SPK ELECTRONICS CO., LTD.

SPECIFICATION

SPEC NO.	:	SP-12B0698GS01-01
PART NO.	:	
PRODUCT NAME	:	Ceramic PIFA Antenna
DESCRIPTION	:	Ceramic PIFA Antenna (40*6*5 mm) Combined GSM 4Band and W-CDMA2100 Antenna and LTE (North American Band)

REVISION STATUS

VERSION	DATE	PAGE	REVISION DESCRIPTION	PREPARED	DESIGNED	APPROVED
V01	2013.11.13	All	新制訂	Mingru	TY	Frank

Prepared By	Designed By	Approved By

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1.SCOPE

SPK-4GANT-001 antenna operates simultaneously in the 698-960MHz and 1700-2200 MHz bands, making it ideal for 4G/3G applications.

The SPK-4GANT-001 design is suitable for both indoor and outdoor applications with wide bandwidth and a low angle radiation pattern that is superior to traditional gain antennas in most applications. The SPK-4GANT-001 antenna is ideal for surface mount applications.

2.Features

- Multiple band coverage with no tuning required
- Can be used for mobile and fixed base applications
- Applicable for both 3G and 4G application

3.Electrical characteristics

3-1 Electrical characteristics of antenna

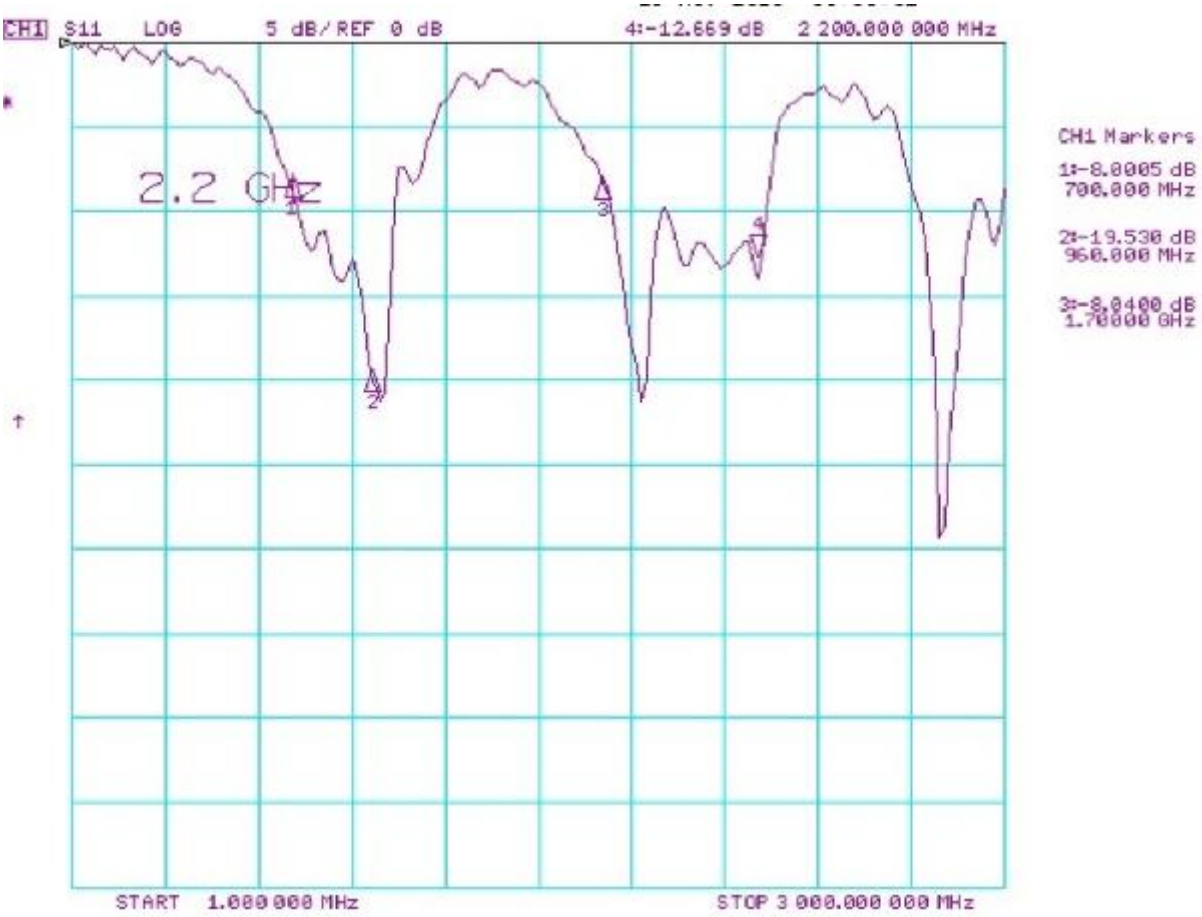
The SPK-4GANT-001 electrical characteristics is indicated on Table 1, and it is under
suggestion layout PCB board.

Table 1

No	Parameter	Specification
1	Working Frequency	698~960 MHz , 1700~2200 MHz
2	Dimension	40×6×5 mm
3	VSWR	4 max (depends on the special environment)
4	Polarization	Linear
5	Impedance	50 Ω
6	Operating Temperature	-40~85℃
7	Termination	Ag (Environmentally-Friendly Pb Free)

* Layout board size is 120X45 mm

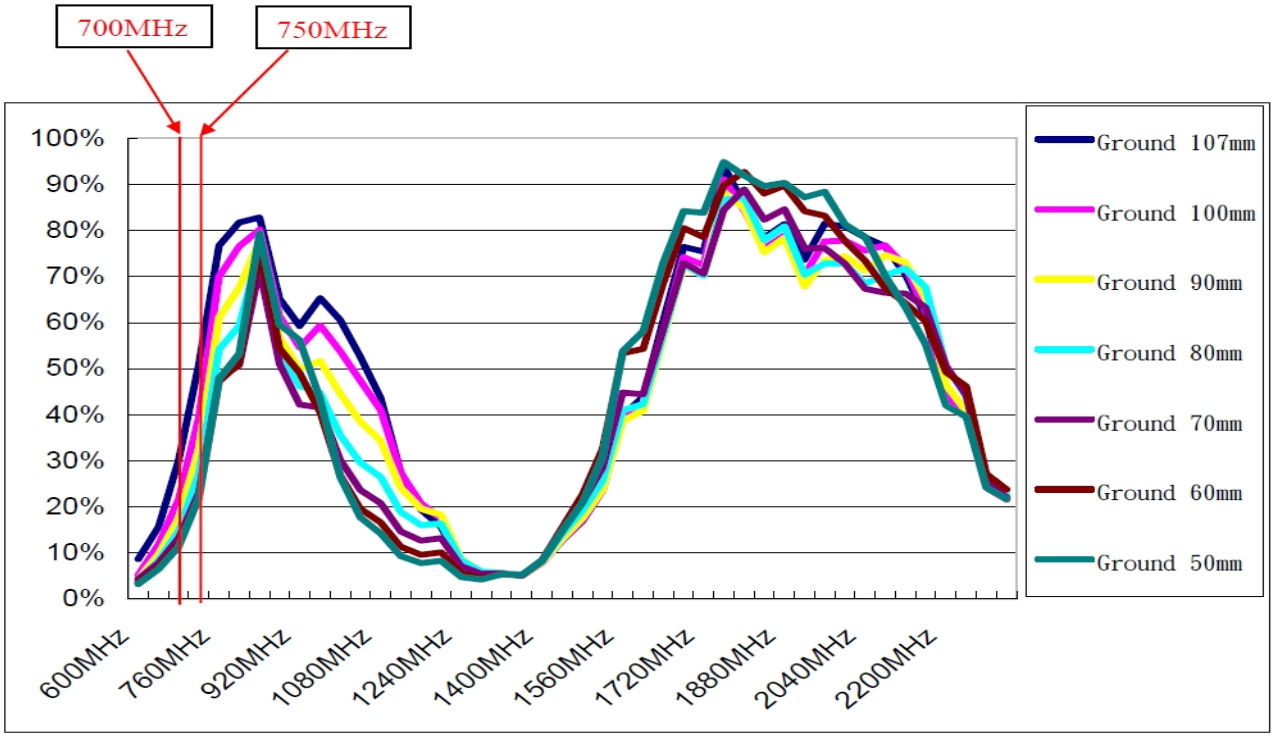
3-2 Characteristic : S11



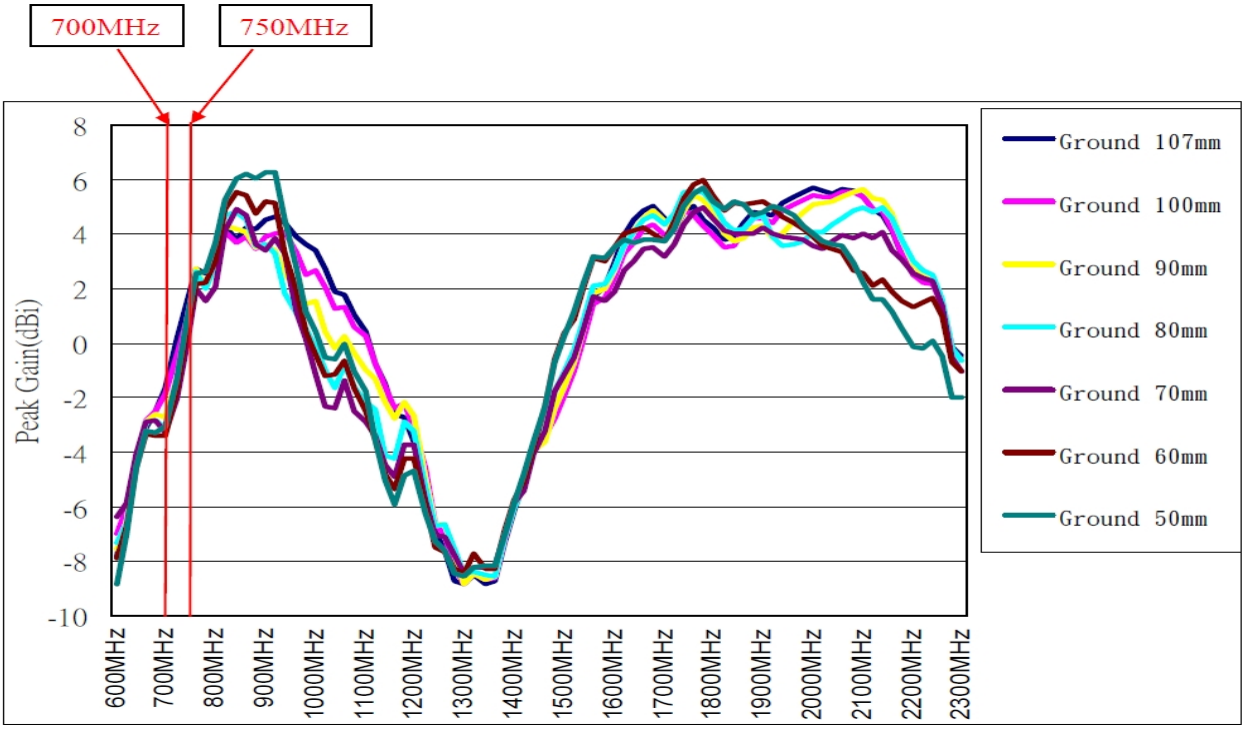
3-3 Gain and Efficiency : Fixed on ground length 105mm

LTE Antenna Peak Gain parameter Summary											
Band		GSM (MHz)				DCS (MHz)		PCS (MHz)		WCDMA (MHz)	
	700	**824**	**880**	**890**	**960**	**1710**	**1880**	**1850**	**1990**	**2110**	**2200**
Peak Gain(dBi)	-1.68	4.37	4.20	4.39	3.95	4.38	4.88	4.18	5.64	5.17	3.70
Efficiency(%)	40.19	87.02	65.28	62.99	65.43	73.49	81.49	80.35	81.98	73.23	57.18
Average Gain(dBi)	-3.91	-0.57	-1.82	-1.98	-1.81	-1.32	-0.86	-0.92	-0.81	-1.31	-2.40

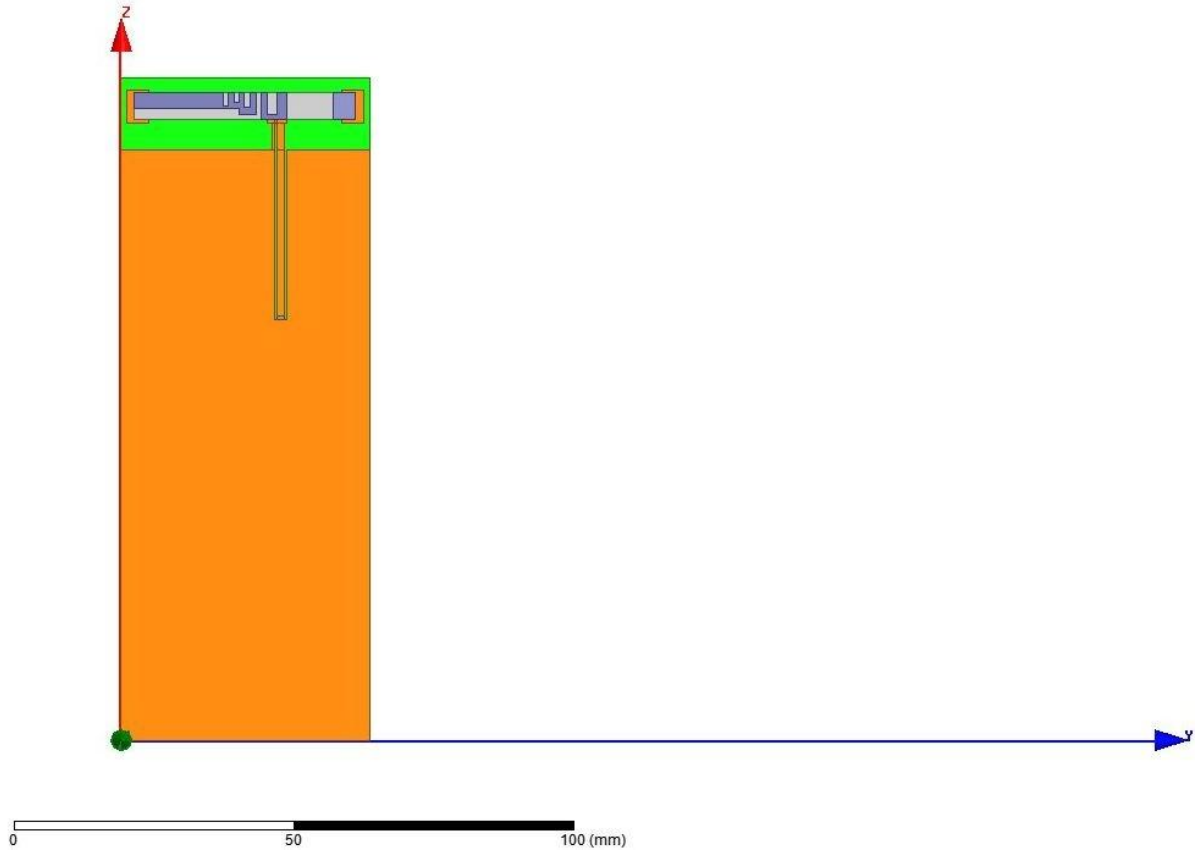
3-4 Efficency VS Ground Length

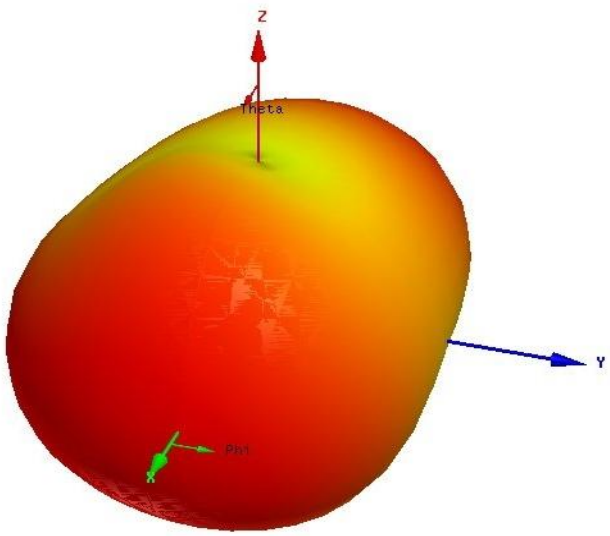


3-5 Gain VS Ground Length

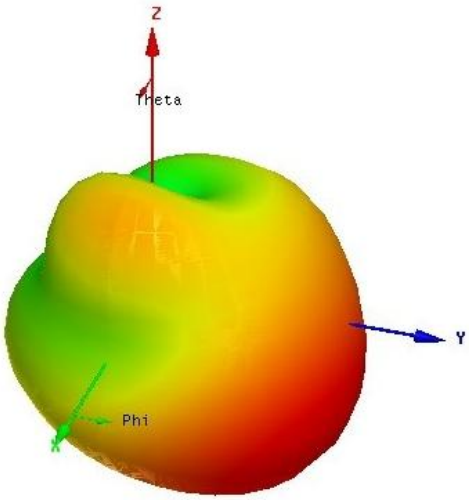


3-6 Radiation Patten

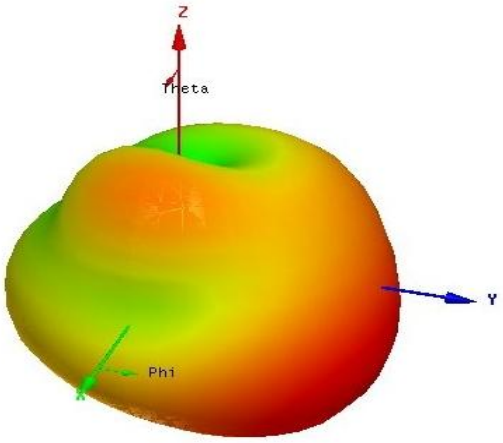




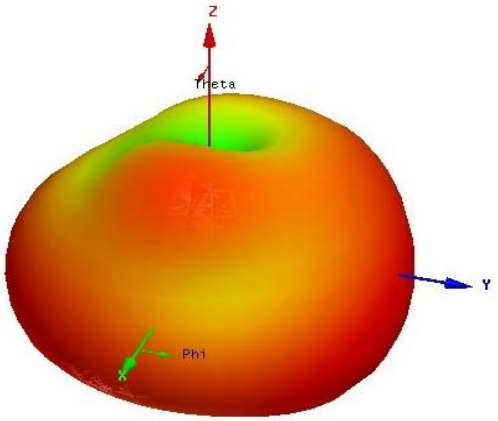
700MHz



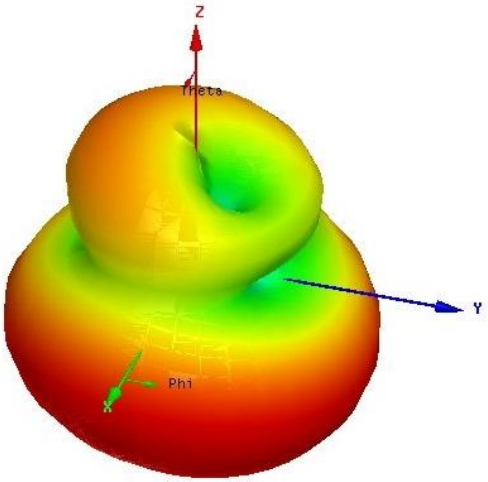
750MHz



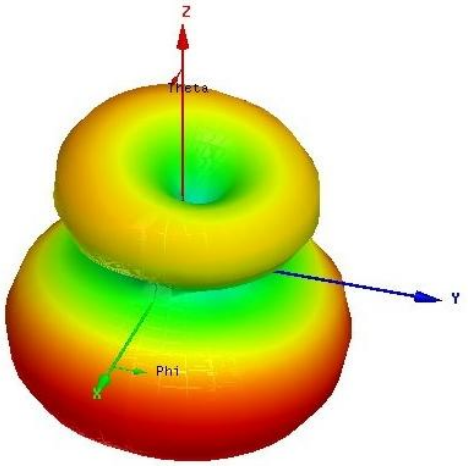
820MHz



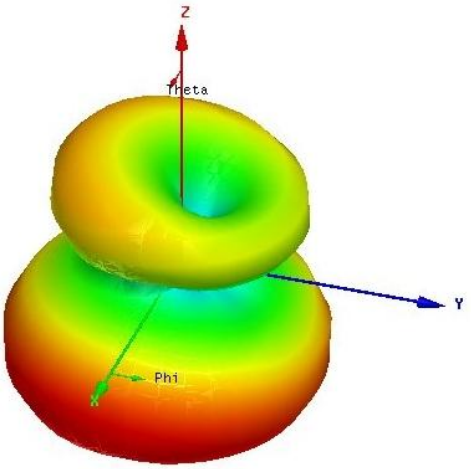
960MHz



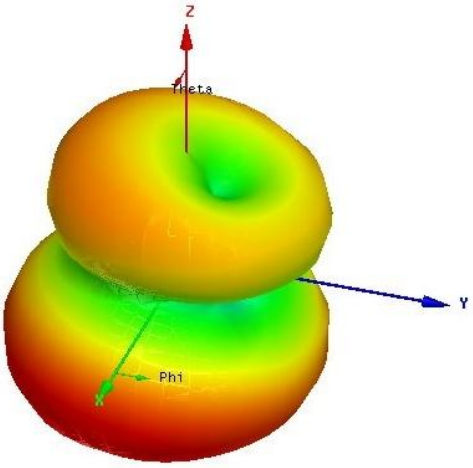
1710MHz



1990MHz



2110MHZ



2170MHZ

4.Environmental conditions

4-1 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 -40℃ to +85℃

5.Reliability tests

5-1. 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.

5-2 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.

5-3 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.

5-4 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.

5-5 Vibration test

5-5-1 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.

5-5-2 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.

5-6 Free fall test in packaged condition

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 270 ± 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) .

6.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.

7.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.

8.Other

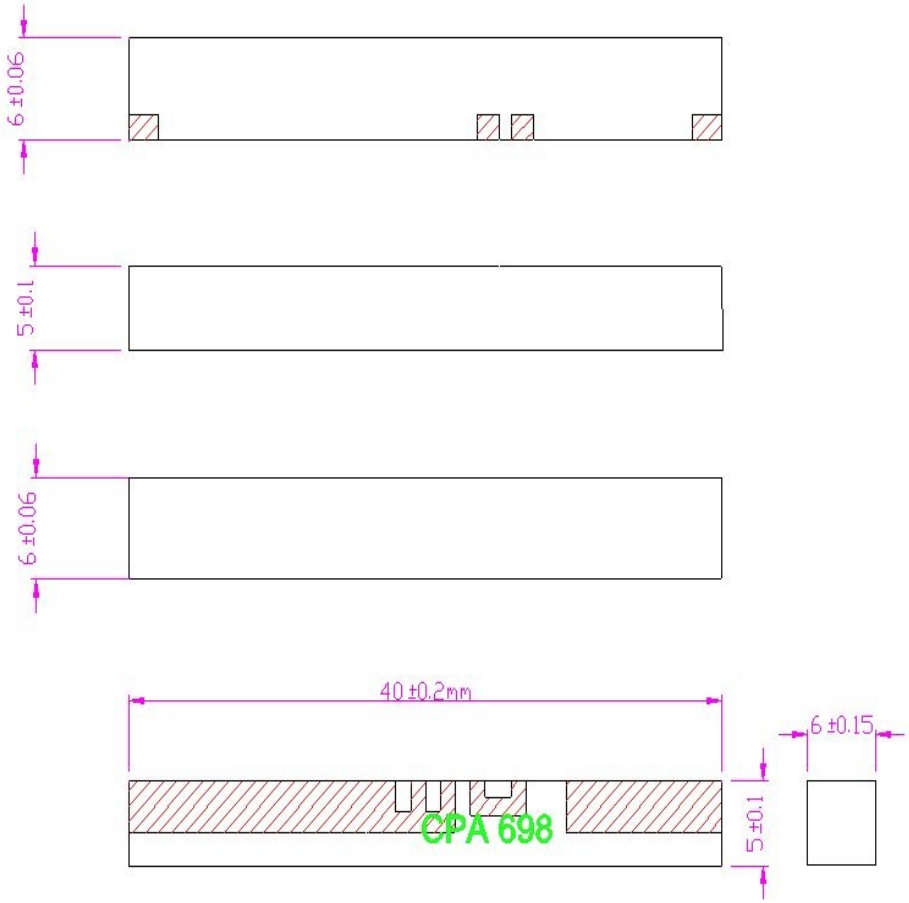
Any question arising from this specification manual shall be solved by arrangement made by both parties.

9.Precautions for use

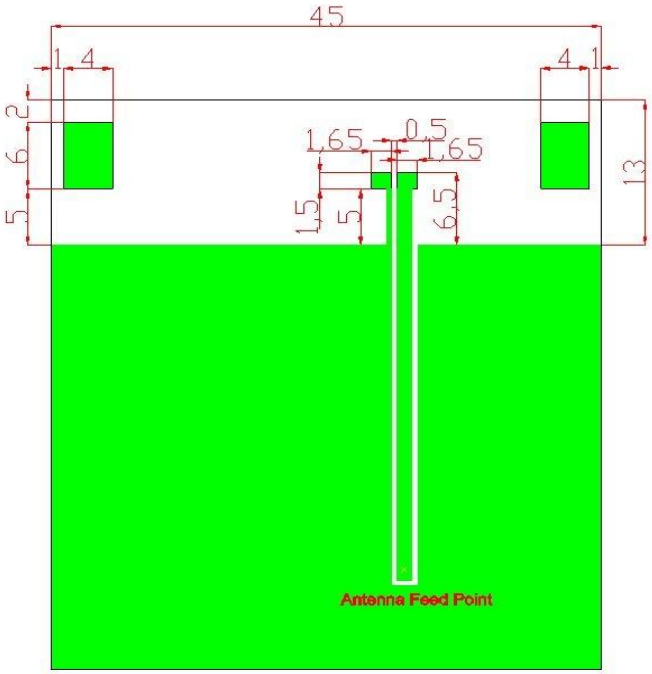
- Antenna pattern use a Ag electrode.
- Please don’t use the corrosion gas (sulfur gas, chlorine gas) in the atmosphere.
- Please don’t direct solder onto the gold electrode of Antenna pattern.

10. Drawings

Shape and Dimension

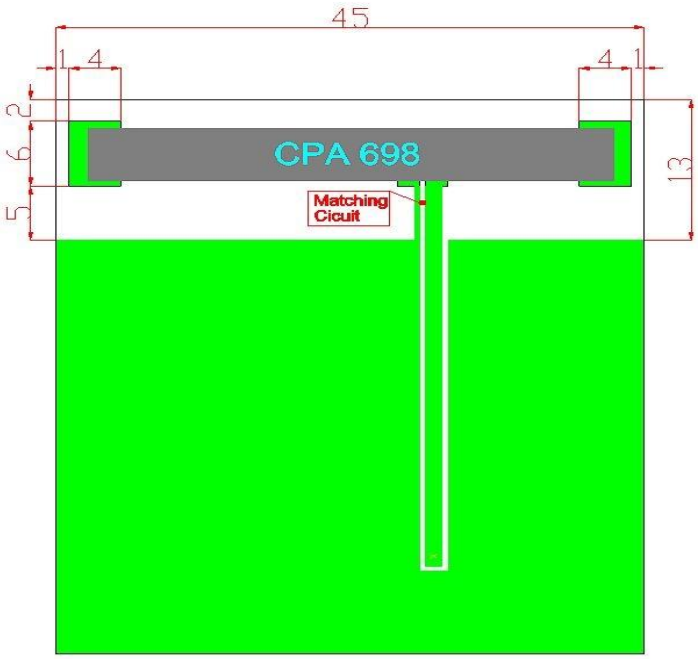


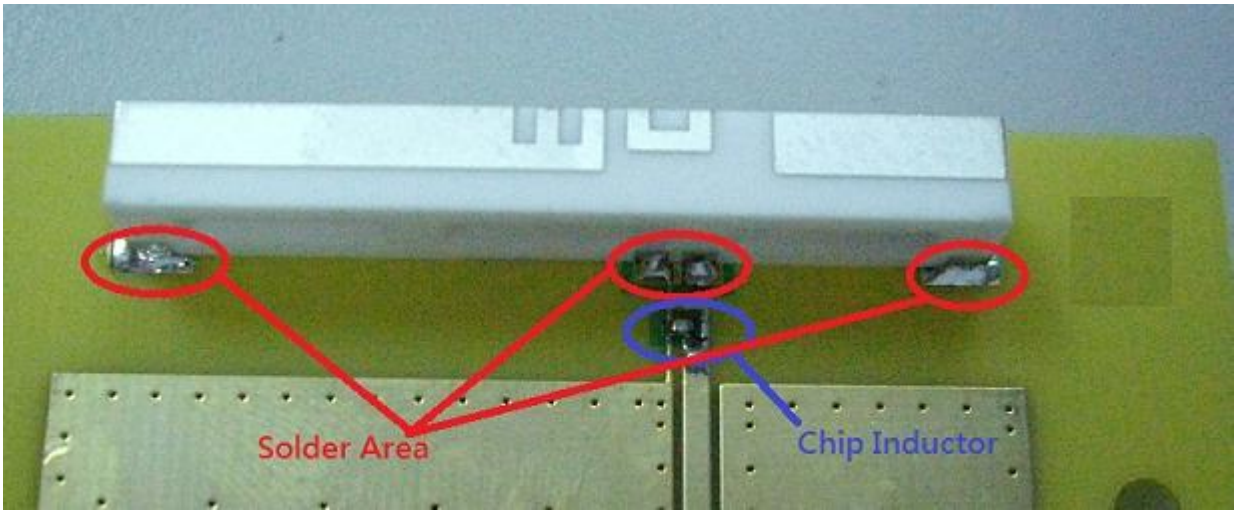
Customer's Requirement Layout Dimension



Antenna Measurement on Demo Board

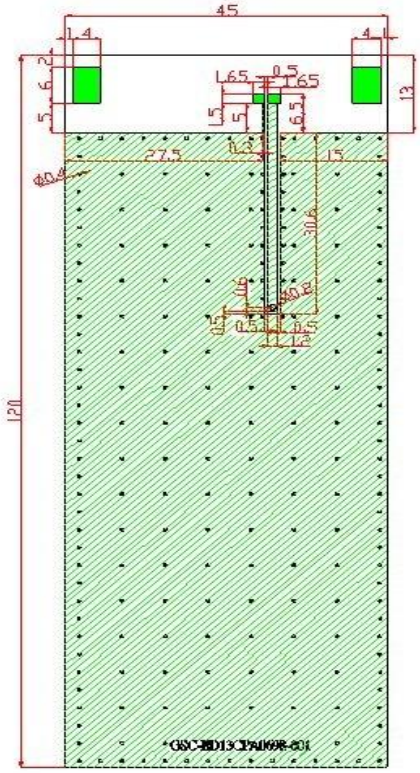
Matching Circuit

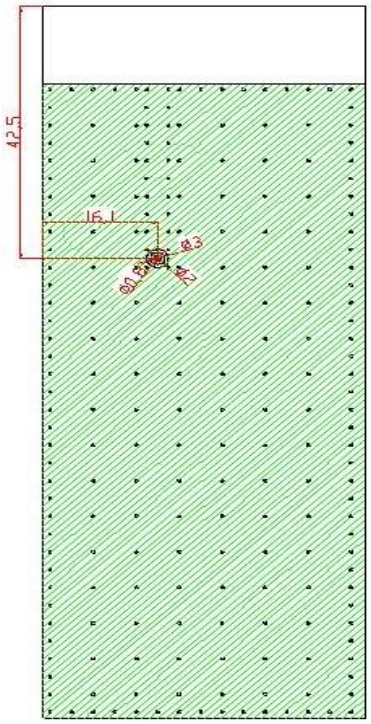

45
1
4
4
1
2
6
5
13
CPA 698
Matching
Cicuit



Circuit Symbol	Size	Description
L1	0402	8.2nH Inductor (MLK1005S8N2D)

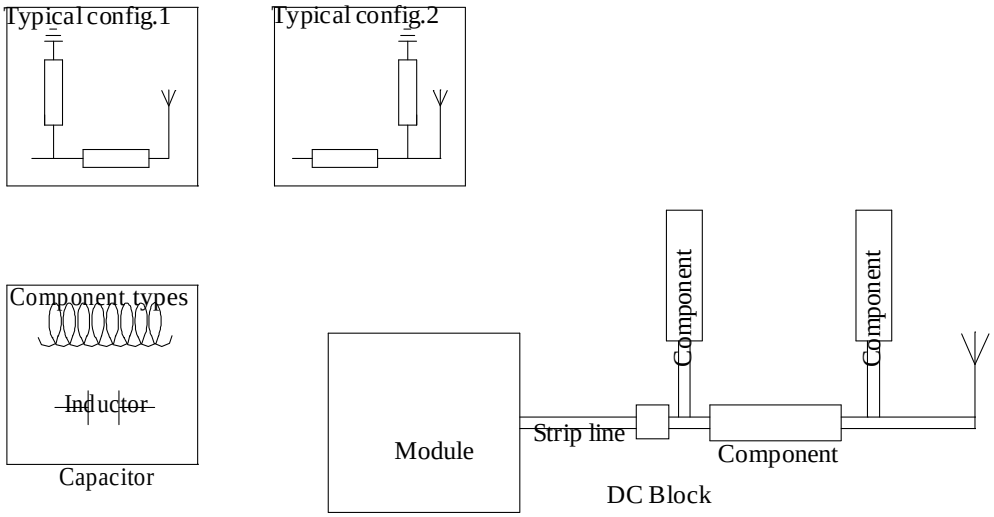
Test board dimensions





The test board is designed for evaluation purposes

Transmission line and matching



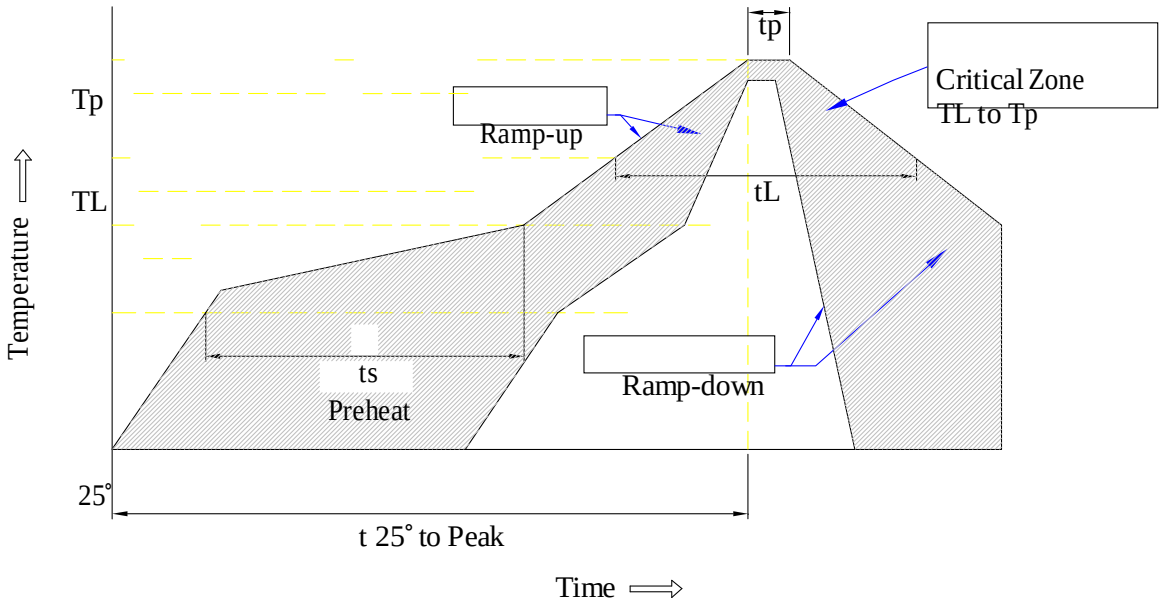
The matching network has to be individually designed using one,two or three components.

11.Recommended Reflow Temperature Profile

SPK-4GANT-001 Planer Inverted-F antenna can be assembled following either Sn-Pb or Pb-free assembly. According to the Standard **IPC/JEDEC J-STD-020C**, the temperature profile suggested is as follow:

Phase	Profile features	Sn-Pb Assembly	Pb-Free Assembly (SnAgCu)
RAMP-UP	Avg. Ramp-up Rate (Ts_{max} to TP)	3℃/second (max)	3℃/second(max)
PREHEAT	-Temperature Min(TS_{min}) -Temperature Max(TS_{min}) -Time(ts_{min} to ts_{max})	100℃ 150℃ 60-120 seconds	100℃ 150℃ 60-120 seconds
REFLOW	-Temperature(T_L) -Total Time above T_L (t_L)	183℃ 60-150 seconds	217℃ 60-150 seconds
PEAK	-Temperature(T_P) -Time(tp)	235℃ 10-30 second	260℃ 20-40 second
RAMP-DOWN	Rate	6℃ / second max.	6℃ / second max.
Time from 25℃ to Peak Temperature		6 minutes max.	8 minutes max.

Next graphic shows temperature profile(gray zone)for the antenna assembly process in reflow ovens.



Temperatures profile