

# SEONG JI / SRM200A

Monarch Quad-mode Module

P/N: WSSRM200A00

DATA SHEET Rev0.0

**SEONG JI INDUSTRIAL CO., LTD**

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Rep. of Korea

<http://www.seongji.co.kr>

**▶ CONTENTS**

|   |    |
|---|----|
| <b>1. Approval Revision Record</b> .....                                | 3  |
| <b>2. Scope</b> .....   | 4  |
| <b>3. Numbering of product</b> .....                                    | 4  |
| 3-1. Product .....  | 4  |
| 3-2. Part No. ....  | 4  |
| 3-3. Lot. No. ....  | 5  |
| <b>4. Absolute Maximum Ratings</b> .....                                | 6  |
| <b>5. DC Characteristics</b> .....                                      | 6  |
| <b>6. I/O Specifications</b> .....                                      | 6  |
| <b>7. Specifications</b> .....  | 6  |
| 7-1. Sigfox.....  | 6  |
| 7-1-1. Electrical Specification .....                                   | 6  |
| 7-1-2. Receiver, Transmitter Specification .....                        | 7  |
| 7-2. BLE .....  | 8  |
| 7-2-1. Electrical Specification .....                                   | 8  |
| 7-2-2. Receiver, Transmitter Specification .....                        | 8  |
| 7-3. WiFi .....   | 9  |
| 7-3-1. Electrical Specification .....                                   | 9  |
| 7-3-2. Receiver Specification .....                                     | 9  |
| 7-3-3. Transmitter Specification .....                                  | 10 |
| 7-4. GPS.....   | 11 |
| 7-4-1. Module Specification .....                                       | 11 |
| 7-5. NFC .....  | 12 |
| 7-5-1. Electrical Specification .....                                   | 12 |
| <b>8. Pin Description</b> .....   | 13 |
| 8-1. Interface PIN(SMD Type : 60 Pin) Top view .....                    | 13 |
| 8-2. Interface PIN description .....                                    | 14 |
| <b>8-2-1. Hardware connection for RF Regulatory Certification</b> ..... | 15 |
| 8-2-2. WIFI status PIN.....   | 16 |
| 8-2-3. Sigfox status PIN .....  | 16 |
| 8-2-4. I2C Master for external sensors.....                             | 16 |
| 8-2-5. I2C Slave for debug .....  | 16 |
| 8-2-6. Two-pin Serial Wire Debug (SWD) interface .....                  | 16 |
| 8-2-7. GPIOs .....  | 17 |
| 8-2-8. NFC.....   | 17 |
| 8-2-9. Reset Pin .....  | 17 |
| <b>9. Block Diagram</b> .....   | 17 |
| <b>10. Dimensions &amp; drawing</b> .....                               | 18 |
| 10-1. Design dimension.....   | 18 |
| 10-2. Recommend Foot print.....   | 18 |
| <b>11. Reflow profile</b> .....   | 20 |
| <b>12. Package</b> .....  | 21 |
| 12-1. Dimension of Tape.....  | 21 |
| 12-2. Dimension of Reel .....   | 21 |
| 12-3. IN BOX .....  | 22 |
| 12-4. OUT BOX .....   | 22 |
| 12-5. IN BOX Label .....  | 23 |
| 12-6. OUT BOX Label .....   | 23 |

**1. Approval Revision Record**

| NO | REVISION | RECORD OF REVISION           | Date       | Remark |
|----|----------|------------------------------|------------|--------|
| 1  | REV 0.0  | WSSRM200A00 Initial Releases | 2019-12-01 | -      |

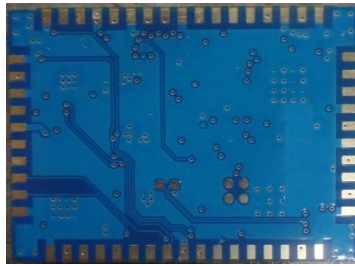
## 2. Scope

- Description
  - Sigfox Configuration RC1, RC2, RC3, RC4, RC5, RC6
  - WIFI (2.4GHz) : Supports 802.11 b/g/n.
  - BLE : Support version BT4.2.
  - NFC : Type 2 near field communication (NFC-A) tag with wakeup-on-field and touch to-pair capabilities.
  - GPS : Supports GPS and GLONASS.
  - Accelerometer :  $\pm 2g/\pm 4g/\pm 8g$  dynamically selectable full-scale.
- Type : SMD Type
- PBA Size : 29mm(W) x 21mm(L) x 2.3mm(H)

This module has completed SIGFOX P1 verification and ETSI, FCC, IC, Telec and KC RF regulatory certification.

## 3. Numbering of product

### 3-1. Product



### 3-2. Part No.

|          |          |          |          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>W</b> | <b>S</b> | <b>S</b> | <b>R</b> | <b>M</b> | <b>2</b> | <b>0</b> | <b>0</b> | <b>A</b> | <b>0</b> | <b>0</b> |
| (1)      | (2)      | (3)      | (4)      | (5)      | (6)      | (7)      | (8)      | (9)      | (10)     | (11)     |

| No.         | EXPLANATION                         |
|-------------|-------------------------------------|
| (1),(2)     | Product Type(WS:Wireless Solution)  |
| (3)         | Application(S:Sigfox)               |
| (4)         | Application(R:Roaming)              |
| (5)         | Type(M:Module)                      |
| (6),(7),(8) | Group model(200: Quad mode)         |
| (9)         | Derived model : Sub Part(A:Default) |
| (10),(11)   | Managed Code : Default(00)          |

3-3. Lot. No.

|          |          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>S</b> | <b>A</b> | <b>C</b> | <b>J</b> | <b>A</b> | <b>2</b> | <b>1</b> | <b>0</b> | <b>1</b> |
| (1)      | (2)      | (3)      | (4)      | (5)      | (6)      | (7)      | (8)      | (9)      |

|             |  |             |         |      |      |      |       |       |         |      |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
|-------------|--|-------------|---------|------|------|------|-------|-------|---------|------|------|------|------|------|------|---|---|---|---|---|---|---|---|---|---|-----|----|----|----|----|----|----|----|----|----|----|--|------|---|---|---|---|---|---|---|---|---|---|--|-----|----|----|----|----|----|----|----|----|----|----|----|------|---|---|---|---|---|---|---|---|---|---|---|
| (1)         | Sigfox Module  |             |         |      |      |      |       |       |         |      |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| (2)         | Manufacture Area<br><table border="1" style="margin-left: 20px;"> <tr> <td style="text-align: center;">Packing Lot</td> <td style="text-align: center;">A</td> <td style="text-align: center;">B</td> <td style="text-align: center;">C</td> </tr> <tr> <td style="text-align: center;">Area</td> <td style="text-align: center;">Korea</td> <td style="text-align: center;">China</td> <td style="text-align: center;">Vietnam</td> </tr> </table>  | Packing Lot | A       | B    | C    | Area | Korea | China | Vietnam |      |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Packing Lot | A  | B           | C       |      |      |      |       |       |         |      |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Area        | Korea  | China       | Vietnam |      |      |      |       |       |         |      |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| (3)         | Year<br><table border="1" style="margin-left: 20px;"> <tr> <td style="text-align: center;">Year</td> <td style="text-align: center;">2018</td> <td style="text-align: center;">2019</td> <td style="text-align: center;">2020</td> <td style="text-align: center;">2021</td> <td style="text-align: center;">2022</td> <td style="text-align: center;">2023</td> <td style="text-align: center;">2024</td> <td style="text-align: center;">2025</td> <td style="text-align: center;">2026</td> <td style="text-align: center;">2027</td> </tr> <tr> <td style="text-align: center;">Mark</td> <td style="text-align: center;">E</td> <td style="text-align: center;">F</td> <td style="text-align: center;">G</td> <td style="text-align: center;">H</td> <td style="text-align: center;">I</td> <td style="text-align: center;">J</td> <td style="text-align: center;">K</td> <td style="text-align: center;">L</td> <td style="text-align: center;">M</td> <td style="text-align: center;">N</td> </tr> </table>   | Year        | 2018    | 2019 | 2020 | 2021 | 2022  | 2023  | 2024    | 2025 | 2026 | 2027 | Mark | E    | F    | G | H | I | J | K | L | M | N |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Year        | 2018   | 2019        | 2020    | 2021 | 2022 | 2023 | 2024  | 2025  | 2026    | 2027 |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Mark        | E  | F           | G       | H    | I    | J    | K     | L     | M       | N    |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| (4)         | Month<br><table border="1" style="margin-left: 20px;"> <tr> <td style="text-align: center;">Month</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> <td style="text-align: center;">9</td> <td style="text-align: center;">10</td> <td style="text-align: center;">11</td> <td style="text-align: center;">12</td> </tr> <tr> <td style="text-align: center;">Mark</td> <td style="text-align: center;">A</td> <td style="text-align: center;">B</td> <td style="text-align: center;">C</td> <td style="text-align: center;">D</td> <td style="text-align: center;">E</td> <td style="text-align: center;">F</td> <td style="text-align: center;">G</td> <td style="text-align: center;">H</td> <td style="text-align: center;">I</td> <td style="text-align: center;">J</td> <td style="text-align: center;">K</td> <td style="text-align: center;">L</td> </tr> </table>  | Month       | 1       | 2    | 3    | 4    | 5     | 6     | 7       | 8    | 9    | 10   | 11   | 12   | Mark | A | B | C | D | E | F | G | H | I | J | K   | L  |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Month       | 1  | 2           | 3       | 4    | 5    | 6    | 7     | 8     | 9       | 10   | 11   | 12   |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Mark        | A  | B           | C       | D    | E    | F    | G     | H     | I       | J    | K    | L    |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| (5)         | Day<br><table border="1" style="margin-left: 20px;"> <tr> <td style="text-align: center;">Day</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> <td style="text-align: center;">9</td> <td style="text-align: center;">10</td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">Mark</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">7</td> <td style="text-align: center;">8</td> <td style="text-align: center;">9</td> <td style="text-align: center;">A</td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">Day</td> <td style="text-align: center;">11</td> <td style="text-align: center;">12</td> <td style="text-align: center;">13</td> <td style="text-align: center;">14</td> <td style="text-align: center;">15</td> <td style="text-align: center;">16</td> <td style="text-align: center;">17</td> <td style="text-align: center;">18</td> <td style="text-align: center;">19</td> <td style="text-align: center;">20</td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">Mark</td> <td style="text-align: center;">B</td> <td style="text-align: center;">C</td> <td style="text-align: center;">D</td> <td style="text-align: center;">E</td> <td style="text-align: center;">F</td> <td style="text-align: center;">G</td> <td style="text-align: center;">H</td> <td style="text-align: center;">I</td> <td style="text-align: center;">J</td> <td style="text-align: center;">K</td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">Day</td> <td style="text-align: center;">21</td> <td style="text-align: center;">22</td> <td style="text-align: center;">23</td> <td style="text-align: center;">24</td> <td style="text-align: center;">25</td> <td style="text-align: center;">26</td> <td style="text-align: center;">27</td> <td style="text-align: center;">28</td> <td style="text-align: center;">29</td> <td style="text-align: center;">30</td> <td style="text-align: center;">31</td> </tr> <tr> <td style="text-align: center;">Mark</td> <td style="text-align: center;">L</td> <td style="text-align: center;">M</td> <td style="text-align: center;">N</td> <td style="text-align: center;">O</td> <td style="text-align: center;">P</td> <td style="text-align: center;">Q</td> <td style="text-align: center;">R</td> <td style="text-align: center;">S</td> <td style="text-align: center;">T</td> <td style="text-align: center;">U</td> <td style="text-align: center;">V</td> </tr> </table> | Day         | 1       | 2    | 3    | 4    | 5     | 6     | 7       | 8    | 9    | 10   |      | Mark | 1    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A |   | Day | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |  | Mark | B | C | D | E | F | G | H | I | J | K |  | Day | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Mark | L | M | N | O | P | Q | R | S | T | U | V |
| Day         | 1  | 2           | 3       | 4    | 5    | 6    | 7     | 8     | 9       | 10   |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Mark        | 1  | 2           | 3       | 4    | 5    | 6    | 7     | 8     | 9       | A    |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Day         | 11   | 12          | 13      | 14   | 15   | 16   | 17    | 18    | 19      | 20   |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Mark        | B  | C           | D       | E    | F    | G    | H     | I     | J       | K    |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Day         | 21   | 22          | 23      | 24   | 25   | 26   | 27    | 28    | 29      | 30   | 31   |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| Mark        | L  | M           | N       | O    | P    | Q    | R     | S     | T       | U    | V    |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| (6), (7)    | Group Model  |             |         |      |      |      |       |       |         |      |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |
| (8), (9)    | A Serial Number (00,01,02...1serial: 600ea)  |             |         |      |      |      |       |       |         |      |      |      |      |      |      |   |   |   |   |   |   |   |   |   |   |     |    |    |    |    |    |    |    |    |    |    |  |      |   |   |   |   |   |   |   |   |   |   |  |     |    |    |    |    |    |    |    |    |    |    |    |      |   |   |   |   |   |   |   |   |   |   |   |

#### 4. Absolute Maximum Ratings

| Symbol | Parameter                   | Rating      | Unit |
|--------|-----------------------------|-------------|------|
| VCC    | Module input voltage        | 3.6         | V    |
| OT     | Operating Temperature       | -30 to +85  | °C   |
| ST     | Storage Temperature         | -40 to +125 | °C   |
| Ves    | Electrostatic handling(HBM) | +/-2000     | V    |

#### 5. DC Characteristics

| Symbol | Parameter            | Min | Typ. | Max | Unit |
|--------|----------------------|-----|------|-----|------|
| VCC    | Module input voltage | 3.0 | 3.3  | 3.6 | V    |

#### 6. I/O Specifications

| Symbol | Parameter                | Min | Typ. | Max | Unit |
|--------|--------------------------|-----|------|-----|------|
| VCC    | supply voltage           |     | 3.3  | 3.6 | V    |
| VIH    | High level input voltage | 2.1 |      |     | V    |
| VIL    | Low level input voltage  |     |      | 0.9 | V    |

#### 7. Specifications

##### 7-1. Sigfox

##### 7-1-1. Electrical Specification

Conditions: VCC=3.3V, Temp=25 °C

| Parameter |                                 | Min | Typ. | Max | Unit |
|-----------|---------------------------------|-----|------|-----|------|
| Current   | Tx Current(@+14.5dBm,CW)RC1,RC6 |     | 32   |     | mA   |
|           | Tx Current(@+13.0dBm,CW)RC3,RC5 |     | 28   |     | mA   |
|           | Tx Current(@+23.5dBm,CW)RC2,RC4 |     | 230  |     | mA   |
|           | RX Current                      |     | 18.5 |     | mA   |
|           | Sleep Current                   |     | 30   |     | uA   |

## 7-1-2. Receiver, Transmitter Specification

Conditions: VCC=3.3V, Temp=25°C

| Parameter                            |          | Min | Typ.    | Max     | Unit    |     |
|--------------------------------------|----------|-----|---------|---------|---------|-----|
| RF Frequency Range                   | RC1      | Tx  | 868.034 | 868.130 | 868.226 | MHz |
|                                      |          | Rx  | 869.429 | 869.525 | 869.621 | MHz |
|                                      | RC2      | Tx  | 902.104 | 902.200 | 902.296 | MHz |
|                                      |          | Rx  | 905.104 | 905.200 | 905.296 | MHz |
|                                      | RC3      | Tx  | 923.104 | 923.200 | 923.296 | MHz |
|                                      |          | Rx  | 922.104 | 922.200 | 922.296 | MHz |
|                                      | RC4      | Tx  | 920.704 | 920.800 | 920.896 | MHz |
|                                      |          | Rx  | 922.204 | 922.300 | 922.396 | MHz |
|                                      | RC5      | Tx  | 923.004 | 923.100 | 923.196 | MHz |
|                                      |          | Rx  | 922.004 | 922.100 | 922.196 | MHz |
|                                      | RC6      | Tx  | 865.104 | 865.200 | 865.296 | MHz |
|                                      |          | Rx  | 866.204 | 866.300 | 866.396 | MHz |
| Tx output power                      | RC1, RC6 |     | +12.5   | +14.5   | -       | dBm |
|                                      | RC2, RC4 |     | +21.5   | +23.5   | -       | dBm |
|                                      | RC3, RC5 |     | +11.0   | +13.0   | -       | dBm |
| Frequency Error Tolerance(+25°C)     |          |     | -3.0    | -       | +3.0    | ppm |
| 2 <sup>nd</sup> Harmonics(conducted) |          |     | -       | -45     | -35     | dBm |
| 3 <sup>nd</sup> Harmonics(conducted) |          |     | -       | -53     | -35     | dBm |
| Rx Sensitivity(@600bps, GFSK)        |          |     | -       | -       | -123    | dBm |
| Rx Spurious Emission(30MHz~12.75GHz) |          |     | -       | -       | -54     | dBm |

**7-2. BLE**
**7-2-1. Electrical Specification**

Conditions: VCC=3.3V, Temp=25°C

| Parameter           |                  | Min | Typ. | Max | Unit |
|---------------------|------------------|-----|------|-----|------|
| Target Power for TX |                  |     |      |     |      |
| BLE                 | Tx mode, Cont.Tx |     | 14   |     | mA   |
|                     | Rx mode          |     | 13   |     | mA   |

**7-2-2. Receiver, Transmitter Specification**

Conditions: VCC=3.3V, Temp=25°C

| Parameter  |                                    | Min   | Typ.  | Max   | Unit |
|--|------------------------------------|-------|-------|-------|------|
| RF Characteristics                                     |                                    |       |       |       |      |
| RF Frequency Range                                     |                                    | 2.402 | -     | 2.480 | GHz  |
| Output Power [TRM-LE/CA/01/C]                          |                                    | -1.0  | 3.0   | 7     | dBm  |
| In Band Emission[TRM-LE/CA/03/C]<br>±2MHz offset       |                                    |       |       | -20   | dBm  |
| ±3MHz offset   |                                    |       |       | -30   |      |
| Modulation Characteristics<br>[TRM-LE/CA/05/C]         | Delta F1 Avg.                      | 225   | -     | 275   | KHz  |
|  | Delta F2 Max.                      | 185   | -     | -     | KHz  |
|  | Delta F2 Avg/F1 Avg                | 0.8   | -     | -     | -    |
| Carrier Frequency Offset and Drift<br>[TRM-LE/CA/06/C] | Initial Center Frequency Tolerance | -50   | -     | 50    | KHz  |
|  | Fn  Max.                           | -150  | -     | 150   | KHz  |
|  | F0 -Fn  Max.                       | -     | -     | 50    | KHz  |
|  | F1 – F0                            | -     | -     | 20    | KHz  |
|  | Fn = Fn-5  max.                    | -     | -     | 20    | KHz  |
| Receiver Sensitivity [PER<30.8%, 1500packets]          |                                    | -     | -93.5 | -70   | dBm  |
| Maximum input lever [PER<30.8%, 1500packets]           |                                    | -10   | 0     |       | dBm  |



**7-3. WiFi**
**7-3-1. Electrical Specification**

Conditions: VCC=3.3V, Temp=25 °C

| Parameter                  |                             | Min | Typ. | Max | Unit |
|----------------------------|-----------------------------|-----|------|-----|------|
| <b>Target Power for TX</b> |                             |     |      |     |      |
| 2.4GHz                     | Tx mode, Cont.Tx@11M        |     | 215  |     | mA   |
|                            | Tx mode, Cont.Tx@54M        |     | 155  |     | mA   |
|                            | Tx mode, Cont.Tx@HT20 MCS7  |     | 156  |     | mA   |
|                            | Rx mode, Cont. Rx@11M       |     | 77   |     | mA   |
|                            | Rx mode, Cont. Rx@54M       |     | 77   |     | mA   |
|                            | Rx mode, Cont. Rx@HT20 MCS7 |     | 77   |     | mA   |

Note: The above mentioned values have been obtained according to our own measuring methods and may very depend on the circuit, in which the component is actually incorporated. Therefore, you are kindly requested to test the performance of the component actually in your set.

**7-3-2. Receiver Specification**

Conditions: VCC=3.3V, Temp=25 °C

| Parameter   | Conditions                       | Min | Typ. | Max | Unit |
|---|----------------------------------|-----|------|-----|------|
| <b>Minimum Receiver Sensitivity in 802.11b mode</b> |                                  |     |      |     |      |
| 1Mbps   | PER<8%, Packet size = 1024bytes  | -   | -95  | -80 | dBm  |
| 2Mbps   |                                  | -   | -91  | -80 | dBm  |
| 5.5Mbps   |                                  | -   | -84  | -76 | dBm  |
| 11Mbps  |                                  | -   | -84  | -76 | dBm  |
| <b>Minimum Receiver Sensitivity in 802.11g mode</b> |                                  |     |      |     |      |
| 6Mbps   | PER<10%, Packet size = 1024bytes | -   | -89  | -82 | dBm  |
| 9Mbps   |                                  | -   | -88  | -81 | dBm  |
| 12Mbps  |                                  | -   | -87  | -79 | dBm  |
| 18Mbps  |                                  | -   | -85  | -77 | dBm  |
| 24Mbps  |                                  | -   | -82  | -74 | dBm  |
| 36Mbps  |                                  | -   | -79  | -70 | dBm  |
| 48Mbps  |                                  | -   | -74  | -66 | dBm  |
| 54Mbps  |                                  | -   | -72  | -65 | dBm  |
| <b>Minimum Receiver Sensitivity in 802.11n mode</b> |                                  |     |      |     |      |
| HT20, MCS7  | PER<10%                          | -   | -70  | -64 | dBm  |
| <b>Maximum Input Signal Level</b>                   |                                  |     |      |     |      |
| 802.11b mode  | PER<8%                           | -10 | -    | -   | dBm  |
| 802.11g mode  | PER<10%                          | -20 | -    | -   | dBm  |

|   |                                  |     |   |   |     |
|---|----------------------------------|-----|---|---|-----|
| 802.11n mode  | PER<10%                          | -20 | - | - | dBm |
| <b>Adjacent channel rejection (ACR) in 802.11b mode</b> |                                  |     |   |   |     |
| 1Mbps   | PER<8%, Packet size = 1024bytes  | 35  | - | - | dB  |
| 2Mbps   |                                  | 35  | - | - | dB  |
| 5.5Mbps   |                                  | 35  | - | - | dB  |
| 11Mbps  |                                  | 35  | - | - | dB  |
| <b>Adjacent channel rejection (ACR) in 802.11g mode</b> |                                  |     |   |   |     |
| 6Mbps   | PER<10%, Packet size = 1024bytes | 16  | - | - | dB  |
| 9Mbps   |                                  | 15  | - | - | dB  |
| 12Mbps  |                                  | 13  | - | - | dB  |
| 18Mbps  |                                  | 11  | - | - | dB  |
| 24Mbps  |                                  | 8   | - | - | dB  |
| 36Mbps  |                                  | 4   | - | - | dB  |
| 48Mbps  |                                  | 0   | - | - | dB  |
| 54Mbps  |                                  | -1  | - | - | dB  |
| <b>Adjacent channel rejection (ACR) in 802.11n mode</b> |                                  |     |   |   |     |
| MCS0  | PER<10%                          | 16  | - | - | dB  |
| MCS7  |                                  | -2  | - | - | dB  |

### 7-3-3. Transmitter Specification

The WiFi output power of the SRM200A module is set as the below table value.  
The output power set in the SRM200A module is RF regulatory certification based on the SEONGJI reference board and the external antenna (INNO-LINK: INNO-EWFSWS-151).  
Refer to "WiFi RF Output Power Control\_ver01" for power control method to increase output power by using internal antenna or chip antenna which is lower efficiency than SEONGJI reference antenna.  
If the output power set in the SRM200A module is changed, WiFi RF regulatory certification of the product is required.

Conditions: VCC=3.3V, Temp=25℃

| Parameter                                       | Conditions                 | Min | Typ. | Max  | Unit |
|---|----------------------------|-----|------|------|------|
| <b>Output Power in 802.11b mode, CCK</b>        |                            |     |      |      |      |
| 1~11Mbps  | As specified in IEEE802.11 | 7.5 | 10   | 12.0 | dBm  |
| <b>Output Power in 802.11g mode, OFDM</b>       |                            |     |      |      |      |
| 6M~54Mbps                                       | As specified in IEEE802.11 | 7.5 | 10   | 12.0 | dBm  |
| <b>Output Power in 802.11n mode, HT20, OFDM</b> |                            |     |      |      |      |
| MCS0~7  | As specified in IEEE802.11 | 7.5 | 10   | 12.0 | dBm  |
| <b>Spectrum mask</b>                            |                            |     |      |      |      |
| Margin to 802.11b/g/n all mode                  | Maximum output power       | 0   | -    | -    | dB   |

| <b>Modulation Accuracy in 802.11b mode</b> |                            |     |   |     |     |
|--|----------------------------|-----|---|-----|-----|
| 1Mbps                                      | As specified in IEEE802.11 | -   | - | 35  | %   |
| 2Mbps                                      |                            | -   | - | 35  | %   |
| 5.5Mbps                                    |                            | -   | - | 35  | %   |
| 11Mbps                                     |                            | -   | - | 35  | %   |
| <b>Modulation Accuracy in 802.11g mode</b> |                            |     |   |     |     |
| 6Mbps                                      | As specified in IEEE802.11 | -   | - | -5  | dB  |
| 9Mbps                                      |                            | -   | - | -8  | dB  |
| 12Mbps                                     |                            | -   | - | -10 | dB  |
| 18Mbps                                     |                            | -   | - | -13 | dB  |
| 24Mbps                                     |                            | -   | - | -16 | dB  |
| 36Mbps                                     |                            | -   | - | -19 | dB  |
| 48Mbps                                     |                            | -   | - | -22 | dB  |
| 54Mbps                                     |                            | -   | - | -25 | dB  |
| <b>Modulation Accuracy in 802.11n mode</b> |                            |     |   |     |     |
| HT20, MCS7                                 | Full packet                | -   | - | -27 | dB  |
| <b>Frequency Tolerance</b>                 |                            |     |   |     |     |
| 802.11b/g/n                                | Operating Temp.            | -25 | 0 | 25  | ppm |

#### 7-4. GPS

##### 7-4-1. Module Specification

Conditions: VCC=3.3V, Temp=25°C

|                                |                |
|--------------------------------|----------------|
| Frequency                      | L1, 1575.42MHz |
| GPS Sensitivity                |                |
| Tracking                       | -158 dBm       |
| Navigation                     | -157 dBm       |
| Acquisition (Cold start)       | -143 dBm       |
| C/N0 <sup>2</sup>              | - 37           |
| Time To First Fix <sup>2</sup> |                |
| Hot Start                      | < 1s           |
| Cold Start                     | < 35s          |

**7-5. NFC**
**7-5-1. Electrical Specification**

| Parameter                                  | Min | Typ.      | Max | Unit |
|--|-----|-----------|-----|------|
| RF Input Frequency                         |     | 13.56     |     | MHz  |
| ISO-14443A                                 |     |           |     |      |
| Carrier modulation index                   | 95  |           |     | %    |
| Data Rate                                  |     | 106       |     | Kbps |
| Modulation sub carrier frequency           |     | 13.56 /16 |     | MHz  |
| NFC Reader                                 | Min | Typ.      | Max | Unit |
| ACR122U (ACS) <sup>1</sup> reading range   | 40  |           |     | mm   |
| Dragon (DUAL I) <sup>2</sup> reading range | 50  |           |     | mm   |

1.Measurement NFC reader

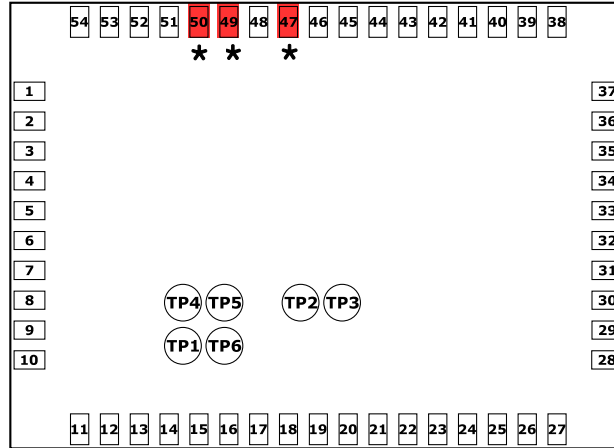
<sup>1</sup>ACR122U: <http://www.acs.com.hk/en/products/3/acr122u-usb-nfc-reader/>

<sup>2</sup>Dragon: <http://duali.com/eng/nfc-product/nfc-reader/nfc-desktop-readers.html>

2. Demonstrated with a reference antenna included in the EVK.

## 8. Pin Description

### 8-1. Interface PIN(SMD Type : 60 Pin) Top view



| NO | PIN NAME        | NO | PIN NAME     | NO  | PIN NAME             |
|----|-----------------|----|--------------|-----|----------------------|
| 1  | STATE_LINK_WIFI | 22 | I2C0_SCL_DBG | 43  | GND                  |
| 2  | STATE_WORK_WIFI | 23 | STATE0       | 44  | NFC2                 |
| 3  | NC              | 24 | WKUP         | 45  | NFC1                 |
| 4  | GND             | 25 | SWCLK_SFX    | 46  | GND                  |
| 5  | GPS_RF          | 26 | SWDIO_SFX    | 47  | DL_EN/INT_WIFI *     |
| 6  | GND             | 27 | GND          | 48  | NRST_SFX             |
| 7  | VDD_MAIN_3P0    | 28 | GND          | 49  | UART0_RX_WIFI *      |
| 8  | V_BCKP_GPS      | 29 | STATE_RF_SFX | 50  | UART0_TX_WIFI *      |
| 9  | VDD_GPS         | 30 | DIO7/BOOT    | 51  | VDD_WIFI             |
| 10 | GND             | 31 | SWDCLK       | 52  | GND                  |
| 11 | GND             | 32 | SWDIO        | 53  | WIFI_RF              |
| 12 | INT1_ACC        | 33 | VDD_SFX      | 54  | GND                  |
| 13 | I2C1_SDA_ACC    | 34 | NRST         | TP1 | NC (VDD USB For GPS) |
| 14 | I2C1_SCL_ACC    | 35 | GND          | TP2 | NC (USB DM For GPS)  |
| 15 | I2C1_SCL_BLE    | 36 | SIGFOX_RF    | TP3 | NC (USB DP For GPS)  |
| 16 | I2C_SDA_BLE     | 37 | GND          | TP4 | NC (GND for GPS)     |
| 17 | DIO13           | 38 | GND          | TP5 | NC                   |
| 18 | BATT            | 39 | AIN1         | TP6 | NC                   |
| 19 | GND             | 40 | AIN0         |     |                      |
| 20 | 2ND_POW_EN      | 41 | GND          |     |                      |
| 21 | I2C0_SDA_DBG    | 42 | BLE_RF       |     |                      |

\* In case of RF regulatory certification, connect to external connector or Test-point to download WiFi test firmware. For details, refer to "8-2-1 Hardware connection for RF Regulatory Certification".

**8-2. Interface PIN description**

| NO.  | PIN NAME        | TYPE | DESCRIPTION   |
|--|-----------------|------|---|
| 1  | STATE_LINK_WIFI | O    | WiFi Link state, 0: unlinked 1: linked  |
| 2  | STATE_WORK_WIFI | O    | WiFi working state, 0: not working 1: working   |
| 3  | NC              |      | Not connect   |
| 4,6,10,11,19,<br>27,28,35,37,38,<br>41,43,46,52,54 | GND             | P    | Ground  |
| 5  | GPS_RF          | RF   | GPS RF Input  |
| 7  | VDD_MAIN_3P0    | P/I  | Supply 3.0V ~ 3.6V  |
| 8  | V_BCKP_GPS      | P/I  | GPS backup power  |
| 9  | VDD_GPS         | P/O  | GPS Power   |
| 12   | INT1_ACC        | I    | Accelerometer interrupt   |
| 13   | I2C1_SDA_ACC*   |      | Accelerometer Side, connect pin16(I2C1_SDA_BLE)   |
| 14   | I2C1_SCL_ACC*   |      | Accelerometer Side, connect pin15(I2C1_SCL_BLE)   |
| 15   | I2C1_SCL_BLE*   |      | BLE(CPU) Side, connect to pin14(I2C1_SCL_ACC)   |
| 16   | I2C1_SDA_BLE*   |      | BLE(CPU) Side, connect to pin13(I2C1_SDA_ACC)   |
| 17   | DIO13           | I/O  | General purpose I/O BlueNRG   |
| 18   | BATT            | P/I  | Supply 3.0V ~ 3.6V  |
| 20   | 2ND_POW_EN      | O    | Secondary DCDC power enable   |
| 21   | I2C0_SDA_DBG    |      | Module Debugging port for I2C.<br><b>It must be connected to an external connector or TP for use in RF regulatory certifications.</b>                 |
| 22   | I2C0_SCL_DBG    |      | Module Debugging port for I2C.<br><b>It must be connected to an external connector or TP for use in RF regulatory certifications.</b>                 |
| 23   | STATE0          | O    | Indicate module(BLE) state  |
| 24   | WKUP            | I    | Module Wake-up from sleep state   |
| 25   | SWCLK_SFX       | I    | Sigfox BlueNRG SW Clock input for programming   |
| 26   | SWDIO_SFX       | I/O  | Sigfox BlueNRG SWD I/O for programming  |
| 29   | STATE_RF_SFX    | O    | Sigfox RF state output  |
| 30   | DIO7/BOOT       | I    | Bootloader pin, General purpose digital I/O   |
| 31   | SWDCLK          | I    | BLE SWD clock input for debug and programming.<br><b>It must be connected to an external connector or TP for use in RF regulatory certifications.</b> |
| 32   | SWDIO           | I/O  | BLE SWD I/O for debug and programming.<br><b>It must be connected to an external connector or TP for use in RF regulatory certifications.</b>         |
| 33   | VDD_SFX         | P/O  | Sigfox Power output   |
| 34   | NRST            | I    | BLE Reset , Main reset , active low   |

|     |                |     |  |
|-----|----------------|-----|--|
| 36  | SIGFOX_RF      | RF  | Sigfox RF In/Out   |
| 39  | AIN1           | I/O | Analog input, General purpose I/O  |
| 40  | AIN0           | I/O | Analog input, General purpose I/O  |
| 42  | BLE_RF         | RF  | BLE RF In/Out  |
| 44  | NFC2           | I/O | NFC antenna connection , General purpose I/O   |
| 45  | NFC1           | I/O | NFC antenna connection , General purpose I/O   |
| 47  | DL_EN/INT_WIFI | I   | WiFi Download enable , active high.<br><b>It must be connected to an external connector or TP for use in RF regulatory certifications.</b> |
| 48  | NRST_WIFI      | I   | WiFi Reset , do not connect  |
| 49  | UART0_RX_WIFI  | I   | WiFi Download<br><b>It must be connected to an external connector or TP for use in RF regulatory certifications.</b>                       |
| 50  | UART0_TX_WIFI  | O   | WiFi Download<br><b>It must be connected to an external connector or TP for use in RF regulatory certifications.</b>                       |
| 51  | VDD_WIFI       | P/O | WiFi Power output  |
| 53  | WIFI_RF        | RF  | WiFi RF In/Out   |
| TP1 | NC             |     | Internal connection  |
| TP2 | NC             |     | Internal connection  |
| TP3 | NC             |     | Internal connection  |
| TP4 | NC             |     | Internal connection  |
| TP5 | NC             |     | Internal connection  |
| TP6 | NC             |     | Internal connection  |

- To use internal accelerometer sensor, connect pin 13 to pin 16 and pin 14 to pin 15.
- Slave address of internal accelerometer is 0x18(7bit)
- External I<sup>2</sup>C devices can be connected to pin 15 and 16.

### 8-2-1. Hardware connection for RF Regulatory Certification

When performing RF certification on products using the SRM200A module, you must have the following hardware connections to control each RF block and download the test-firmware.

#### - WiFi control and firmware download

The specified test-firmware must be downloaded to the internal flash memory of the SRM200A module and controlled using the AT command to RF certification proceed. Hardware pin47, pin49 and pin50 must be connected to an external connector or test-point.

#### - Sigfox, BLE, GPS control

There is no need to download a test-firmware, and one of the two below must be connected to an external connector or test-point to control the RF block.

[Case 1]

The SWD(pin31 and pin32) port can be used to control Sigfox, BLE and GPS.  
However, JTAG equipment such as J-link is required.

[Case 2]

The I2C(pin21 and pin22) port can be used to control Sigfox, BLE and GPS.  
However, I2C to USB converter is required.

8-2-2. WIFI status PIN

- STATE\_LINK\_WIFI : TBD
- STATE\_WORK\_WIFI : WIFI Scan State (0: not working 1: working)

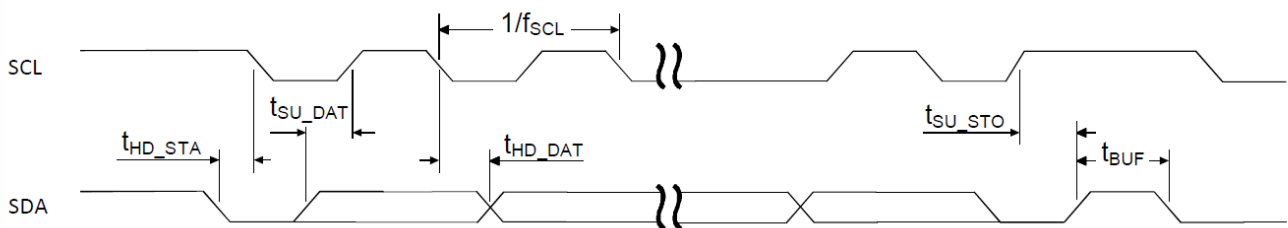
8-2-3. Sigfox status PIN

- STATE\_RF\_SFX: Sigfox RF state output

8-2-4. I2C Master for external sensors

- The TWI master is compatible with I2C operating at 100 kHz and 400 kHz.

| Symbol                 | Description   | Min.  | Typ. | Max. | Units |
|------------------------|---|-------|------|------|-------|
| $f_{TWI,SCL,100k}$     | SCL clock frequency, 100 kbps                                     |       | 100  |      | kHz   |
| $f_{TWI,SCL,400k}$     | SCL clock frequency, 400 kbps                                     |       | 400  |      | kHz   |
| $t_{TWI,SU\_DAT}$      | Data setup time before positive edge on SCL – all modes           | 300   |      |      | ns    |
| $t_{TWI,HD\_DAT}$      | Data hold time after negative edge on SCL – all modes             | 500   |      |      | ns    |
| $t_{TWI,HD\_STA,100k}$ | TWI master hold time for START and repeated START condition, 100k | 10000 |      |      | ns    |
| $t_{TWI,HD\_STA,400k}$ | TWI master hold time for START and repeated START condition, 400k | 2500  |      |      | ns    |
| $t_{TWI,SU\_STO,100k}$ | TWI master setup time from SCL high to STOP condition, 100k       | 5000  |      |      | ns    |
| $t_{TWI,SU\_STO,400k}$ | TWI master setup time from SCL high to STOP condition, 400k       | 1250  |      |      | ns    |
| $t_{TWI,BUF,100k}$     | TWI master bus free time between STOP and START conditions, 100k  | 5800  |      |      | ns    |
| $t_{TWI,BUF,400k}$     | TWI master bus free time between STOP and START conditions, 400k  | 2100  |      |      | ns    |



TWI timing diagram, 1 byte transaction

8-2-5. I2C Slave for debug

- Up to 400Khz

8-2-6. Two-pin Serial Wire Debug (SWD) interface

- The debug and trace system offers a flexible and powerful mechanism for non-intrusive debugging. The main features of the debug and trace system are:
  - . Two-pin Serial Wire Debug (SWD) interface
  - . Flash Patch and Breakpoint Unit (FPB) supports:
    - . Two literal comparators
    - . Six instruction comparators
  - . Data Watchpoint and Trace Unit (DWT)
    - . Four comparators
  - . Instrumentation Trace Macrocell (ITM)
  - . Embedded Trace Macrocell (ETM)



8-2-7. GPIOs

- support 4 GPIO  
STATE0  
WKUP  
AIN1  
AIN0

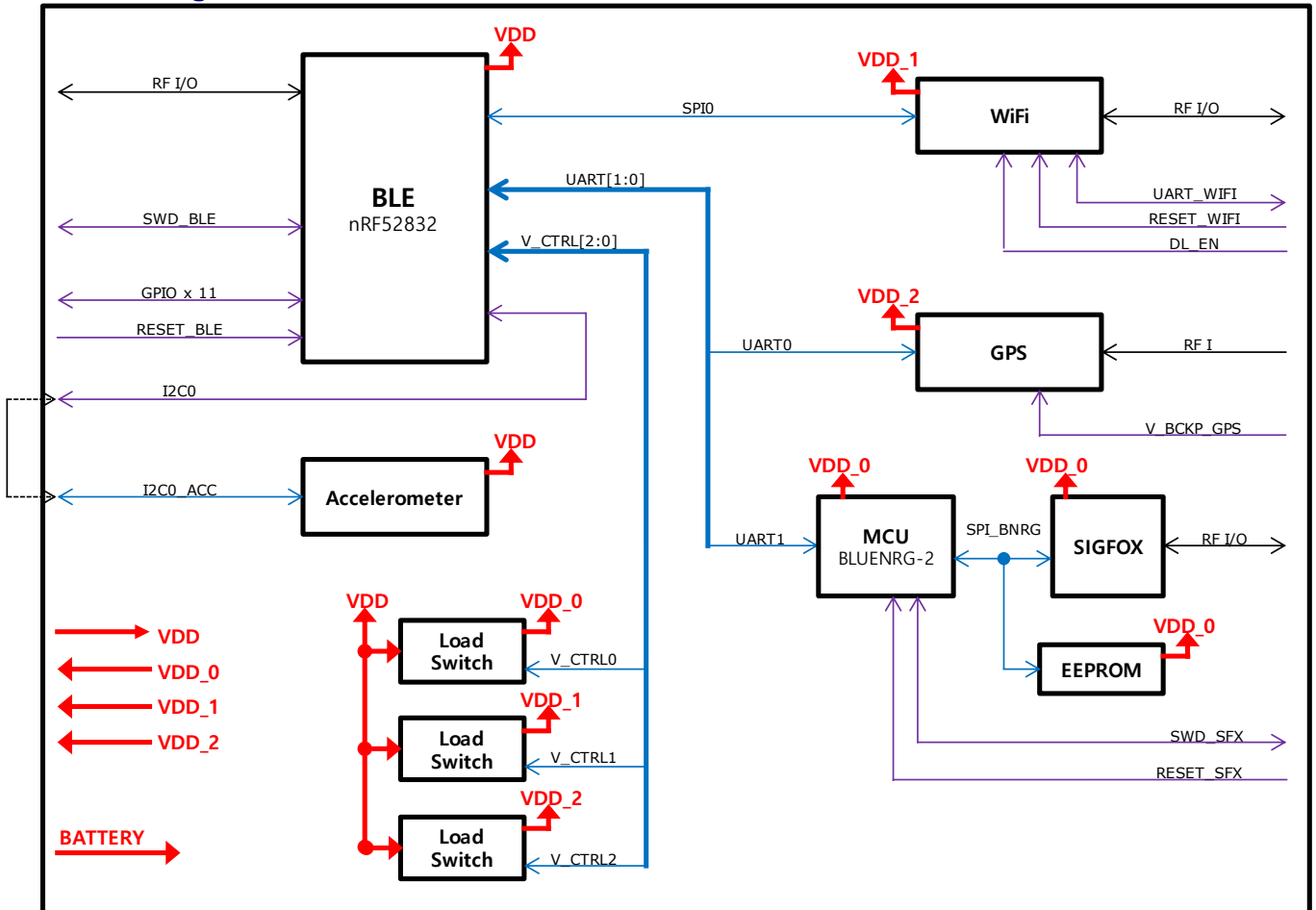
8-2-8. NFC

- Type 2 near field communication (NFC-A) tag with wakeup-on-field and touch to-pair capabilities

8-2-9. Reset Pin

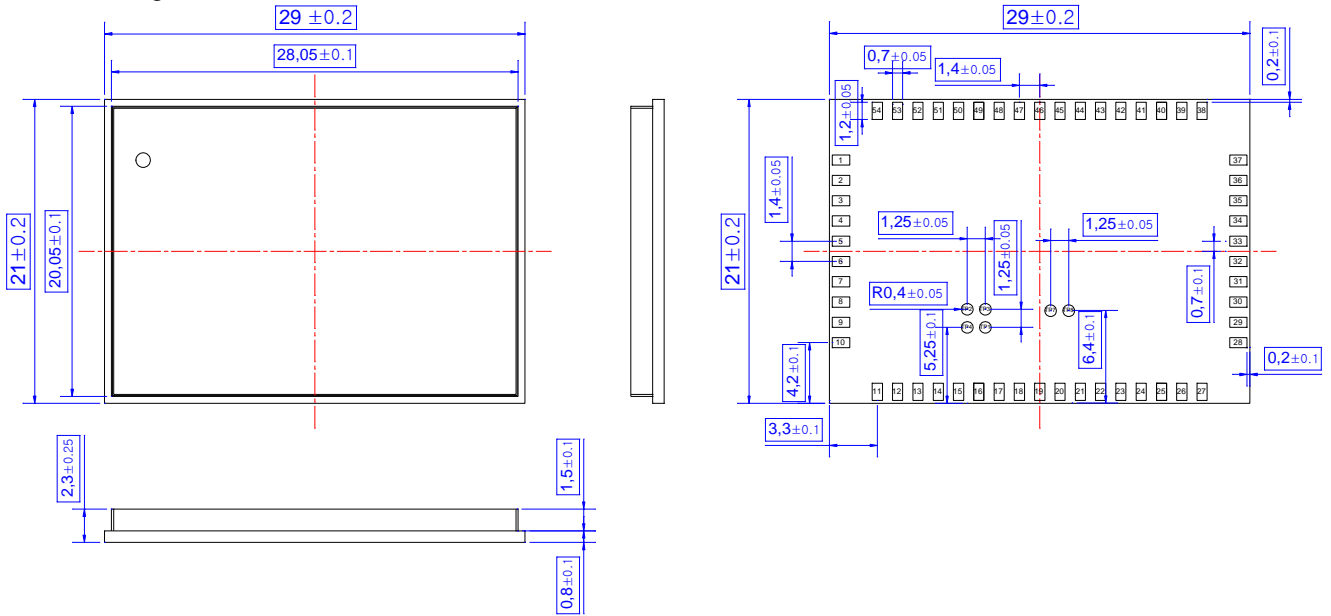
- Chip reset input. Active low.

9. Block Diagram

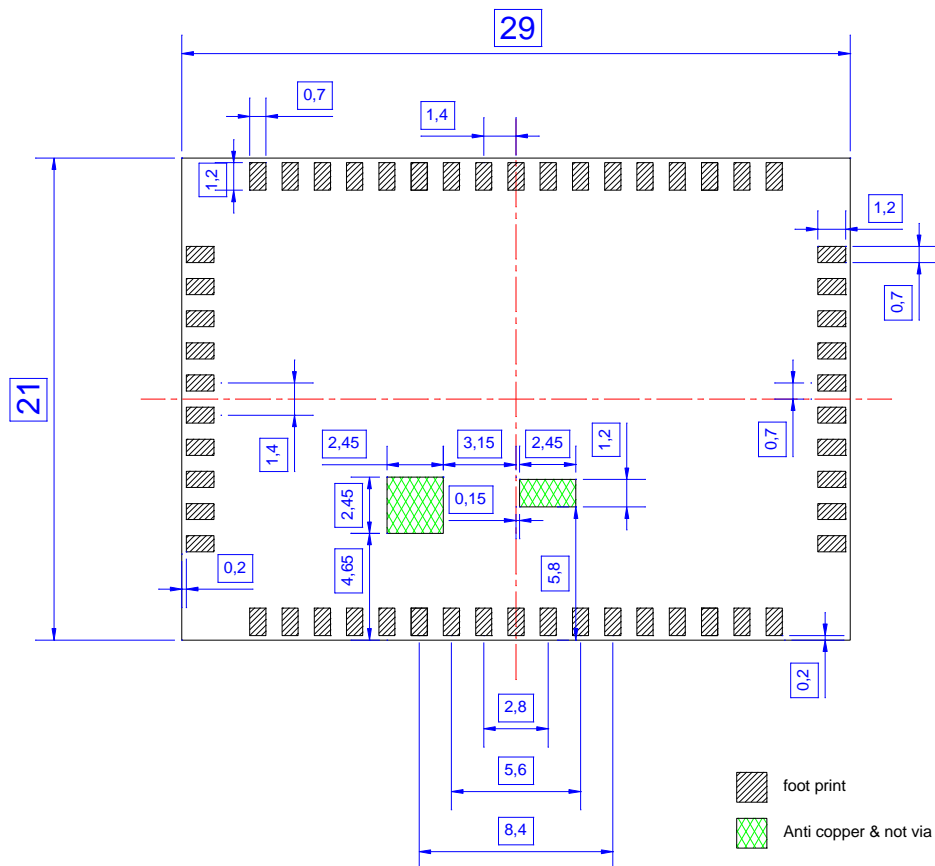


10. Dimensions & drawing

10-1. Design dimension



10-2. Recommend Foot print

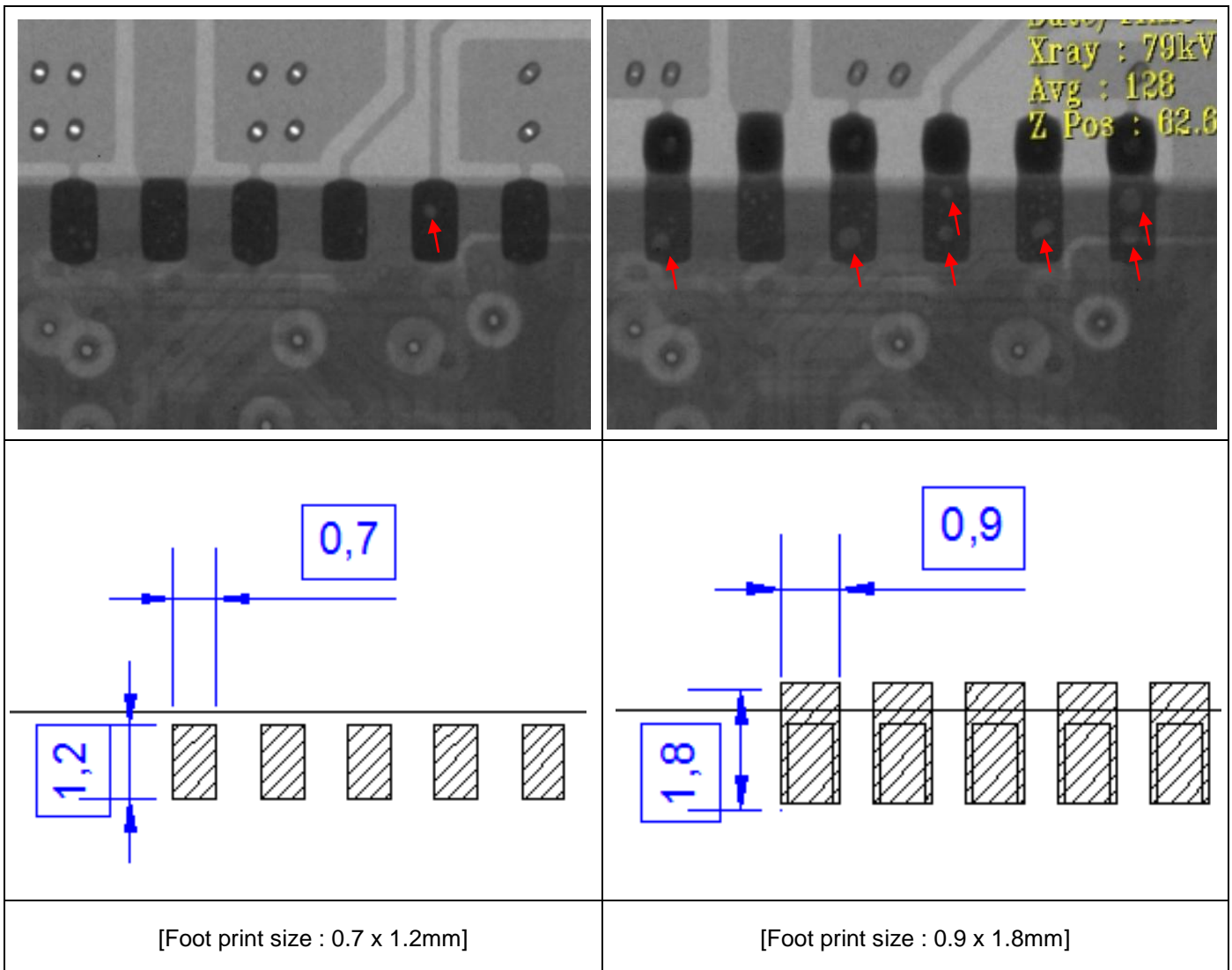


- X-ray by Foot print size

The foot print size was designed 0.7x1.2mm and 0.9x1.8mm then the SMD was performed.

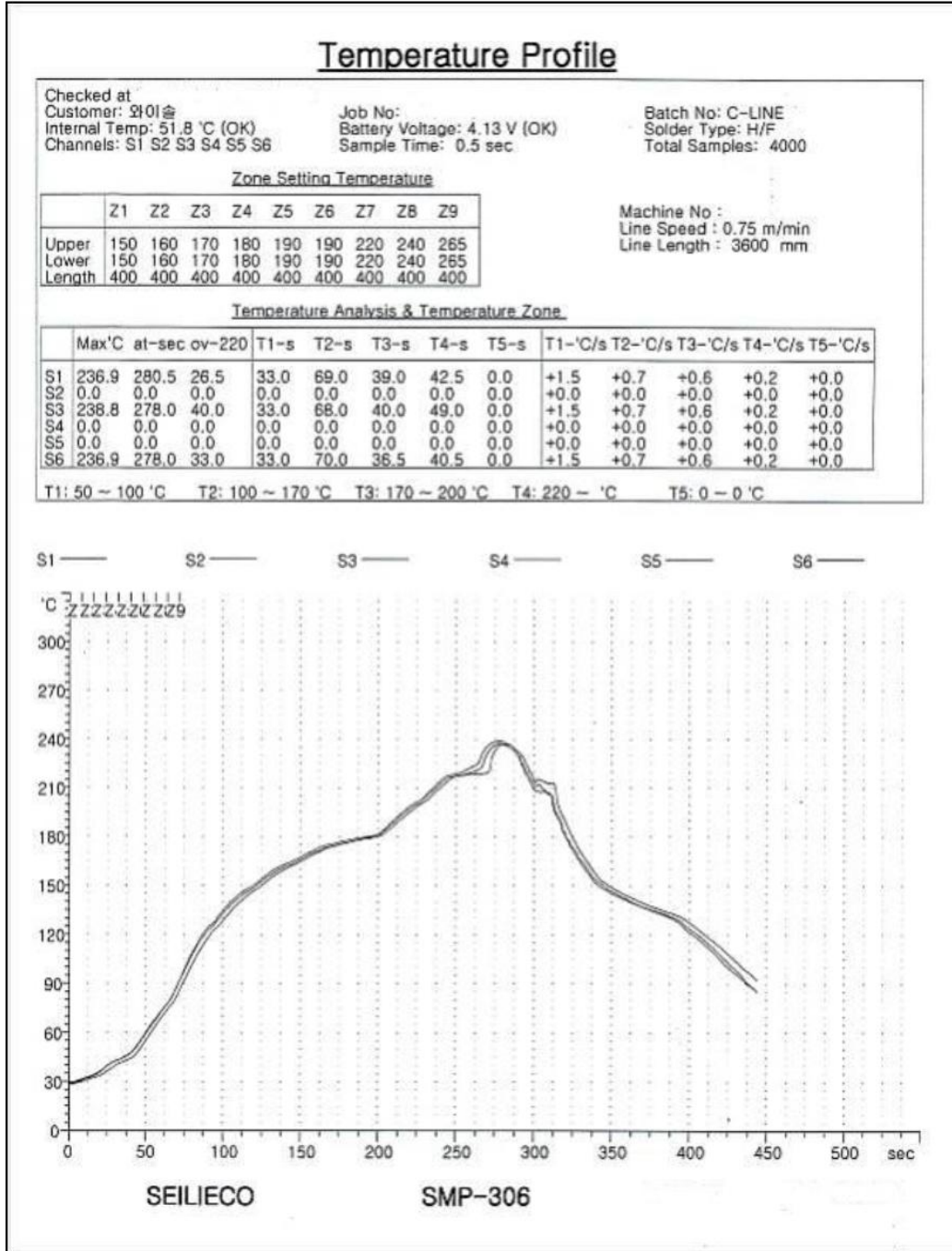
It is not a big difference, but it can be seen that the design with 0.7x1.2mm has better soldering performance with less Void as seen in the X-ray below. The disadvantage is that manual soldering is not possible, so it may be better to design 0.9x1.8mm for development stage. However, we recommend a foot print of 0.7 x 1.2mm for mass production.

**Please don't use a bigger PAD like as 0.9x1.8mm than recommended PAD except for the development stage.**



11. Reflow profile

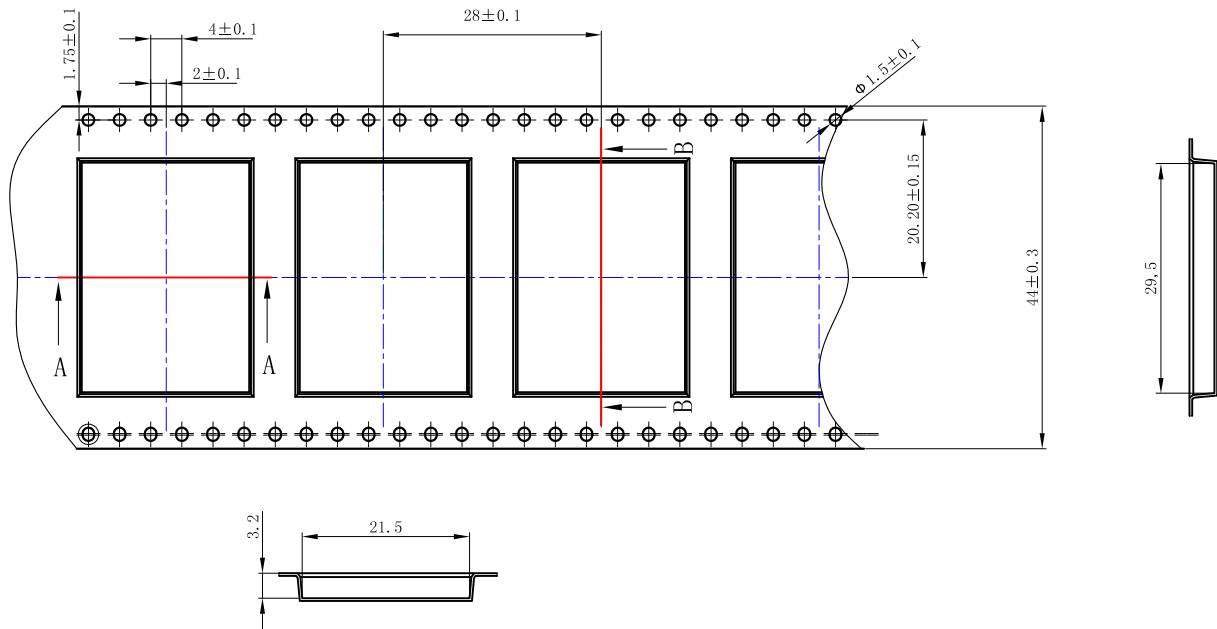
<Reflow profile of Module>



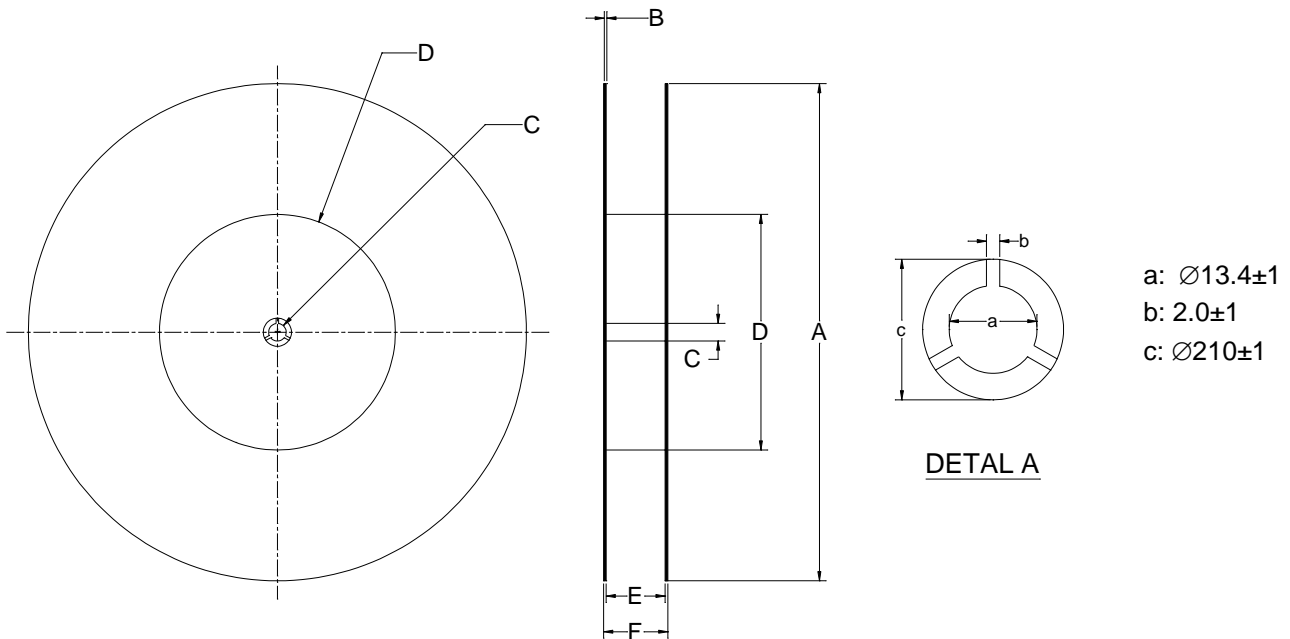
| SPEC                  | Preheat   | Soak      | Ramp     | PEAK  |
|-----------------------|-----------|-----------|----------|-------|
|                       | 50~100°C  | 100~170°C | 220°C ↑  | 240°C |
|                       | 1~2°C/sec | 60~100sec | 30~50sec | ±5°C  |
| result of measurement | 1.5       | 69        | 44       | 237.5 |
|                       | OK        | OK        | OK       | OK    |

## 12. Package

### 12-1. Dimension of Tape



### 12-2. Dimension of Reel



| A              | B            | C               | D              | E             | F             |
|----------------|--------------|-----------------|----------------|---------------|---------------|
| $380 \pm 1$ mm | $2 \pm 1$ mm | $13.4 \pm 1$ mm | $180 \pm 1$ mm | $45 \pm 1$ mm | $49 \pm 1$ mm |

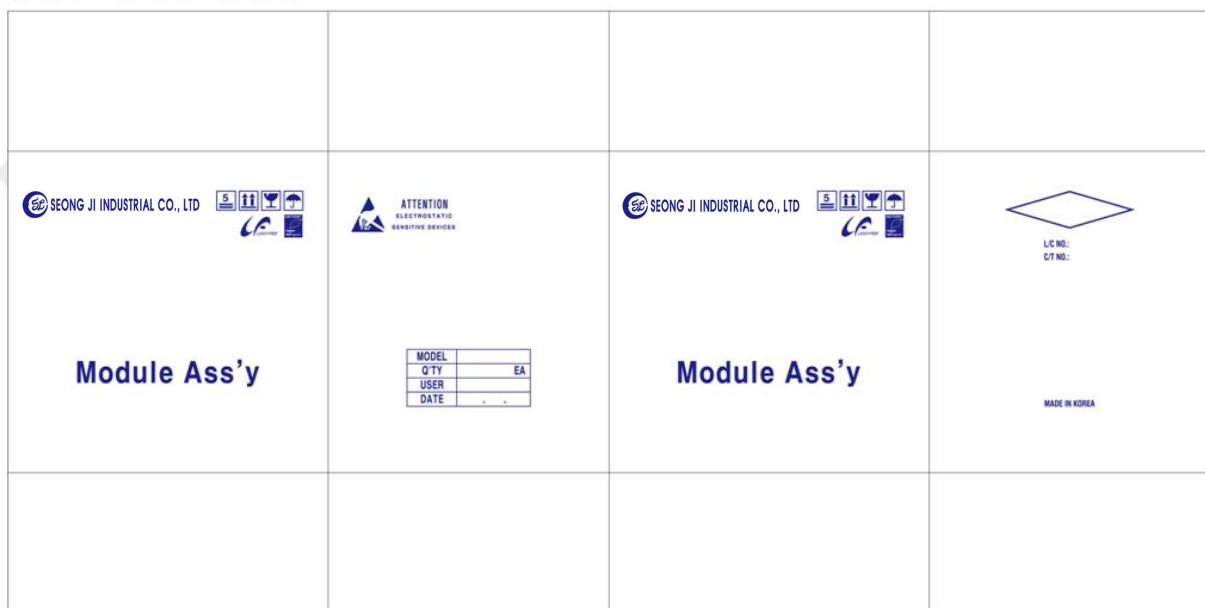
12-3. IN BOX

**384\*65\*386**

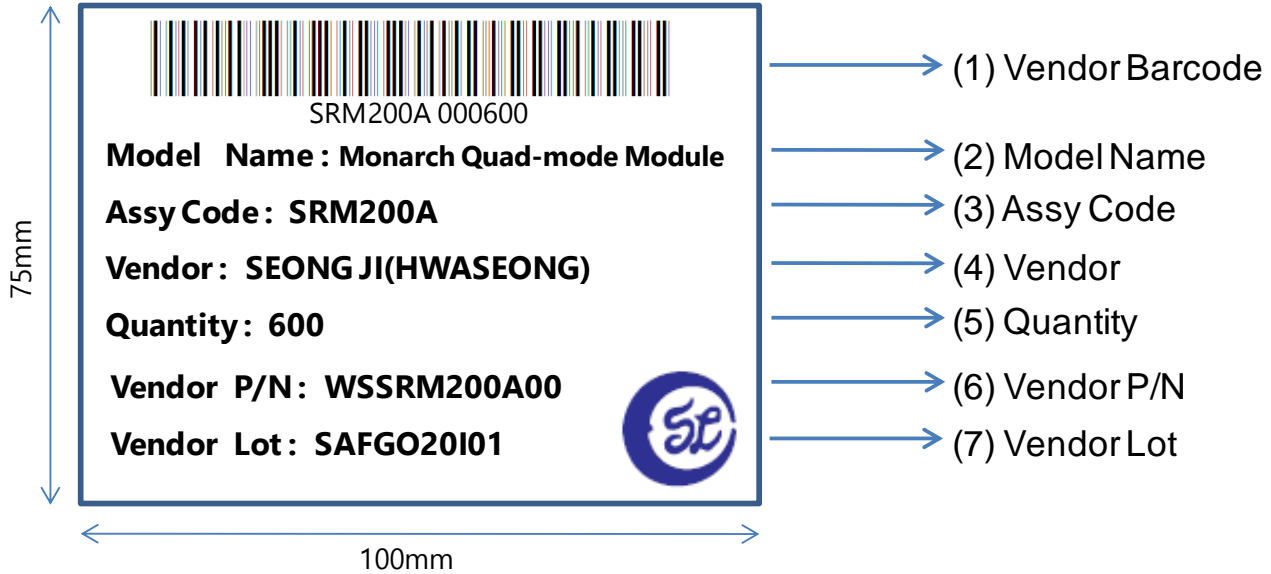


12-4. OUT BOX

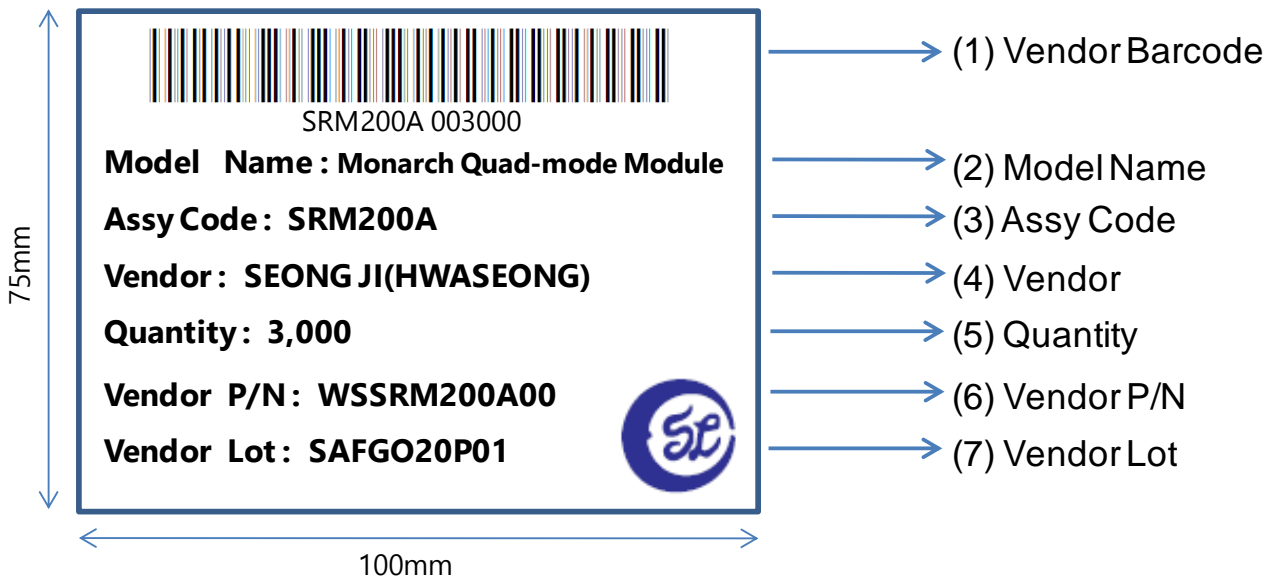
**387\*340\*390**



12-5. IN BOX Label



12-6. OUT BOX Label



# ESD Warning



This modules are ESD sensitive devices, appropriate precautions should be taken during the module assembly in the final product. Mechanical impact and harsh tools must be avoided during the module assembly in the final product.

Product ESD specification:

- HBM  $\pm 2\text{kV}$

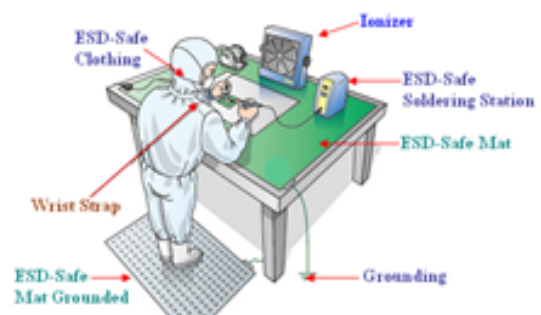
The following precautions must be taken:

- Do not open the protective conductive packaging until you have use the following, and are at an approved anti-static work station.



- Use a conductive wrist strap attached to a good earth ground.

- If working on a prototyping board, use a soldering iron or station that is marked as ESD-safe.
- If possible, use SMT equipment(reflow) when making prototype boards.
- Use an approved anti-static mat to cover your work surface.



- Always discharge yourself by touching a grounded bare metal surface or approved anti-static mat before picking up an ESD - sensitive electronic component.