

# APPROVAL SHEET

## **FREE ANTENNA**

RGFRA Series / Pb free









## **Halogens Free Product**

2.4 GHz ISM Band Working Frequency

**P/N: RGFRA1903041A1T**

\*Contents in this sheet are subject to change without prior notice. ■

## REVISED HISTORY

Rev	P/N	Old Marking	Description	Date
V01	RGFRA1903041A0T	 Walsin	First Version	2006/2/22
Rev	P/N	New Marking	Description	Date
V02	RGFRA1903041A1T	 Walsin 1903A1	1. Change Marking 2. Chang part number from RGFRA1903041A0T to RGFRA1903041A1T	2006/9/26
V03	RGFRA1903041A1T	 Walsin 1903A1	1.PSA 華新科技集團的 logo 來取代原有的 Walsin logo 2.Transform RELIABILITY TEST into Pb-free data	2010/4/22
V04	RGFRA1903041A1T	 Walsin 1903A1	修改了第七頁的輻射場形圖，以符合第四頁的電性規格表。	2010/7/22
V05	RGFRA1903041A1T	 Walsin 1903A1	1.DIMENSIONS:T=4.0 ± 0.20 mm 2.2D、3D 3.PACKAGING:P1=8.0 ±0.1mm 4. RELIABILITY TEST 5.ORDERING CODE :Thickness 4.0	2012/12/21
V06	RGFRA1903041A1T	 Walsin 1903A1	增加 Return Loss Definition	2013/05/17
V07	RGFRA1903041A1T	 Walsin 1903A1	增加 Return Loss : -10 dB max	2013/05/21
V08	RGFRA1903041A1T	 Walsin 1903A1	將單孔 PC 包裝帶變更為雙孔 PC 包裝帶	2013/12/27

## FEATURES

1. Surface Mounted Devices with a small dimension of  $19 \times 3 \times 4 \text{ mm}^3$ .
2. Able to be placed above/on ground plane. No external keep-out zone (empty space) required, which relatively save more space on PC board.
3. Allow placing other components besides antenna or on the backside of PCB right underneath antenna.
4. No sensitive to environmental includes hand effects. Ideal for Handheld devices application.

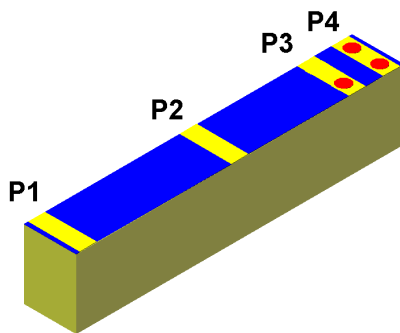
## APPLICATIONS

1. Bluetooth, ISM 2.4GHz in samrt phone, PDA and other handheld devices.
2. ISM band 2.4GHz applications

## DESCRIPTION

Walsin Technology Corporation develops a new antenna specified for 2.4 GHz ISM Band application, as shown in below "CONSTRUCTION". It's application typically located on this unlicensed frequency band which range covers from 2.4GHz to 2.4835GHz. To fulfill the friendly usage for antenna, this antenna has been designed to no empty space required and no sensitive to environmental through Walsin's superior product design via 3D EM Simulation Skill.

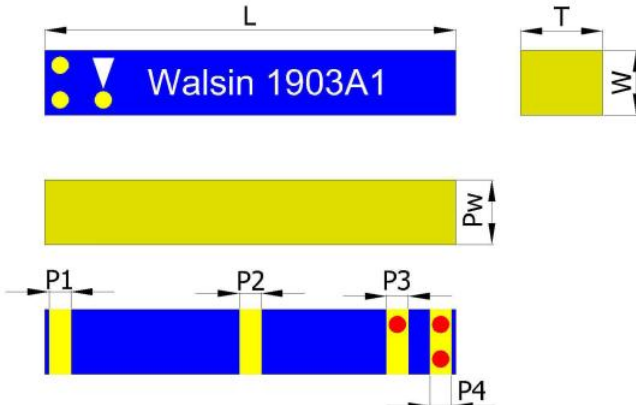
## CONSTRUCTION



PIN	Definition
P1	Soldering
P2	Soldering
P3	Feed
P4	Gronud

Fig 1. Outline of Free Antenna – RGFRA1403041A1T

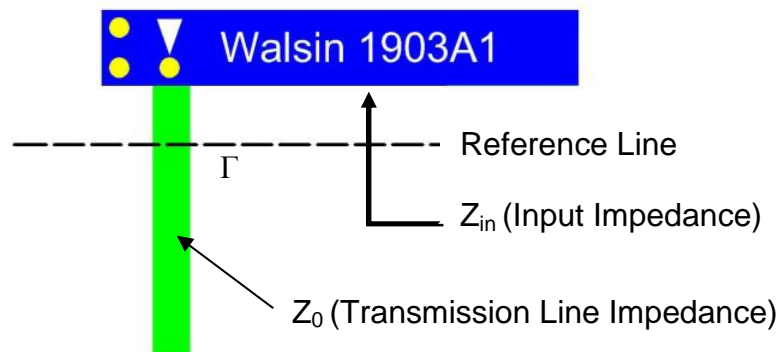
## DIMENSIONS

Figure	Dimension (mm)		Port definition
	L	$19.0 \pm 0.15$	-
	W	$3.0 \pm 0.15$	-
	T	$4.0 \pm 0.20$	-
	P <sub>w</sub>	$3.0 \pm 0.10$	Pad width
	P <sub>1</sub>	$1.0 \pm 0.10$	Soldering terminal
	P <sub>2</sub>	$1.0 \pm 0.10$	Soldering terminal
	P <sub>3</sub>	$1.0 \pm 0.10$	Feed terminal
	P <sub>4</sub>	$1.0 \pm 0.10$	Ground terminal

**ELECTRICAL CHARACTERISTICS**

<b>RGFRA1903041A1T</b>	<b>Specification</b>
Working Frequency Range	2.4 GHz ~ 2.5GHz
Gain	2 dBi (Typical)
Return Loss	-10 dB max.
VSWR	2 max.
Polarization	Linear
Azimuth Beamwidth	Omni-directional
Impedance	50Ω
Rated Power (max.)	1 W
Operation Temperature	-40°C ~ +85°C

**Remark: The specification is defined based on the test board dimension as in below**

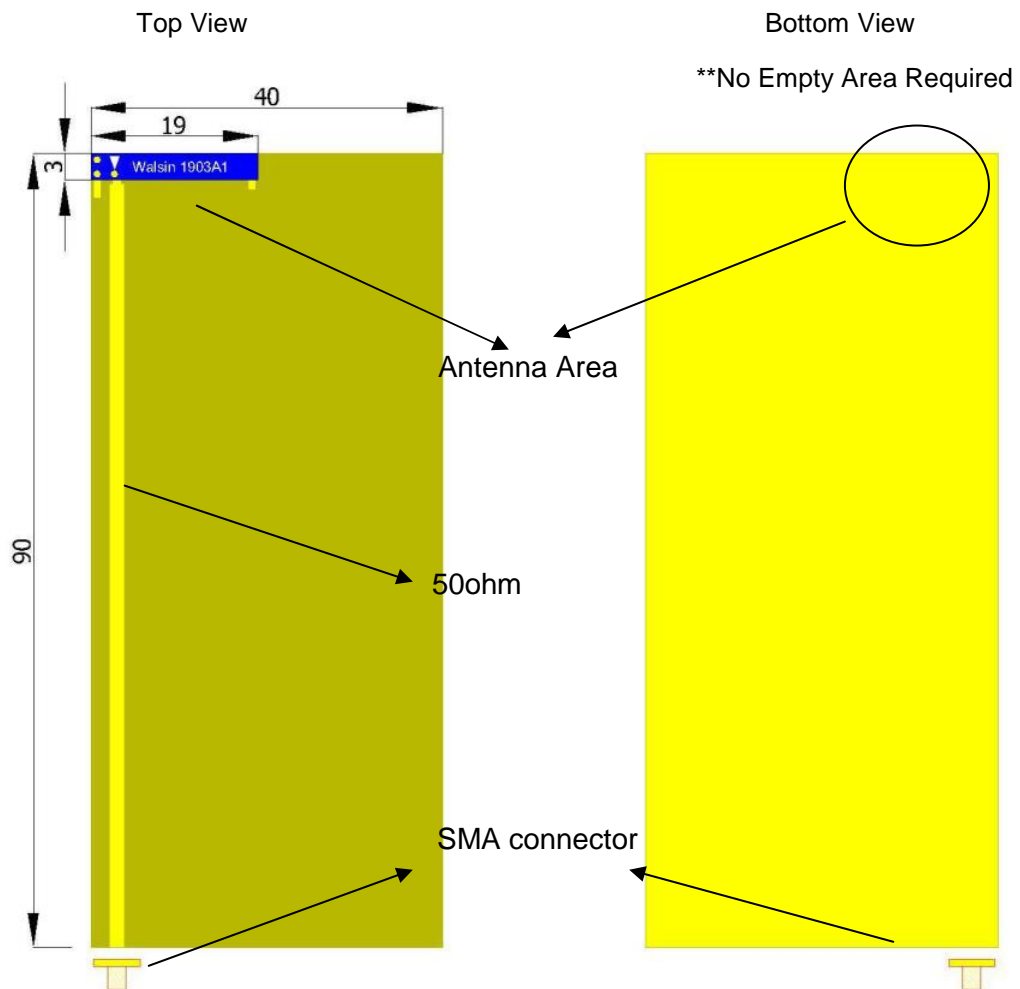
**Return Loss Definition**

$$\Gamma = \frac{Z_{in} - Z_0}{Z_{in} + Z_0}, \text{ where } \Gamma \text{ means Reflection Coefficient}$$

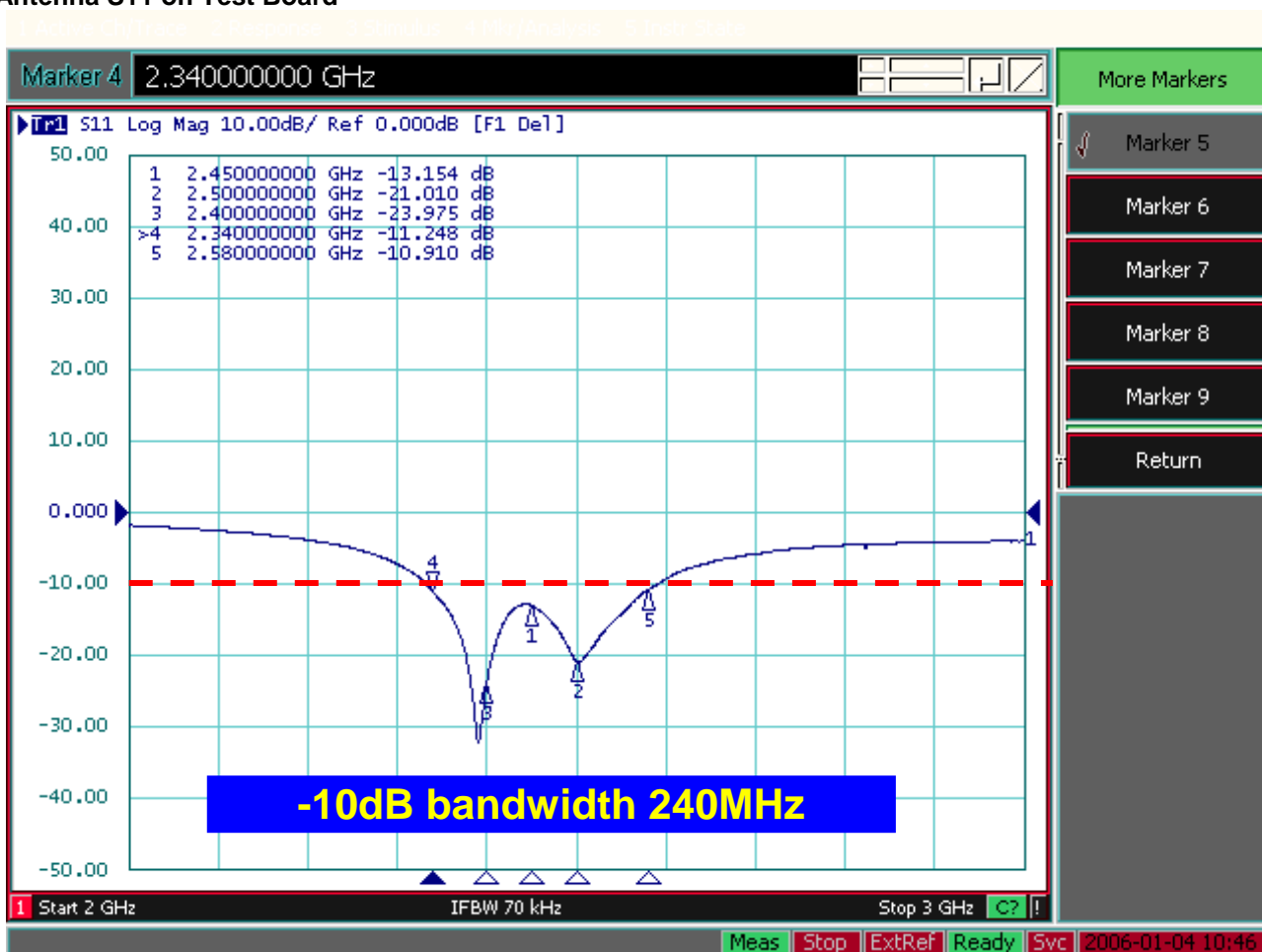
$$RL = 20\log|\Gamma| \text{ dB, where RL means } S_{11}$$

$$VSWR = \frac{1 + |\Gamma|}{1 - |\Gamma|}, \text{ where SWR means Voltage Standing Wave Ratio}$$

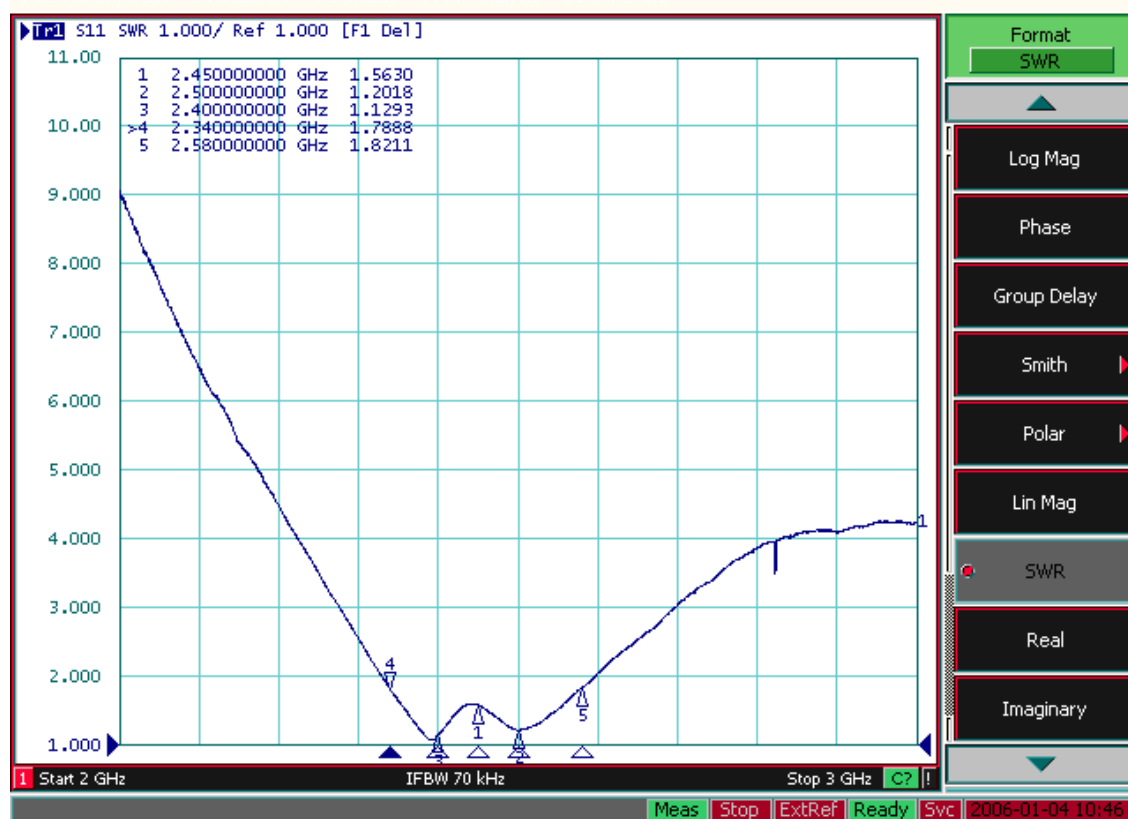
# Antenna on Test Board



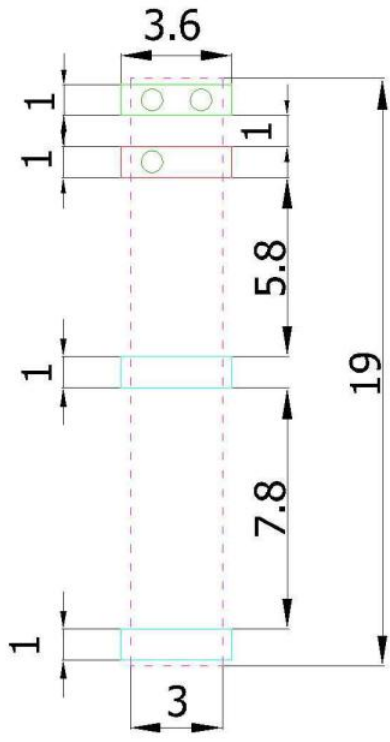
## Antenna S11 on Test Board



## VSWR:

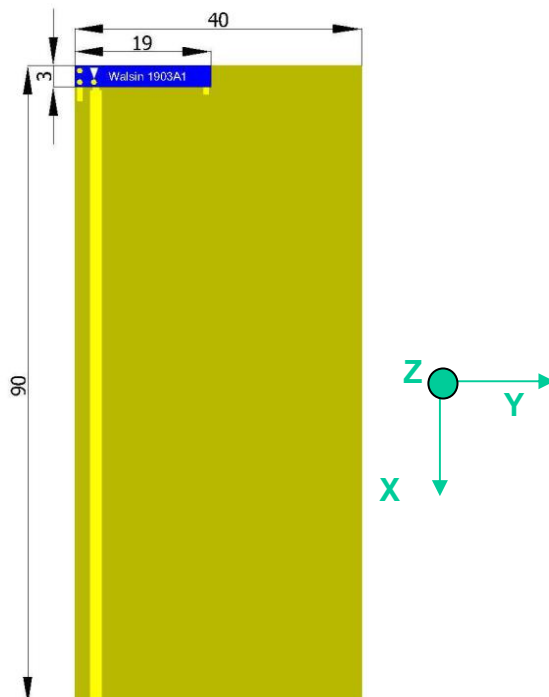


### SOLDER LAND PATTERN DESIGN

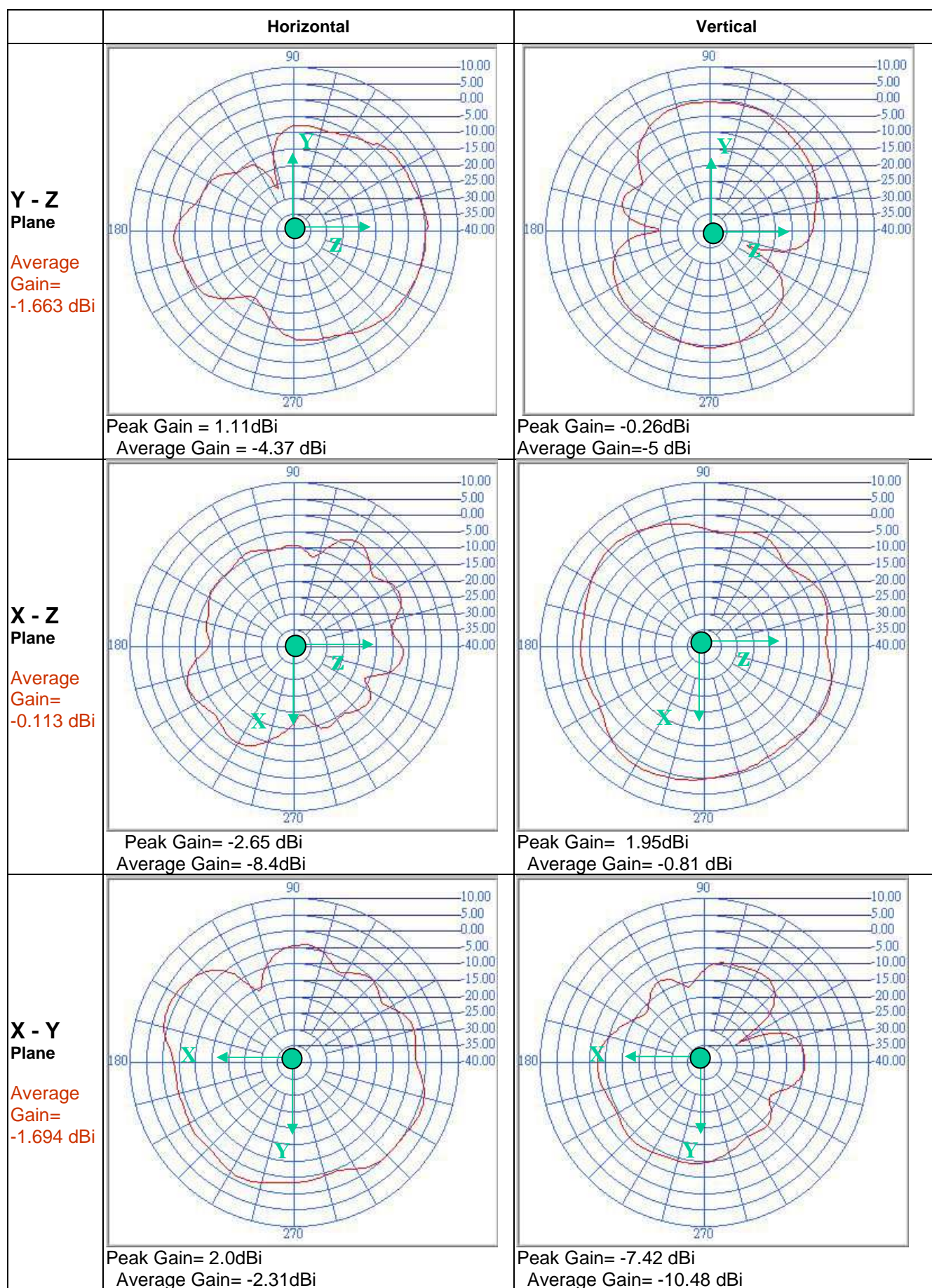
Figure	Symbol	Dimension
 <p>The diagram shows a vertical rectangular layout with a total height of 19 mm. It includes a top ground pad (3.6 mm wide), a feed line (5.8 mm long), a soldering pad (7.8 mm long), and a bottom soldering pad (3 mm wide). Spacing of 1 mm is indicated between the top ground pad and the feed line, and between the feed line and the bottom soldering pad. A dashed purple line indicates the antenna outline.</p>	<p>Ground, connect to ground</p> <p>Feed, connected to 50ohm transmission line</p> <p>Soldering pads</p> <p>Antenna outline</p> <p>Unit: mm</p>	

### RADIATION PATTERN

Radiation Pattern and Gain were dependent on measurement board design. The specification of RGFA1903041A1T antenna was measured based on the test board size and the antenna installation position as shown in the below:









**RELIABILITY TEST**

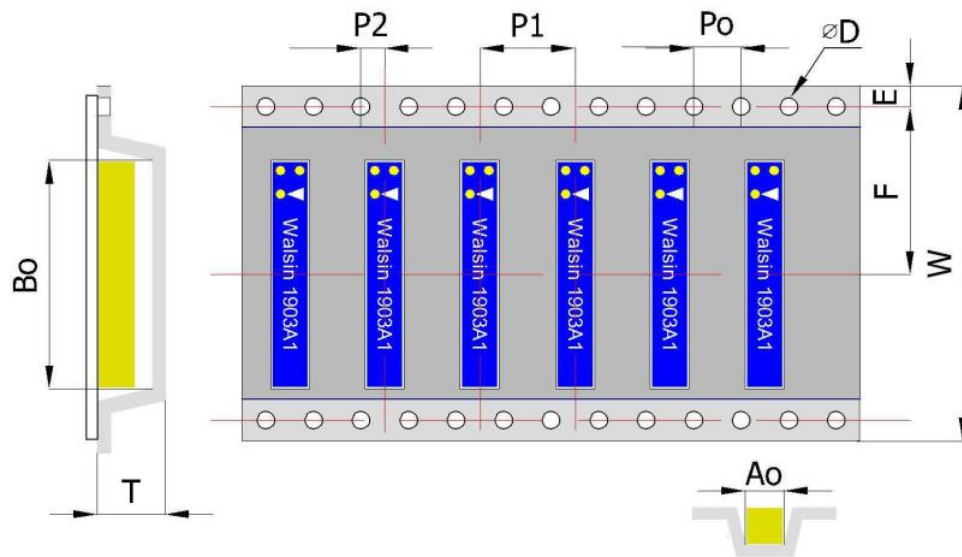
Test item	Test condition / Test method	Specification
Solderability JIS C 0050-4.6 JESD22-B102D	*Solder bath temperature : $235 \pm 5^{\circ}\text{C}$ *Immersion time : $2 \pm 0.5$ sec Solder : Sn3Ag0.5Cu for lead-free	At least 95% of a surface of each terminal electrode must be covered by fresh solder.
Leaching (Resistance to dissolution of metallization) IEC 60068-2-58	*Solder bath temperature : $260 \pm 5^{\circ}\text{C}$ *Leaching immersion time : $30 \pm 0.5$ sec Solder : SN63A	Loss of metallization on the edges of each electrode shall not exceed 25%.
Resistance to soldering heat JIS C 0050-5.4	*Preheating temperature : $120 \sim 150^{\circ}\text{C}$ , 1 minute. *Solder temperature : $270 \pm 5^{\circ}\text{C}$ *Immersion time : $10 \pm 1$ sec Solder : Sn3Ag0.5Cu for lead-free Measurement to be made after keeping at room temperature for $24 \pm 2$ hrs	No mechanical damage. Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within $-40 \sim 85^{\circ}\text{C}$ . Loss of metallization on the edges of each electrode shall not exceed 25%.
Drop Test JIS C 0044 Customer's specification.	*Height : 75 cm *Test Surface : Rigid surface of concrete or steel. *Times : 6 surfaces for each units ; 2 times for each side.	No mechanical damage. Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within $-40 \sim 85^{\circ}\text{C}$ .
Vibration JIS C 0040	*Frequency : 10Hz~55Hz~10Hz(1min) *Total amplitude : 1.5mm *Test times : 6hrs.(Two hrs each in three mutually perpendicular directions)	No mechanical damage. Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within $-40 \sim 85^{\circ}\text{C}$ .
Adhesive Strength of Termination JIS C 0051- 7.4.3	*Pressurizing force : 5N( $\leq 0603$ ) ; 10N(>0603) *Test time : $10 \pm 1$ sec	No remarkable damage or removal of the termination.
Bending test JIS C 0051- 7.4.1	The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm/s per second until the deflection becomes 1mm/s and then pressure shall be maintained for $5 \pm 1$ sec. Measurement to be made after keeping at room temperature for $24 \pm 2$ hours	No mechanical damage. Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within $-40 \sim 85^{\circ}\text{C}$ .

Temperature cycle JIS C 0025	1. 30±3 minutes at -40°C±3°C, 2. 10~15 minutes at room temperature, 3. 30±3 minutes at +85°C±3°C, 4. 10~15 minutes at room temperature, Total 100 continuous cycles  Measurement to be made after keeping at room temperature for 24±2 hrs	No mechanical damage.  Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within -40 ~ 85°C.
High temperature JIS C 0021	*Temperature : 85°C±2°C *Test duration : 1000+24/-0 hours  Measurement to be made after keeping at room temperature for 24±2 hrs	No mechanical damage.  Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within -40 ~ 85°C.
Humidity (steady conditions) JIS C 0022	*Humidity : 90% to 95% R.H. *Temperature : 40±2°C *Time : 1000+24/-0 hrs.  Measurement to be made after keeping at room temperature for 24±2 hrs  ※ 500hrs measuring the first data then 1000hrs data	No mechanical damage.  Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within -40 ~ 85°C.
Low temperature JIS C 0020	*Temperature : -40°C±2°C *Test duration : 1000+24/-0 hours  Measurement to be made after keeping at room temperature for 24±2 hrs	No mechanical damage.  Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within -40 ~ 85°C.

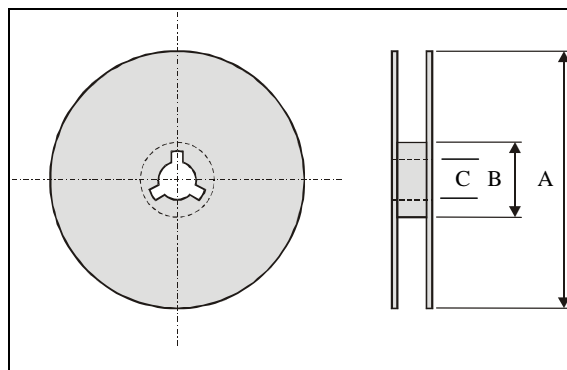
**ORDERING CODE**

RG	FRA	190304	1	A	1	T
<b>Walsin</b> RG: RF /Pb free device	<b>Product code</b> FRA : Antenna	<b>Dimension code</b> Per 2 digits of Length, Width, Thickness : e.g. : 190304= Length 19.0, Width 3.0, Thickness 4.0	<b>Unit of dimension</b> 0 : 0.1 mm 1 : 1.0 mm	<b>Application</b> A : 2.4GHz ISM Band	<b>Specification</b> Design Code	<b>Packing</b> T : Reeled

Minimum Ordering Quantity: 1000 pcs per reel.

**PACKAGING****Plastic Tape specifications** (unit :mm)

Index	Ao	Bo	ΦD	T	W
Dimension (mm)	3.25 ± 0.1	19.35 ± 0.1	1.50 ± 0.10	4.05 ± 0.1	32 ± 0.3
Index	E	F	Po	P1	P2
Dimension (mm)	1.75 ± 0.1	14.25 ± 0.1	4.0 ± 0.1	8.0 ± 0.1	2.0 ± 0.1

**Reel dimensions**

Index	A	B	C
Dimension (mm)	Φ330±1	Φ99 ±1	Φ17.4 ± 0.5

Typing Quantity: 1000 pieces per 13" reel

**CAUTION OF HANDLING****Limitation of Applications**

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects, which might directly cause damage to the third party's life, body or property.

- (1) Aircraft equipment
- (2) Aerospace equipment
- (3) Undersea equipment
- (4) Medical equipment
- (5) Disaster prevention / crime prevention equipment
- (6) Traffic signal equipment
- (7) Transportation equipment (vehicles, trains, ships, etc.)
- (8) Applications of similar complexity and /or reliability requirements to the applications listed in the above.

**Storage condition**

- (1) Products should be used in 6 months from the day of WALSIN outgoing inspection, which can be confirmed.
- (2) Storage environment condition.
  - Products should be storage in the warehouse on the following conditions.
  - Temperature : -10 to +40°C
  - Humidity : 30 to 70% relative humidity
  - Don't keep products in corrosive gases such as sulfur. Chlorine gas or acid or it may cause oxidization of electrode, resulting in poor solderability.
  - Products should be storage on the palette for the prevention of the influence from humidity, dust and son on.
  - Products should be storage in the warehouse without heat shock, vibration, direct sunlight and so on.
  - Products should be storage under the airtight packaged condition.