direction of parallel to the substrate. (the soldering should be done by reflow and be conducted with care so that the soldering is uniform and free of defect by stress such as heat shock) .

Inspection

As for the examination in the mass production, the receiving character of the ratio wave sent in a shield box from the standard antenna and VSWR are confirmed in the picking out examination.

Warranty

If any defect occurs form the product during proper use within a year after delivery, it will be repaired or replaced free of charge.

Other

Any question arising from this specification manual shall be solved by arrangement made by both parties.

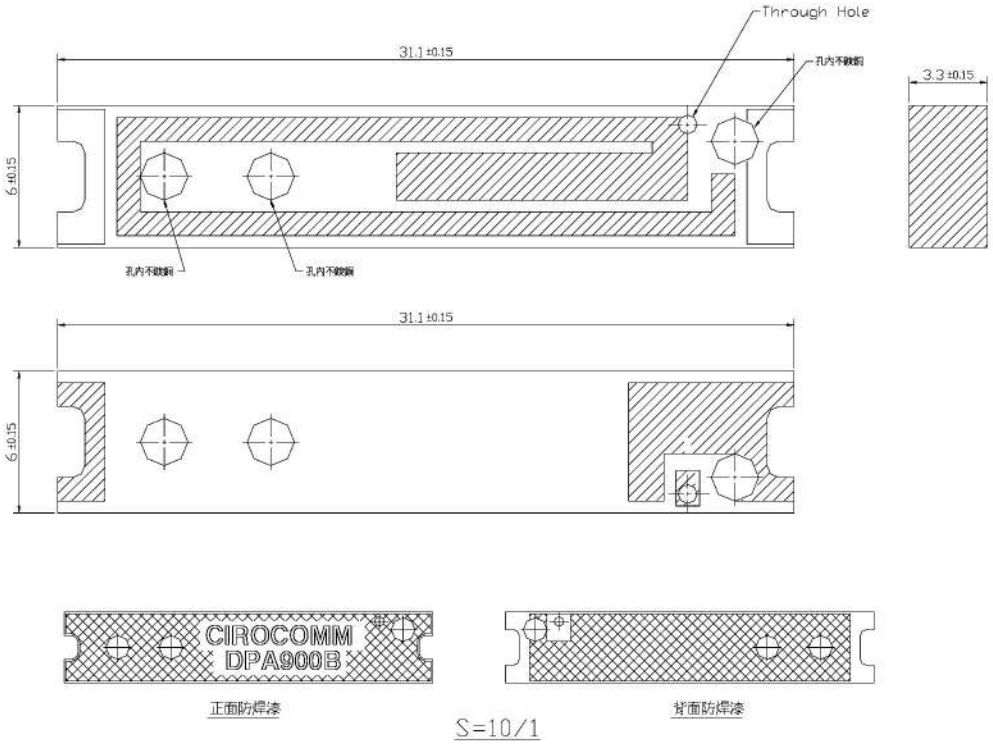
Precautions for use

- Antenna pattern use a Ag electrode.
- Please don't use the corrosion gas (sulfur gas, chlorine gas) in the atmosphere.
- Please don't direct solder onto the gold electrode of Antenna pattern.

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

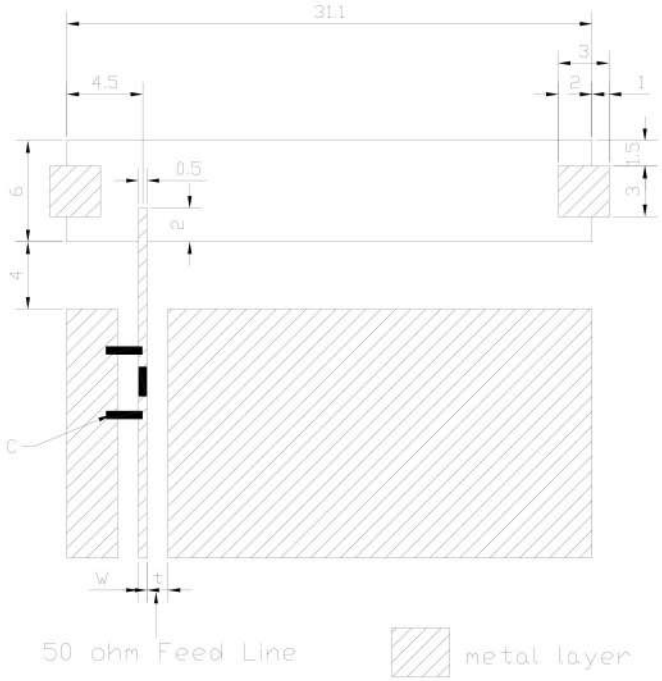
Drawings

Shape and Dimension



S=10/1

Recommended foot print for Evaluation Board



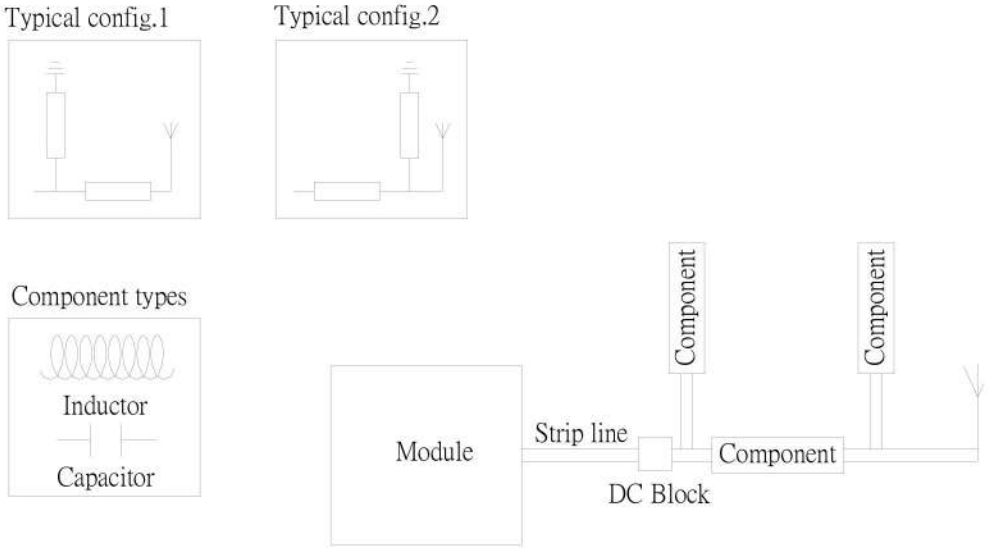
t,w=Unique dimensioning according to your PCB.

C=inductor and capacitor values according to your specific device.

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

Drawings

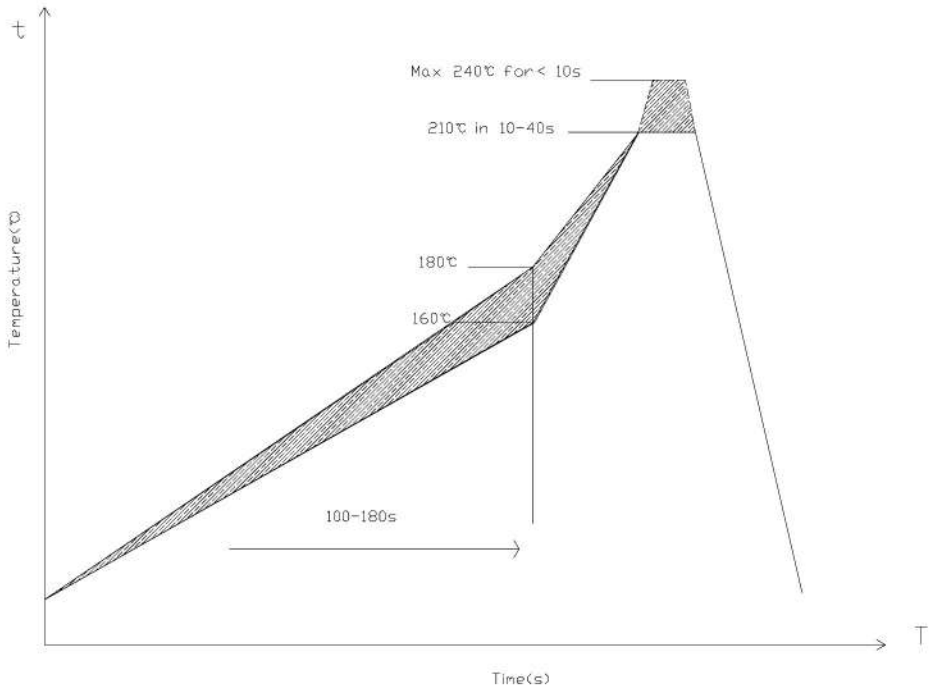
Transmission Line and Matching



The matching network has to be individually designed using one,two or three components.

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

Recommended Reflow Temperature Profile



※General attention to soldering:

- High soldering temperatures and long soldering times can cause leaching of the termination, decrease in adherence strength, and the change of characteristic may occur.

- For soldering, please refer to the soldering curves above. However, please keep exposure to temperatures exceeding 200°C to under 50 seconds.

- Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

※Cleaning:

When using ultrasonic cleaning, the board may resonate if the output power is too high. Since this vibration can cause cracking or a decrease in the adherence of the termination, we recommend that you use the conditions below.

Frequency: 40 kHz max.

Output power: 20W/liter

Cleaning time: 5minutes max.

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

FAQ

1 What is radio wave?

Radio waves are waves produced by the interaction of time -varying electric and magnetic fields. More properly they are referred to as electromagnetic waves. With the Wireless Telegraphy Act it was decided that all electromagnetic waves with a frequency below 3,000GHz would be called radio waves.

2 What is antenna?

An antenna converts electrical energy to radio waves and transmits them into the sky as well as collecting radio waves from the sky and converting them to electrical energy.

3 What is good antenna (1)?

As antenna serves as the electrical power conversion device between a circuit and the air, the keys to it's efficiency are as follows:

(1) Input characteristics with the contact point on the circuit side.

(2) Radiation characteristics from the contact point to the air.

Input Characteristics

Electric power is supplied efficiently to the antenna without reflecting back into the circuit at the feeding point.

◎ If the impedance between the antenna and the feed line is not matched correctly, the signal will reflect back and no power will be supplied to the antenna.

Radiation Characteristics

The power supplied to the antenna is not lost within the antenna but is transmitted as a radio wave.

◎ If the antenna is made of high loss material (conductors and dielectrics), then the power that was supplied to the antenna will be dissipated into heat and lost.

4 What is good antenna (2)?

The characteristics of a general antenna are shown below.

(1) Input Characteristics

Frequency - Return loss chart …where the return loss is low, indicates that the antenna is Frequency - VSWR chart … …well matched at that frequency. In the same way, a low value shows a good matching of the antenna.

Bandwidth … The antenna is good to the extent of good matching and the width of the frequency domain.

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

FAQ

(2) Radiation Characteristics

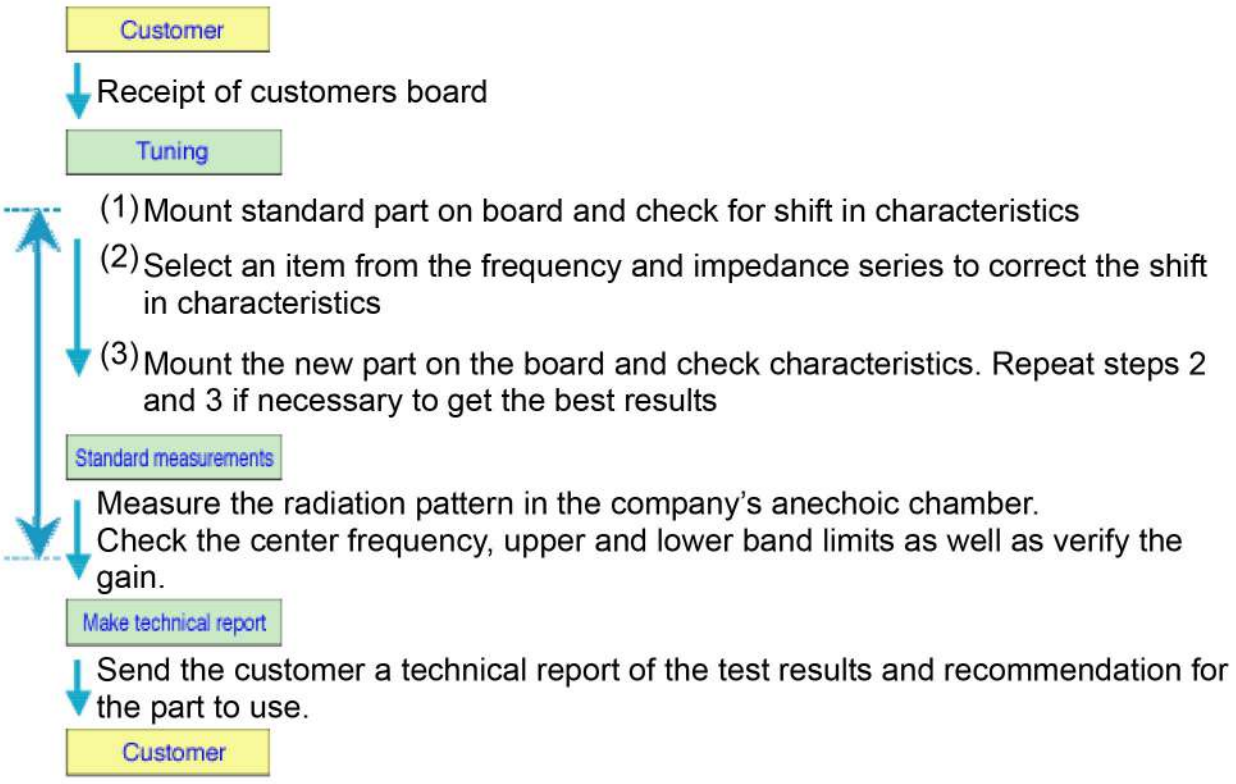
Radiation pattern …The strength of the antenna emission is displayed.
It shows that antennas emit well in their projected direction.
It is usually displayed in three planes (XY, YZ and ZX planes).
Gain [dBd] … …Given as a ratio to a standard antenna (half wave dipole).
Usually displayed as the average of the three planes (XY, YZ and ZX planes).
Designated as a combination of the vertical and horizontal polarity power gains.

5 Importance of tuning?

Because many things, such as the board shape, surrounding components and the case covering the board, can affect the characteristics of an antenna, most designs require customization of the antenna to compensate for the shift in characteristics. Correcting the shift in the characteristics of the antenna is known as tuning. For this work, having lots of experience from adjusting many items and equipment is where an antenna maker can really show their strengths.

This experience can really help the user in getting the help needed for a quick product design.

6 Our workflow for tuning?



Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

FAQ

7 Why can we response so quickly?

(1) We have anticipated the characteristic shifts and created a series of parts that match those shifts and corrects them.

Frequency Series Parts

When an antenna is mounted, the center frequency will shift due to surrounding elements. These parts will bring that frequency back to the proper center frequency. There are 18 values available in 29MHz steps.

Impendence Series Parts

The impedance of an antenna will appear different depending on the shape of the board and other items surrounding the antenna. Normally in these situations, designers will make a matching circuit by adding capacitors or inductors, we however have created antennas with 3 different impedances values, so a standard antenna can be quickly matched to the design without any modifications to the circuit.

(2) Complete Measurement Environment

Our facilities are complete with a full anechoic chamber and all required test equipment for quick and complete testing.

(3) Standard Data Reporting

Using standardized data forms, the information can quickly be assembled into a report.

* If a verbal reply is sufficient, we can reply within 2 days of receiving the customer's board.

8 How to select the correct antenna?

It is important to select the correct antenna for the application.

1) Important Information about Small Antennas!

As for chip antennas, you must consider the ground plane surrounding the area the chip is mounted. When using a small antenna it is often necessary to make a large ground plan to improve the characteristics of the antenna, the results is a larger area on the board for the antenna. Also, since small antennas typically are lambda/4 type antennas, a large GND is also important. In fact if the GND is not large enough, there are some small antennas that will not operate.

➢ We consider the ground plane area in addition to the area for mounting antenna as a set, and can propose the optimum configuration for both.

Otto Wireless Solutions
58 Wakis Avenue, Strijdompark
Randburg, 2155
PO BOX 55536 Northlands 2116
Republic of South Africa
Tel: +27 11 791 1033 | Fax: +27 11 791 1187
wireless@otto.co.za | www.otto.co.za

FAQ

2) Use Directivity Appropriately!

When you know the direction of the transmission, you should choose to use a directional antenna. If you don't, you will scatter the radio waves and the power will be wasted.

Also, as seen in the recent case with SAR, directional antennas were best to effectively isolate the body.

➢ We have both directional and omni-directional antennas, so please consider what are best for your application.

3) Pitfall of Broadband Antennas!

For return loss characteristics, the loss amount is a combination of the transmission power and the power lost. Even in the case where the power loss is great and there is no transmission at all, the antenna may be seen as having very good broadband characteristics. To best judge the band, the gain's frequency characteristics should be judged.

➢ The standard data we submit then is the average gain for the necessary frequency.

4) Losses for the Matching Circuit!

This circuit is used to match the impedance at the feed of the antenna. In actuality, this circuit is also the primary cause of power loss. In addition, this circuit takes up additional space on the board, adding to the total area required for the antenna. If however, the antenna's impedance is matched with the characteristic impedance from the beginning, there is no need for this circuit.

➢ We do not use matching circuits, but instead have the ability to tune the antenna to match the impedance.