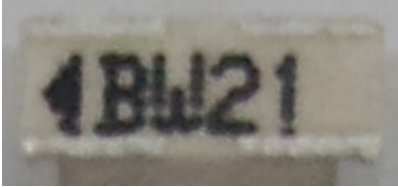





# Approval Sheet

|                      |                     |   |
|----------------------|---------------------|---|
| <b>Products</b>      | <b>Chip Antenna</b> | <b>3D Structure</b>   |
| <b>Supplier CODE</b> | <b>ODBWPTR5020</b>  |  <p>Top-Side View</p>  <p>Bottom-Side View</p> |
| <b>Model</b>         | <b>SNH-V6430BN</b>  |   |
| <b>SEC CODE</b>      |                     |   |
| <b>Revision</b>      | <b>Ver1.0 07/08</b> |   |
| <b>Supplier</b>      | <b>Partron</b>      |   |

|              |   |  |
|--------------|---|--|
| <b>MSL</b>   | <b>LEAD FREE</b>  | <b>BFRs-Free, Halogen-Free</b>   |
| <b>MSL 1</b> |  |  |

|                   |   |  |
|-------------------|---|--|
| By designed       | By checked  | By approved  |
| <b>김흥기</b>        |  |  |
| <b>Hongki.Kim</b> | <b>Chanik.Jeon</b>  | <b>Namsik.Min</b>  |
| <b>07/08</b>      | <b>07/08</b>  | <b>07/08</b>   |

**- Contents -**

|                                      |      |
|--------------------------------------|------|
| ※ Cover .....                        | 1 p  |
| ※ Contents .....                     | 2 p  |
| 1. Revision History .....            | 3 p  |
| 2. Summary of Parts .....            | 4 p  |
| 3. Critical to Quality .....         | 5 p  |
| 4. Electrical Characteristics .....  | 6 p  |
| 5. Measurement Process .....         | 16 p |
| 6. Equivalent Circuit .....          | 17 p |
| 7. Application Note .....            | 18 p |
| 8. Test Fixture Specification .....  | 22 p |
| 9. REFLOW PROFILE .....              | 25 p |
| 10. Primary Inspection List .....    | 26 p |
| 11. Reliability Condition .....      | 27 p |
| 12. Mechanical Characteristics ..... | 29 p |
| 13. Structure and Material .....     | 31 p |
| 14. Attention .....                  | 32 p |
| 15. Packing .....                    | 33 p |
| 16. Process Control .....            | 37 p |
| 17. RoHS Data .....                  | 40 p |
| 18. Reliability test report .....    | 46 p |
| 19. Shipment Inspection Report ..... | 47 p |

**1. Revision**

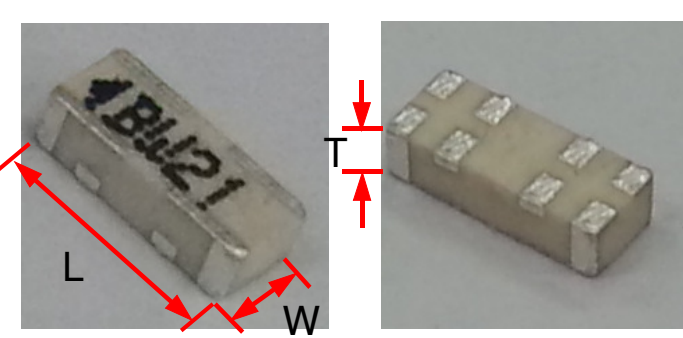
| Revision No | Originator | Description of changes | Date of changes |
|-------------|------------|------------------------|-----------------|
| Ver 1.0     | Hongki.Kim | Issued                 | 2016.07.08      |
|             |            |                        |                 |
|             |            |                        |                 |
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|             |            |                        |                 |

## 2. Summary of Parts & Dimension

### 2.1 Summary of Parts

This product is the internal dielectric chip antenna of radio communication, forms the pattern with Ag paste on the brick of dielectric block and materializes the characteristics.


### 2.2 Dimension of parts

| Type                                | Only Bulk Ceramic                 |                     |   |             |            |                  |
|-------------------------------------|-----------------------------------|---------------------|---|-------------|------------|------------------|
| Material                            | Dielectric Block                  |                     | $Mg_2SiO_4$ (Magnesium Silicate)  |             |            |                  |
|                                     | Electrode Paste                   |                     | Ag  |             |            |                  |
| Size [mm]                           | $L = 5.0 \pm 0.1$<br>(CPK: 2.14)  |                     |  |             |            |                  |
|                                     | $W = 2.0 \pm 0.1$<br>(CPK: 2.43)  |                     |   |             |            |                  |
|                                     | $T = 1.2 \pm 0.1$<br>(CPK: 2.26)  |                     |   |             |            |                  |
| Flatness Level                      | 0.04                              |                     |   |             |            |                  |
| MSL LEVEL                           | MSL LEVEL 1                       |                     |   |             |            |                  |
| ESD LEVEL                           | More than 15 KV<br>(HBM CLASS 3B) |                     |   |             |            |                  |
| Version                             | Revision 1.0                      |                     |   |             |            |                  |
| Electrical Characteristics<br>(CTF) | Characteristics                   | <b>VSWR(CTF)</b>    | <b>Cycle of management</b>  | <b>Q`ty</b> | <b>CPK</b> | <b>Reference</b> |
|                                     | <b>2095MHz</b>                    | <b>1.0 ~ 3.0 :1</b> | all inspection  | all         | 2.36       | 4,5,8,27 Page    |
|                                     | <b>2125MHz</b>                    | <b>1.0 ~ 3.0 :1</b> | all inspection  | all         | 3.33       | 4,5,8,27 Page    |

### 3. Critical to Quality( )

- The following list is specified as the emphasis management list and managed.

| CTQ Item                      | SPEC       | Cycle of management | measurement System |
|-------------------------------|------------|---------------------|--------------------|
| Plasticity Temperature        | 1350±15 °C | three times a day   | Temperature Sensor |
| Dry Temperature               | 200±15 °C  | three times a day   | Temperature Sensor |
| Hot Belt Conveyor Temperature | 900±25 °C  | three times a day   | Temperature Sensor |

| CTF Item  | Specification Reason   |
|--|--|
| Single Element Measurement SWR   | This item is an important parameter that fixes an electrical characteristic          |
| Single Element Measurement Dimension   | Dimension Degree of precision is an important item of characteristic of chip antenna |

- require attention for the following list.

| ITEM    | Content   |
|---------|---|
| Keeping | Sealing tightly when keeping for a long time.           |
| Action  | Maybe characteristics changes when changing any design. |

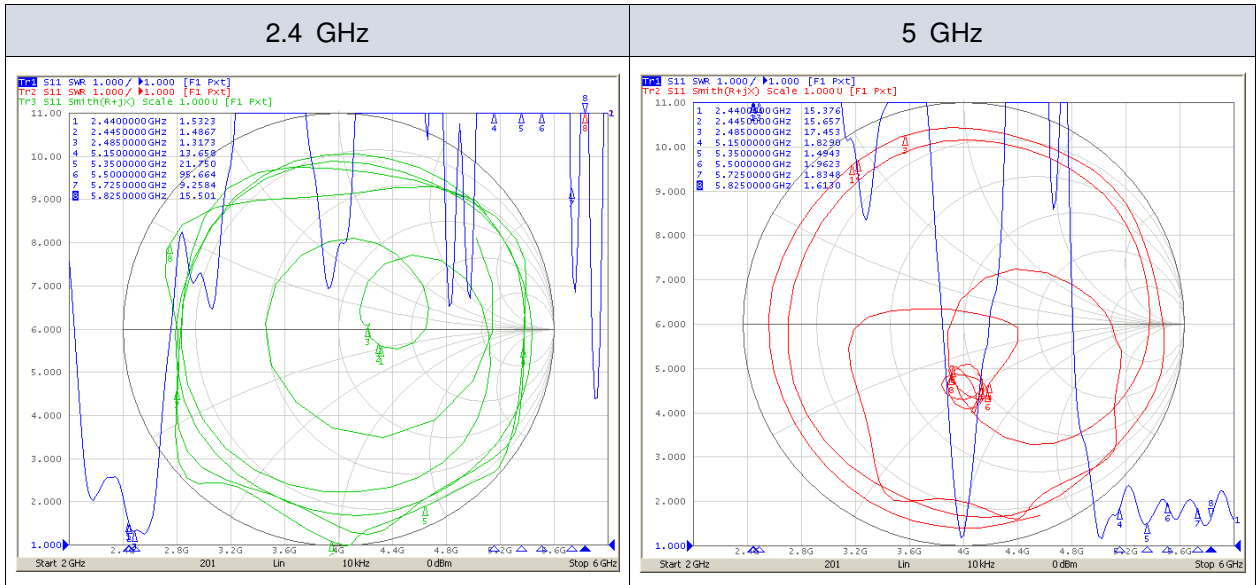


## 4. Electrical Characteristics

### 4.1 Set Condition

| 항 목                            |                                 |       |         | 특 성  |
|--------------------------------|---------------------------------|-------|---------|--|
| Frequency Range [MHz]          |                                 |       |         | WiFi (2.4GHz) : 2400 ~ 2485<br>WiFi (5GHz) : 5150 ~ 5825 |
| SWR [Max]                      |                                 |       |         | 2.5 : 1 (Typ 2.0 : 1)                                    |
| Input Impedance [ $\Omega$ ]   |                                 |       |         | 50 Ohm   |
| Polarization                   |                                 |       |         | Linear   |
| Gain [dBi]<br>WiFi<br>(2.4GHz) | Total Gain ( Peak / Avg ) [dBi] |       |         | -0.3 / -5.3  |
|                                | Azimuth                         | Theta | Peak    | -7.99  |
|                                |                                 |       | Average | -12.39   |
|                                |                                 | Phi   | Peak    | -0.57  |
|                                |                                 |       | Average | -4.84  |
|                                | Elevation 1                     | Theta | Peak    | -0.82  |
|                                |                                 |       | Average | -5.36  |
|                                |                                 | Phi   | Peak    | 1.77   |
|                                |                                 |       | Average | -3.56  |
|                                | Elevation 2                     | Theta | Peak    | 1.86   |
|                                |                                 |       | Average | -2.99  |
|                                |                                 | Phi   | Peak    | -1.80  |
| Average                        |                                 |       | -8.48   |  |
| Gain [dBi]<br>WiFi<br>(5GHz)   | Total Gain ( Peak / Avg ) [dBi] |       |         | -1.8 / -6.7  |
|                                | Azimuth                         | Theta | Peak    | -7.99  |
|                                |                                 |       | Average | -13.55   |
|                                |                                 | Phi   | Peak    | 1.88   |
|                                |                                 |       | Average | -3.30  |
|                                | Elevation 1                     | Theta | Peak    | -1.44  |
|                                |                                 |       | Average | -5.27  |
|                                |                                 | Phi   | Peak    | -1.83  |
|                                |                                 |       | Average | -7.34  |
|                                | Elevation 2                     | Theta | Peak    | -2.37  |
|                                |                                 |       | Average | -7.58  |
|                                |                                 | Phi   | Peak    | -4.99  |
| Average                        |                                 |       | -9.55   |  |

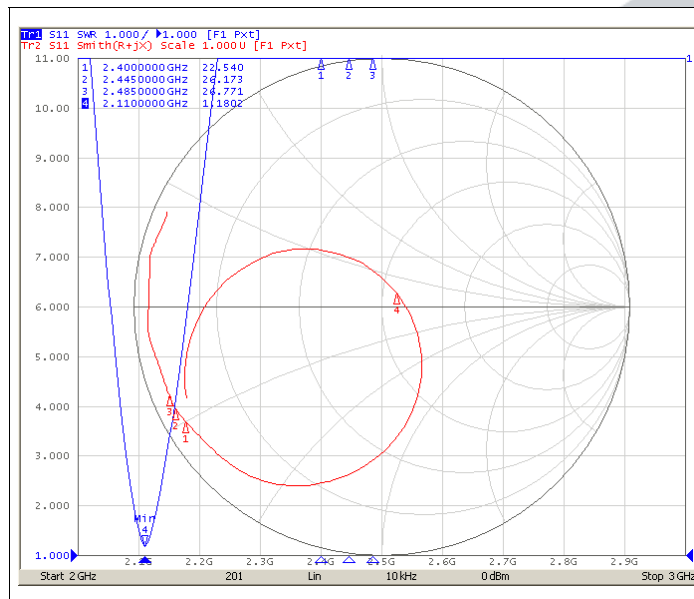
### 4.2 S11 Graph of Set Condition



### 4.3 Test Fixture Condition

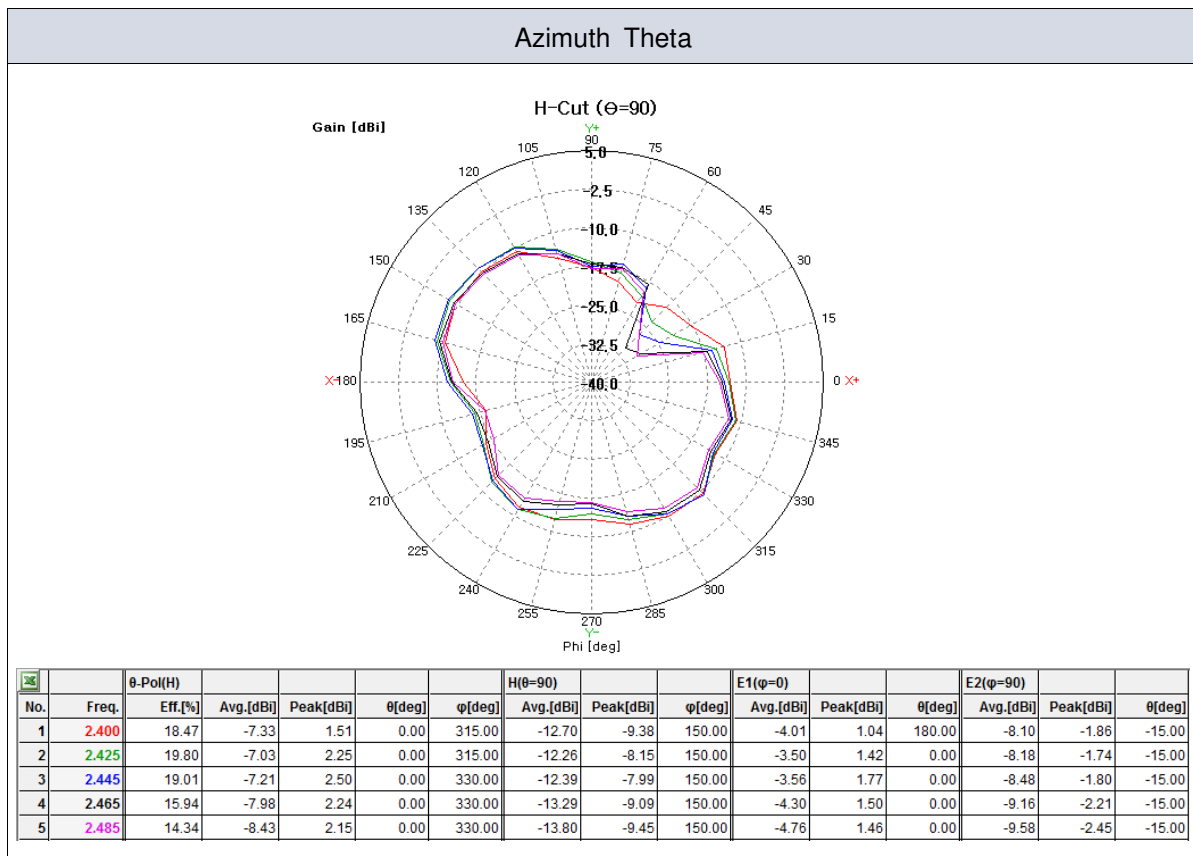
| ITEM                                    | SPEC                        |
|---|-----------------------------|
| Frequency Range [MHz]                   | 2095 ~ 2125                 |
| Lower frequency(2095 MHz) SWR [Min~Max] | 1.0 ~ 3.0 : 1 (Typ 2.5 : 1) |
| Upper frequency(2125 MHz) SWR [Min~Max] | 1.0 ~ 3.0 : 1 (Typ 2.5 : 1) |

### 4.4 S11 Graph of Test Fixture Condition

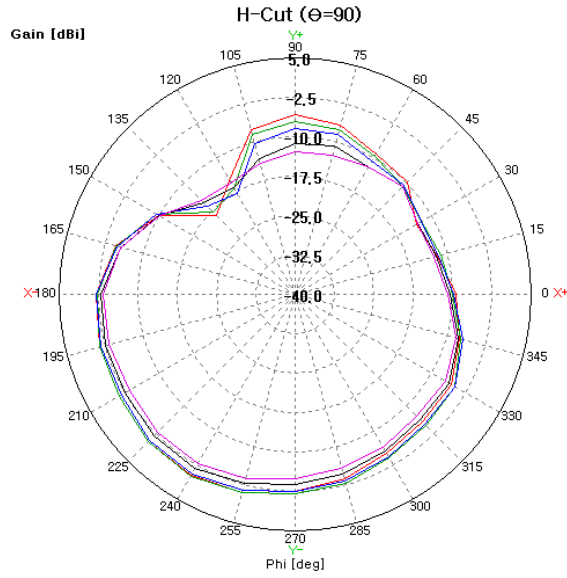


## 4.5-1 Radiation Pattern (2.4GHz Band)

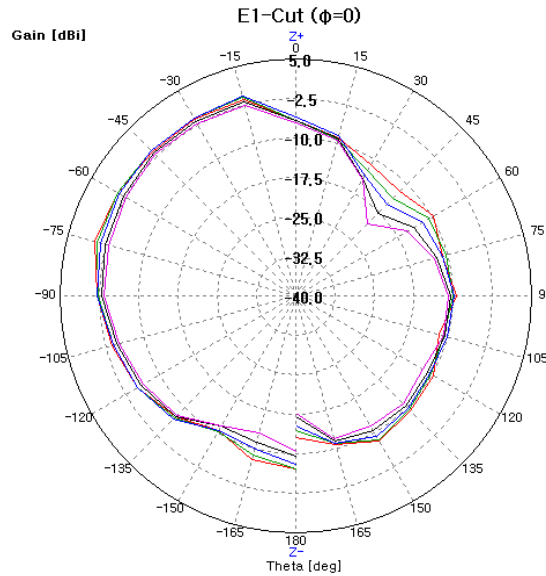
| Azimuth Plane | Elevation1 Plane                   | Elevation2 Plane |
|---------------|------------------------------------|------------------|
|               |                                    |                  |
| Theta         | Vertical field of measured plane   |                  |
| Phi           | Horizontal field of measured plane |                  |



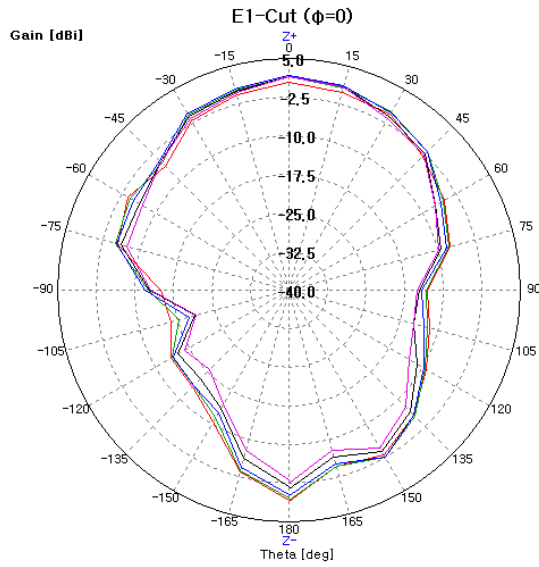


**Azimuth Phi**


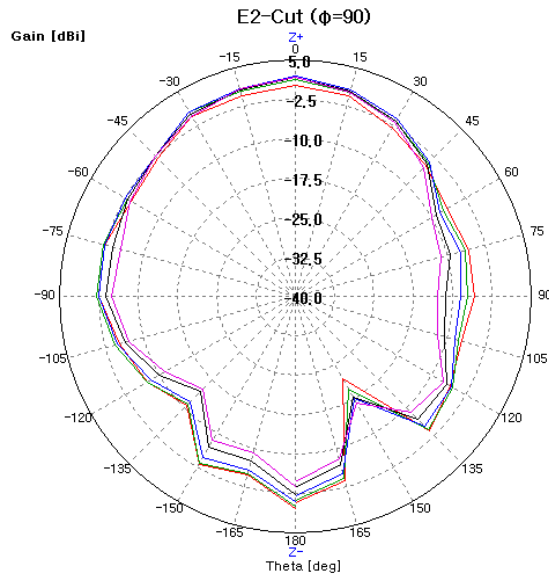
| No. | Freq. | φ-Pol(V) |           |           | H(θ=90) |        |           | E1(φ=0)   |        |           | E2(φ=90)  |        |           |           |         |
|-----|-------|----------|-----------|-----------|---------|--------|-----------|-----------|--------|-----------|-----------|--------|-----------|-----------|---------|
|     |       | Eff.[%]  | Avg.[dBi] | Peak[dBi] | θ[deg]  | φ[deg] | Avg.[dBi] | Peak[dBi] | φ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg]  |
| 1   | 2.400 | 31.81    | -4.97     | 2.23      | 15.00   | 225.00 | -4.60     | -0.15     | 240.00 | -5.16     | -0.26     | -75.00 | -3.34     | 0.31      | -180.00 |
| 2   | 2.425 | 32.91    | -4.83     | 2.62      | 15.00   | 225.00 | -4.49     | -0.10     | 240.00 | -5.21     | -0.75     | -60.00 | -2.95     | 1.19      | 0.00    |
| 3   | 2.445 | 31.54    | -5.01     | 2.74      | 15.00   | 225.00 | -4.84     | -0.57     | 240.00 | -5.36     | -0.82     | -15.00 | -2.99     | 1.86      | 0.00    |
| 4   | 2.465 | 25.63    | -5.91     | 2.26      | 0.00    | 240.00 | -5.95     | -1.70     | 240.00 | -6.21     | -1.54     | -45.00 | -3.80     | 1.63      | 0.00    |
| 5   | 2.485 | 22.55    | -6.47     | 2.11      | 0.00    | 240.00 | -6.72     | -2.76     | 240.00 | -6.71     | -1.99     | -45.00 | -4.29     | 1.59      | 0.00    |

**Elevation1 Theta**


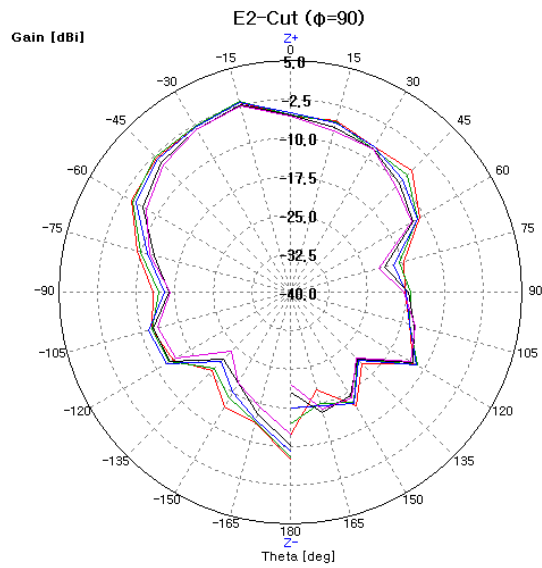
| No. | Freq. | φ-Pol(V) |           |           | H(θ=90) |        |           | E1(φ=0)   |        |           | E2(φ=90)  |        |           |           |         |
|-----|-------|----------|-----------|-----------|---------|--------|-----------|-----------|--------|-----------|-----------|--------|-----------|-----------|---------|
|     |       | Eff.[%]  | Avg.[dBi] | Peak[dBi] | θ[deg]  | φ[deg] | Avg.[dBi] | Peak[dBi] | φ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg]  |
| 1   | 2.400 | 31.81    | -4.97     | 2.23      | 15.00   | 225.00 | -4.60     | -0.15     | 240.00 | -5.16     | -0.26     | -75.00 | -3.34     | 0.31      | -180.00 |
| 2   | 2.425 | 32.91    | -4.83     | 2.62      | 15.00   | 225.00 | -4.49     | -0.10     | 240.00 | -5.21     | -0.75     | -60.00 | -2.95     | 1.19      | 0.00    |
| 3   | 2.445 | 31.54    | -5.01     | 2.74      | 15.00   | 225.00 | -4.84     | -0.57     | 240.00 | -5.36     | -0.82     | -15.00 | -2.99     | 1.86      | 0.00    |
| 4   | 2.465 | 25.63    | -5.91     | 2.26      | 0.00    | 240.00 | -5.95     | -1.70     | 240.00 | -6.21     | -1.54     | -45.00 | -3.80     | 1.63      | 0.00    |
| 5   | 2.485 | 22.55    | -6.47     | 2.11      | 0.00    | 240.00 | -6.72     | -2.76     | 240.00 | -6.71     | -1.99     | -45.00 | -4.29     | 1.59      | 0.00    |

**Elevation1 Phi**


| No. | Freq. | θ-Pol(H) | Eff.[%] | Avg.[dBi] | Peak[dBi] | θ[deg] | φ[deg] | H(θ=90) | Avg.[dBi] | Peak[dBi] | φ[deg] | E1(φ=0) | Avg.[dBi] | Peak[dBi] | θ[deg] | E2(φ=90) | Avg.[dBi] | Peak[dBi] | θ[deg] |
|-----|-------|----------|---------|-----------|-----------|--------|--------|---------|-----------|-----------|--------|---------|-----------|-----------|--------|----------|-----------|-----------|--------|
| 1   | 2.400 |          | 18.47   | -7.33     | 1.51      | 0.00   | 315.00 | -12.70  | -9.38     | 150.00    |        | -4.01   | 1.04      | 180.00    |        | -8.10    | -1.86     | -15.00    |        |
| 2   | 2.425 |          | 19.80   | -7.03     | 2.25      | 0.00   | 315.00 | -12.26  | -8.15     | 150.00    |        | -3.50   | 1.42      | 0.00      |        | -8.18    | -1.74     | -15.00    |        |
| 3   | 2.445 |          | 19.01   | -7.21     | 2.50      | 0.00   | 330.00 | -12.39  | -7.99     | 150.00    |        | -3.56   | 1.77      | 0.00      |        | -8.48    | -1.80     | -15.00    |        |
| 4   | 2.465 |          | 15.94   | -7.98     | 2.24      | 0.00   | 330.00 | -13.29  | -9.09     | 150.00    |        | -4.30   | 1.50      | 0.00      |        | -9.16    | -2.21     | -15.00    |        |
| 5   | 2.485 |          | 14.34   | -8.43     | 2.15      | 0.00   | 330.00 | -13.80  | -9.45     | 150.00    |        | -4.76   | 1.46      | 0.00      |        | -9.58    | -2.45     | -15.00    |        |

**Elevation2 Theta**


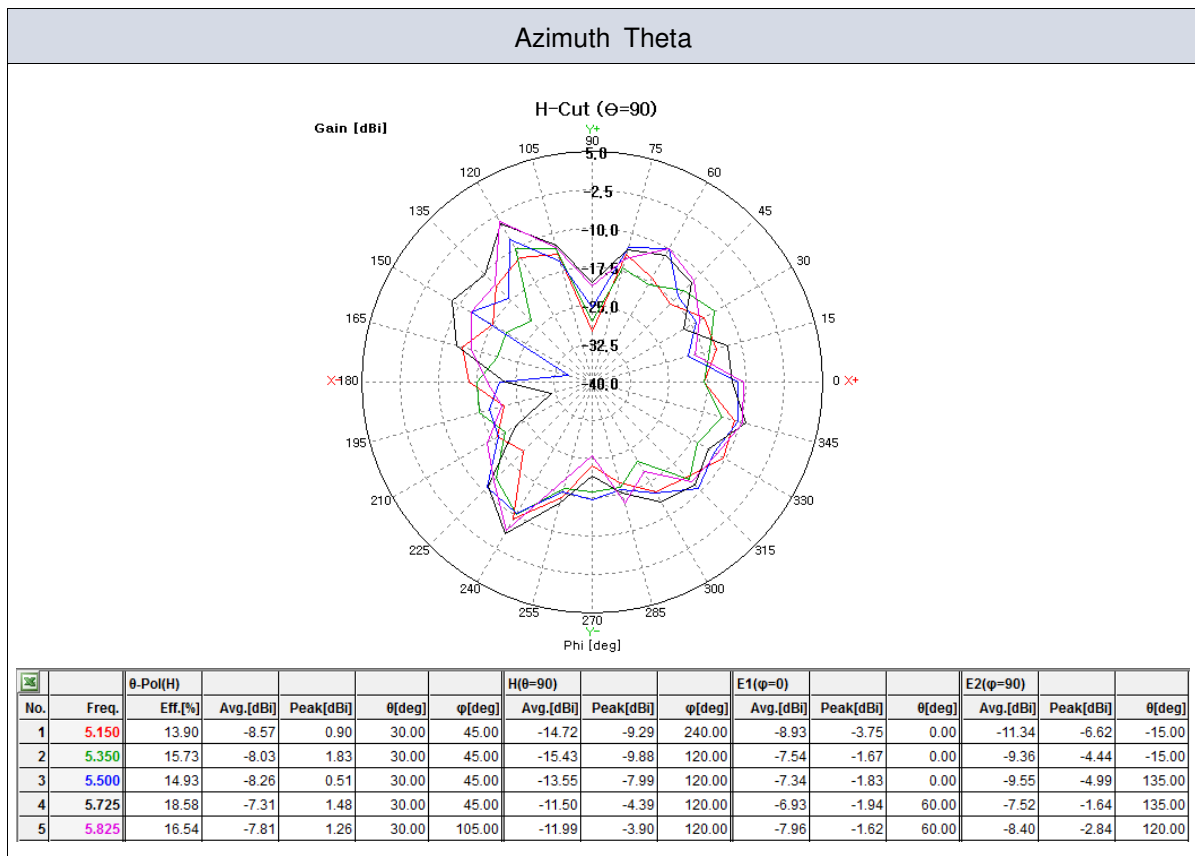
| No. | Freq. | φ-Pol(V) | Eff.[%] | Avg.[dBi] | Peak[dBi] | θ[deg] | φ[deg] | H(θ=90) | Avg.[dBi] | Peak[dBi] | φ[deg] | E1(φ=0) | Avg.[dBi] | Peak[dBi] | θ[deg] | E2(φ=90) | Avg.[dBi] | Peak[dBi] | θ[deg] |
|-----|-------|----------|---------|-----------|-----------|--------|--------|---------|-----------|-----------|--------|---------|-----------|-----------|--------|----------|-----------|-----------|--------|
| 1   | 2.400 |          | 31.81   | -4.97     | 2.23      | 15.00  | 225.00 | -4.60   | -0.15     | 240.00    |        | -5.16   | -0.26     | -75.00    |        | -3.34    | 0.31      | -180.00   |        |
| 2   | 2.425 |          | 32.91   | -4.83     | 2.62      | 15.00  | 225.00 | -4.49   | -0.10     | 240.00    |        | -5.21   | -0.75     | -60.00    |        | -2.95    | 1.19      | 0.00      |        |
| 3   | 2.445 |          | 31.54   | -5.01     | 2.74      | 15.00  | 225.00 | -4.84   | -0.57     | 240.00    |        | -5.36   | -0.82     | -15.00    |        | -2.99    | 1.86      | 0.00      |        |
| 4   | 2.465 |          | 25.63   | -5.91     | 2.26      | 0.00   | 240.00 | -5.95   | -1.70     | 240.00    |        | -6.21   | -1.54     | -45.00    |        | -3.80    | 1.63      | 0.00      |        |
| 5   | 2.485 |          | 22.55   | -6.47     | 2.11      | 0.00   | 240.00 | -6.72   | -2.76     | 240.00    |        | -6.71   | -1.99     | -45.00    |        | -4.29    | 1.59      | 0.00      |        |

**Elevation2 Phi**


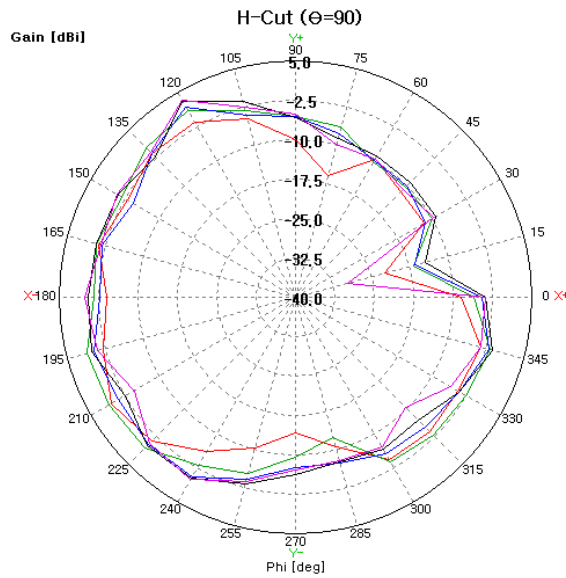
| No. | Freq. | θ-Pol(H) |           |           |        |        | H(θ=90)   |           |        | E1(φ=0)   |           |        | E2(φ=90)  |           |        |
|-----|-------|----------|-----------|-----------|--------|--------|-----------|-----------|--------|-----------|-----------|--------|-----------|-----------|--------|
|     |       | Eff.[%]  | Avg.[dBi] | Peak[dBi] | θ[deg] | φ[deg] | Avg.[dBi] | Peak[dBi] | φ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] |
| 1   | 2.400 | 18.47    | -7.33     | 1.51      | 0.00   | 315.00 | -12.70    | -9.38     | 150.00 | -4.01     | 1.04      | 180.00 | -8.10     | -1.86     | -15.00 |
| 2   | 2.425 | 19.80    | -7.03     | 2.25      | 0.00   | 315.00 | -12.26    | -8.15     | 150.00 | -3.50     | 1.42      | 0.00   | -8.18     | -1.74     | -15.00 |
| 3   | 2.445 | 19.01    | -7.21     | 2.50      | 0.00   | 330.00 | -12.39    | -7.99     | 150.00 | -3.56     | 1.77      | 0.00   | -8.48     | -1.80     | -15.00 |
| 4   | 2.465 | 15.94    | -7.98     | 2.24      | 0.00   | 330.00 | -13.29    | -9.09     | 150.00 | -4.30     | 1.50      | 0.00   | -9.16     | -2.21     | -15.00 |
| 5   | 2.485 | 14.34    | -8.43     | 2.15      | 0.00   | 330.00 | -13.80    | -9.45     | 150.00 | -4.76     | 1.46      | 0.00   | -9.58     | -2.45     | -15.00 |

## 4.5-2 Radiation Pattern (5GHz Band)

| Azimuth Plane | Elevation1 Plane                   | Elevation2 Plane |
|---------------|------------------------------------|------------------|
|               |                                    |                  |
| Theta         | Vertical field of measured plane   |                  |
| Phi           | Horizontal field of measured plane |                  |

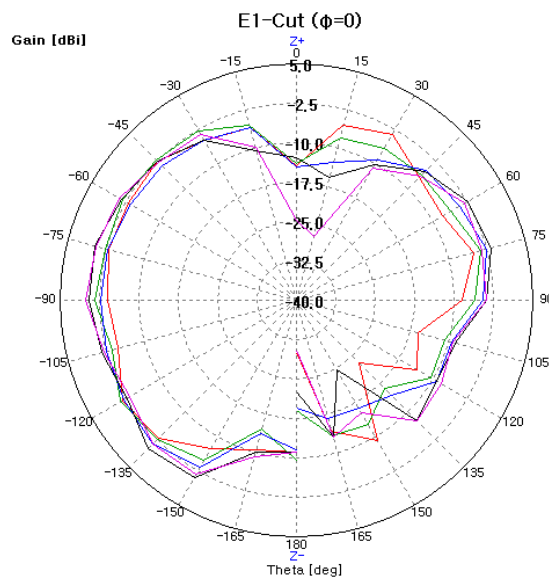


### Azimuth Phi

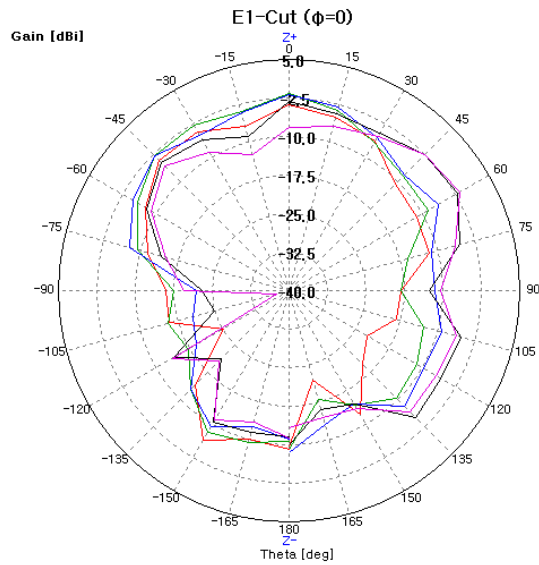


| No. | Freq. | φ-Pol(V) | Eff.[%] | Avg.[dBi] | Peak[dBi] | θ[deg] | φ[deg] | H(θ=90)   |           |        | E1(φ=0)   |           |        | E2(φ=90)  |           |        |
|-----|-------|----------|---------|-----------|-----------|--------|--------|-----------|-----------|--------|-----------|-----------|--------|-----------|-----------|--------|
|     |       |          |         |           |           |        |        | Avg.[dBi] | Peak[dBi] | φ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] |
| 1   | 5.150 | 31.42    | -5.03   | 1.39      | 75.00     | 165.00 | -4.53  | 0.45      | 210.00    | -5.87  | -1.72     | -120.00   | -7.90  | -2.51     | 30.00     |        |
| 2   | 5.350 | 39.80    | -4.00   | 1.95      | 60.00     | 195.00 | -2.68  | 1.11      | 120.00    | -5.08  | -1.40     | -120.00   | -7.62  | -3.25     | 0.00      |        |
| 3   | 5.500 | 36.57    | -4.37   | 2.34      | 120.00    | 120.00 | -3.30  | 1.88      | 120.00    | -5.27  | -1.44     | -135.00   | -7.58  | -2.37     | 0.00      |        |
| 4   | 5.725 | 43.43    | -3.62   | 3.91      | 120.00    | 120.00 | -2.62  | 3.17      | 120.00    | -4.11  | -0.02     | -135.00   | -7.36  | -2.43     | 15.00     |        |
| 5   | 5.825 | 37.54    | -4.26   | 3.39      | 90.00     | 120.00 | -2.98  | 3.39      | 120.00    | -4.42  | 0.19      | -90.00    | -8.24  | -3.15     | 15.00     |        |

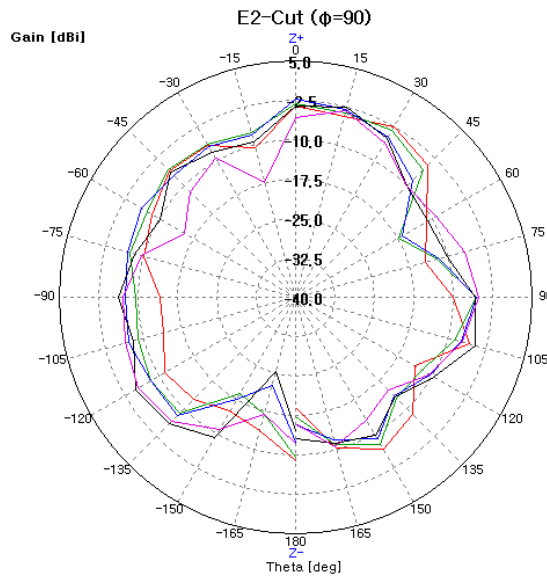
### Elevation1 Theta



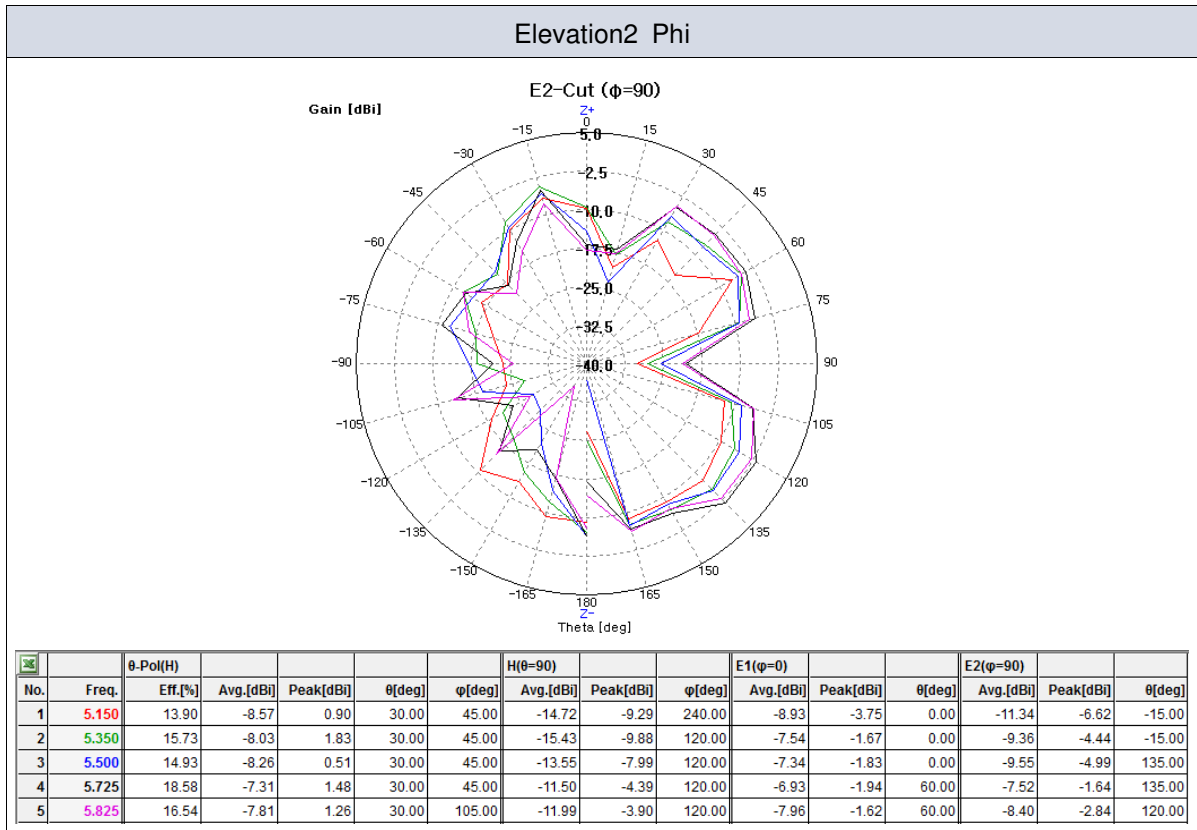
| No. | Freq. | φ-Pol(V) | Eff.[%] | Avg.[dBi] | Peak[dBi] | θ[deg] | φ[deg] | H(θ=90)   |           |        | E1(φ=0)   |           |        | E2(φ=90)  |           |        |
|-----|-------|----------|---------|-----------|-----------|--------|--------|-----------|-----------|--------|-----------|-----------|--------|-----------|-----------|--------|
|     |       |          |         |           |           |        |        | Avg.[dBi] | Peak[dBi] | φ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] |
| 1   | 5.150 | 31.42    | -5.03   | 1.39      | 75.00     | 165.00 | -4.53  | 0.45      | 210.00    | -5.87  | -1.72     | -120.00   | -7.90  | -2.51     | 30.00     |        |
| 2   | 5.350 | 39.80    | -4.00   | 1.95      | 60.00     | 195.00 | -2.68  | 1.11      | 120.00    | -5.08  | -1.40     | -120.00   | -7.62  | -3.25     | 0.00      |        |
| 3   | 5.500 | 36.57    | -4.37   | 2.34      | 120.00    | 120.00 | -3.30  | 1.88      | 120.00    | -5.27  | -1.44     | -135.00   | -7.58  | -2.37     | 0.00      |        |
| 4   | 5.725 | 43.43    | -3.62   | 3.91      | 120.00    | 120.00 | -2.62  | 3.17      | 120.00    | -4.11  | -0.02     | -135.00   | -7.36  | -2.43     | 15.00     |        |
| 5   | 5.825 | 37.54    | -4.26   | 3.39      | 90.00     | 120.00 | -2.98  | 3.39      | 120.00    | -4.42  | 0.19      | -90.00    | -8.24  | -3.15     | 15.00     |        |

**Elevation1 Phi**


| No. | Freq. | θ-Pol(H) | Eff.[%] | Avg.[dBi] | Peak[dBi] | θ[deg] | φ[deg] | H(θ=90) | Peak[dBi] | φ[deg] | E1(φ=0) | Peak[dBi] | θ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] |
|-----|-------|----------|---------|-----------|-----------|--------|--------|---------|-----------|--------|---------|-----------|--------|-----------|-----------|--------|
| 1   | 5.150 | 13.90    | -8.57   | 0.90      | 30.00     | 45.00  | -14.72 | -9.29   | 240.00    | -8.93  | -3.75   | 0.00      | -11.34 | -6.62     | -15.00    |        |
| 2   | 5.350 | 15.73    | -8.03   | 1.83      | 30.00     | 45.00  | -15.43 | -9.88   | 120.00    | -7.54  | -1.67   | 0.00      | -9.36  | -4.44     | -15.00    |        |
| 3   | 5.500 | 14.93    | -8.26   | 0.51      | 30.00     | 45.00  | -13.55 | -7.99   | 120.00    | -7.34  | -1.83   | 0.00      | -9.55  | -4.99     | 135.00    |        |
| 4   | 5.725 | 18.58    | -7.31   | 1.48      | 30.00     | 45.00  | -11.50 | -4.39   | 120.00    | -6.93  | -1.94   | 60.00     | -7.52  | -1.64     | 135.00    |        |
| 5   | 5.825 | 16.54    | -7.81   | 1.26      | 30.00     | 105.00 | -11.99 | -3.90   | 120.00    | -7.96  | -1.62   | 60.00     | -8.40  | -2.84     | 120.00    |        |

**Elevation2 Theta**


| No. | Freq. | φ-Pol(V) | Eff.[%] | Avg.[dBi] | Peak[dBi] | θ[deg] | φ[deg] | H(θ=90) | Peak[dBi] | φ[deg] | E1(φ=0) | Peak[dBi] | θ[deg] | Avg.[dBi] | Peak[dBi] | θ[deg] |
|-----|-------|----------|---------|-----------|-----------|--------|--------|---------|-----------|--------|---------|-----------|--------|-----------|-----------|--------|
| 1   | 5.150 | 31.42    | -5.03   | 1.39      | 75.00     | 165.00 | -4.53  | 0.45    | 210.00    | -5.87  | -1.72   | -120.00   | -7.90  | -2.51     | 30.00     |        |
| 2   | 5.350 | 39.80    | -4.00   | 1.95      | 60.00     | 195.00 | -2.68  | 1.11    | 120.00    | -5.08  | -1.40   | -120.00   | -7.62  | -3.25     | 0.00      |        |
| 3   | 5.500 | 36.57    | -4.37   | 2.34      | 120.00    | 120.00 | -3.30  | 1.88    | 120.00    | -5.27  | -1.44   | -135.00   | -7.58  | -2.37     | 0.00      |        |
| 4   | 5.725 | 43.43    | -3.62   | 3.91      | 120.00    | 120.00 | -2.62  | 3.17    | 120.00    | -4.11  | -0.02   | -135.00   | -7.36  | -2.43     | 15.00     |        |
| 5   | 5.825 | 37.54    | -4.26   | 3.39      | 90.00     | 120.00 | -2.98  | 3.39    | 120.00    | -4.42  | 0.19    | -90.00    | -8.24  | -3.15     | 15.00     |        |

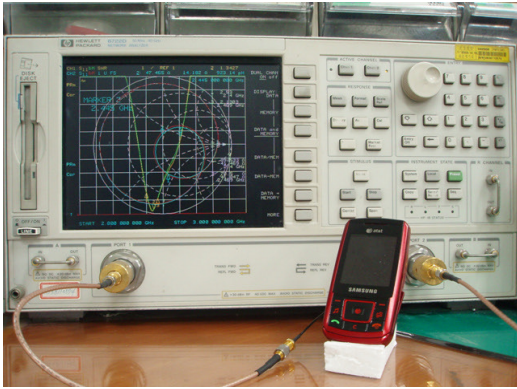
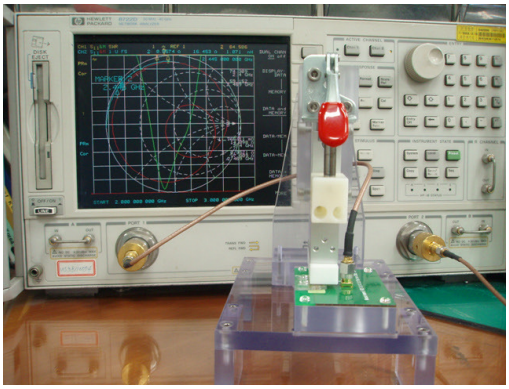


## 5. Measurement Process

### 5.1 SWR / Return Loss

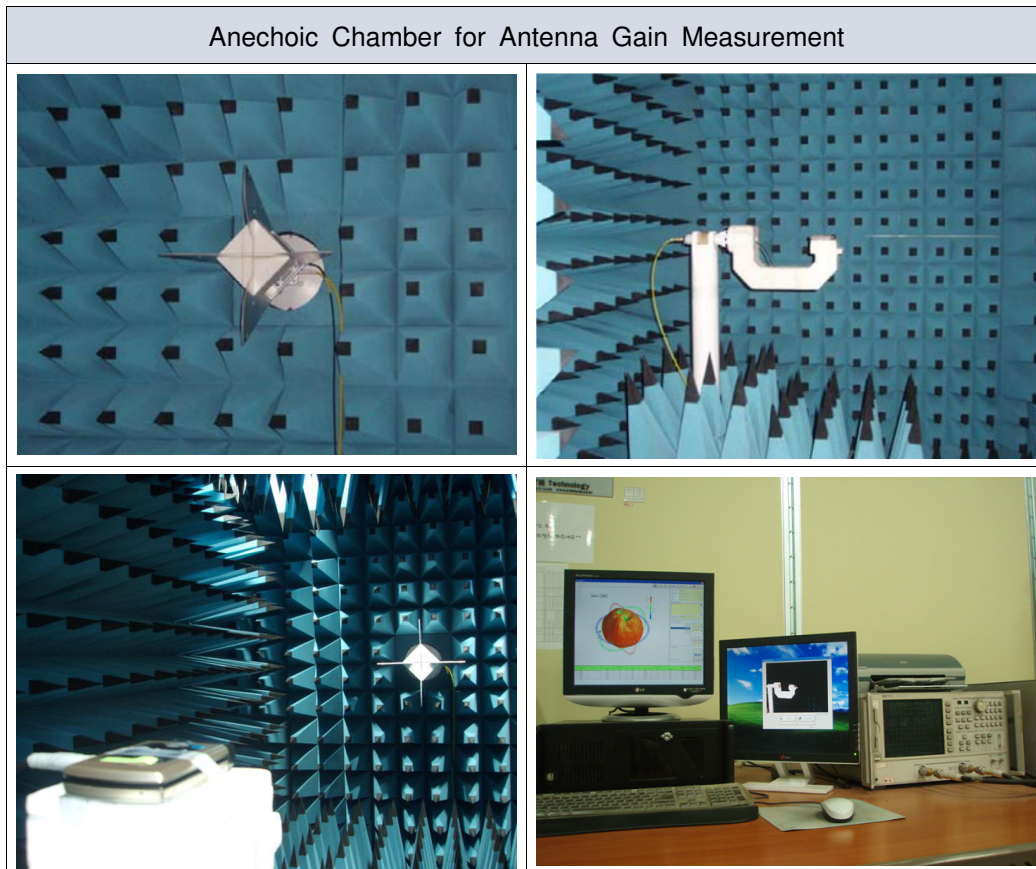
Use Network Analyzer when measuring SWR/Return loss and selecting standard SPL,

Use automatic inspection equipment when selecting superior and inferior goods.

|                  | Set Condition  | Test Fixture Condition  |
|------------------|--|---|
| Network Analyzer | Agilent HP8753E or Advantest R3765CH   | Agilent HP8753E or Advantest R3765CH  |
| Cable            | RF cable (300 mm)  | RF cable (300 mm)   |
| Test condition   |  |  |

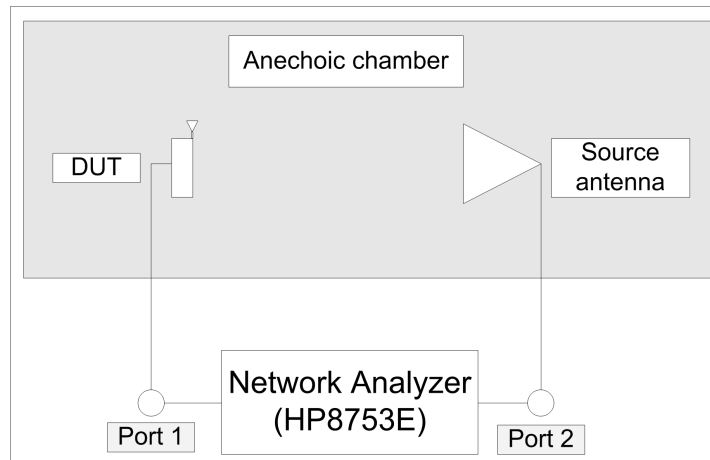
### 5.2 Gain

Antenna gain is measured in the Anechoic Chamber of this company, using set above of 4.1 list.



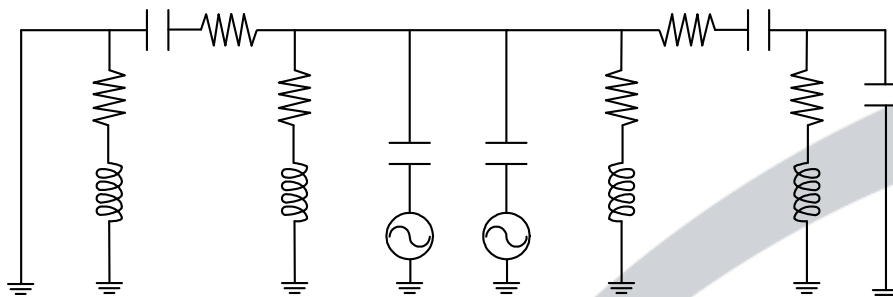


5.3 Gain test block diagram

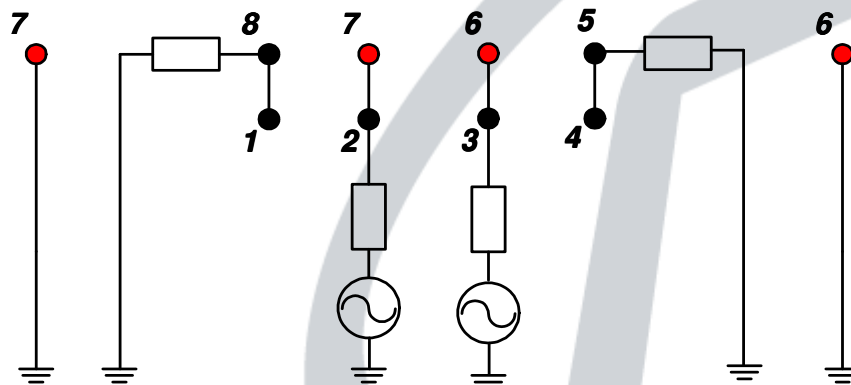


6. Equivalent Circuit

This product is an RF part that realizes the performance of the structure shape of the silver(Ag) pattern on the surface of a rectangular body made of dielectrics by the following structural equivalent circuit configuration.



< Chip Antenna Equivalent Circuit >



< Default Condition Equivalent Circuit >

## 7. Application Note

This product is an internal dielectric chip antenna that acts to convert guide waves on a transmission structure into free space waves.

This is able to position at anywhere of the PCB that you want. Even if the surround condition of chip antenna alter into the changed electrical characteristic, you can tune the electrical characteristic by designing the another PCB layout. And so far as circumstances permit, using only lumped element, you can adjust the electrical characteristic of antenna without the PCB layout alteration.

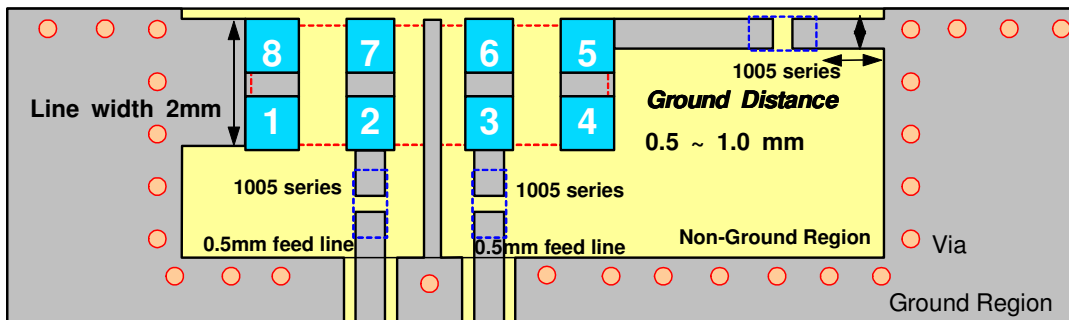
However, You must carefully choose the space for a chip antenna. Because this is only electromagnetic RF device, the electrical characteristic is changed by surrounding condition of antenna.

In case of this product, the four land pads exist and the fixed feeding structure is not, each the No 1, 2, 3 and 4 land pads can become the input pad or the ground short in each another situations. Sometimes, some land pads become just mount pad.

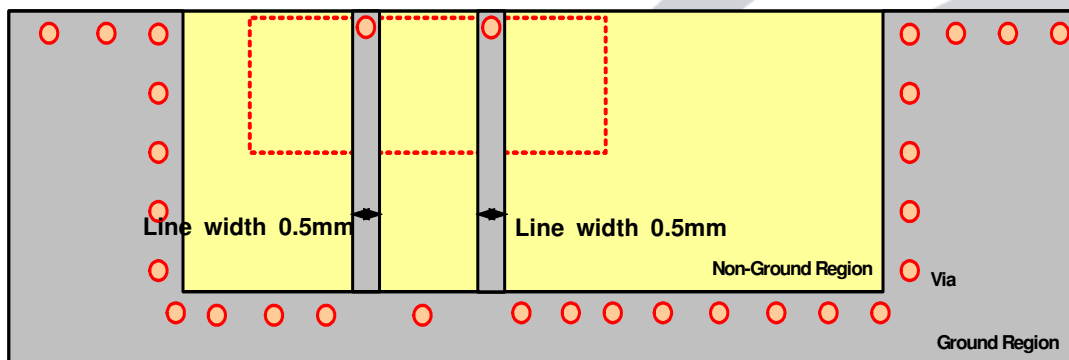
You can obtain the detail informations about the selection of each land pad from PARTRON.

### ■ PCB Layout Design

#### - Basic Design



< Chip Antenna The surface to be mounted >



< Chip Antenna The opposite surface to be mounted >

The figure above is a view of the basic PCB drawing for this product as seen from the side opposite to the side on which the chip antenna is mounted.

This structure adds autocad drawing as an appendix for measuring PCB. Please refer to the detailed dimensions of the figure.

**A** : The No2 Pad is an input pad and Wi-Fi Band. The No3 Pad is an input pad and BlueTooth Band. Pads 1 and 4 are fixed, and pad 5 is connected to the adjacent ground through a lumped element. At this time, the line width connected to each pad is designed as 0.5 mm. Also, pads 6 and 7 are connected via vias to the opposite side of the antenna mount.

**B** : A non-grounded area extends to an acceptable area to remove all metal surfaces. This product can not operate with the metal surface area. All layers have the same area and the metal surface is removed. As shown in the figure, the vias are used for the outer surface of the area where there is no metal surface. The non-metallic area of the basic design value of this product is 4.2x12 mm<sup>2</sup>. (Non-metal areas may change depending on the frequency used.)

**C** : Pads 6 and 7 are connected to the ground via the vias and the opposite side of the antenna mount. Pads 2 and 3 are connected to the input line as shown in the figure.

**D** : Pad No. 5 is connected to the adjacent ground by the width of 0.5mm line. As shown in the figure, pad No. 1 and pad No. 8 are connected to the adjacent ground by the width of 2mm line.

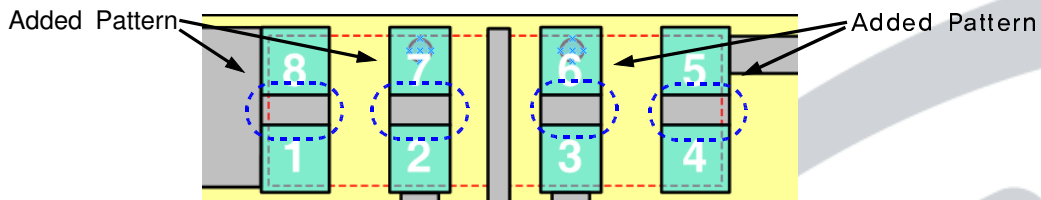
**E** : Pad No. 5 is connected to the adjacent ground through the 1005 lumped element. At this time, the value of the device used changes according to the frequency band used. (Refer to the Data Sheet for details of the value of lumped element.)

**F** : As shown in the figure above, insert the vias as many as possible in the corners.

**G** : Between pad no.2 and pad no.3 there is a Line width of 0.3mm.

## - Land Pad Design

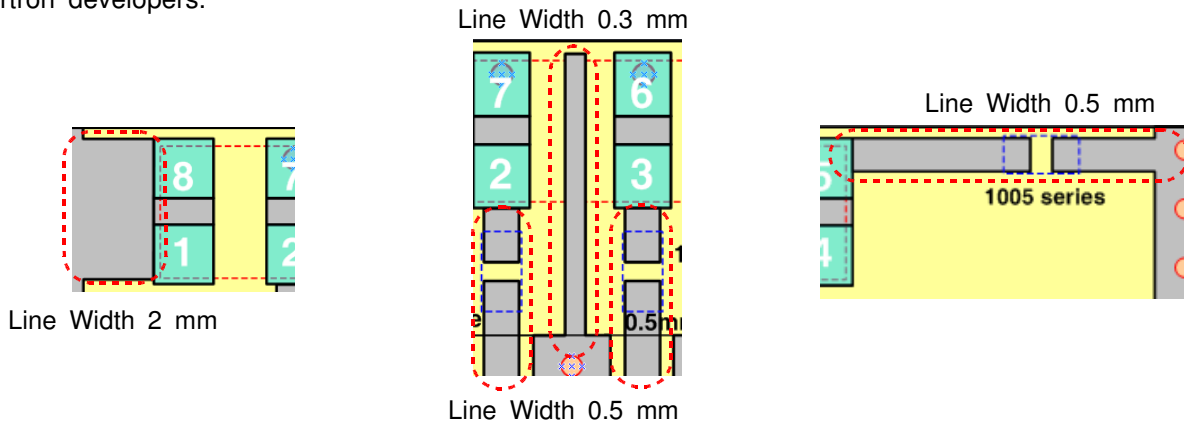
In the case of the first PCB structure, the first and second pads are shorted to the same width, and the second and fourth pads, third and sixth pads and fourth pads The pad 5 is also shorted to the same width, and the actual appearance of the pad is shown as the following four pads only.



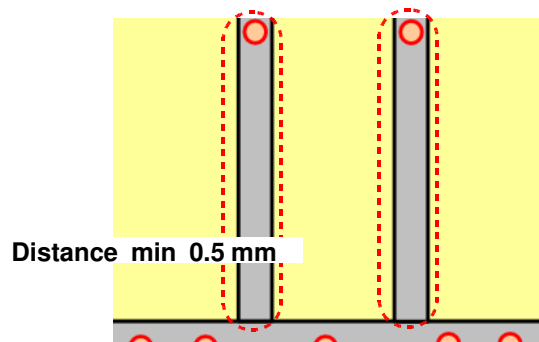
The four pads can be six or eight pads, eliminating the additional connection pads for the short circuit due to changes in the design of the wireless communication system for development applications. This can be changed by the application of Partron developers during the development process. The additional pattern is silk-screened so that lead is not connected and there are eight solder pads as well.

**- Line Design**

All RF lines configured for this product are designed with a fixed width of 0.5 mm. If you need to change the track width due to unavoidable circumstances, it must be done after consultation with Partron developers.



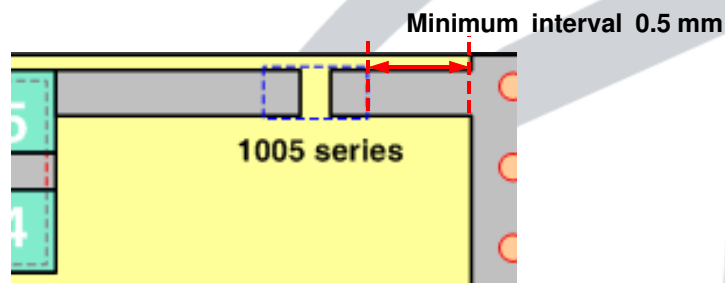
<Figure 1,2,3 Ant track width>



< Figure 4 Line width on the opposite side of the Ant mounting. >

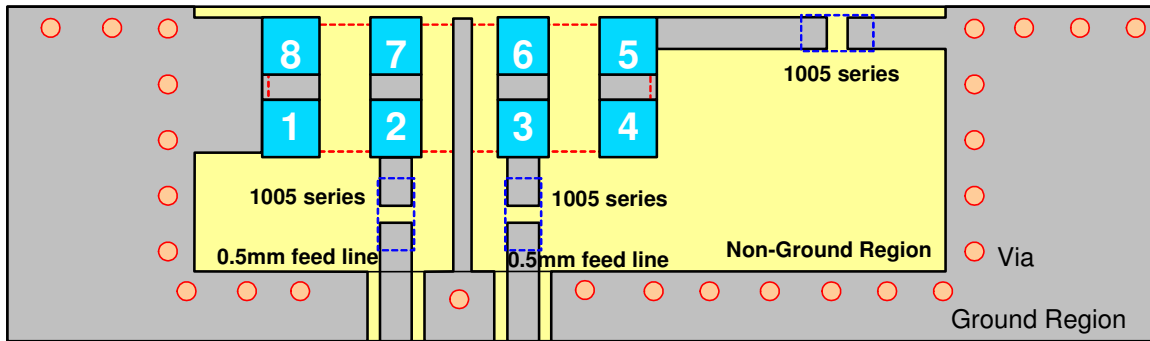
**- Inserted Lumped Element**

In case of lumped element connected to pad No. 5 for this product, it is based on non-grounded area, and it is located at least 0.5 mm apart from adjacent ground if possible.

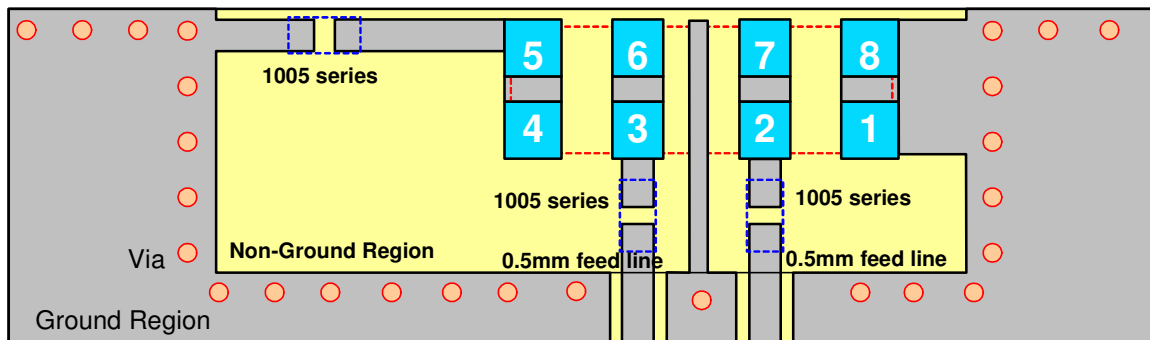


If you don't permit this design, it is possible to change position of lumped element and another design. Have a conference with PARTRON.

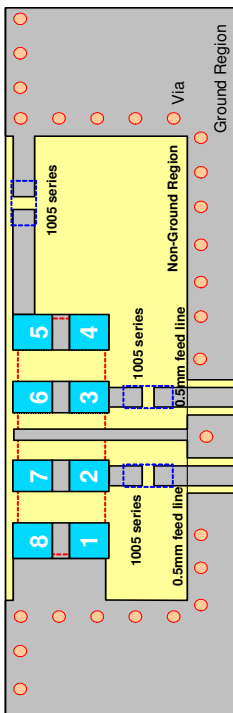
■ Change of Antenna Position



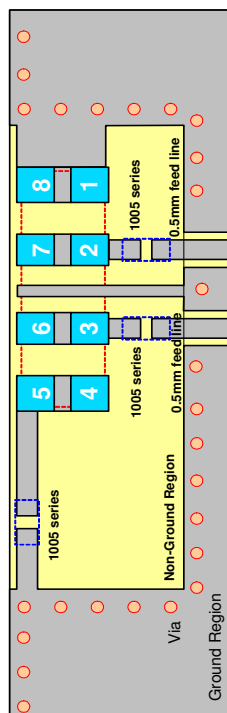
<Left Position>



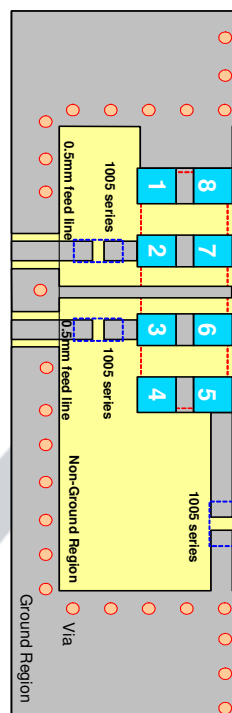
<Right Position>



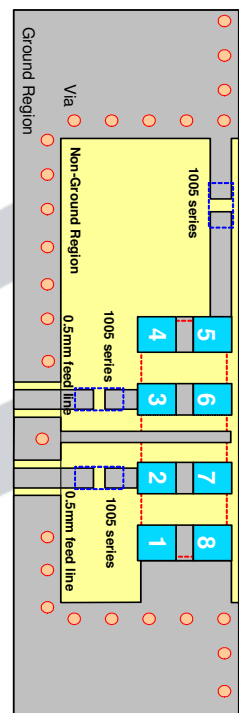
<Right side/up>



<Right Side/Down>



<Left Side/Up>

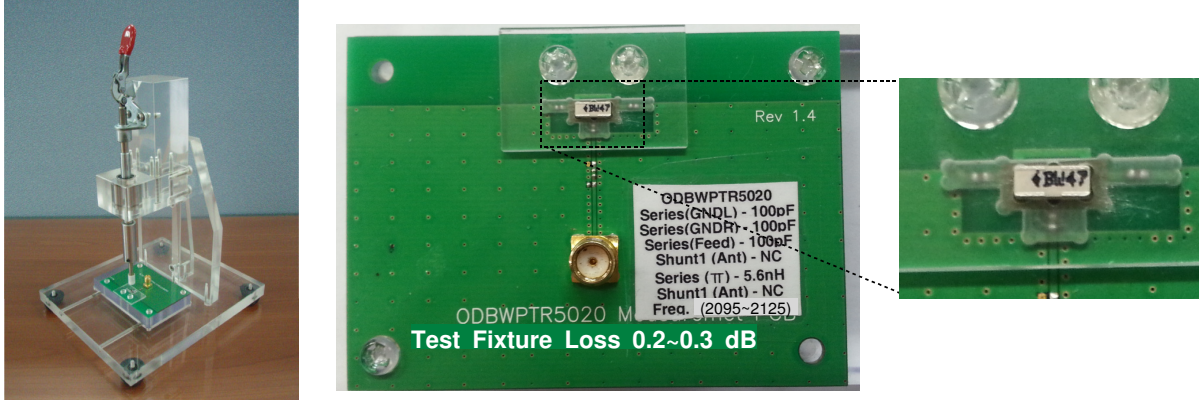


<Left Side/Down>

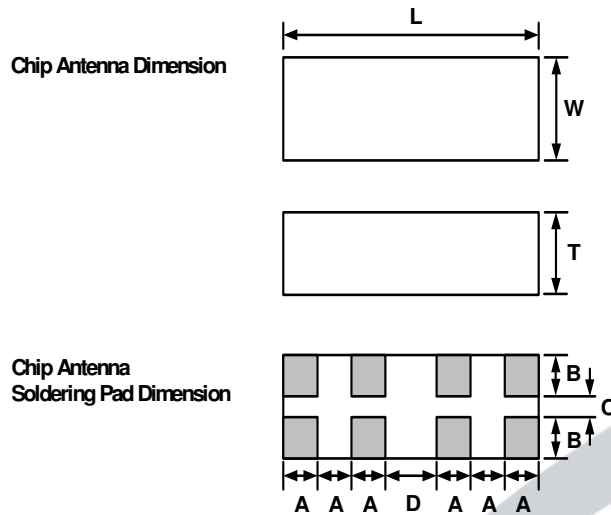
As shown in the above figure, even if the position of the product is changed inside the development application wireless communication system, the position of LMS registration pad is changed to symmetrical or horizontally symmetrical, and then the structure is designed according to PCB design guidelines.

## 8. Test Fixture Specification

### 8.1 Test Fixture and Test PCB

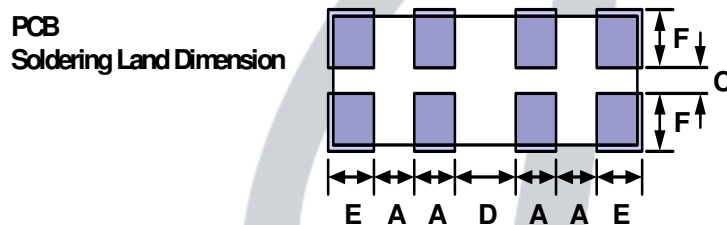


- ※ Ev B'd is the same as the manual measuring jig (Ev B'd is soldered to the contact type and manual measuring jig is the same for the eastern contact type)



| Parameter | L         | W         | T         | A   | B   | C   | D   |
|-----------|-----------|-----------|-----------|-----|-----|-----|-----|
| Value[mm] | 5.0 ± 0.1 | 2.0 ± 0.1 | 1.2 ± 0.1 | 0.6 | 0.8 | 0.4 | 1.4 |

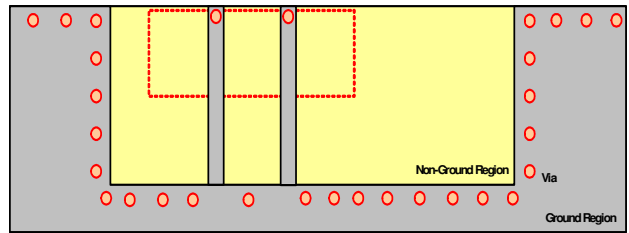
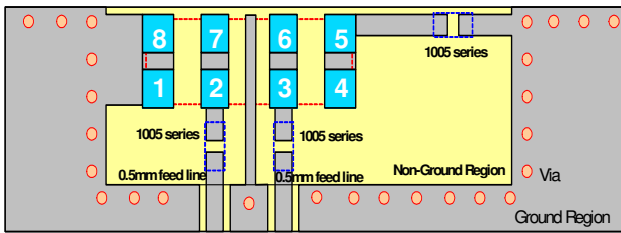
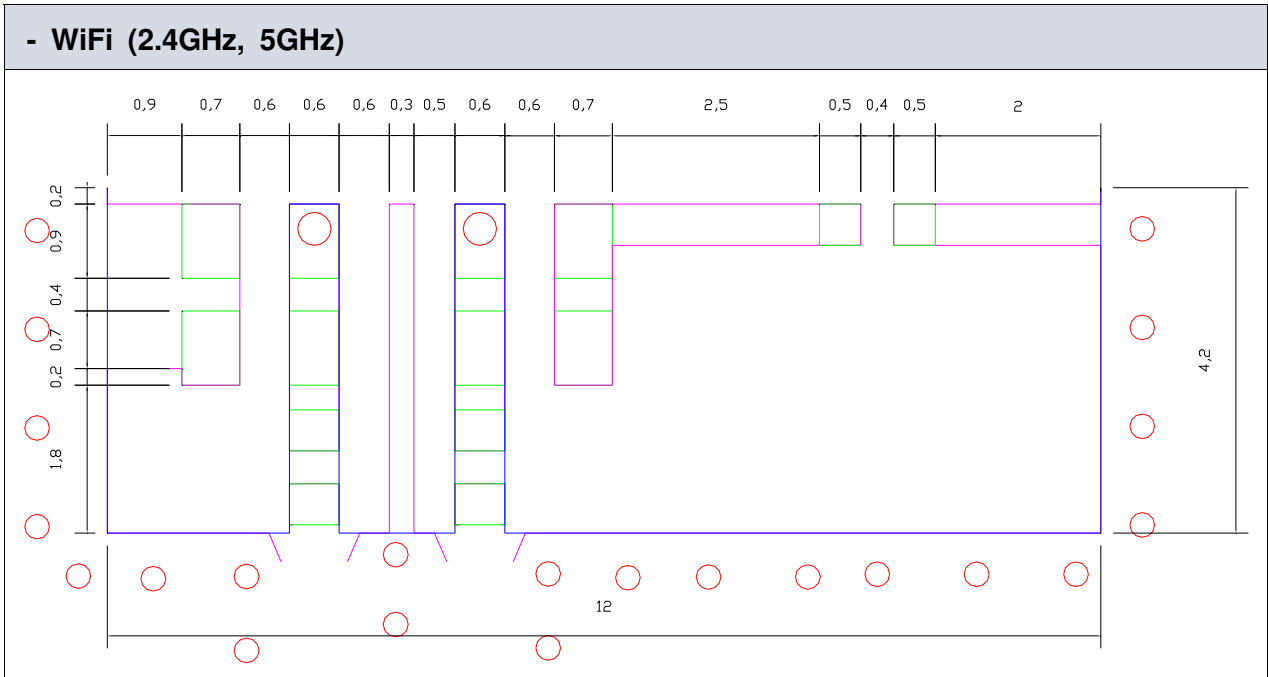
### 8.2 Soldering Pad Dimension and PCB layout Dimension



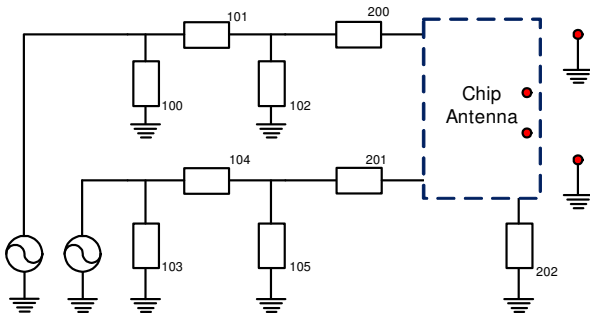
| Parameter | A   | C   | D   | E   | F   |
|-----------|-----|-----|-----|-----|-----|
| Value[mm] | 0.6 | 0.4 | 1.4 | 0.7 | 0.9 |

Unless Specified tolerances are ± 0.05 mm

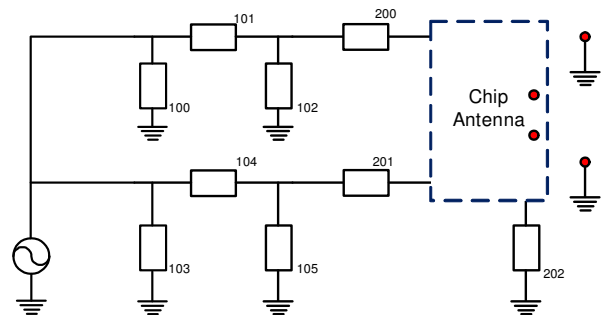
■ PCB Drawing(Auto CAD Design)



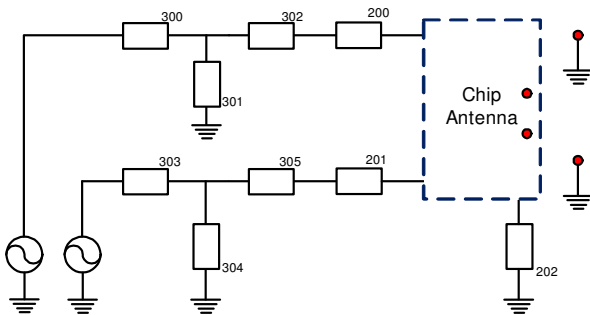
### 8.3 Matching Circuit and Default



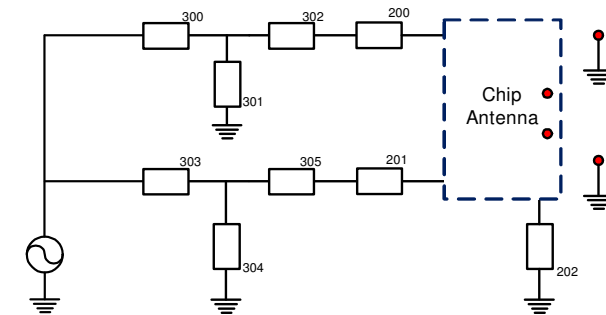
Two Feeding



One Feeding



Two Feeding



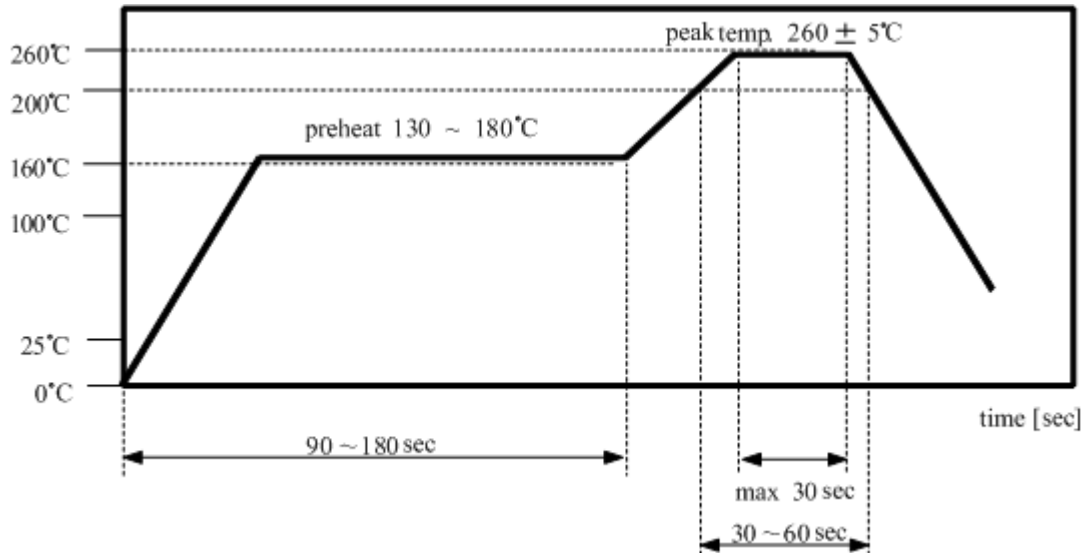
One Feeding

| No            |             | 100 | 101  | 102 | 103 | 104   | 105  | 200    | 201    | 202    | 300    | 301 | 302  | 303    | 304  | 305   |
|---------------|-------------|-----|------|-----|-----|-------|------|--------|--------|--------|--------|-----|------|--------|------|-------|
| Default Value | One Feeding | N/C | 4 pF | N/C | N/C | 12 pF | 1 pF | 100 pF | 100 pF | 1.2 nH | 100 pF | N/C | 4 pF | 100 pF | 1 pF | 12 pF |
|               | Two Feeding | N/C | 4 pF | N/C | N/C | 12 pF | 1 pF | 100 pF | 100 pF | 1.2 nH | 100 pF | N/C | 4 pF | 100 pF | 1 pF | 12 pF |



## 9. REFLOW PROFILE

### 9.1 Reflow Soldering



### 9.2 Manual Soldering

Pre-heating Temperature : 120°C , 60 ~ 300 sec.

Soldering Temperature : 340°C±5°C , 5sec max per each terminal.

### 9.3 Applied PCB Pattern Design

7. Basic Operation and Application and 8.2 PCB Structure and Solder Pad Dimensions Reference

**10. Primary Inspection List** 

| Item     | Frequency [MHz] |          | Size [mm]   |             |             |
|----------|-----------------|----------|-------------|-------------|-------------|
| Standard | SWR 3.0 Max     |          | L = 5.0±0.1 | W = 2.0±0.1 | T = 1.2±0.1 |
|          | 2095 MHz        | 2125 MHz |             |             |             |
| 1        | 1.81            | 1.62     | 5.02        | 2.01        | 1.20        |
| 2        | 1.74            | 1.60     | 4.99        | 1.99        | 1.21        |
| 3        | 1.68            | 1.69     | 5.01        | 2.00        | 1.22        |
| 4        | 1.70            | 1.63     | 4.98        | 2.02        | 1.20        |
| 5        | 1.59            | 1.74     | 5.02        | 1.98        | 1.20        |
| 6        | 1.64            | 1.69     | 5.00        | 2.00        | 1.19        |
| 7        | 1.76            | 1.60     | 4.98        | 1.99        | 1.21        |
| 8        | 1.67            | 1.62     | 5.00        | 2.00        | 1.18        |
| 9        | 1.53            | 1.58     | 5.01        | 2.01        | 1.20        |
| 10       | 1.52            | 1.63     | 5.03        | 2.00        | 1.17        |
| 11       | 1.61            | 1.51     | 4.99        | 2.02        | 1.20        |
| 12       | 1.64            | 1.50     | 5.00        | 1.98        | 1.19        |
| 13       | 1.83            | 1.64     | 4.99        | 2.01        | 1.21        |
| 14       | 1.58            | 1.63     | 5.01        | 1.99        | 1.23        |
| 15       | 1.55            | 1.62     | 4.99        | 2.00        | 1.20        |
| 16       | 1.68            | 1.51     | 5.02        | 1.98        | 1.19        |
| 17       | 1.59            | 1.58     | 5.00        | 2.02        | 1.22        |
| 18       | 1.67            | 1.62     | 4.99        | 1.98        | 1.18        |
| 19       | 1.68            | 1.69     | 5.02        | 2.00        | 1.19        |
| 20       | 1.83            | 1.64     | 4.98        | 1.99        | 1.20        |
| X        | 1.52            | 1.51     | 5.10        | 2.10        | 1.30        |
| σ        | 1.83            | 1.74     | 4.90        | 1.90        | 1.10        |
| Cpk      | 1.67            | 1.62     | 5           | 2           | 1.2         |
| Decision | OK              | OK       | OK          | OK          | OK          |

## 11. Reliability Condition

### 11.1 Environment Test

| ITEM                       | TEST CONDITION            | LIMIT  |
|----------------------------|---------------------------|--|
| PCT                        | +121±5 °C, RH=100%, 96 hr | After test, Must meet the characteristics spec of 4.3 list |
| Low Temperature Resistance | -40°C±3°C, 120hr          |  |
| Humidity Action            | +85±3°C, RH85%            |  |

### 11.2 Thermal shock test , Reflow test

| ITEM          | TEST CONDITION   | LIMIT  |
|---------------|--|--|
| Thermal shock | condition : -40°C±3°C/1min ↔ +85°C±3°C/1min<br>Test Cycle : 20 cycle<br>Temperature change time : within 5 min | After test, Must meet the characteristics spec of 4.3 list |
| Reflow        | Pre Heating : 200±5°C, 30~60 sec<br>Peak Heating : 260°C±5°C, 30sec Max  |  |

### 11.3 Mechanical Test

| ITEM      | TEST CONDITION  | LIMIT  |
|-----------|---|--|
| Vibration | Freq : 10~500Hz , Acceleration : 10 ×9.8m/s <sup>2</sup> (G)<br>Sweep time : 15 min , X.Y.Z each 5 times    | After test, Must meet the characteristics spec of 4.3 list |
| Drop      | 18 times free fall Using the drop jig 152cm high<br>Jig : 120g±20g Plastic Jig<br>Bottom : Concrete or Iron |  |

### 11.4 MSL LEVEL Test

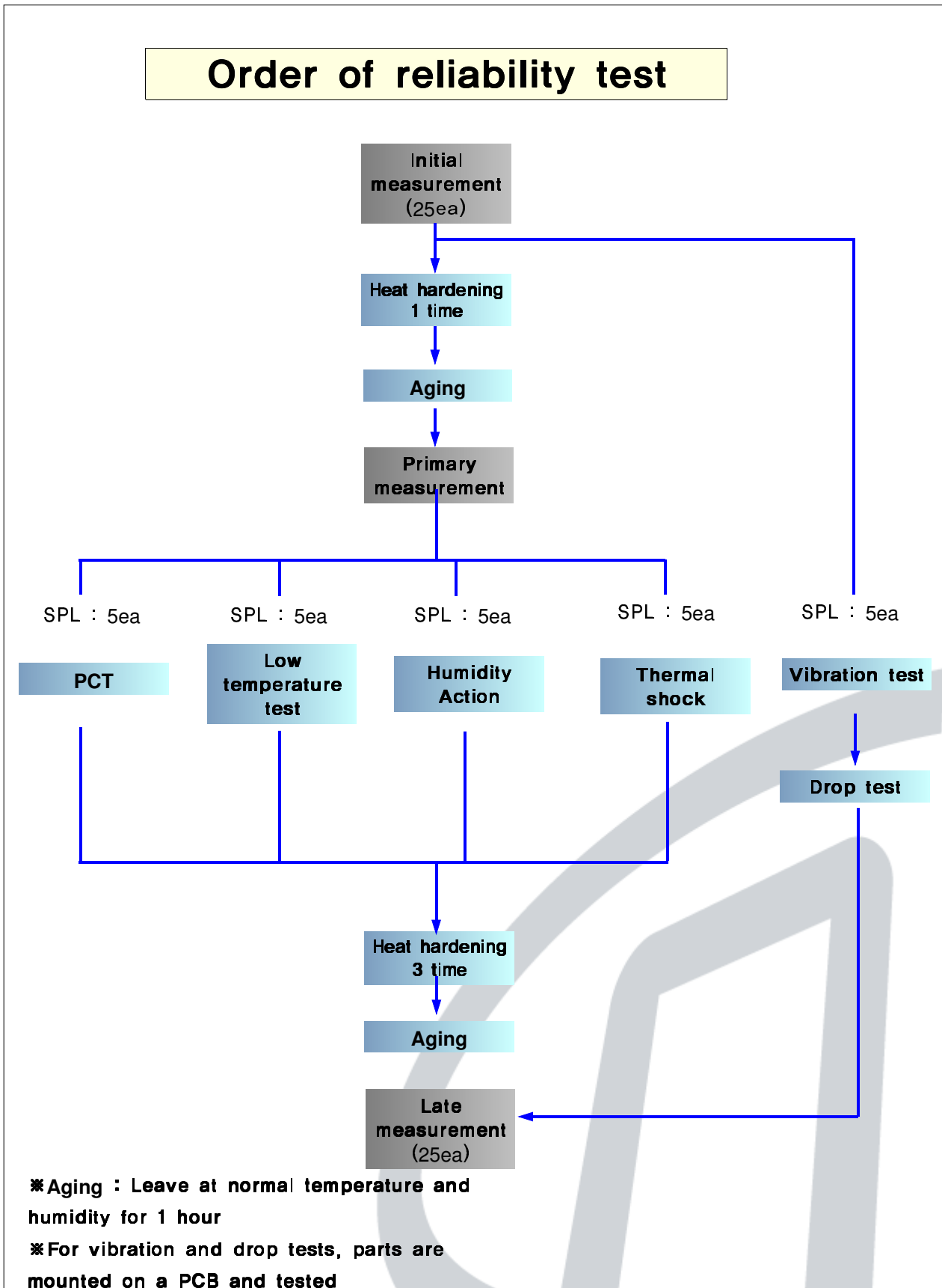
#### 1) JEDEC J-STD-020C Test

|   | Floor Life |                   | Soak Requirements |                   |
|---|------------|-------------------|-------------------|-------------------|
|   | Time       | Conditions        | Time              | Conditions        |
| 1 | Unlimited  | = < 30°C / RH 85% | 168+5 / -0        | = < 85°C / RH 85% |

#### 2) Test Condition

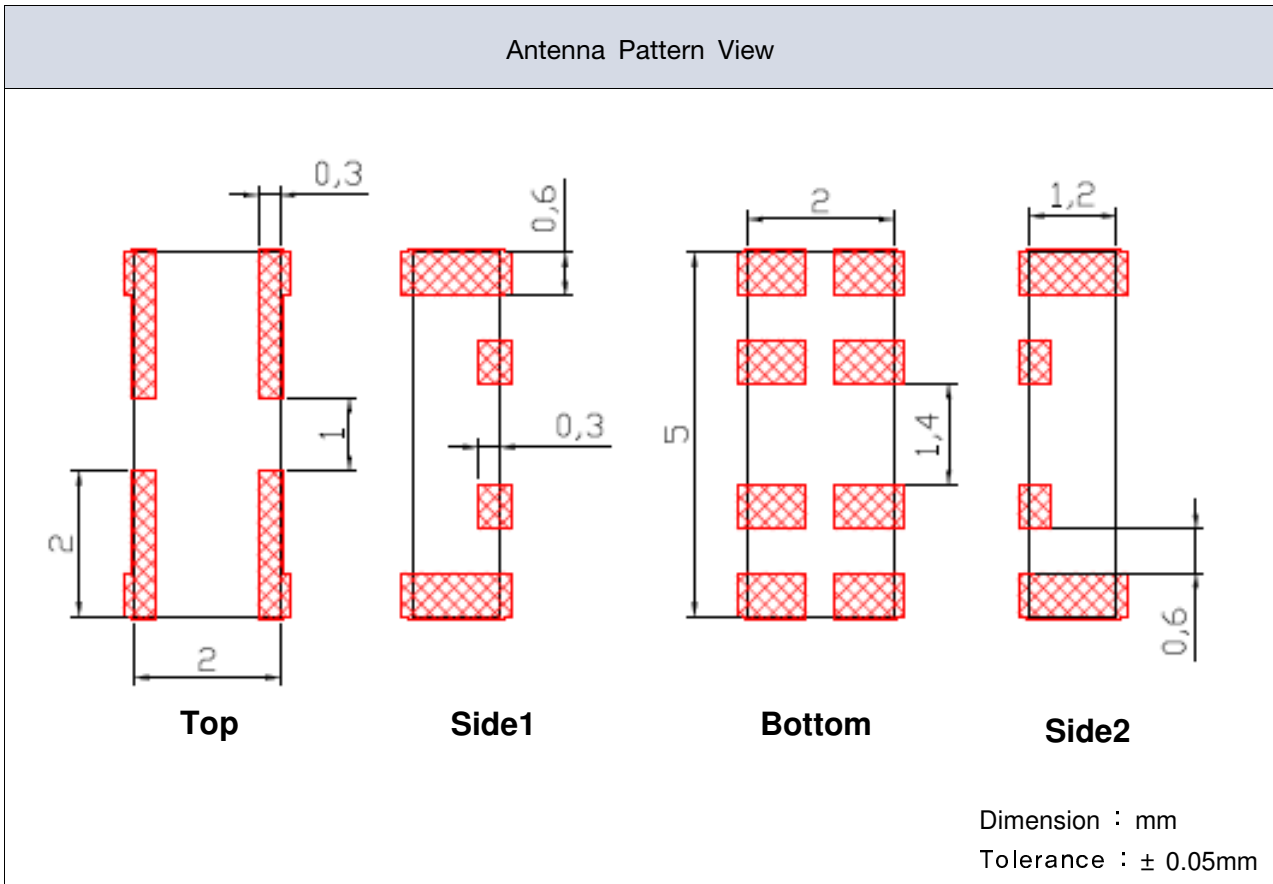
| ITEM              | Conditon   | LIMIT  |
|-------------------|--|--|
| Soak Requirements | After leaving +85±3°C, RH85% 168hr±2hr<br>3 times Reflow without aging | After test, Must meet the characteristics spec of 4.3 list |

11.5 Order of reliability test

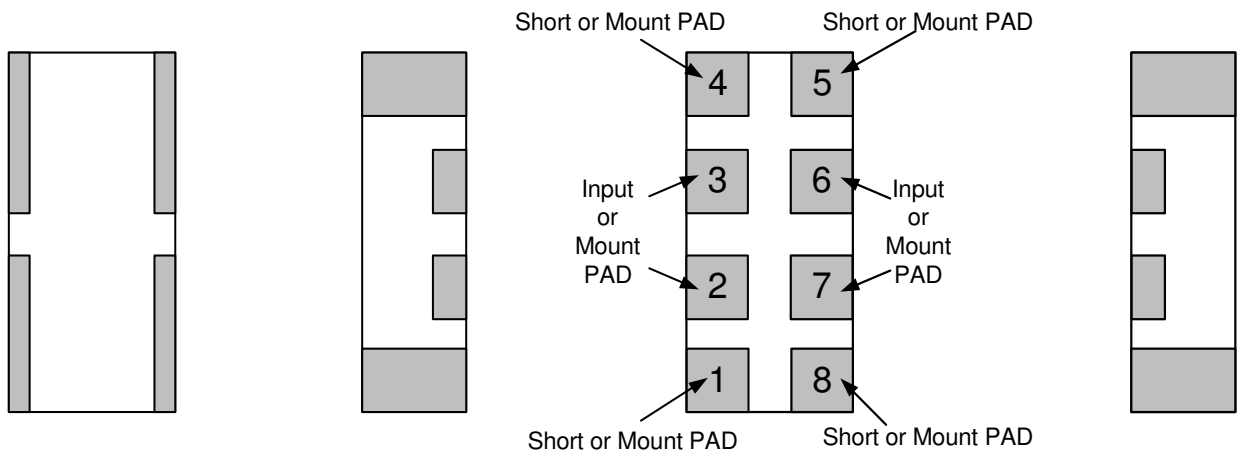


## 12. Mechanical Characteristics

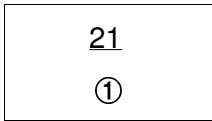
### 12.1 Antenna Pattern Dimension



### 12.2 Pin name

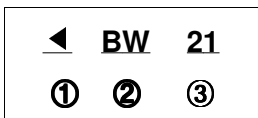
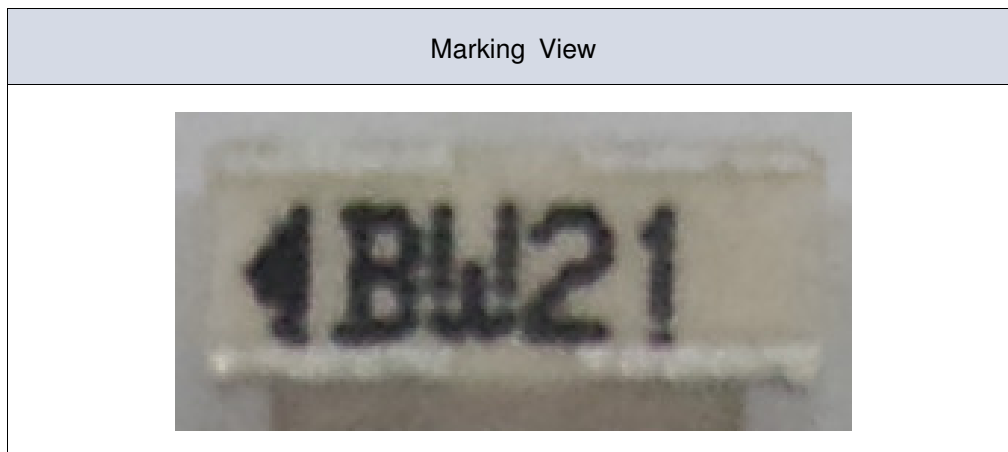


### 12.3 LOT number notation



① Week : 1 - 1 Week, 2 - 2 Week, 3 - 3 Week, ..., 20 - 20 Week, 21 - 20 Week ...

### 12.4 Marking



① Input Signal

② Bluetooth, WiFi

③ Week : 1 - 1 Week, 2 - 2 Week, 3 - 3 Week, ..., 20 - 20 Week, 21 - 20 Week ...

### 12.5 Marking type

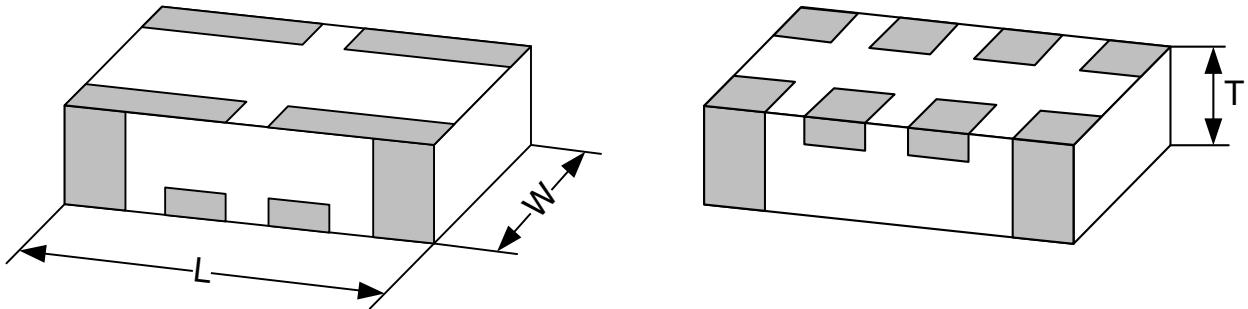
Ink marking - Using Black Ink

### 13. Structure and Material

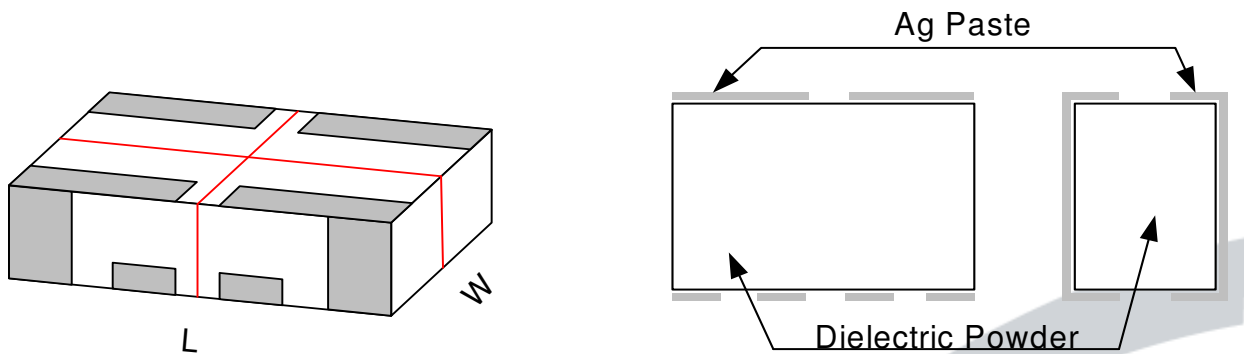
#### 13.1 materialization method

Chip antenna forms the pattern with Ag paste on the brick of dielectric block and materializes the characteristics

#### 13.2 Structure



#### 13.3 Internal cross section



#### 13.4 Material

| ITEM             | Material | Maker     | Printing pattern SPEC                        |
|------------------|----------|-----------|--|
| Dielectric Block | Powder   | INanoTech |  |
| PATTERN          | Ag Paste | DeaJoo    | Thickness : Min10 $\mu$ m(TYP 16~20 $\mu$ m) |

**14. Attention**

## 14.1 Temperature Condition

|                         | Range of Temperature | Unit |
|-------------------------|----------------------|------|
| Application Temperature | -40 ~ +100           | °C   |
| Keeping Temperature     | -40 ~ + 70           | °C   |

## 14.2 Temperature Test Condition

|                         | Condition | Range of Temperature                        |
|-------------------------|-----------|---|
| Application temperature | Low       | 24hr normal action at -75°C                 |
|                         | High      | 24hr normal action at +150°C                |
| Keeping temperature     | Low       | normal action when left for 1000hr at -75°C |
|                         | High      | normal action when left for 1000hr at +85°C |

\* Because of the keeping temperature problem, no admission when left over +85°C

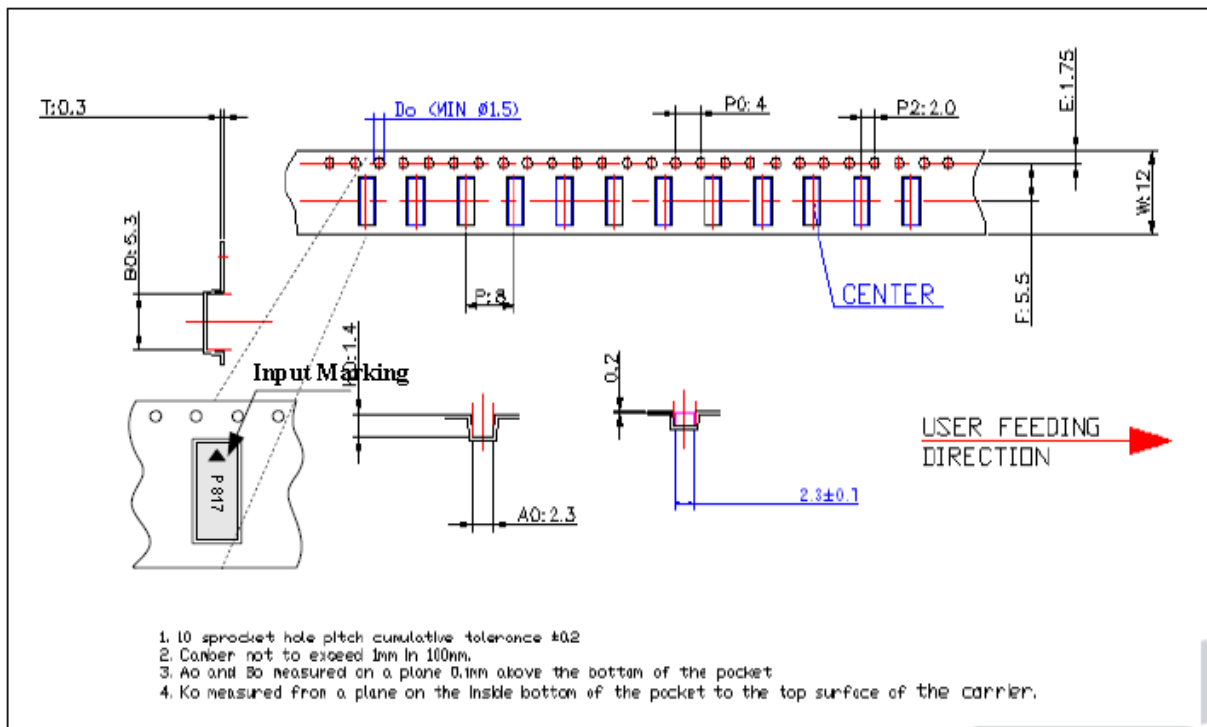




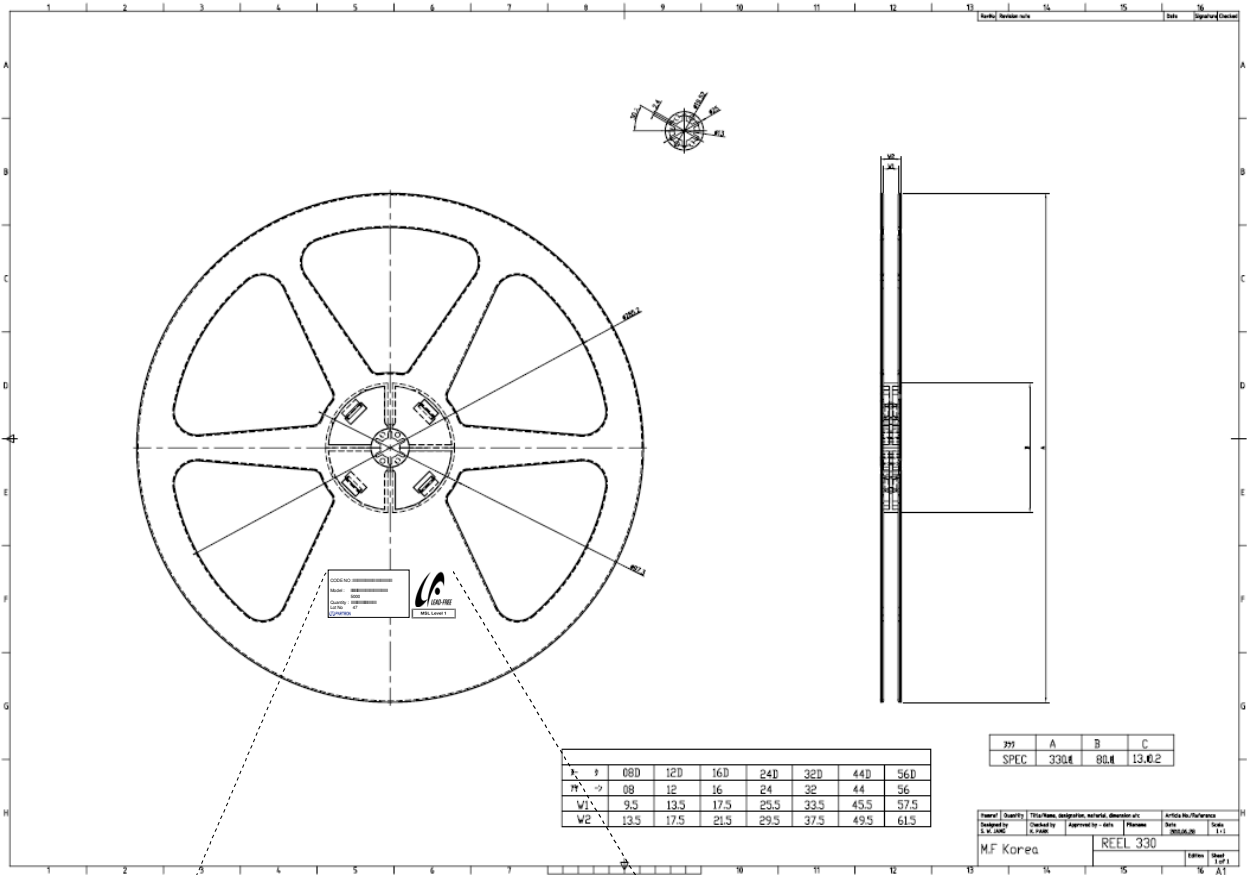
## 15. Packing


### 15.1 Carrier/Reel

| Item         | Material | Surface Resistance   | Electricity | Method     |
|--------------|----------|----------------------|-------------|------------|
| Carrier tape | A-PET    | Typical $10^8\Omega$ | 10V MAX     | Heat Press |
| Cover tape   | PET      | Typical $10^8\Omega$ | 30V MAX     |            |
| Reel         | PS       | Typical $10^8\Omega$ | 30V MAX     | -          |



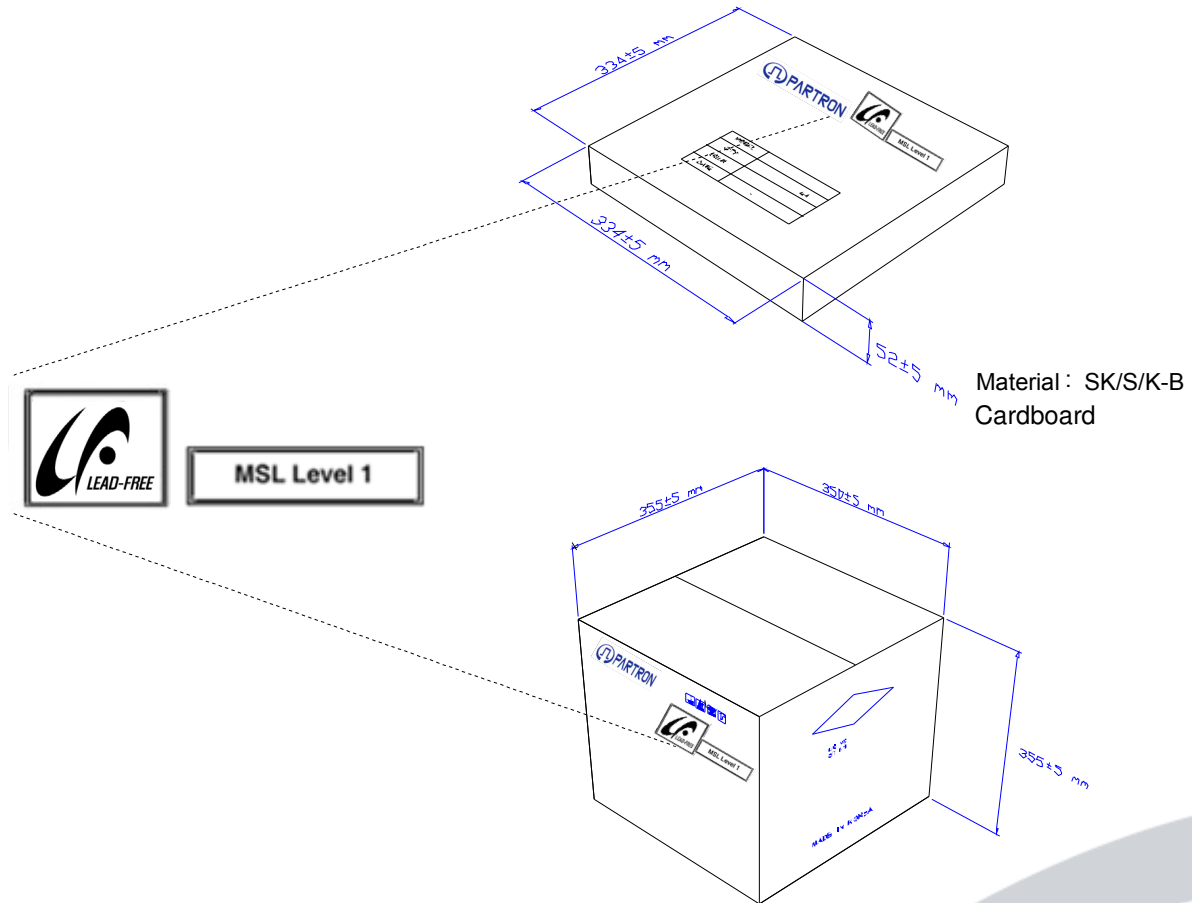
|                        |                              |              |                |
|------------------------|------------------------------|--------------|----------------|
| DKC DWG. No.           | D-1208-058                   | NAME         | SPEC.          |
| DIMENSIONAL UNIT       | MM                           | W            | 12.0 $\pm$ 0.2 |
| UNTOLERANCED DIMENSION | $\pm 0.1$                    | E            | 1.75 $\pm$ 0.1 |
| CAD FILE NAME          | 051010                       | F            | 5.5 $\pm$ 0.1  |
| DESIGNED BY            | K. M. C                      | Do           | 1.5 $\pm$ 0.1  |
| SCALE                  | 1/1                          | P            | 8.0 $\pm$ 0.1  |
| TITLE                  | CARRIER TAPE<br>2.0*5.0*1.2P | P0           | 4.0 $\pm$ 0.1  |
| PART.                  |                              | CARRIER TAPE | P2             |
| MATERIAL               | A-PET                        | A0           | 2.3 $\pm$ 0.1  |
| LENGTH                 | 50.4M                        | B0           | 5.3 $\pm$ 0.1  |
| COUNT                  | 6300P                        | K0           | 1.4 $\pm$ 0.1  |
|                        |                              | T            | 0.3 $\pm$ 0.05 |



CODE NO : :::::::::::::::::::::  
Model : :::::::::::::::::::::  
Quantity : :::::::::::::::::::::  
Lot No 21  




15.2 Box



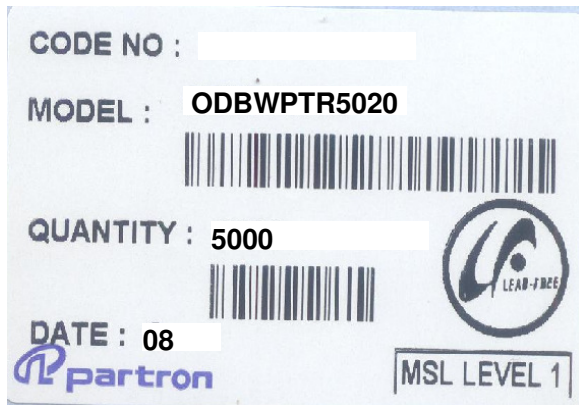
15.3 Actual packing picture



Reel



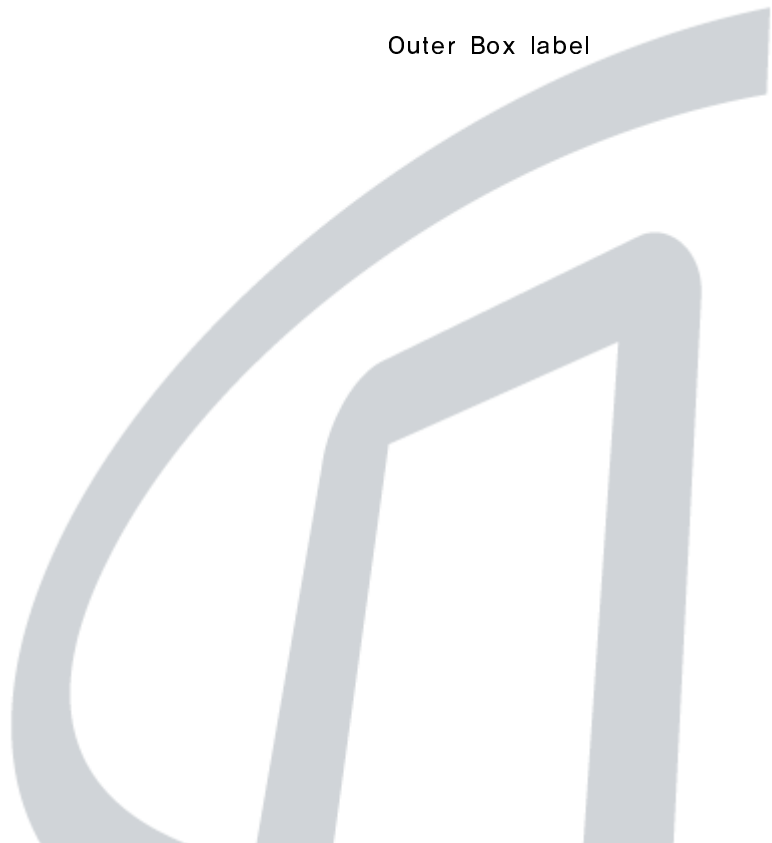
Internal Box



Reel / Inner Box label









Outer Box label



**16. Process Control**

| Product          |             | Issued/Revision |                    | Process Control       |                                    |                      |                     |                   | Record                                   | By designed          | By checked                            | By approved              |          |         |
|------------------|-------------|-----------------|--------------------|-----------------------|------------------------------------|----------------------|---------------------|-------------------|--|----------------------|---------------------------------------|--------------------------|----------|---------|
| CHIP ANTENNA     |             | Issued          | 04.04.06           |                       |                                    |                      |                     |                   | Record                                   |                      |                                       |                          |          |         |
|                  |             | Revised         | 05.04.03           |                       |                                    |                      |                     |                   | PRCP-C001                                |                      |                                       |                          |          |         |
| Input Materials  | FLOW CHART  |                 | Process name       | Management of Factors |                                    |                      |                     |                   | Management of quality                    |                      |                                       |                          |          |         |
|                  | preparation | Main Process    |                    | Equipment Name        | Checked                            | Condition            | Cycle of management | Record            | Checked Item                             | Margin               | Method of Inspection                  | Cycle of management      | Record   | Action  |
| Ceramic POWDER   |             | ◇               | Import Inspection  |                       |                                    |                      |                     |                   | shrinking rate permittivity              | refer to Guide Sheet | Micrometer Network                    | 10ea/LOT                 | C/sheet  | Return  |
| POWDER lubricant | ○           |                 | powder             | Mixer                 |                                    |                      |                     |                   | mixing                                   | POWDER lubricant     | Scale                                 | PER MIXING               | -        | Exhaust |
|                  |             | ○               | Shaping            | Press                 | pressure Mold Condition            | refer to Guide Sheet | Per LOT 1/day       | parameter C/SHEET | dimension weight density aspect          | refer to Guide Sheet | Micrometer scale Calculated Visual    | 5/100EA<br>10ea/lot      | LOT CARD | Exhaust |
|                  |             | ○               | Plasticity         | Plasticity Hole       | SETTER Outside Temperature PROFILE | refer to Guide Sheet | all 2/day 1/month   | C/sheet           |  |                      |                                       |                          |          |         |
|                  |             | ◇               | Block              |                       |                                    |                      |                     |                   | wide length shape                        | refer to Guide Sheet | Micrometer Calipers Visual Inspection | 20ea/LOT<br>20ea/LOT all | C/sheet  | Exhaust |
| AG PASTE         |             | ○               | SIDE1 PAD Printing | Printer screen        | Squeeze velocity/pressure SNAP     | refer to Guide Sheet | 1/day               | -                 | PATTERN Dimension aspect                 | refer to Guide Sheet | Microscope                            | 10ea/3Jig                | c/sheet  | Rework  |
|                  |             | ○               | Dry                | Dryer Dry Jig         | Temperature Belt speed             | refer to Guide Sheet | 1/week              | Parameter         | Dry Condition Printed condition breakage | refer to Guide Sheet | Visual Inspection                     | all                      | Lot card | Rework  |

| Product         |             | Issued/Revision   |                            | Process Control       |                                |                      |                     |                   | Record                                   | By designed          | By checked            | By approved         |          |                |
|-----------------|-------------|---|----------------------------|-----------------------|--------------------------------|----------------------|---------------------|-------------------|--|----------------------|-----------------------|---------------------|----------|----------------|
| CHIP ANTENNA    |             | Issued  | 04.04.06                   |                       |                                |                      |                     |                   | Revised                                  | 05.04.03             | PRCP-C001             |                     |          |                |
| Input Materials | FLOW CHART  |   | Process name               | Management of Factors |                                |                      |                     |                   | Management of quality                    |                      |                       |                     |          |                |
|                 | preparation | Main Process  |                            | Equipment Name        | Checked                        | Condition            | Cycle of management | Record            | Checked Item                             | Margin               | Method of Inspection  | Cycle of management | Record   | Action         |
| AG PASTE        |             |    | SIDE 2 PAD Printing        | Printer screen        | Squeeze velocity/pressure SNAP | refer to Guide Sheet | 1/day               | -                 | PATTERN Dimension aspect                 | refer to Guide Sheet | Microscope            | 10ea/3Jig           | c/sheet  | Rework         |
|                 |             |    | Dry                        | Dryer Dry Jig         | Temperature Belt speed         | refer to Guide Sheet | 1/week              | Parameter         | Dry Condition Printed condition breakage | refer to Guide Sheet | Visual Inspection     | all                 | Lot card | Rework         |
|                 |             |    | Baking                     | Baking Hole mesh net  | Temperature Belt speed         | refer to Guide Sheet | 1/week              | Parameter C/Sheet | Breakage Pollution                       | refer to Guide Sheet | Visual Inspection     | all                 | Lot card | Exhaust Rework |
| AG PASTE        |             |   | TOP printing               | Printer screen        | Squeeze velocity/pressure SNAP | refer to Guide Sheet | 1/day               | -                 | PATTERN dimension                        | refer to Guide Sheet | measure               | 10ea/3Jig           | c/sheet  | Rework         |
|                 |             |  | Dry                        | Dryer Dry Jig         | Temperature Belt speed         | refer to Guide Sheet | 1/week              | Parameter         | Dry Condition Printed condition breakage | refer to Guide Sheet | Visual Inspection     | all                 | Lot card | Rework         |
| AG PASTE        |             |  | BOTTOM PAD Printing<br>CTQ | printer screen        | Squeeze velocity/pressure SNAP | refer to Guide Sheet | 1/day               | -                 | PATTERN dimension aspect                 | refer to Guide Sheet | measure<br>Microscope | 10ea/3Jig           | c/sheet  | Rework         |

| Product                  |             | Issued/Revision |                              | Process Control           |                           |                         |                     |                      | Record  | By designed                              | By checked                                 | By approved                |                                 |                   |
|--------------------------|-------------|-----------------|------------------------------|---------------------------|---------------------------|-------------------------|---------------------|----------------------|---|--|--|----------------------------|---------------------------------|-------------------|
| CHIP ANTENNA             |             | Issued          | 04.04.06                     |                           |                           |                         |                     |                      | Record  |  |  |                            |                                 |                   |
|                          |             | Revised         | 05.04.03                     | PRCP-C001                 |                           |                         |                     |                      |   |  |  |                            |                                 |                   |
| Input Materials          | FLOW CHART  |                 | Process name                 | Management of Factors     |                           |                         |                     |                      | Management of quality                             |  |  |                            |                                 |                   |
|                          | preparation | Main Process    |                              | Equipment Name            | Checked                   | Condition               | Cycle of management | Record               | Checked Item                                      | Margin                                   | Method of Inspection                       | Cycle of management        | Record                          | Action            |
|                          | ○           |                 | Dry                          | Dryer<br>Dry Jig          | Temperature<br>Belt speed | refer to<br>Guide Sheet | 1/week              | Parameter            | Dry Condition<br>Printed<br>condition<br>breakage | refer to<br>Guide Sheet                  | Visual Inspection                          | all                        | Lot card                        | Rework            |
|                          |             | ○               | Baking                       | Baking Hole<br>mesh net   | Temperature<br>Belt speed | refer to<br>Guide Sheet | 1/week              | Parameter<br>C/Sheet | Breakage<br>Pollution                             | refer to<br>Guide Sheet                  | Visual Inspection                          | all                        | Lot card                        | Exhaust<br>Rework |
|                          |             | ◇               | aspect<br>inspection         |                           |                           |                         |                     |                      | aspect  | Reference SPL<br>refer to<br>Guide Sheet | Visual Inspection<br>microscope            | all                        | Lot card<br>production<br>diary | Exhaust<br>repair |
|                          |             | ○               | MARKING                      | Marking<br>Machine        |                           |                         |                     |                      | marking   | Reference SPL                            | Visual Inspection                          | all                        | Lot card<br>production<br>diary | Rework<br>Exhaust |
|                          |             | ◇               | Electrical<br>Characteristic | NETWORK<br>Inspection Jig | proofreading<br>Condition | refer to<br>Guide Sheet | 1/2hour             | C/sheet              | Electrical<br>Characteristic                      | refer to<br>Guide Sheet                  | Network                                    | all                        | Lot card<br>production<br>diary | Exhaust<br>repair |
|                          |             | ◇               | aspect<br>inspection         |                           |                           |                         |                     |                      | aspect<br>dimension                               | Reference SPL<br>refer to<br>Guide Sheet | Visual Inspection<br>microscope            | all                        | Lot card<br>production<br>diary | Exhaust<br>repair |
| Carrier<br>cover<br>reel |             | ○               | Taping                       |                           |                           |                         |                     |                      | Quantity<br>Direction<br>aspect                   | refer to<br>Guide Sheet                  | Manual                                     | all                        | Lot card<br>production<br>diary | Rework            |
|                          |             | ◇               | shipper<br>inspection        | NETWORK<br>Inspection Jig | proofreading<br>Condition | refer to<br>Guide Sheet | 1/person            | C/sheet              | Electrical<br>Characteristic<br>aspect<br>packing | refer to<br>Guide Sheet                  | Network<br>microscope<br>Visual Inspection | refer<br>to Guide<br>Sheet | Result<br>Paper                 | return<br>Exhaust |
| packing<br>box<br>label  |             | ○               | packing                      | bar code<br>printer       |                           |                         |                     |                      | packing<br>P/N<br>Quantity                        | refer to<br>Guide Sheet                  | Visual Inspection                          | all                        | -                               | Rework            |
|                          |             | ◇               | packing<br>inspection        |                           |                           |                         |                     |                      | packing<br>P/N<br>Quantity                        | refer to<br>Guide Sheet                  | Visual Inspection                          | all                        | -                               | return            |

### 17. RoHS Data

#### 1) Ceramic Powder

|                     |  |
|---------------------|--|
| Parts Name          | IM-K8                                      |
| Tester Organization | SGS Testing KOREA co. Ltd.                 |
| Measurement Tester  | Please see the 'method' in the test report |
| Measurement Data    | Please see the report under the table      |

**Test Report** No. SHAEIC1519187401 Date: 23 Sep 2015 Page 1 of 5

WUXI INANKOTECH CO.,LTD  
NO.518-3 ZHONGJI ROAD, WUXI, JIANGSU, CHINA (214174)

The following sample(s) was/were submitted and identified on behalf of the clients as: CERAMIC POWDER

SGS Job No.: SP16-031877 - SH  
Model No.: IM-K8  
Composition: Mg/SiO4 5/100  
Date of Sample Received: 21 Sep 2015  
Testing Period: 21 Sep 2015 - 23 Sep 2015  
Test Requested: Selected test(s) as requested by client.  
Test Method: Please refer to next page(s).  
Test Results: Please refer to next page(s).  
Conclusion: Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polychlorinated biphenyls (PCBs), Polychlorinated diphenyl ethers (PCDEs) comply with the limits as set by RoHS Directive 2011/65/EU Annex II, recasting 2002/95/EC.

Signed for and on behalf of  
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

*Mary Ma*  
Mary Ma  
Approved Signatory

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**Test Report** No. SHAEIC1519187401 Date: 23 Sep 2015 Page 2 of 5

Test Results:

**Test Part Description:**

Specimen No. SGS Sample ID Description  
SN1 SH15-191874.001 Grey powder

Remarks:

(1) 1 mg/kg = 0.0001%  
(2) MDL = Method Detection Limit  
(3) ND = Not Detected (< MDL)  
(4) "-" = Not Requested

**RoHS Directive 2011/65/EU**

Test Method: (1) With reference to IEC 62321-5:2013, determination of Cadmium by ICP-OES.  
(2) With reference to IEC 62321-5:2013, determination of Lead by ICP-OES.  
(3) With reference to IEC 62321-4:2013, determination of Mercury by ICP-OES.  
(4) With reference to IEC 62321-2:2008, determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.  
(5) With reference to IEC 62321-6:2015, determination of PBBs and PBDEs by GC-MS.

| Test Item(s)                 | Limit | Unit  | MDL | Result |
|------------------------------|-------|-------|-----|--------|
| Cadmium (Cd)                 | 100   | mg/kg | 2   | ND     |
| Lead (Pb)                    | 1000  | mg/kg | 2   | ND     |
| Mercury (Hg)                 | 1000  | mg/kg | 2   | ND     |
| Hexavalent Chromium (Cr(VI)) | 1000  | mg/kg | 2   | ND     |
| Sum of PBBs                  | -     | mg/kg | -   | ND     |
| Monobromobiphenyl            | -     | mg/kg | 5   | ND     |
| Dibromobiphenyl              | -     | mg/kg | 5   | ND     |
| Tribromobiphenyl             | -     | mg/kg | 5   | ND     |
| Tetrabromobiphenyl           | -     | mg/kg | 5   | ND     |
| Pentabromobiphenyl           | -     | mg/kg | 5   | ND     |
| Hexabromobiphenyl            | -     | mg/kg | 5   | ND     |
| Heptabromobiphenyl           | -     | mg/kg | 5   | ND     |
| Octabromobiphenyl            | -     | mg/kg | 5   | ND     |
| Nonabromobiphenyl            | -     | mg/kg | 5   | ND     |
| Decabromobiphenyl            | -     | mg/kg | 5   | ND     |
| Sum of PBDEs                 | 1000  | mg/kg | -   | ND     |
| Monobromodiphenyl ether      | -     | mg/kg | 5   | ND     |

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**Test Report** No. SHAEIC1519187401 Date: 23 Sep 2015 Page 3 of 5

| Test Item(s)             | Limit | Unit  | MDL | Result |
|--------------------------|-------|-------|-----|--------|
| Dibromodiphenyl ether    | -     | mg/kg | 5   | ND     |
| Tribromodiphenyl ether   | -     | mg/kg | 5   | ND     |
| Tetrabromodiphenyl ether | -     | mg/kg | 5   | ND     |
| Pentabromodiphenyl ether | -     | mg/kg | 5   | ND     |
| Hexabromodiphenyl ether  | -     | mg/kg | 5   | ND     |
| Heptabromodiphenyl ether | -     | mg/kg | 5   | ND     |
| Octabromodiphenyl ether  | -     | mg/kg | 5   | ND     |
| Nonabromodiphenyl ether  | -     | mg/kg | 5   | ND     |
| Decabromodiphenyl ether  | -     | mg/kg | 5   | ND     |

Notes:

(1) The maximum permissible limit is quoted from directive 2011/65/EU, Annex II

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**Test Report** No. SHAEIC1519187401 Date: 23 Sep 2015 Page 4 of 5

**ATTACHMENTS**

**RoHS Testing Flow Chart**

1) Name of the person who made testing: Bob Zhang/Gary Xu/Zengzhen Zhu/Sunny Qin  
2) Name of the person in charge of testing: Jan Shi/Summer Jin/Jessy Huang/Stone Chen  
3) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr<sup>6+</sup> and PBBs/PBDEs test method excluded)

```

graph TD
    A[Sample Preparation] --> B[Sample Measurement]
    B --> C[Pb/Cd/Hg]
    B --> D[PBBs/PBDEs]
    B --> E[Cr6+]
    
    C --> C1[Acid digestion with microwave/hotplate]
    C --> C2[Filtration]
    C1 --> C3[Solution]
    C2 --> C4[Residue]
    C3 --> C5[ICP-OES/AA]
    C4 --> C6[1) Alkali Fusion / Dry Ashing / 2) Acid to dissolve]
    C6 --> C5
    
    D --> D1[Sample solvent extraction]
    D --> D2[Concentration/ Dilution of extraction solution]
    D1 --> D3[Filtration]
    D2 --> D4[GC/MS]
    D3 --> D5[DATA]
    D4 --> D5
    
    E --> E1[Nonmetallic material]
    E --> E2[Metallic material]
    E1 --> E3[Adding digestion reagent]
    E2 --> E4[Spot test]
    E3 --> E5[Heating to 90-95°C for extraction]
    E4 --> E6[Positive]
    E4 --> E7[Negative]
    E5 --> E6
    E6 --> E8[Adding 1,5-diphenylcarbazide for color development]
    E7 --> E9[Boiling water extraction]
    E8 --> E10[A red color indicates the presence of Cr6+. If necessary, confirm with UV-Vis.]
    E9 --> E10
    E10 --> E11[DATA]
  
```

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**2) Ag Paste**

|                            |   |
|----------------------------|---|
| <b>Parts Name</b>          | <b>DNF2010C</b>                                   |
| <b>Tester Organization</b> | <b>SGS Testing KOREA co. Ltd.</b>                 |
| <b>Measurement Tester</b>  | <b>Please see the 'method' in the test report</b> |
| <b>Measurement Data</b>    | <b>Please see the report under the table</b>      |

**Test Report No.** F86101LF-CTSAVA15-23789      **Issued Date :** 2015. 05. 18      **Page 1 of 7**

**DAEJOO ELECTRONICS MATERIALS CO., LTD.**  
145 Seokhwan-ro  
Sheung-si Gyeonggi-do  
Korea

The following sample(s) was/were submitted and identified by/on behalf of the client as:-

**SGS File No.** : AYAA15-23789  
**Product Name** : Ag Paste  
**Item No./Part No.** : N/A  
**Client Reference Data** : DNF610C(Y150310), DNF6510(Y150320), DNF6510(Y160305)  
**Received Date** : 2015. 05. 08  
**Test Period** : 2015. 05. 08 to 2015. 05. 18  
**Report Comments** : By the applicant's request, item No./part No.s & client reference information are stated/added on report.  
**Test Results** : For further details, please refer to following page(s)

SGS Korea Co., Ltd.  
*Jeff Jaig*  
Jeff Jaig / Chemical Lab Mgr

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**Test Report No.** F86101LF-CTSAVA15-23789      **Issued Date :** 2015. 05. 18      **Page 2 of 7**

**Sample No.** : AYAA15-23789.001  
**Sample Description** : Ag Paste  
**Item No./Part No.** : N/A  
**Materials** : N/A

| Heavy Metals                |       |   |     |         |
|-----------------------------|-------|---|-----|---------|
| Test Items                  | Unit  | Test Method   | MDL | Results |
| Lead (Pb)                   | mg/kg | With reference to IEC 62321-6:2013 (Determination of Lead by ICP-OES)   | 5   | N.D.    |
| Cadmium (Cd)                | mg/kg | With reference to IEC 62321-6:2013 (Determination of Cadmium by ICP-OES)  | 0.5 | N.D.    |
| Mercury (Hg)                | mg/kg | With reference to IEC 62321-4:2013 (Determination of Mercury by ICP-OES)  | 2   | N.D.    |
| Hexavalent Chromium (Cr-VI) | mg/kg | With reference to IEC 62321-2:2008 (Determination of Hexavalent Chromium by spot test/Colorimetric Method using UV/Vis) | 1   | N.D.    |

| Flame Retardants-PBBs/PBDEs |       |   |     |         |
|-----------------------------|-------|---|-----|---------|
| Test Items                  | Unit  | Test Method   | MDL | Results |
| Monobromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Dibromodiphenyl ether       | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Tribromodiphenyl ether      | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Tetabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Pentabromodiphenyl ether    | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Hexabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Heptabromodiphenyl ether    | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Octabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Nonabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Decabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Monobromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Dibromodiphenyl ether       | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Tribromodiphenyl ether      | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Tetabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |

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**Test Report No.** F86101LF-CTSAVA15-23789      **Issued Date :** 2015. 05. 18      **Page 3 of 7**

**Sample No.** : AYAA15-23789.001  
**Sample Description** : Ag Paste  
**Item No./Part No.** : N/A  
**Materials** : N/A

| Flame Retardants-PBBs/PBDEs |       |   |     |         |
|-----------------------------|-------|---|-----|---------|
| Test Items                  | Unit  | Test Method   | MDL | Results |
| Pentabromodiphenyl ether    | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Hexabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Heptabromodiphenyl ether    | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Octabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Nonabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |
| Decabromodiphenyl ether     | mg/kg | With reference to IEC 62321-2:2008 (Determination of PBBs and PBDEs by GC-MS) | 5   | N.D.    |

| Halogen Content |       |                                |     |         |
|-----------------|-------|--------------------------------|-----|---------|
| Test Items      | Unit  | Test Method                    | MDL | Results |
| Chlorine(Cl)    | mg/kg | With reference to EN 14562, IC | 30  | N.D.    |
| Bromine(Br)     | mg/kg | With reference to EN 14562, IC | 30  | N.D.    |

**NOTE:** (1) N.D. = Not detected (<MDL)  
(2) mg/kg = ppm  
(3) MDL = Method Detection Limit  
(4) - = No regulation  
(5) Negative = Undetectable / Positive = Detectable  
(6) "+" = Qualitative analysis (No Unit)  
(7) = Boiling-water-extraction  
Negative = Absence of Cr(VI) coating  
Positive = Presence of Cr(VI) coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm<sup>2</sup> sample surface area.

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**Test Report No.** F86101LF-CTSAVA15-23789      **Issued Date :** 2015. 05. 18      **Page 4 of 7**

Picture of Sample as Received:

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**Test Report** No. F860101LF-CTSAVA15-23789  
Issued Date : 2015. 05. 19  
Page 5 of 7

**Flow Chart of Digestion**

The samples were dissolved totally by pre-conditioning method according to above flow chart.  
Section Chief : GBae YI

| Sample material               | Digestion Acid   |
|-------------------------------|--|
| Metal:Fe, Cu, Al, etc.        | Aqua regia, HCl, HNO <sub>3</sub>                            |
| Plastic                       | HNO <sub>3</sub> , HCl, HF, HClO <sub>4</sub>                |
| Silver                        | HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub>            |
| Solder, Au, Pt, Pd, Sb, Sn    | Aqua regia   |
| Glass                         | HNO <sub>3</sub> , HF  |
| Ti, Zr, W, Mo, Si, Hf, Nb, Ta | HNO <sub>3</sub> , HCl, HF                                   |
| Sn(as IEC 82321)              | HNO <sub>3</sub> , HCl, H <sub>2</sub> SO <sub>4</sub> , HBr |
| Others                        | Any acid   |

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**Test Report** No. F860101LF-CTSAVA15-23789  
Issued Date : 2015. 05. 19  
Page 6 of 7

**Flow Chart of Cr 6+, PBB/PBDEs Testing**

| PBB/PBDEs                                     | Cr 6+  | Cr 6+  |
|---|--|--|
| Mechanic_Sample                               | Mechanic_Sample                                    | Mechanic_Sample                                    |
| Sample Measurement                            | Sample Measurement                                 | Sample Measurement                                 |
| Solvent Extraction of the Sample              | Nonmetallic Material                               | Spot Test / Boiling Water Extraction               |
| Screen Analysis                               | Adding Extraction Solution                         | Adding 1,5-Diphenylcarbazide for Color Development |
| Concentration/Dilution of Extraction Solution | Heating to 90-95°C for Extraction                  | Confirm with UV-Vis                                |
| GC/MS   | Filtration and pH Adjustment                       | DATA   |
| DATA  | Adding 1,5-Diphenylcarbazide for Color Development | DATA   |
|   | UV-Vis   |  |
|   | DATA   |  |

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**Test Report** No. F860101LF-CTSAVA15-23789  
Issued Date : 2015. 05. 19  
Page 7 of 7

**Flow Chart for Halogen Test**

\*\*\* End of Report \*\*\*

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Issued Date : 2015. 05. 19  
Page 7 of 7

**Flow Chart for Halogen Test**

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**3) Marking Ink**

|                     |  |
|---------------------|--|
| Parts Name          | IR/IC-270BK INK                            |
| Tester Organization | SGS Testing KOREA co. Ltd.                 |
| Measurement Tester  | Please see the 'method' in the test report |
| Measurement Data    | Please see the report under the table      |

**测试报告** No. SHAEIC1510713104 日期: 2015年06月09日 第1页,共6页

多米诺标识科技有限公司  
中国上海市浦东金桥出口加工区云桥路1150号

以下测试之样品是由申请者所提供及确认: IR-299BK/IC-299BK 印刷油墨

SGS工作编号: SP15-018441 - SH

料号: IR-299BK/IC-299BK  
型号: AC000132A  
样品接收日期: 2015年06月05日  
测试日期: 2015年06月05日 - 2015年06月09日  
测试要求: 根据客户要求测试  
测试方法: 请参见下一页  
测试结果: 请参见下一页

结论: 基于所送样品进行的测试, 铅、镉、汞、六价铬、多溴联苯(PBBs)、多溴二苯醚(PBDEs)的测试结果符合欧盟RoHS指令2002/95/EC的修订指令2011/65/EU附录II的限值要求。

道标技术服务(上海)有限公司  
授权签名

Helen Liu 刘海鹏  
批准签署人

本报告编号为SHAEIC1510713103报告中文版本。

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**测试报告** No. SHAEIC1510713104 日期: 2015年06月09日 第2页,共6页

测试样品描述:

| 样品编号 | SGS样品ID          | 描述   |
|------|------------------|------|
| SN1  | SHA15-107131.002 | 黑色液体 |

备注:

- (1) 1 mg/kg = 0.0001%
- (2) MDL = 方法检测限
- (3) ND = 未检出 (< MDL)
- (4) "-" = 未规定

RoHS指令2011/65/EU

测试方法: (1) 参考IEC 62321-5:2013, 用ICP-OES测定铅的含量  
(2) 参考IEC 62321-5:2013, 用AAS测定镉的含量  
(3) 参考IEC 62321-4:2013, 用ICP-OES测定汞的含量  
(4) 参考IEC 62321-2:2008, 用紫外-可见分光光度计比色法测定六价铬的含量  
(5) 参考IEC 62321-2:2008, 用GC-MS测定PBBs(多溴联苯)和PBDEs(多溴二苯醚)的含量

| 测试项目           | 限值   | 单位    | MDL | 结果 |
|----------------|------|-------|-----|----|
| 铅(Cd)          | 100  | mg/kg | 2   | ND |
| 镉(Pb)          | 1000 | mg/kg | 2   | ND |
| 汞(Hg)          | 1000 | mg/kg | 2   | ND |
| 六价铬(CrVI)      | 1000 | mg/kg | 2   | S3 |
| 多溴联苯之和(PBBs)   | 1000 | mg/kg | ND  | ND |
| 一溴联苯           | -    | mg/kg | 5   | ND |
| 二溴联苯           | -    | mg/kg | 5   | ND |
| 三溴联苯           | -    | mg/kg | 5   | ND |
| 四溴联苯           | -    | mg/kg | 5   | ND |
| 五溴联苯           | -    | mg/kg | 5   | ND |
| 六溴联苯           | -    | mg/kg | 5   | ND |
| 七溴联苯           | -    | mg/kg | 5   | ND |
| 八溴联苯           | -    | mg/kg | 5   | ND |
| 九溴联苯           | -    | mg/kg | 5   | ND |
| 十溴联苯           | -    | mg/kg | 5   | ND |
| 多溴二苯醚之和(PBDEs) | 1000 | mg/kg | -   | ND |
| 一溴二苯醚          | -    | mg/kg | 5   | ND |
| 二溴二苯醚          | -    | mg/kg | 5   | ND |

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**测试报告** No. SHAEIC1510713104 日期: 2015年06月09日 第3页,共6页

| 测试项目  | 限值 | 单位    | MDL | 结果 |
|-------|----|-------|-----|----|
| 三溴二苯醚 | -  | mg/kg | 5   | ND |
| 四溴二苯醚 | -  | mg/kg | 5   | ND |
| 五溴二苯醚 | -  | mg/kg | 5   | ND |
| 六溴二苯醚 | -  | mg/kg | 5   | ND |
| 七溴二苯醚 | -  | mg/kg | 5   | ND |
| 八溴二苯醚 | -  | mg/kg | 5   | ND |
| 九溴二苯醚 | -  | mg/kg | 5   | ND |
| 十溴二苯醚 | -  | mg/kg | 5   | ND |

备注: (1) 最大允许限值引用自指令2011/65/EU附录II。

注意: 参照EN 14682:2007方法进行测定, 采用ICP进行分析。

测试方法: 参照EN 14682:2007方法进行测定, 采用ICP进行分析。

| 测试项目  | 单位    | MDL | 结果 |
|-------|-------|-----|----|
| 铅(Pb) | mg/kg | 50  | ND |
| 镉(Cd) | mg/kg | 50  | ND |
| 汞(Hg) | mg/kg | 50  | ND |
| 铜(Cu) | mg/kg | 50  | ND |

备注: 所示结果为液样品总重量中的含量。

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**测试报告** No. SHAEIC1510713104 日期: 2015年06月09日 第4页,共6页

附件

**RoHS 测试流程图**

- 1) 分析人员: 张小波/助理: 李增/廖春霞
- 2) 项目负责人: 崔晋/李增/廖春霞
- 3) 样品按照下述流程被完全溶解 (六价铬和多溴联苯/多溴二苯醚测试除外)。

```

    graph TD
      A[预处理] --> B[萃取]
      B --> C[铅/镉/汞]
      B --> D[多溴联苯/多溴二苯醚]
      B --> E[六价铬]
      C --> C1[用微波消解仪电热板进行溶解]
      C1 --> C2[过滤]
      C2 --> C3[溶液]
      C2 --> C4[滤渣物]
      C3 --> C5[1) 碱熔法/灰化 2) 溶解]
      C5 --> C6[电感耦合等离子体发射光谱仪/原子吸收光谱]
      C6 --> C7[数据]
      D --> D1[用溶剂萃取]
      D1 --> D2[浓缩/稀释萃取液]
      D2 --> D3[过滤]
      D3 --> D4[气相色谱-质谱联用仪]
      D4 --> D5[数据]
      E --> E1[非金属]
      E --> E2[金属]
      E1 --> E1a[加入溶解液]
      E1a --> E1b[在 90-95℃ 条件下萃取]
      E1b --> E1c[过滤, 调整 pH]
      E1c --> E1d[加入 1,5-二苯胺 酰二胺显色]
      E1d --> E1e[紫外-可见分光光度计]
      E1e --> E1f[数据]
      E2 --> E2a[检测]
      E2a --> E2b{点测}
      E2b --> E2c{尖检测}
      E2c --> E2d[沸水萃取]
      E2d --> E2e[加入 1,5-二苯胺 酰二胺显色]
      E2e --> E2f[若显示红色, 表明检测到六价铬, 必要时用紫外-可见分光光度计验证]
      E2f --> E2g[数据]
  
```

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附件

**Halogen(氧弹法)测试流程图**

1) 分析人员: 印宇  
2) 项目负责人: 李丹

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18. Reliability test report - an annexed paper



**19. Shipment Inspection Report**

| 내부   | 발령                   |    |                      | 확인      |                           |     | 승인                   |          |                      | <b>검사성적서</b> |                     |                 |       |    |            | 외부       |  |  |
|--|----------------------|----|----------------------|---------|---------------------------|-----|----------------------|----------|----------------------|--------------|---------------------|-----------------|-------|----|------------|----------|--|--|
|  |                      |    |                      |         |                           |     |                      |          |                      |              |                     |                 |       |    |            |          |  |  |
| 협력회사명  | 주 파 트 론              |    |                      | 부품명     | CHIP Antenna(ODBWPTR5020) |     |                      |          |                      |              | 출고수량                |                 |       |    |            |          |  |  |
| 적용모델   | ODBWPTR5020          |    |                      | CODE NO |                           |     |                      | LOT - NO |                      |              |                     | Ver(버전)         | 1.0   |    |            |          |  |  |
| 검사일  | 파트론                  | 20 |                      | 검사원     | 파트론                       | 안선주 |                      | 종합판정     | 파트론                  | 합격           |                     | 재질              |       |    |            |          |  |  |
|  | 업체                   |    |                      |         | 업체                        |     |                      |          | 업체                   |              |                     | Powder+Ag paste |       |    |            |          |  |  |
| 검사항목   | 검사방식                 |    |                      |         | 검사조건                      |     |                      |          | 시료수                  |              |                     |                 | 불량수   |    |            |          |  |  |
|  | 파트론                  |    | 업체                   |         | 파트론                       |     | 업체                   |          | 파트론                  |              | 업체                  |                 | 파트론   |    | 업체         |          |  |  |
| 외관   | KS Q ISO 2869-1 G-2  |    |                      |         | 0.65 (c=0)                |     |                      |          | n=                   |              |                     |                 | Pn= 0 |    |            |          |  |  |
| 치수   | 체크 검사                |    |                      |         | c=0                       |     |                      |          | n= 20                |              |                     |                 | Pn= 0 |    |            |          |  |  |
| 전기적특성  | KS Q ISO 2869-1 G-2  |    |                      |         | 0.65 (c=0)                |     |                      |          | n=                   |              |                     |                 | Pn= 0 |    |            |          |  |  |
| 유해물질   | 체크 검사                |    |                      |         | c=0                       |     |                      |          | n=1                  |              |                     |                 | Pn= 0 |    |            |          |  |  |
| <b>측정 DATA</b> ※ 검사항목별 검사 수중에 일치된 수량을 검사하고 시트가 20개 이상일 경우 측정DATA는 20개만 지정한다. |                      |    |                      |         |                           |     |                      |          |                      |              |                     |                 |       |    |            |          |  |  |
| 검사항목   | 특성검사                 |    |                      |         | 치수(mm)                    |     |                      |          |                      |              | 외관검사                |                 |       |    | 유해물질       |          |  |  |
|  | 2096MHz<br>1.0 ~ 3.0 |    | 2126MHz<br>1.0 ~ 3.0 |         | L<br>① 5.00<br>±0.10      |     | W<br>② 2.00<br>±0.10 |          | T<br>③ 1.20<br>±0.10 |              | 파손, 미인쇄, 인쇄법질, 변색 등 |                 |       |    | 판정기준에 준함 것 |          |  |  |
| 구분   | 파트론                  | 업체 | 파트론                  | 업체      | 파트론                       | 업체  | 파트론                  | 업체       | 파트론                  | 업체           | 파트론                 | 업체              | 파트론   | 업체 | 파트론        | 업체       |  |  |
| 1  | 1.81                 |    | 1.62                 |         | 5.02                      |     | 2.01                 |          | 1.20                 |              | OK                  |                 |       |    | Cd         | 0        |  |  |
| 2  | 1.74                 |    | 1.60                 |         | 4.99                      |     | 1.99                 |          | 1.21                 |              | OK                  |                 |       | Pb | 1097       | 세라믹 함유Pb |  |  |
| 3  | 1.68                 |    | 1.69                 |         | 5.01                      |     | 2.00                 |          | 1.22                 |              | OK                  |                 |       | Hg | 117        |          |  |  |
| 4  | 1.70                 |    | 1.63                 |         | 4.98                      |     | 2.02                 |          | 1.20                 |              | OK                  |                 |       | Cr | 0          |          |  |  |
| 5  | 1.69                 |    | 1.74                 |         | 5.02                      |     | 1.98                 |          | 1.20                 |              | OK                  |                 |       | Br | 8          |          |  |  |
| 6  | 1.64                 |    | 1.69                 |         | 5.00                      |     | 2.00                 |          | 1.19                 |              | OK                  |                 |       | Cl | 0          |          |  |  |
| 7  | 1.76                 |    | 1.60                 |         | 4.98                      |     | 1.99                 |          | 1.21                 |              | OK                  |                 |       | Sb | 0          |          |  |  |
| 8  | 1.67                 |    | 1.62                 |         | 5.00                      |     | 2.00                 |          | 1.18                 |              | OK                  |                 |       | Sn | 0          |          |  |  |
| 9  | 1.63                 |    | 1.68                 |         | 5.01                      |     | 2.01                 |          | 1.20                 |              | OK                  |                 |       | S  | 0          |          |  |  |
| 10   | 1.62                 |    | 1.63                 |         | 5.03                      |     | 2.00                 |          | 1.17                 |              | OK                  |                 |       |    |            |          |  |  |
| 11   | 1.61                 |    | 1.61                 |         | 4.99                      |     | 2.02                 |          | 1.20                 |              | OK                  |                 |       |    |            |          |  |  |
| 12   | 1.64                 |    | 1.60                 |         | 5.00                      |     | 1.98                 |          | 1.19                 |              | OK                  |                 |       |    |            |          |  |  |
| 13   | 1.83                 |    | 1.64                 |         | 4.99                      |     | 2.01                 |          | 1.21                 |              | OK                  |                 |       |    |            |          |  |  |
| 14   | 1.68                 |    | 1.63                 |         | 5.01                      |     | 1.99                 |          | 1.23                 |              | OK                  |                 |       |    |            |          |  |  |
| 15   | 1.66                 |    | 1.62                 |         | 4.99                      |     | 2.00                 |          | 1.20                 |              | OK                  |                 |       |    |            |          |  |  |
| 16   | 1.68                 |    | 1.61                 |         | 5.02                      |     | 1.98                 |          | 1.19                 |              | OK                  |                 |       |    |            |          |  |  |
| 17   | 1.69                 |    | 1.68                 |         | 5.00                      |     | 2.02                 |          | 1.22                 |              | OK                  |                 |       |    |            |          |  |  |
| 18   | 1.67                 |    | 1.62                 |         | 4.99                      |     | 1.98                 |          | 1.18                 |              | OK                  |                 |       |    |            |          |  |  |
| 19   | 1.68                 |    | 1.69                 |         | 5.02                      |     | 2.00                 |          | 1.19                 |              | OK                  |                 |       |    |            |          |  |  |
| 20   | 1.83                 |    | 1.64                 |         | 4.98                      |     | 1.99                 |          | 1.20                 |              | OK                  |                 |       |    |            |          |  |  |
| X  | 1.67                 |    | 1.62                 |         | 5.00                      |     | 2.00                 |          | 1.20                 |              |                     |                 |       |    |            |          |  |  |
| σ  | 0.09                 |    | 0.06                 |         | 0.02                      |     | 0.01                 |          | 0.01                 |              |                     |                 |       |    |            |          |  |  |
| Cpk  | 2.36                 |    | 3.33                 |         | 2.14                      |     | 2.43                 |          | 2.26                 |              |                     |                 |       |    |            |          |  |  |
| 판정   | OK                   |    | OK                   |         | OK                        |     | OK                   |          | OK                   |              |                     |                 |       |    | OK         |          |  |  |

도면

· 본 검사 LOT는 당사 출하검사 규정에 만족하며 품질을 보증함

|   |               |     |     |     |              |     |     |     |      |      |  |
|---|---------------|-----|-----|-----|--------------|-----|-----|-----|------|------|--|
| <b>RoHS</b><br>REACH<br>Sb-F<br>Antimony-Free | 유기물 (단위: ppm) |     |     |     |              |     |     |     |      |      |  |
|   | RoHS-Free     |     |     |     | Halogen-free |     |     | 안티몬 | 유기추석 | TVOG |  |
|   | Cd            | Pb  | Hg  | Cr  | Br           | Cl  | Sb  | Sn  | TVOG | TVOG |  |
| 판정기준  | 50            | 200 | 700 | 700 | 900          | 900 | 700 | 900 | 16   |      |  |

· 대 표 이 사 김 영 구 (인)