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Application Note No.001

SMD Mounting Antenna Series

3G Omni-directional Antenna

WA-P-P5-00-001

Prepared	Checked	Approved

Innovation、Nature、

People、Advance、Quality

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Application Note

3G Omno-directional Antenna – WA-P-P5-00-001

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Previous Version :

Page	Subjects (major changes since last revision)	Version
All	Make up all document	A0

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WA-P-P5-00-001 Application Note

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Applications

This antenna is designed for GSM&3G application and it's suitable for cellular phones, PDA, notebook, and all devices which haveGSM&3G function.

Features

- GSM&3G antenna supporting up to Penta-Band
- High Efficiency
- Low profile and compact size(40.0x 10.0 x 3.2mm)
- Low cost
- Lead free soldering compatible
- Easy to integrate
- intended for SMD mounting
- RoHS compliant
- Tray packing

Description

3G antenna uses a ground plane in order to radiate efficiently, but this ground plane must not extend underneath the antenna itself.
The antenna uses a matching circuit ti achieve optimized results for the specific frequency bands that are required. This product specification shows the performance of the antenna when optimized to cover a typical penta-band reception:GSM850/GSM900/GSM1800 /GSM1900 and WCDMA.

Part number/Marker

Part NO.“WA-P-P5-00-001”

Marker “INPAQ 3G Antenna”

3G Antenna Data

Electrical characteristics of antenna

The antenna has the electrical characteristics given as follow

(1)General data

Electrical Specification*	
Frequency	824~960MHz,1710~2170MHz
VSWR	3max(depends on the special environment)
Polarization	Linear
Impedance with matching	50Ω
Antenna type	SMD
Operating temperature	-40~85℃
Dimension	40*10*3.2mm

* Electrical characteristic depends on INPAQ evaluation board with matching circuit.

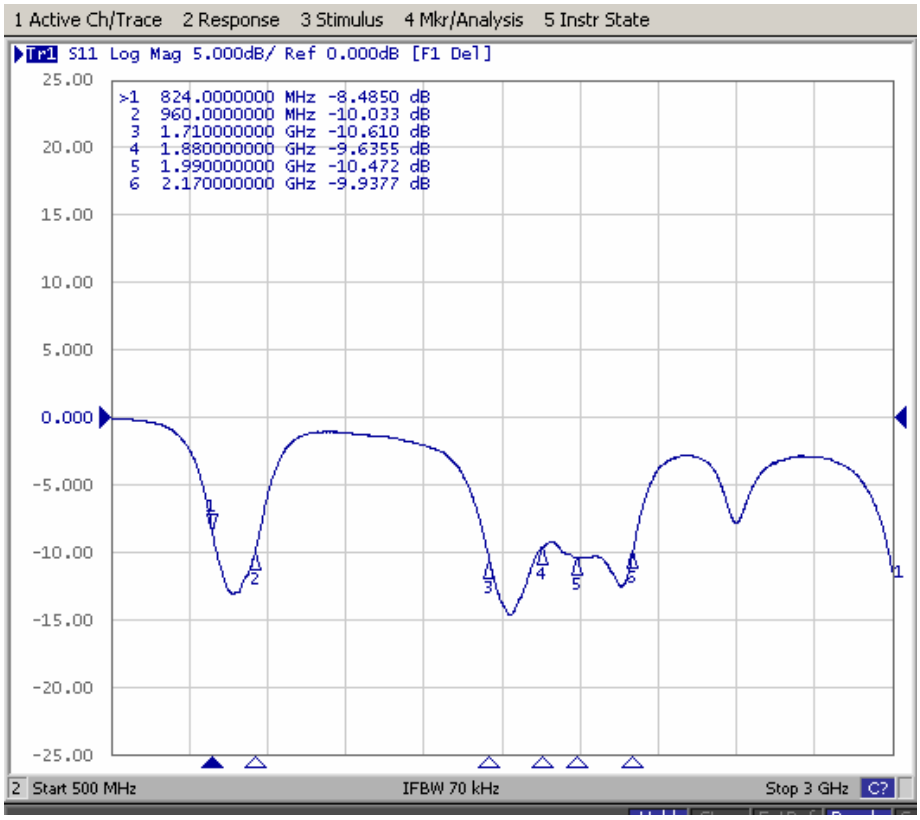
* The dimension of evaluation board is 40 x 110 mm.

(2)Electrical characteristics

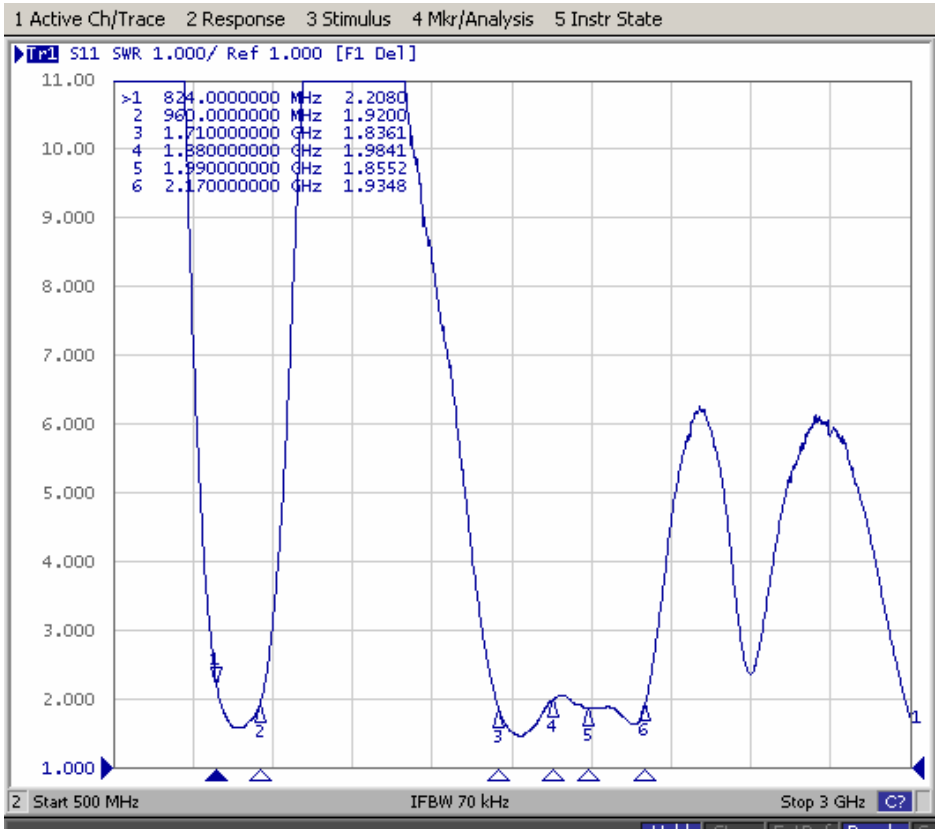
	Typical performance	Conditions
Peak Gain	1.5dBi @ 876MHz 2.5dBi@1917MHz	All data measured on DEMO board. Data given for the 824~960MHz and 1710~2170MHz frequency ranges
Average gain(Linear)	-1.5dBi 824~960MHz -2.0dBi 1710~2170MHz	
Average efficiency 824-960 MHz 1710-2170 MHz	 65% 62%	
Maximum Return Loss	-8dB	
Maximum VSWR	2.5:1	

Electrical performance

(1)Return Loss



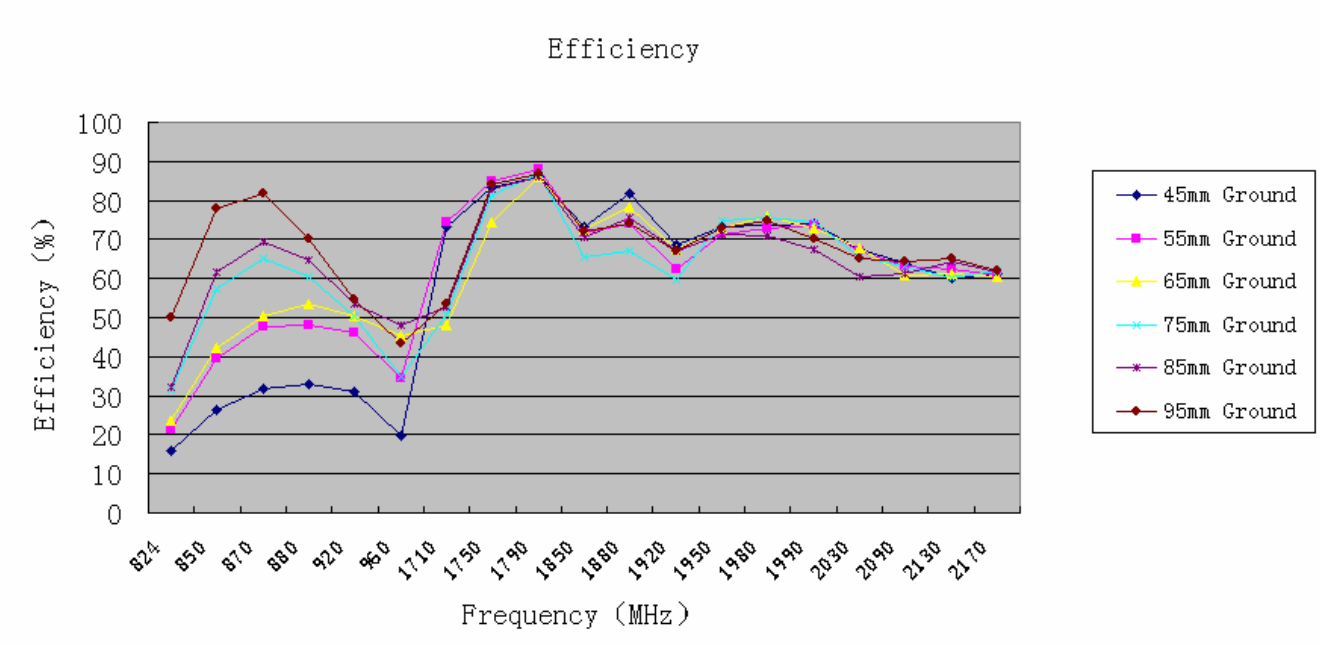
(2)VSWR



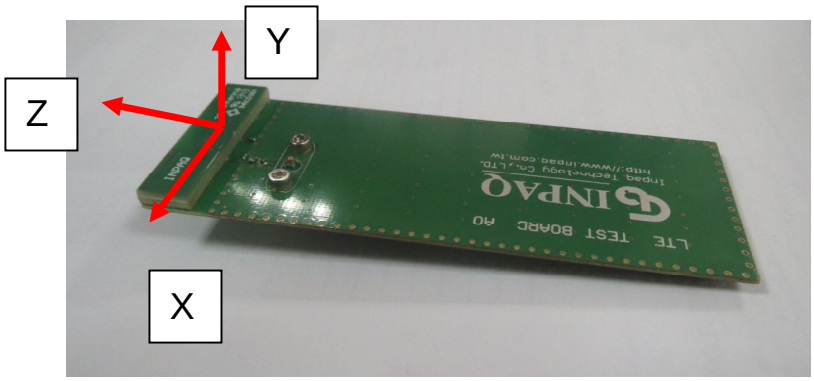
(3)Gain and Efficiency
(Ground length: 9.5cm)

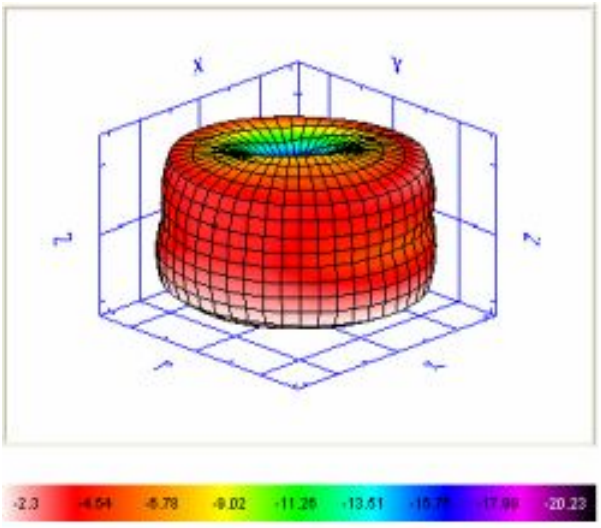
Antenna peak gain and efficency parameter sunnary										
Band	GSM(MHz)				DCS(MHz)		PCS(MHz)		WCDMA(MHz)	
	824	890	880	960	1710	1880	1850	1990	2110	2170
Peak Gain(dBi)	0.98	1.91	0.94	0.87	3.02	3.0	2.76	2.58	2.39	2.15
Efficiency(%)	60.10	84.75	70.30	59.47	64.52	69.71	63.87	67.11	61.49	62.52

Reference efficiency data with different ground plane length:

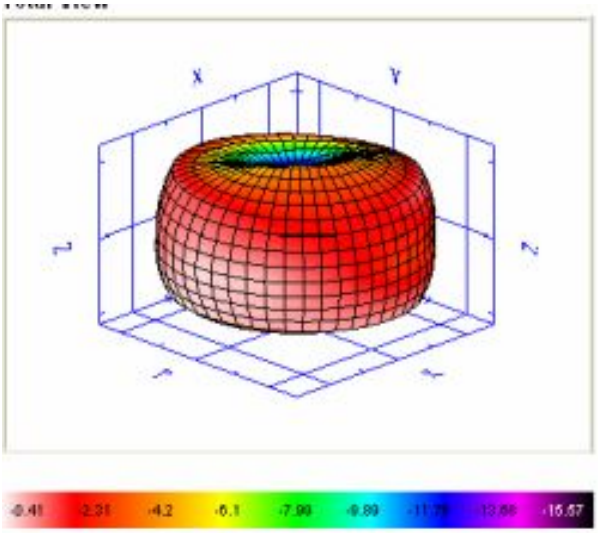


(4)3D Radiation Pattern

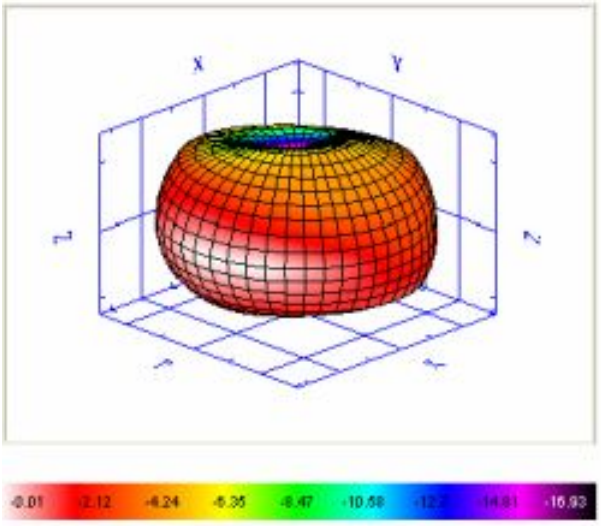




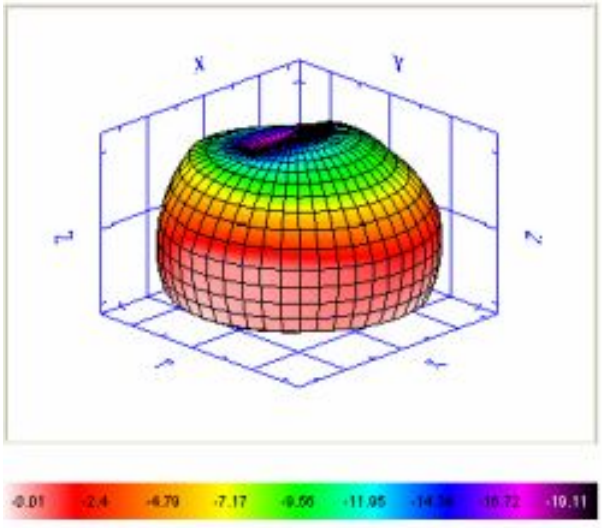
824MHz



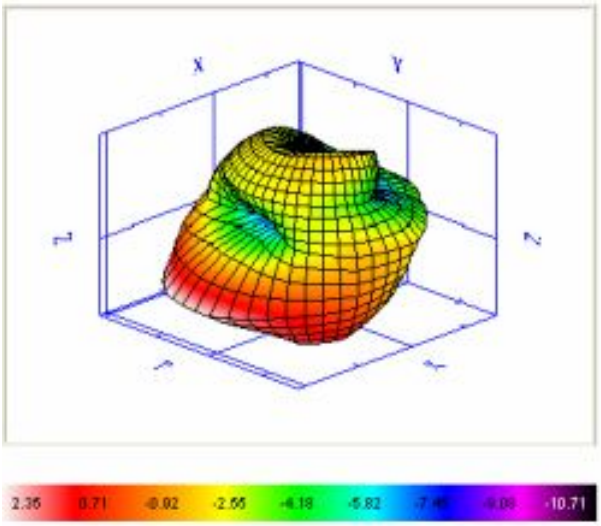
850MHz



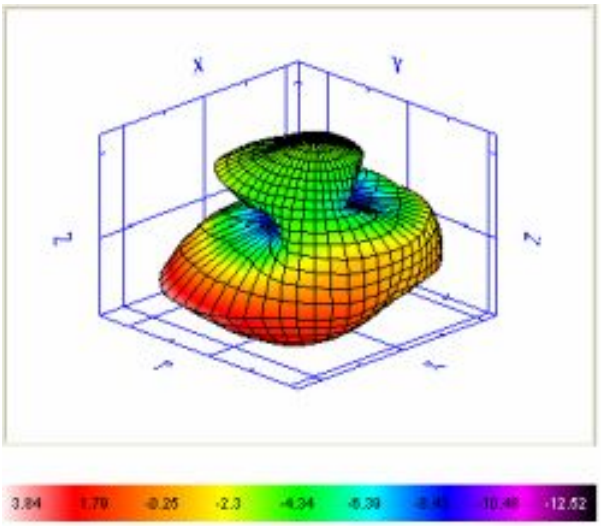
880MHz



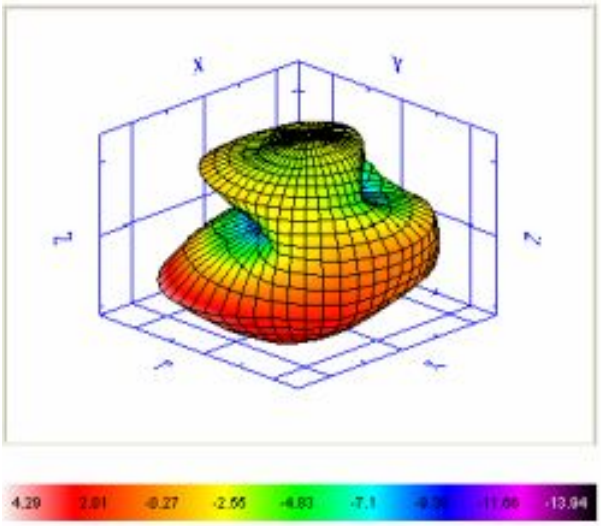
960MHz



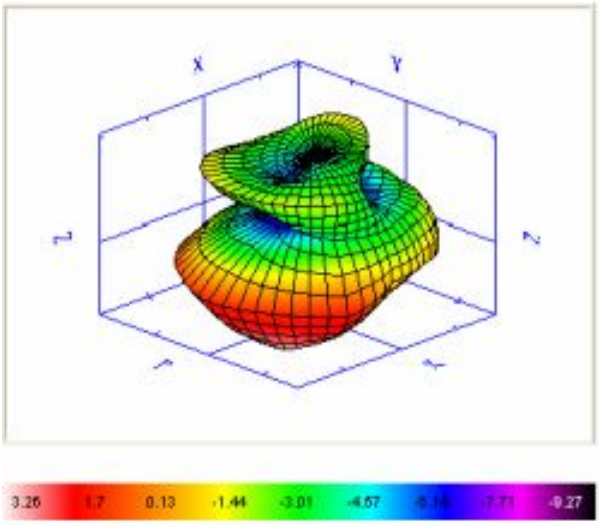
1710MHz



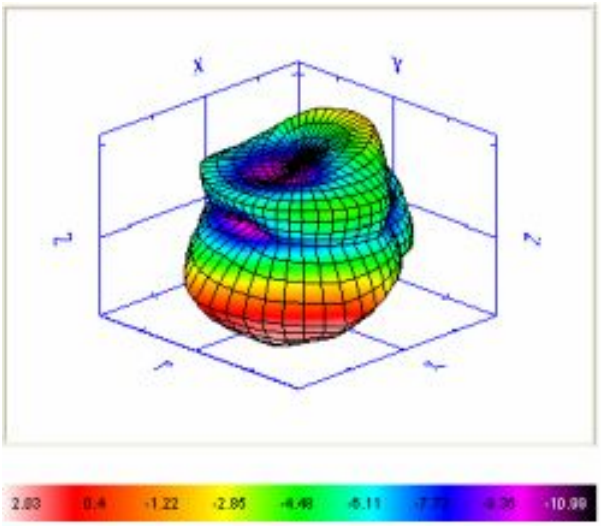
1850MHz



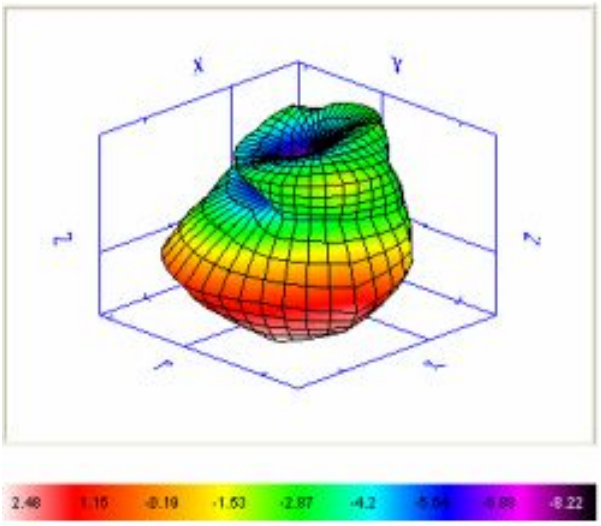
1880MHz



1990MHz

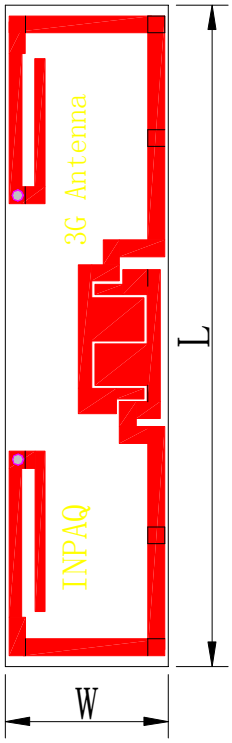


2110MHz

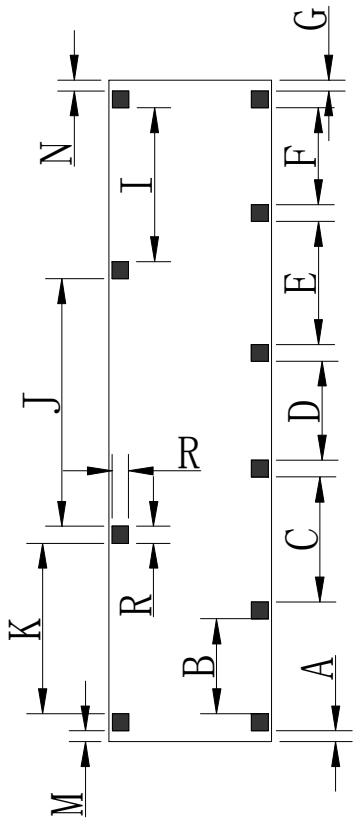


2170MHz

Antenna dimensions



Top plane



Bottom plane

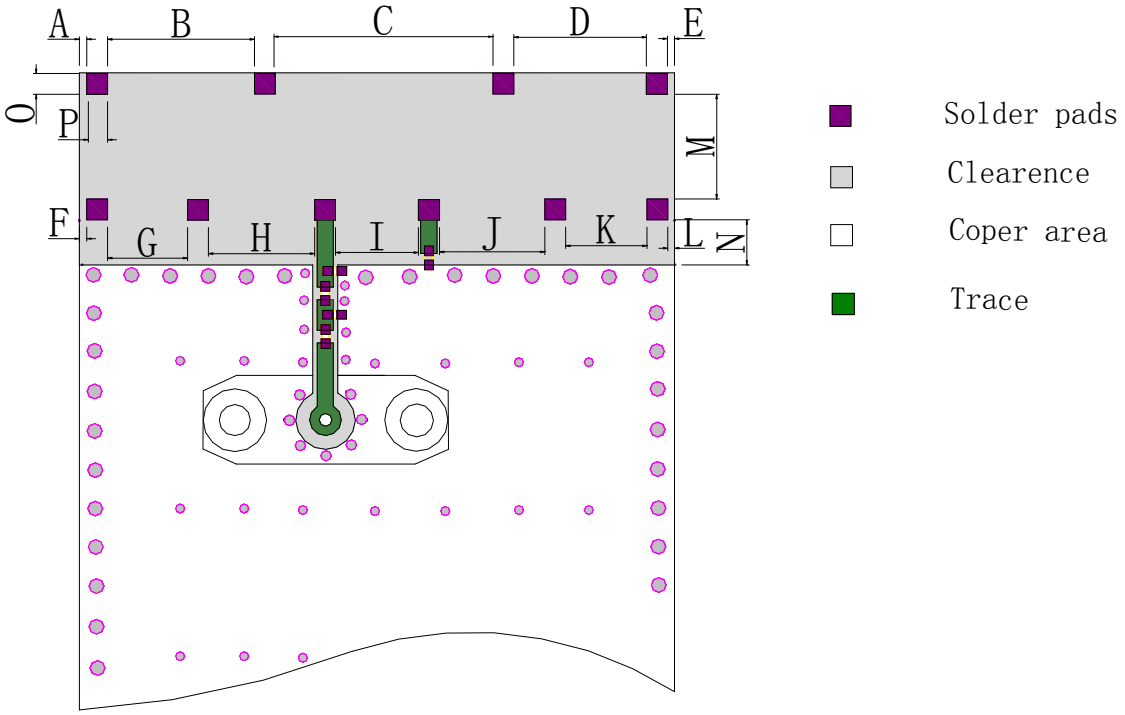
■ Solder Pads

The size of solder pads is same.

W	L	H	A	B	C	D	E
Widch	Length	Height					
10.0±0.2	40.0±0.2	3.2±0.15	0.66±0.15	5.85±0.15	7.49±0.15	5.85±0.15	7.49±0.15

F	G	I	J	K	M	N	R
5.85±0.15	0.66±0.15	9.80±0.15	14.98±0.15	9.80±0.15	0.66±0.15	0.66±0.15	1.02±0.15

Antenna footprint



A	B	C	D	E	F	G	H
0.50±0.15	9.68±0.15	14.76±0.15	9.68±0.15	0.50±0.15	0.50±0.15	5.63±0.15	7.27±0.15

I	J	K	L	M	N	O	P
5.63±0.15	7.27±0.15	5.63±0.15	0.50±0.15	7.10±0.15	3.0±0.15	1.40±0.15	1.30±0.15

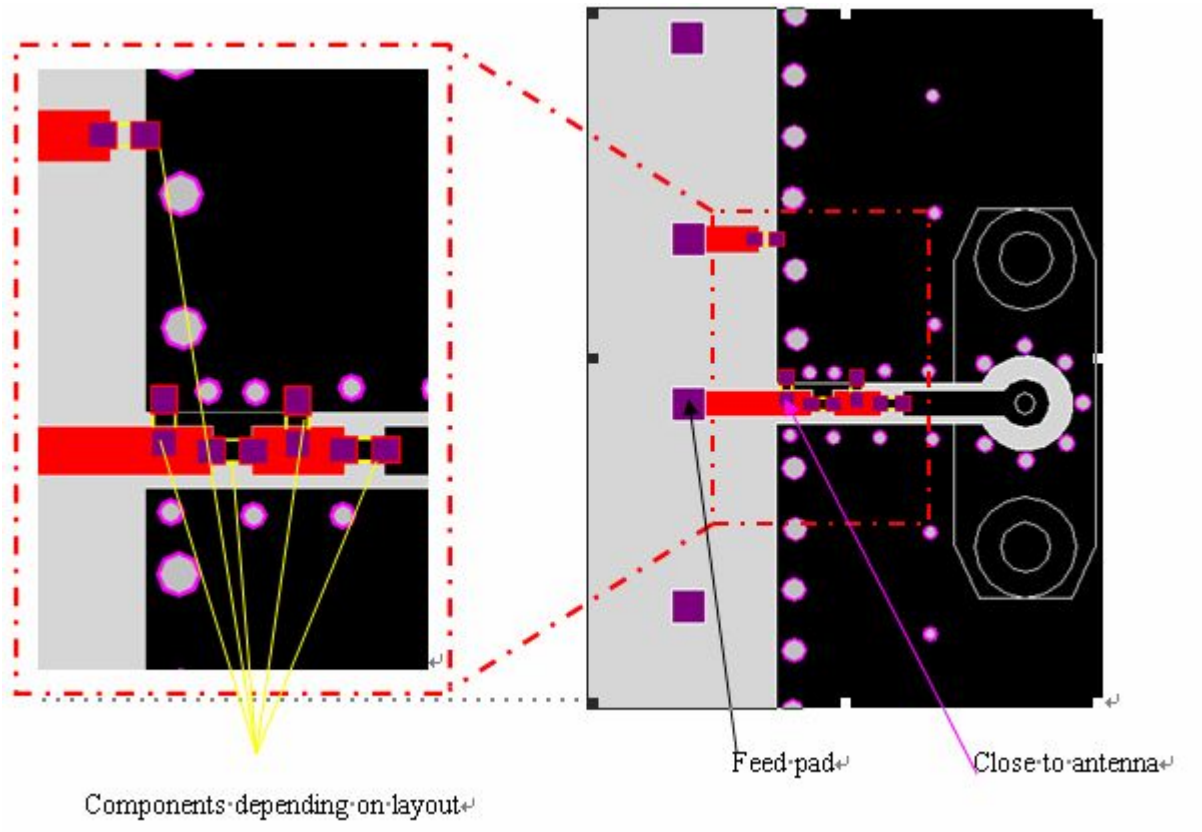
Note: All transmission line should be designed to have a characteristic impedance of 50Ω.The length of the transmission lines should be kept to a minimum. Any other part of the RF system like transceivers, power amplifiers, etc, should also be designed to have an impedance of 50Ω.

Once the material of the PCB has been chosen (PCB thickness and dielectric constant),a co-planar transmission line can easily be design. For the chosen PCB thickness, copper thickness and substrate dielectric constant, the program will calculate the appropriate transmission line width and gaps on either side of the track so the characteristic impedance of the co-planar transmission line is 50Ω.

Matching circuit

The antenna requires a matching circuit that must be optimized for each customer's product. The matching circuit will require up to five components depending on the impedance of the antenna when situated in the device, and pads have been designed for 0402 components for best results. In addition to the matching circuit, a separate DC blocking capacitor will also be required between the radio and the antenna matching circuit.

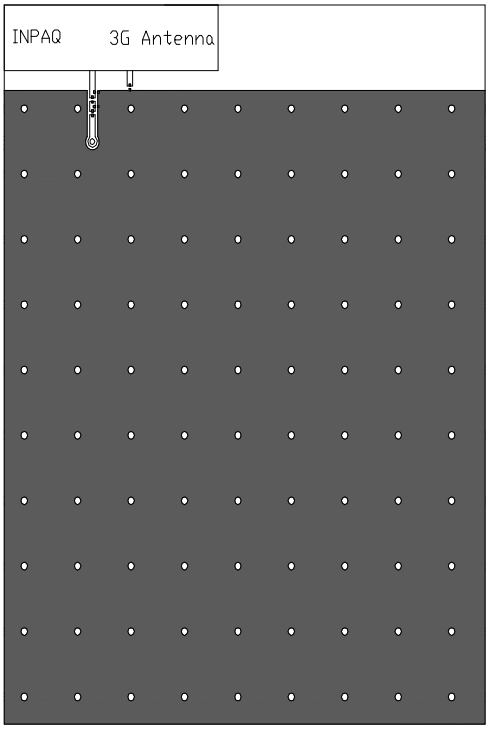
The following pad layout should be designed into the device so the correct circuit can be installed:



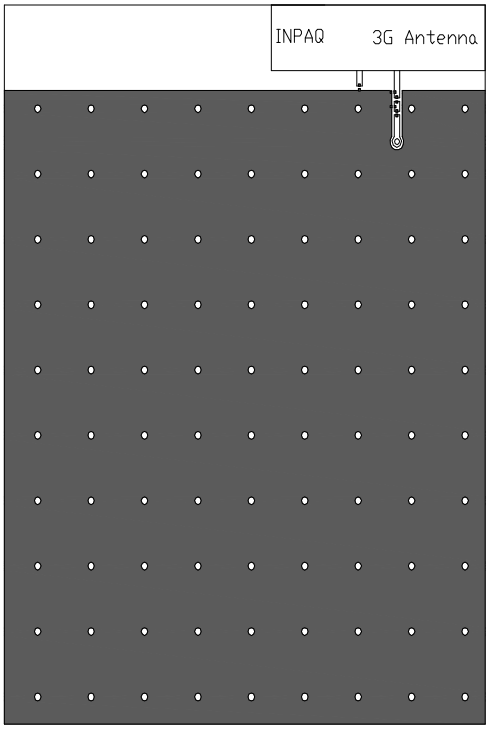
Note: The component values for the matching circuit will vary depending on the size of the PCB and surrounding components. The impedance of the antenna should be measured before selecting suitable matching components.

Antenna placement

3G Antenna should be fitted to the device so that power from the antenna can radio into free space. INPAQ recommends placing the antenna near the edge of the board. Maximum antenna performance is achieved by placing the antenna close to the corner of the PCB with few components or metal objects nearby. Ground can be placed at the side of the antenna, but the remaining space around the antenna, including directly above and below should be free from components or conducting objects. The placements shown here are for guidance only, the actual performance differences will depend on each individual device.

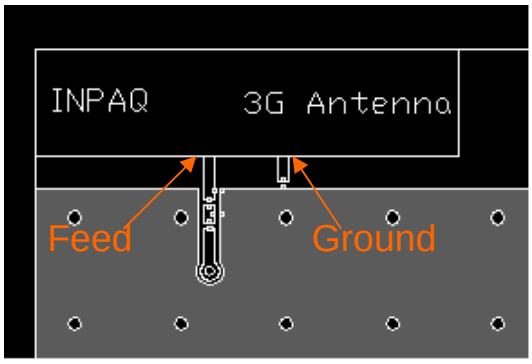


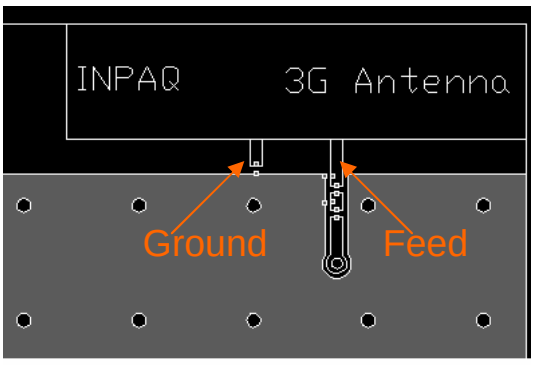
Antenna mounted Left Hand Side (LHS)



Antenna mounted Right Hand Side (LRS)

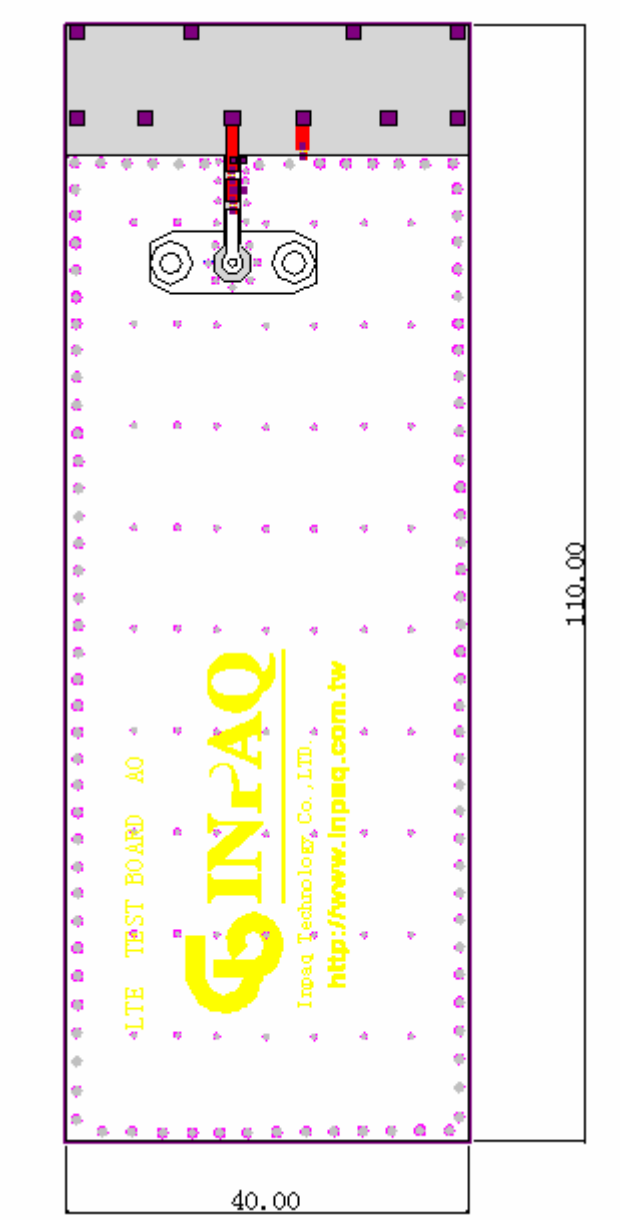
Antenna Placement and relative feed and ground position





Demo Board

The Demo Board has been designed for evaluation purpose of 3G Antenna and it includes a SMA female connector. The reference board is available with 3G Antenna tuned to cover 5 bands:GSM850/ GSM850/ GSM900/GSM1800/ GSM1900/WCDMA.



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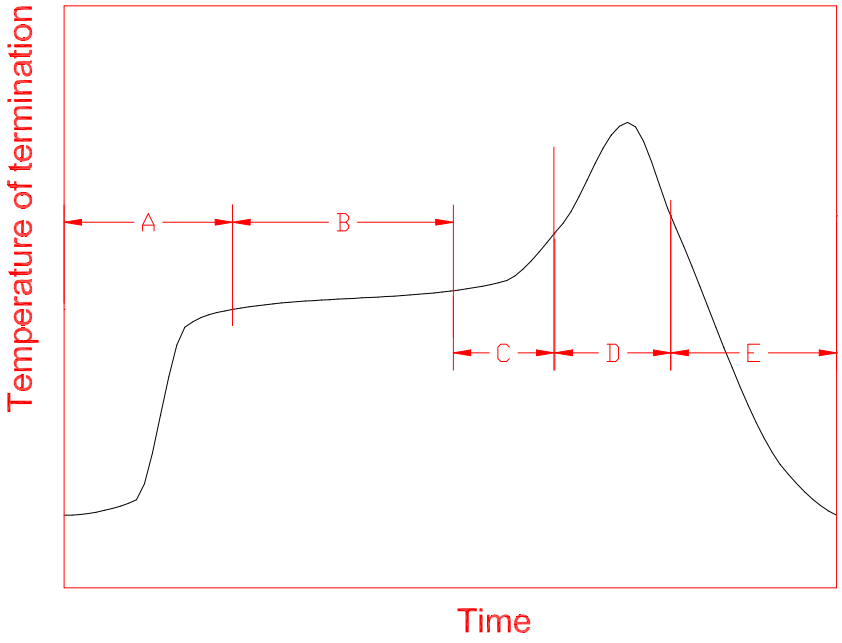
(1) Reliability Test

Item	Condition	Specification
Thermal shock	1. 30±3 minutes at -40°C±5°C, 2. Convert to +85°C (5 minutes) 3. 30±3 minutes at +85°C±5°C, 4. Convert to -40°C (5 minutes) 5. Total 100 continuous cycles	No apparent damage Fulfill the electrical spec. after test.
Humidity resistance	1. Humidity: 70% R.H. 2. Temperature: 85±5°C 3. Time: 250 hours.	No apparent damage Fulfill the electrical spec. after test.
High temperature resistance	1. Temperature: 85°C±2°C 2. Time: 250 hours.	No apparent damage Fulfill the electrical spec. after test.
Low temperature resistance	1. Temperature: -40°C±5°C 2. Time: 250 hours.	No apparent damage Fulfill the electrical spec. after test.
Soldering heat resistance	1. Solder bath temperature : 260±5℃ 2. Bathing time: 10±1 seconds	No apparent damage
Solder ability	The dipped surface of the terminal shall be at least 75% covered with solder after dipped in solder bath of 245±5℃ for 3±1 seconds.	No apparent damage

(2) Operating temperature range

Operating temperature range: -40℃ to +85℃.

Recommendable reflow soldering



A	1st rising temperature	The normal to Preheating temperature	30s to 60s
B	Preheating	140℃ to 160℃	60s to 120s
C	2nd rising temperature	Preheating to 200℃	20s to 40s
D	Main heating	if 220℃	50s～60s
		if 230℃	40s～50s
		if 240℃	30s～40s
		if 250℃	20s～40s
		if 260℃	20s～40s
E	Regular cooling	200℃ to 100℃	1℃/s ～ 4℃/s

(1) Soldering gun procedure

Note the follows, in case of using solder gun for replacement.

(a) The tip temperature must be less than 380°C for the period within 5 seconds by using soldering gun under 30 W.

(b) The soldering gun tip shall not touch this product directly.

(2) Soldering volume

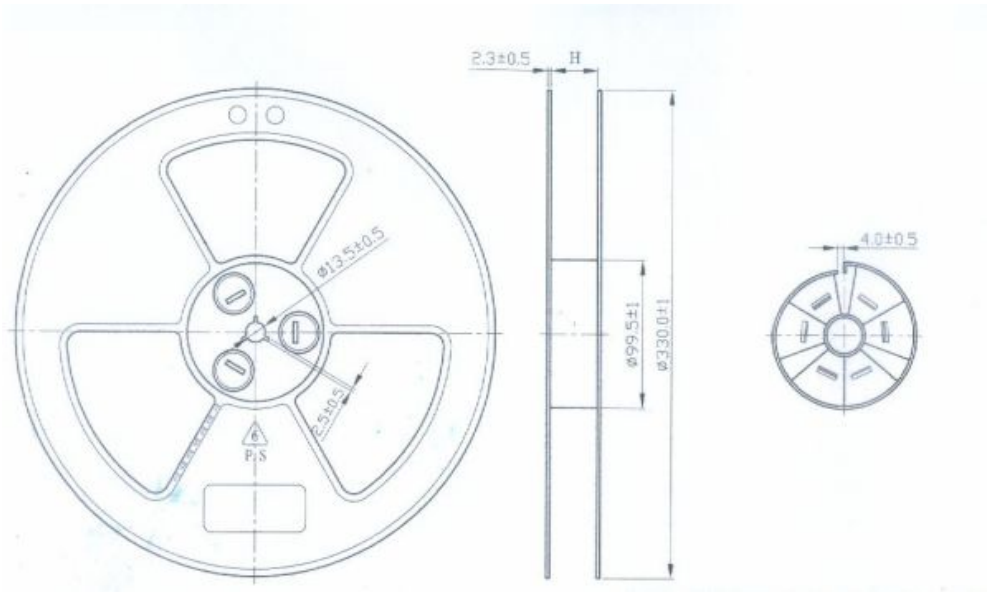
Note that excess of soldering volume will easily get crack the body of this Product.

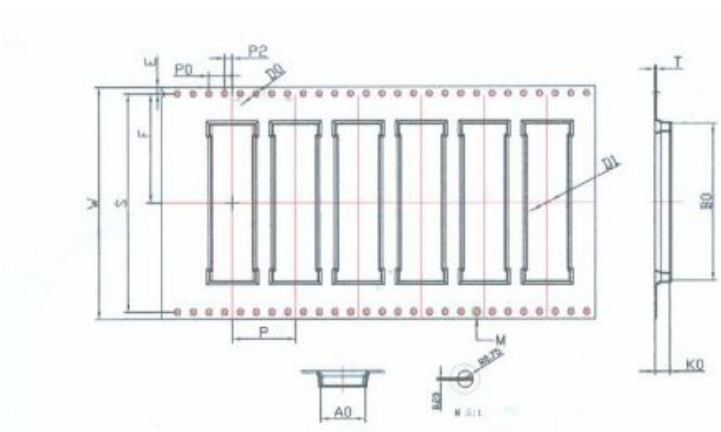
Packaging

Optimal storage conditions for packaged reels

Temperature	-10℃ to 40℃
Humidity	Less than 70%RH
shelf Life	12 Months
Storage place	Away from corrosive gas and direct sunlight
Packaging	Reels should be stored in unopened seald manufacturer's plastic packaging.

Tape and reel dimensions:





外觀	規格	公差
W	56.00	±0.30
P	16.00	±0.10
S	52.40	±0.10
E	1.75	±0.10
F	26.20	±0.10
P2	2.00	±0.10
D0	1.50	+0.10 −0.00
D1	2.00	+0.10 −0.00
Po	4.00	±0.10
10Po	40.00	±0.20

外觀	規格	公差
Ao	11.50	±0.10
B0	40.55	±0.10
Ko	4.0	±0.10
t	0.40	±0.05

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