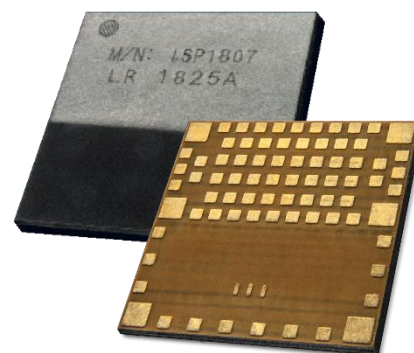


# ISP1807

## Built-in Antenna Low Energy Module

### BT 5 Long Range, Zigbee, Thread, ANT+

This ultra-small LGA module, 8 x 8 x 1 mm, is based on the nRF52840 Chip. Its powerful Cortex™ M4 CPU, flash and RAM memory combined with an optimized antenna offers the perfect solution for Bluetooth connectivity. The solution is best in class for RF performance and low power consumption. Long range and multiple digital and analogue interfaces give optimum flexibility for sensor integration.



#### Key Features

- 2.4GHz Ultra Low Power RF Transceiver
- Full Bluetooth 5 – long range stack  
ANT/ANT+ stack  
2.4 GHz proprietary stack
- BT Mesh, Zigbee, Thread stacks available
- NFC-A Tag for OOB pairing
- Fully integrated RF matching and Antenna
- Integrated 32 MHz & 32 kHz Clock
- DC/DC converter with loading circuit
- Based on Nordic Semiconductor nRF52
- 32-bit ARM Cortex M4F CPU
- ARM CryptoCell 310
- 1 MB Flash / 256 kB SRAM
- Configurable 46 GPIOs including 8 ADC
- Many interfaces USB, SPI, UART, PDM, I2C
- Power supply 1.7 to 3.6V, USB supply 5V
- Very small size 8.0 x 8.0 x 1.0 mm
- Temperature -40 to +85 °C
- Pin to Pin compatible with ISP1507

#### Applications

- Advanced Wearables: watches, fitness devices, wireless payment wearables, connected health, augmented reality applications ...
- Smart Home sensors and controllers
- Industrial IoT sensors and controllers
- Advanced remote controls
- Remote & Gaming controllers
- Beacons



#### Certifications

- Bluetooth SIG certified
- CE certified
- FCC, IC certification pending
- TELEC, KCC certified
- RoHS and Reach compliant
- Conflict Mineral Declaration

## Revision History

| Revision | Date       | Ref   | Change Description                                                                    |
|----------|------------|-------|---------------------------------------------------------------------------------------|
| R0       | 23/11/2017 | cr pg | Preliminary release                                                                   |
| R1       | 12/12/2017 | cr pg | Engineering samples release                                                           |
| R2       | 20/04/2018 | cr pg | Section 5.2 – FW tool correction and update<br>Section 6.5 – Extension name change    |
| R3       | 22/08/2018 | cr pg | Section 3 – Typo error correction                                                     |
| R4       | 12/12/2018 | cr pg | Section 2.9 – Schematic updated                                                       |
| R5       | 18/02/2019 | cr pg | Definitive release                                                                    |
| R6       | 14/03/2019 | cr pg | Correction VCC / VCCH<br>No High-Power Mode availability                              |
| R7       | 06/06/2019 | mm pg | Change to MSL3                                                                        |
| R8       | 08/11/2019 | mm pg | Section 4.1 – Mechanical dimension precision<br>Section 8 – Certification list update |
| R9       | 18/02/2020 | mm pg |                                                                                       |

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## 1. Block Diagram

This module is based on nRF52840 Nordic Semiconductor 2.4GHz wireless System on Chip (SoC) integrating a 2.4 GHz transceiver, a 32-bit ARM Cortex™-M4F CPU, a1 MB flash memory, a 256 kB RAM and analog and digital peripherals.

It can support BLE, ANT/ANT+ and a range of proprietary 2.4 GHz protocols, such as Gazell from Nordic Semiconductor.

Fully qualified BLE stacks for nRF52840 are implemented in the S140 SoftDevices which can be freely downloaded. ISP1807 can then be used in Bluetooth Central, Peripheral, Observer or Broadcaster role with up to 20 connections and for both ends of other proprietary protocols. nRF52840 platform also provides extensive software support for ANT, ZIGBEE and THREAD applications.

Ultra-low power consumption and advanced power management enables battery lifetimes up to several years on a coin cell battery. Even though its very small size 8 x 8 x 1.0 mm, the module integrates decoupling capacitors, 32 MHz and 32.768 kHz crystals, load capacitors, DC-DC converter, RF matching circuit and antenna in addition to the wireless SoC.

Only the addition of a suitable DC power source is necessary for BLE / ANT / ZIGBEE / THREAD connectivity. Sensor applications require the further addition of appropriate sensors. The antenna was designed to be optimized with several standard ground plane sizes. The NFC tag antenna can be connected externally.

Confidential

## 2. Specifications

### 2.1. Important Notice

The electrical specifications of the module are directly related to the Nordic Semiconductor specifications for the nRF52840 chipset. Bellow information is only a summary of the main parameters. For more detailed information, especially about current consumption, please refer to the up-to-date specification of the chipset available on Nordic Semi website.

### 2.2. Absolute Maximum Ratings

| Parameter                                       | Min  | Typ | Max   | Unit   |
|-------------------------------------------------|------|-----|-------|--------|
| Main Supply Voltage respect to ground – VCC_nRF | -0.3 |     | 3.9   | V      |
| USB Supply Voltage respect to ground – VBUS     | -0.3 |     | 5.8   | V      |
| IO Pin Voltage                                  | -0.3 |     | 3.9   | V      |
| RF Input Level                                  |      |     | 10    | dBm    |
| NFC Antenna pin current                         |      |     | 80    | mA     |
| Storage Temperature                             | -40  |     | +125  | °C     |
| Moisture Sensitivity Level                      |      |     | 5     | -      |
| ESD Human Body Model                            |      |     | 4000  | V      |
| ESD Charged Device Model                        |      |     | 750   | V      |
| Flash Endurance                                 |      |     | 10000 | cycles |



#### ATTENTION

CONSERVE PRECAUTION FOR HANDLING  
ELECTROSTATIC SENSITIVE DEVICES  
Human Body Model Class 3A

### 2.3. Operating Conditions

| Parameter                                          | Min  | Typ | Max | Unit |
|----------------------------------------------------|------|-----|-----|------|
| VCC_nRF Supply Voltage, independent of DCDC enable | 1.7  | 3.0 | 3.6 | V    |
| VBUS Supply Voltage                                | 4.35 | 5.0 | 5.5 | V    |
| Extended Industrial Operating Temperature Range    | -40  | +25 | +85 | °C   |

## 2.4. Power Consumption

| Parameter                                       | Min | Typ  | Max | Unit |
|-------------------------------------------------|-----|------|-----|------|
| Peak Current, Transmitter +8 dBm, VCC 3V + DCDC |     | 16.4 |     | mA   |
| Peak Current, Transmitter 0 dBm, VCC 3V + DCDC  |     | 6.4  |     | mA   |
| Peak Current, Receiver 1 Mbps, VCC 3V + DCDC    |     | 6.26 |     | mA   |
| System OFF, no RAM retention                    |     | 0.4  |     | μA   |
| System ON, no RAM retention, wake on RTC        |     | 1.5  |     | μA   |
| Additional RAM retention current per 4 KB block |     | 30   |     | nA   |

## 2.5. Clock Sources

| Parameter                                                                                                      | Min | Typ | Max     | Unit |
|----------------------------------------------------------------------------------------------------------------|-----|-----|---------|------|
| Internal High Frequency Clock for RF Stability:<br>32 MHz Crystal Frequency Tolerance <sup>(1)</sup>           |     |     | +/- 40  | ppm  |
| Internal Low Frequency Clock for BLE Synchronization:<br>32.768 kHz Crystal Frequency Tolerance <sup>(1)</sup> |     |     | +/- 40  | ppm  |
| Internal Low Frequency Clock for BLE Synchronization:<br>RC Oscillator <sup>(2)</sup>                          |     |     | +/- 250 | ppm  |
| RF Frequency Tolerance for BLE Operation                                                                       |     |     | +/- 40  | ppm  |

(1) including initial tolerance, drift, aging, and frequency pulling

(2) Frequency tolerance after calibration

## 2.6. Radio Specifications

| Parameter                                               | Min   | Typ  | Max   | Unit |
|---------------------------------------------------------|-------|------|-------|------|
| Frequency Range                                         | 2402  |      | 2480  | Mhz  |
| Maximum Output Power, Transmitter 1 Mbps <sup>(1)</sup> |       | +8   | +8.38 | dBm  |
| Maximum Output Power, Transmitter 2 Mbps <sup>(1)</sup> |       | +8   | +8.35 | dBm  |
| Rx Sensitivity Level, BLE1 Mbps                         |       | -95  |       | dBm  |
| Rx Sensitivity Level, BLE Long Range 125 kbps           |       | -103 |       | dBm  |
| Antenna Gain                                            |       | 0.6  |       | dBi  |
| EIRP                                                    | -19.4 |      | 8.6   | dBm  |
| Data Rate                                               | 125   |      | 2000  | kbps |

(1) maximum measured values

## 2.7. Range Measurement

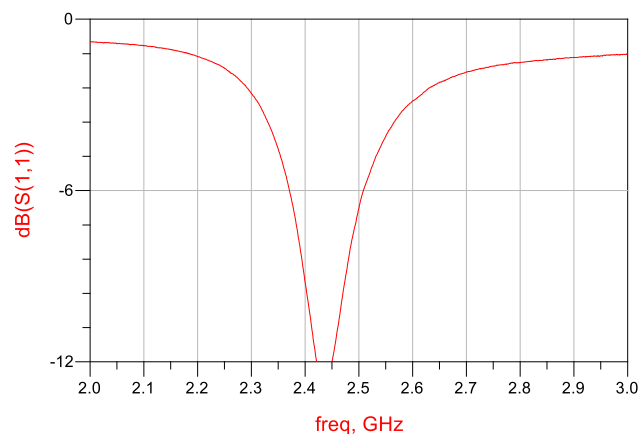
Range measurement between ISP1807-LR test board (configured as Central) and ISP1807-LR test board (configured as Peripheral).

| Parameter                                     | Min | Typ | Max | Unit |
|-----------------------------------------------|-----|-----|-----|------|
| Range Open field @1m height (0 dBm, 1 Mbps)   |     | 150 |     | m    |
| Range Open field @1m height (0 dBm, 125 Kbps) |     | 175 |     | m    |
| Range Open field @1m height (8 dBm, 1 Mbps)   |     | 230 |     | m    |
| Range Open field @1m height (8 dBm, 125 Kbps) |     | 450 |     | m    |

## 2.8. Antenna Performance

### Typical Antenna Return Loss

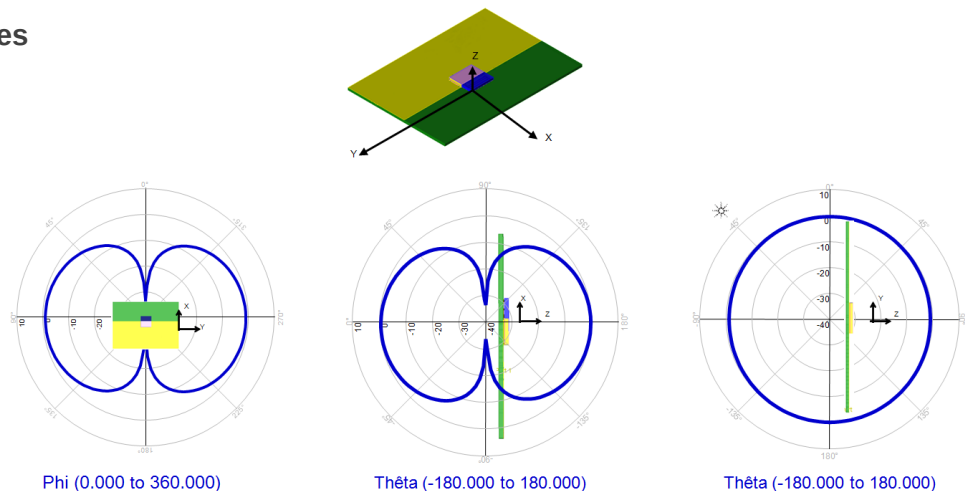
Module mounted on a  
USB dongle ground plane



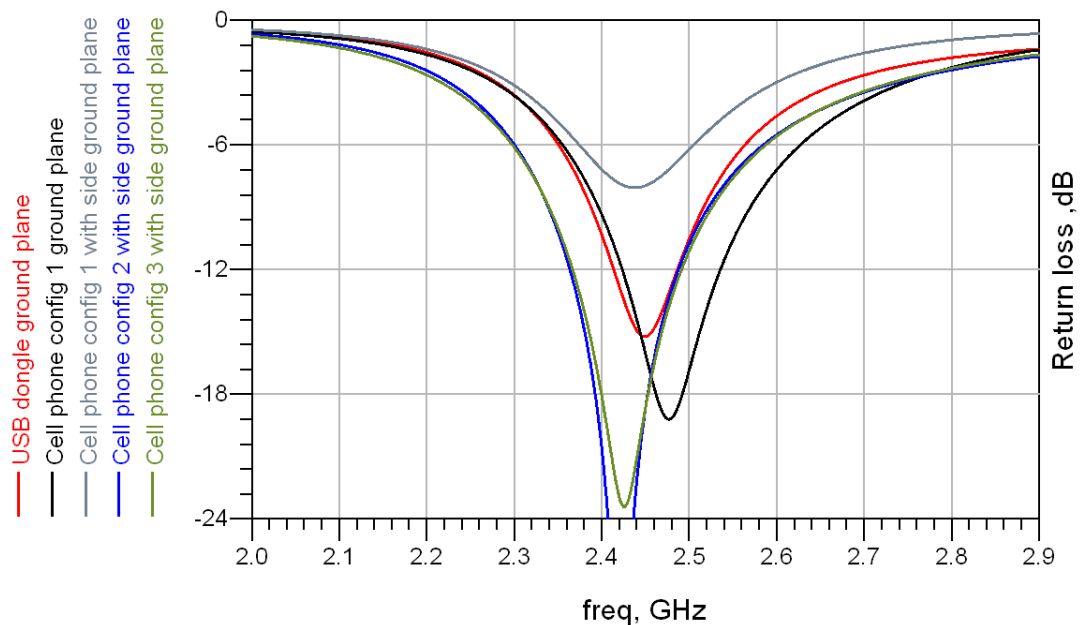
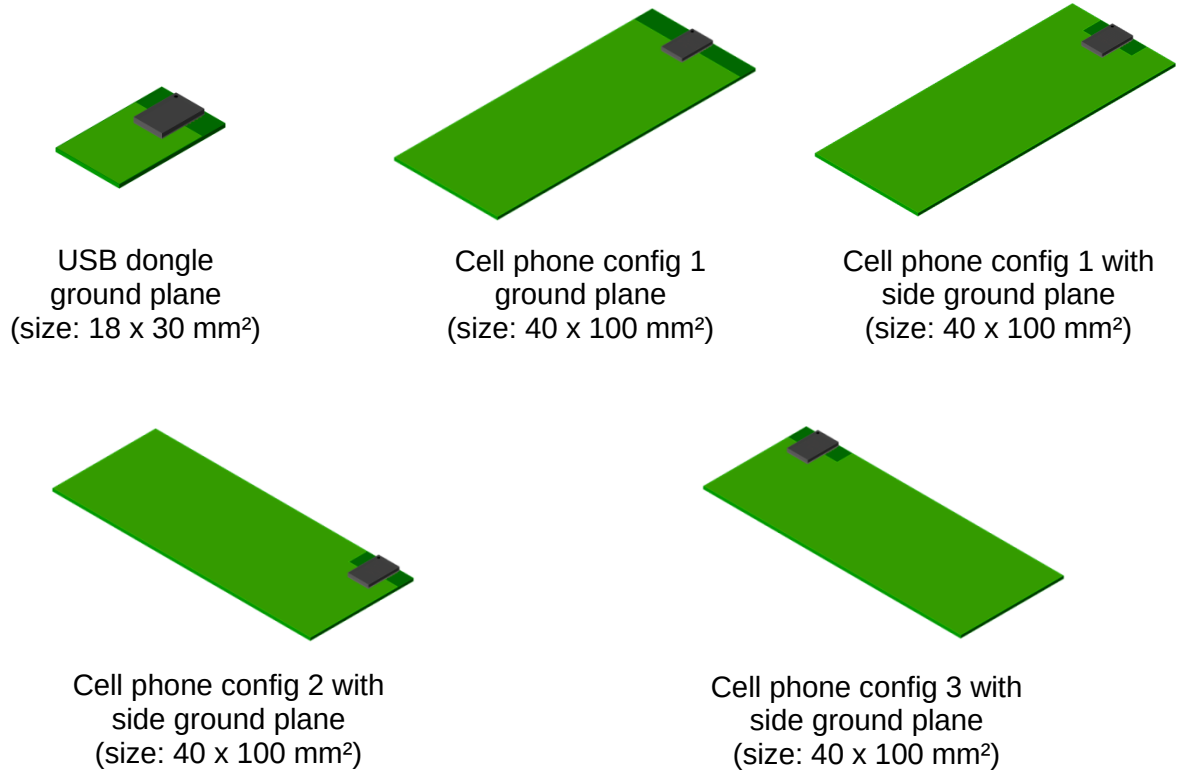
### Radiation Pattern in 3 planes

Module mounted on a USB  
dongle ground plane

Gain measurement  
in dBi @ 2.45 GHz.



## Ground Plane Effect Simulation



## 2.9. Electrical Schematic

Electrical schematic showing  
ISP1807 module connections

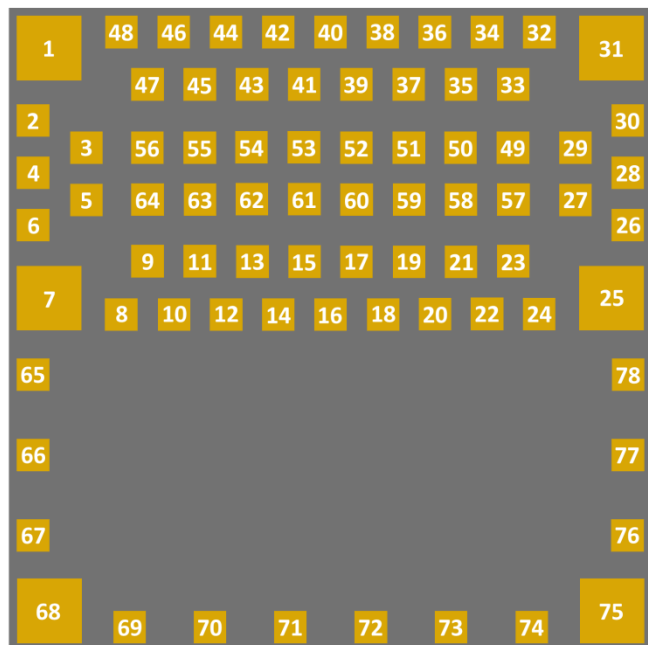
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## 3. Pin Description

The module uses an LGA format with a double row of pads on a 0.65 mm pitch. The pad layout follows the QFN Jedec standard for 2 row LGA parts. The NC pads are to be connected to isolated metal pads on the application PCB for mechanical stability and reliability (drop test).

| Pin | Name                | Pin function             | Description                                                                                                    |
|-----|---------------------|--------------------------|----------------------------------------------------------------------------------------------------------------|
| 1   | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 2   | P0_09<br>NFC1       | Digital I/O<br>NFC Input | General purpose I/O pin<br>NFC antenna connection                                                              |
| 3   | P0_12<br>TRACEDATA1 | Digital I/O              | General purpose I/O pin<br>Trace port output                                                                   |
| 4   | P0_10<br>NFC2       | Digital I/O<br>NFC Input | General purpose I/O pin<br>NFC antenna connection                                                              |
| 5   | P0_14               | Digital I/O              | General purpose I/O pin                                                                                        |
| 6   | P0_26               | Digital I/O              | General purpose I/O pin                                                                                        |
| 7   | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 8   | D+                  | Digital I/O              | USB D+                                                                                                         |
| 9   | P0_16               | Digital I/O              | General purpose I/O pin                                                                                        |
| 10  | D-                  | Digital I/O              | USB D-                                                                                                         |
| 11  | P0_21               | Digital I/O              | General purpose I/O pin                                                                                        |
| 12  | VBUS                | Power                    | 5V input for USB 3.3V regulator                                                                                |
| 13  | P0_18<br>RESET      | Digital I/O              | General purpose I/O pin<br>Configurable as system RESET pin                                                    |
| 14  | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 15  | P0_20               | Digital I/O              | General purpose I/O pin                                                                                        |
| 16  | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 17  | P0_22               | Digital I/O              | General purpose I/O pin                                                                                        |
| 18  | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 19  | P0_24               | Digital I/O              | General purpose I/O pin                                                                                        |
| 20  | OUT_ANT             | Antenna I/O              | This pin is connected to the internal antenna<br>It should be connected to Pin 22 OUT_MOD for normal operation |
| 21  | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 22  | OUT_MOD             | Antenna I/O              | This pin is the RF I/O pin of the BLE module<br>It should be connected to Pin 20 OUT_ANT for normal operation  |
| 23  | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 24  | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 25  | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 26  | VCC_nRF             | Power                    | Power supply (1.7 – 3.6V)                                                                                      |
| 27  | P0_17               | Digital I/O              | General purpose I/O pin                                                                                        |
| 28  | SWDIO               | Digital I/O              | Serial Wire Debug I/O for debug and programming                                                                |
| 29  | P0_13               | Digital I/O              | General purpose I/O pin                                                                                        |
| 30  | SWDCLK              | Digital Input            | Serial Wire Debug clock input for debug and programming                                                        |
| 31  | VSS                 | Ground                   | Should be connected to ground plane on application PCB                                                         |
| 32  | P0_08               | Digital I/O              | General purpose I/O pin                                                                                        |
| 33  | P0_07<br>TRACECLK   | Digital I/O              | General purpose I/O pin<br>Trace port clock output                                                             |

| Pin         | Name                | Pin function                | Description                                              |
|-------------|---------------------|-----------------------------|----------------------------------------------------------|
| 34          | P0_06               | Digital I/O                 | General purpose I/O pin                                  |
| 35          | P0_04<br>AIN2       | Digital I/O<br>Analog Input | General purpose I/O pin<br>SAADC/COMP/LPCOMP input       |
| 36          | P0_05<br>AIN3       | Digital I/O<br>Analog Input | General purpose I/O pin<br>SAADC/COMP/LPCOMP input       |
| 37          | P0_15               | Digital I/O                 | General purpose I/O pin                                  |
| 38          | P0_03<br>AIN1       | Digital I/O<br>Analog Input | General purpose I/O pin<br>SAADC/COMP/LPCOMP input       |
| 39          | P0_27               | Digital I/O                 | General purpose I/O pin                                  |
| 40          | P0_02<br>AIN0       | Digital I/O<br>Analog Input | General purpose I/O pin<br>SAADC/COMP/LPCOMP input       |
| 41          | P0_25               | Digital I/O                 | General purpose I/O pin                                  |
| 42          | P0_31<br>AIN7       | Digital I/O<br>Analog Input | General purpose I/O pin<br>SAADC/COMP/LPCOMP input       |
| 43          | P0_11<br>TRACEDATA2 | Digital I/O                 | General purpose I/O pin<br>Trace port output             |
| 44          | P0_30<br>AIN6       | Digital I/O<br>Analog Input | General purpose I/O pin<br>SAADC/COMP/LPCOMP input       |
| 45          | P0_19               | Digital I/O                 | General purpose I/O pin                                  |
| 46          | P0_29<br>AIN5       | Digital I/O<br>Analog Input | General purpose I/O pin<br>SAADC/COMP/LPCOMP input       |
| 47          | P0_23               | Digital I/O                 | General purpose I/O pin                                  |
| 48          | P0_28<br>AIN4       | Digital I/O<br>Analog Input | General purpose I/O pin<br>SAADC/COMP/LPCOMP input       |
| 49          | P1_02               | Digital I/O                 | General purpose I/O pin                                  |
| 50          | P1_06               | Digital I/O                 | General purpose I/O pin                                  |
| 51          | P1_15               | Digital I/O                 | General purpose I/O pin                                  |
| 52          | P1_14               | Digital I/O                 | General purpose I/O pin                                  |
| 53          | P1_13               | Digital I/O                 | General purpose I/O pin                                  |
| 54          | P1_05               | Digital I/O                 | General purpose I/O pin                                  |
| 55          | P1_08               | Digital I/O                 | General purpose I/O pin                                  |
| 56          | P1_09<br>TRACEDATA3 | Digital I/O                 | General purpose I/O pin<br>Trace port output             |
| 57          | P1_00<br>TRACEDATA0 | Digital I/O                 | General purpose I/O pin<br>Trace port output             |
| 58          | P1_03               | Digital I/O                 | General purpose I/O pin                                  |
| 59          | P1_12               | Digital I/O                 | General purpose I/O pin                                  |
| 60          | P1_10               | Digital I/O                 | General purpose I/O pin                                  |
| 61          | P1_11               | Digital I/O                 | General purpose I/O pin                                  |
| 62          | P1_07               | Digital I/O                 | General purpose I/O pin                                  |
| 63          | P1_04               | Digital I/O                 | General purpose I/O pin                                  |
| 64          | P1_01               | Digital I/O                 | General purpose I/O pin                                  |
| 65<br>to 78 | NC                  | Not Connected               | Isolated pad on application PCB for mechanical stability |



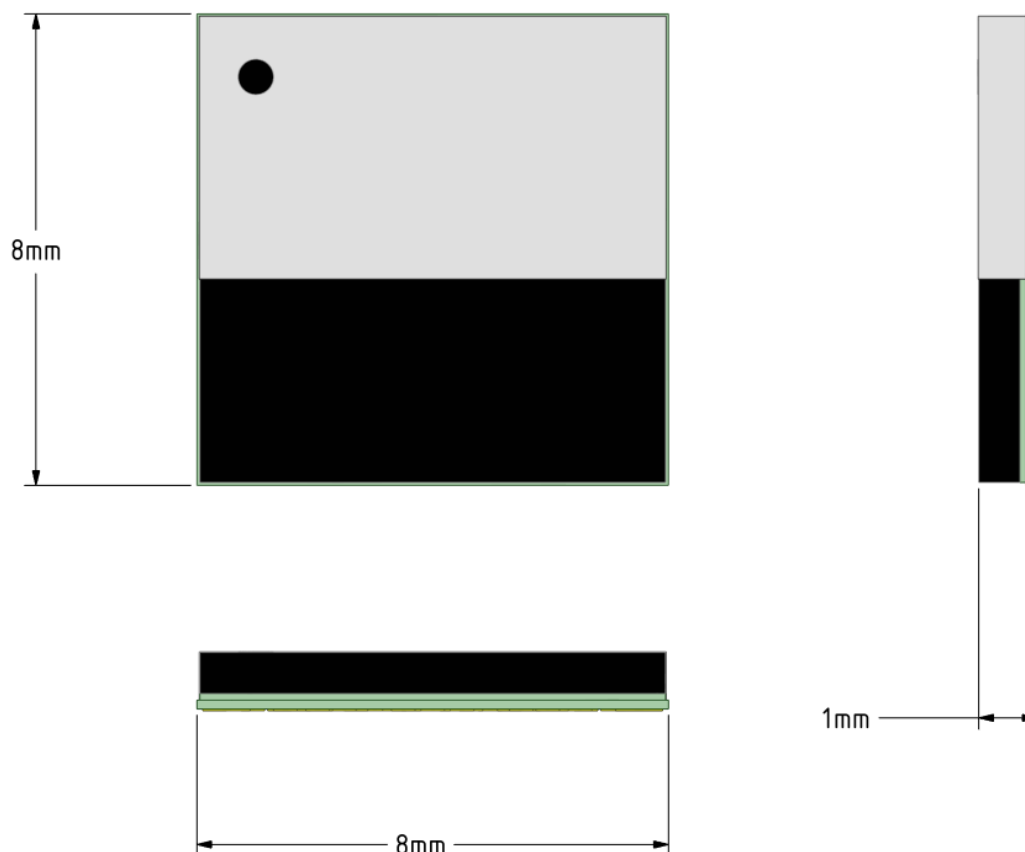
ISP1807  
pad placement and pin assignment  
for the LGA QFN package

TOP VIEW

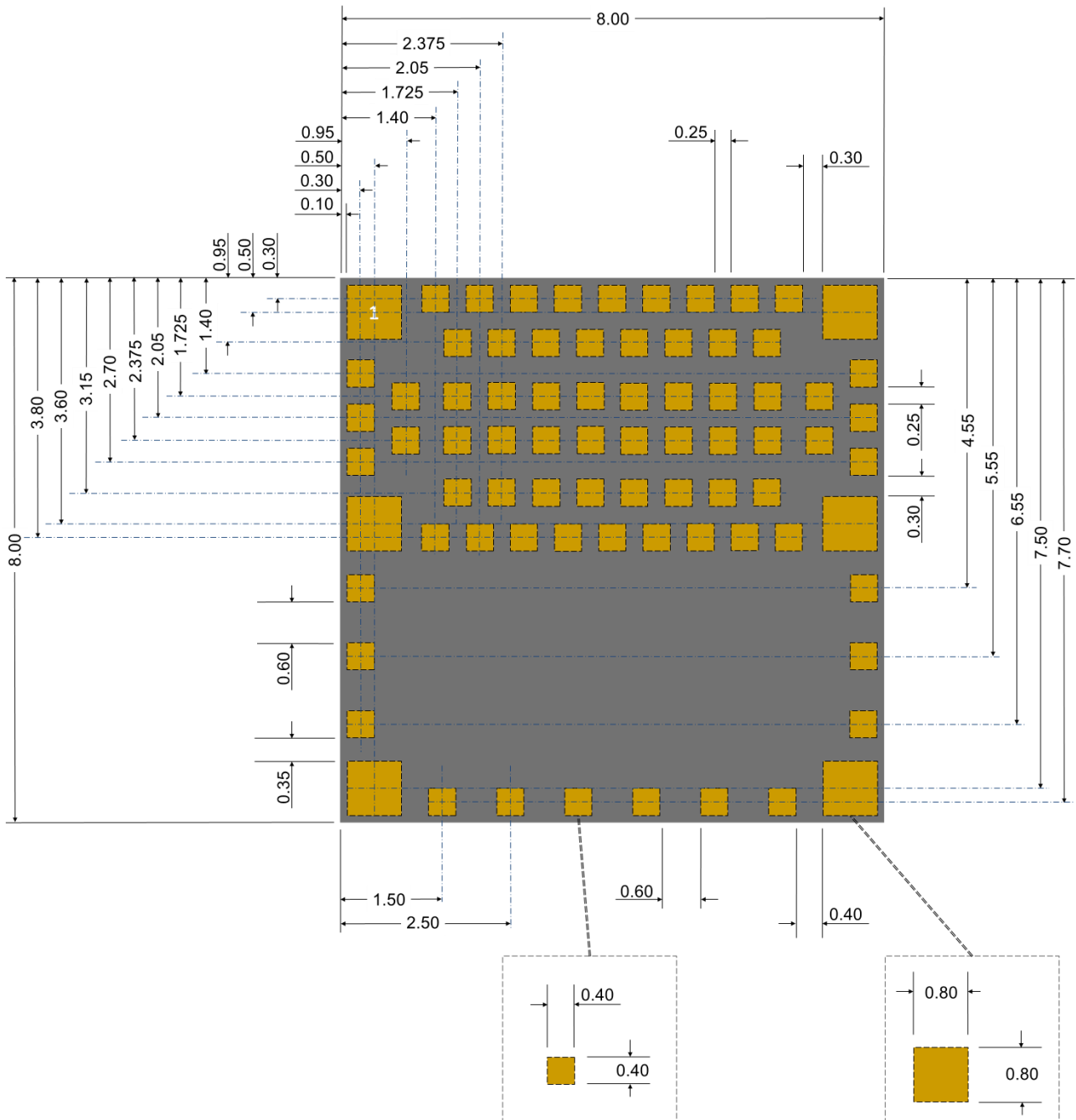
## 4. Mechanical Outlines

### 4.1. Mechanical Dimensions

Package dimensions



## Dimensional drawing for 62-Pad LGA Package



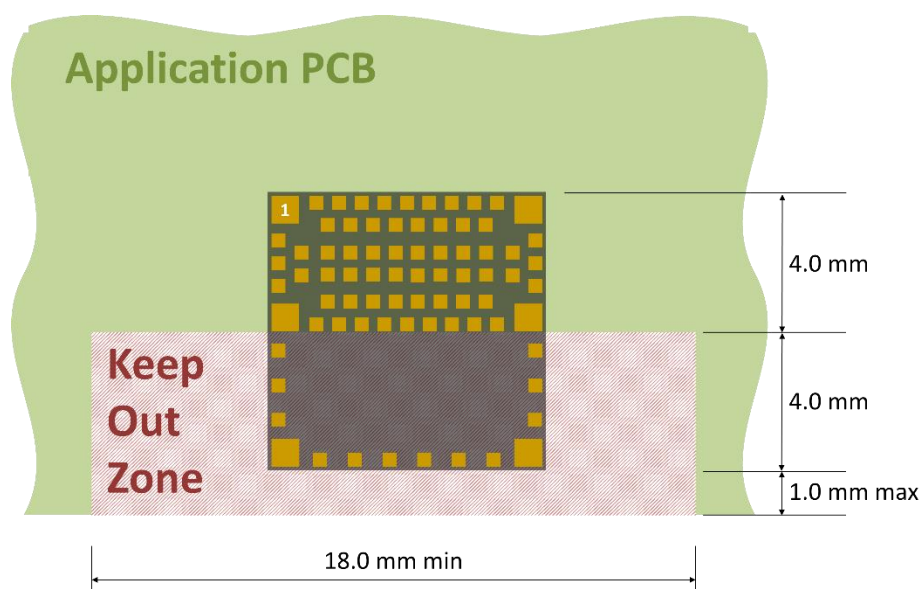
## 4.2. SMT Assembly Guidelines

For PCB Land Patterns and Solder Mask layout, Insight SiP recommends using the same dimensions as module pads, ie 0.4 x 0.4 mm for standard pads and 0.8 x 0.8 mm for corner pads.

Please contact Insight SiP for more detailed information.

## 4.3. Antenna Keep-Out Zone

For optimal antenna performance, it is recommended to respect a metal exclusion zone to the edge of the board: no metal, no traces and no components on any application PCB layer except mechanical LGA pads.



---

## 5. Product Development Tools

---

### 5.1. Hardware

In order to assist clients in developing their Bluetooth Smart solutions based on the ISP1807, Insight SiP offers a Development Kit containing:

- One Interface Board
- J-Link Lite CortexM-9 JTAG/SWD Emulator
- One Test Board
- A Development Dongle
- 5 ISP1807 module samples
- Cables, power supply and coin battery holder

Using this development kit, product developers can use a working solution as starting point to develop their own products. Time to market is saved by avoiding starting from a blank sheet of paper. In addition, there may be some applications that use the hardware as is.

Please refer to the documentation for more information:

[http://www.insightsip.com/fichiers\\_insightsip/pdf/ble/ISP1807/isp\\_ble\\_DS1807\\_DK.pdf](http://www.insightsip.com/fichiers_insightsip/pdf/ble/ISP1807/isp_ble_DS1807_DK.pdf)

### 5.2. Firmware

ISP1807 supports Bluetooth Low Energy protocol stacks. It also provides extensive software support for ANT, ZIGBEE and THREAD applications as well as 2.4 GHz protocol stacks, including Gazell. All are available as downloads at [www.nordicsemi.com](http://www.nordicsemi.com).

🚦 The S140 SoftDevice is a Bluetooth low energy (BLE) Central and Peripheral protocol stack solution. The S140 SoftDevice supports up to twenty connections with an additional observer and a broadcaster role all running concurrently.

The S140 SoftDevice integrates a Bluetooth low energy Controller and Host, and provides a full and flexible API for building Bluetooth low energy nRF52 System on Chip (SoC) solutions:

- Bluetooth 5.0 compliant low energy single-mode protocol stack suitable for Bluetooth low energy products.
- Concurrent central, observer, peripheral, and broadcaster roles with up to 20 concurrent connections along with one Observer and one Broadcaster.
- Link layer supporting LE 1M PHY and LE 2M PHY.
- LL Privacy.
- LE Data Packet Length Extension.
- LE Secure Connections pairing model

### 5.3. Development Tools

The following development tools and software are recommended for using and testing ISP1807 module:

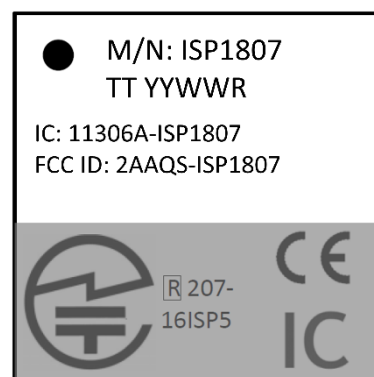
-  Nordic Semiconductor nRFgo Studio:  
Downloadable after registering at [www.nordicsemi.com](http://www.nordicsemi.com).
-  Nordic Semiconductor Master Control Panel:  
Downloadable after registering at [www.nordicsemi.com](http://www.nordicsemi.com).
-  Keil MDK-ARM Lite:  
Downloadable from <https://www.keil.com/demo/eval/arm.htm>.
-  Segger J-Link Lite:  
Downloadable from <http://www.segger.com/jlink-software.html>.
-  nRF52 Software Development Kit (SDK):  
nRF52 SDK can be downloaded after registering at [www.nordicsemi.com](http://www.nordicsemi.com). It contains example of source codes applications (C language):
  - Precompiled HEX files
  - Source code
  - Keil ARM project files
  - IAR project files

## 6. Packaging & Ordering information

### 6.1. Marking

|   |    |   |   |   |   |   |   |   |   |
|---|----|---|---|---|---|---|---|---|---|
| M | /N | : | I | S | P | 1 | 8 | 0 | 7 |
| T | T  |   | Y | Y | W | W | R |   |   |

| ISP1807 | Part Number                             |
|---------|-----------------------------------------|
| TT      | 2 letters Module Type (see section 6.5) |
| YY      | 2 digits year number                    |
| WW      | 2 digits week number                    |
| R       | 1 letter Hardware revision              |



### 6.2. Prototype Packaging

For engineering samples and prototype quantities up to 99 units, deliveries are provided in thermoformed trays or cut tapes.

They are delivered in sealed pack with desiccant pack and humidity sensors. Please see section 7.2 for more information on moisture sensitivity.

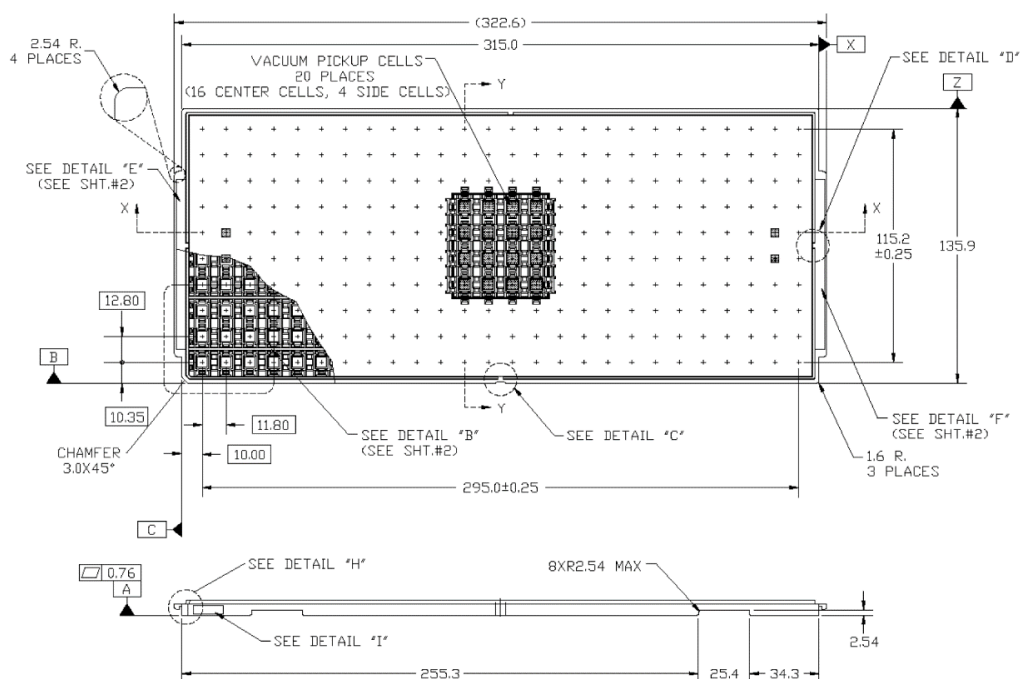
Please order with "ST" code packaging suffix.



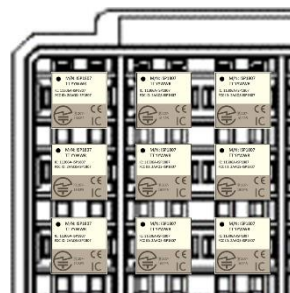
### 6.3. Jedec Trays

For pre-production volumes, ISP1807 are available in Jedec trays. They are delivered in sealed pack with desiccant pack and humidity sensors. These Jedec trays are also suitable for further baking. Please see section 7.2 for more information on moisture sensitivity. Please order with "JT" code packaging suffix.

Refer to tray sizes below. Complete information on Jedec trays is available on request.

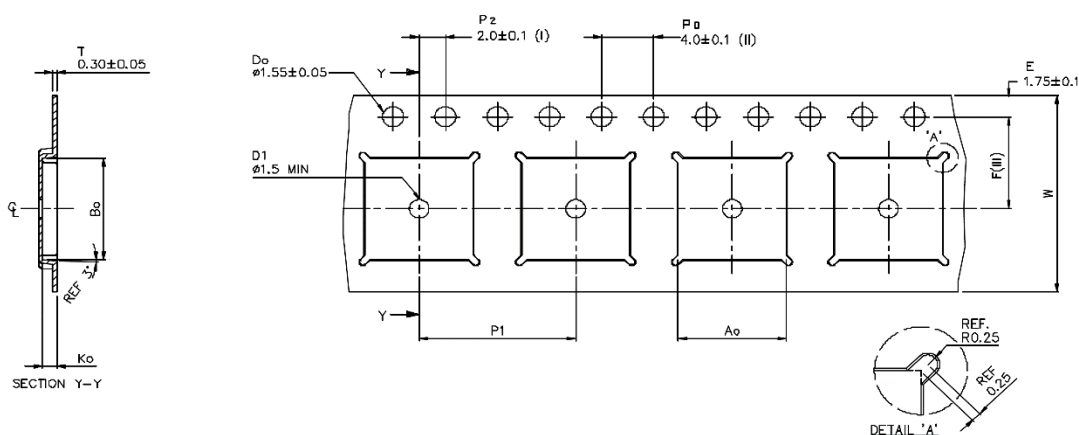


Top view position of modules within the tray.



## 6.4. Tape and Reel

ISP1807 are also available in Tape & Reel. They are delivered in sealed pack with desiccant pack and humidity sensors. Reels are proposed in standard quantities of 500 units (180mm / 7" reel) or 2000 units (330mm / 13" reel) only. Please order with "RS" code packaging suffix for 500-unit reels and "R2" for 2000-unit reels.



|    |              |
|----|--------------|
| Ao | 8.30 +/−0.1  |
| Bo | 8.30 +/−0.1  |
| Ko | 1.10 +/−0.1  |
| F  | 7.50 +/−0.1  |
| P1 | 12.00 +/−0.1 |
| W  | 16.00 +/−0.3 |

- (I) Measured from centreline of sprocket hole to centreline of pocket.
  - (II) Cumulative tolerance of 10 sprocket holes is  $\pm 0.20$ .
  - (III) Measured from centreline of sprocket hole to centreline of pocket.
  - (IV) Other material available.
- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

|   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | S | P | 1 | 8 | 0 | 7 |   |   |   |   |   |   |
|   |   |   |   |   |   |   | - | T | T | - | Z | Z |
|   |   |   |   |   |   |   |   | ▼ | ▼ |   | ▼ | ▼ |
|   |   |   |   |   |   |   |   | ▼ | ▼ |   | ▼ | ▼ |
|   |   |   |   |   |   |   |   | ▼ | ▼ |   | ▼ | ▼ |
| I | S | P | 1 | 8 | 0 | 7 |   |   |   |   |   |   |
|   |   |   |   |   |   |   | - | L | R |   |   |   |
|   |   |   |   |   |   |   |   |   |   | - | E | B |
|   |   |   |   |   |   |   |   |   |   | - | T | B |
|   |   |   |   |   |   |   |   |   |   | - | S | T |
|   |   |   |   |   |   |   |   |   |   | - | J | T |
|   |   |   |   |   |   |   |   |   |   | - | R | S |
|   |   |   |   |   |   |   |   |   |   | - | R | 2 |

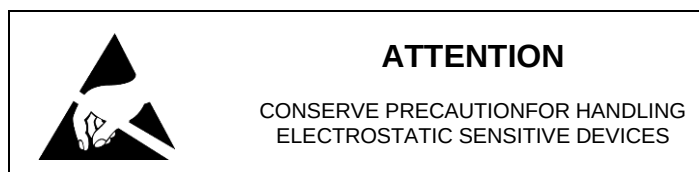
|                                 |
|---------------------------------|
| Part Number                     |
| Long range version              |
| Evaluation Board <sup>(1)</sup> |
| Test board <sup>(1)</sup>       |
| Standard Tray or Cut Tape       |
| Jedec Tray Packaging            |
| Reel of 500 units               |
| Reel of 2000 units              |

[http://www.insightsip.com/fichiers\\_insightsip/pdf/ble/ISP1807/isp\\_ble\\_DS1807\\_DK.pdf](http://www.insightsip.com/fichiers_insightsip/pdf/ble/ISP1807/isp_ble_DS1807_DK.pdf)  
[http://www.insightsip.com/fichiers\\_insightsip/pdf/ble/ISP1807/isp\\_ble\\_ANXXXXXX.pdf](http://www.insightsip.com/fichiers_insightsip/pdf/ble/ISP1807/isp_ble_ANXXXXXX.pdf)

## 7. Storage & Soldering information

### 7.1. Storage and Handling

- ✚ Keep this product away from other high frequency devices which may interfere with operation such as other transmitters and devices generating high frequencies.
- ✚ Do not expose the module to the following conditions:
  - Corrosive gasses such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, or NO<sub>x</sub>
  - Extreme humidity or salty air
  - Prolonged exposure to direct Sunlight
  - Temperatures beyond those specified for storage
- ✚ Do not apply mechanical stress
- ✚ Do not drop or shock the module
- ✚ Avoid static electricity, ESD and high voltage as these may damage the module



### 7.2. Moisture Sensitivity

All plastic packages absorb moisture. During typical solder reflow operations when SMDs are mounted onto a PCB, the entire PCB and device population are exposed to a rapid change in ambient temperature. Any absorbed moisture is quickly turned into superheated steam. This sudden change in vapor pressure can cause the package to swell. If the pressure exerted exceeds the flexural strength of the plastic mold compound, then it is possible to crack the package. Even if the package does not crack, interfacial delamination can occur.

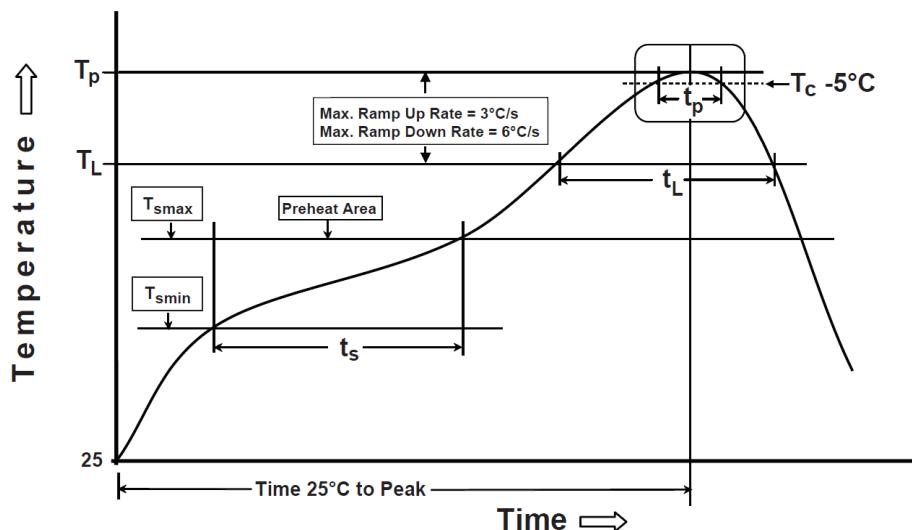
Since the device package is sensitive to moisture absorption, it is recommended to bake the product before assembly. The baking process for dry packing is 24 hours at 125°C.

ISP1807 has been tested MSL-3 according to standards. After baking, modules can be exposed to ambient room conditions (approximately 30 °C/60%RH) during 168 hours before assembly on the PCB.



## 7.3. Soldering information

Recommendation for RoHS reflow process is according to Jedec J-STD-020 and 033 standard profiles.



|                                                  |              |
|--------------------------------------------------|--------------|
| Preheat/Soak                                     |              |
| Temperature Min ( $T_{smin}$ )                   | 150 °C       |
| Temperature Max ( $T_{smax}$ )                   | 200 °C       |
| Time ( $t_s$ ) from ( $T_{smin}$ to $T_{smax}$ ) | 60-120 sec   |
| Ramp-up rate ( $T_L$ to $T_p$ )                  | 3 °C/sec max |
| Liquidous temperature ( $T_L$ )                  | 217 °C       |
| Time ( $t_L$ ) maintained above $T_L$            | 60-150 sec   |

|                                                   |                    |
|---------------------------------------------------|--------------------|
| Peak package body temperature ( $T_p$ )           | 260°C<br>(+0/-5°C) |
| Classification Temperature ( $T_c$ )              | 260 °C             |
| Time ( $t_p$ ) maintained above $T_c - 5^\circ C$ | 30 sec             |
| Ramp-down rate ( $T_p$ to $T_L$ )                 | 6 °C/sec max       |
| Time 25 °C to peak temperature                    | 8 mn max           |

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## 8. Quality & User information

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### 8.1. Certifications

- Bluetooth SIG Declaration ID n° D046560
- CE Certified, DoC Insight SiP Ref TR190901
- TELEC Certified, n° pending
- KCC Certification n° R-C-iNs-ISP1807
- FCC Certification pending
- IC Certification pending
- RoHS and Reach compliant
- Conflict Mineral Declaration available

### 8.2. EC – CE Certification

This device can be operated in at least one Member State without infringing applicable requirements on the use of radio spectrum.

### 8.3. USA – User information

#### FCC Part 15.19(a)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

#### FCC Part 15.105

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

#### FCC Part 15.21

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

## OEM Responsibilities to comply with FCC

- The module is limited to OEM installation only.
- The OEM integrator is responsible for ensuring that the end-user has no manual instructions to remove or install module.
- The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times.
- The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.
- Separate approval will be required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations other than supplied antennas.

As long as the condition above is met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). Also, the OEM integrator is responsible to provide to the host manufacturer for compliance with the Part 15B requirements.

## Host User Manual

The host manual shall include the following regulatory statement:

Part 15.19: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Part 15.21: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

RF exposure

This device is only authorized for use in a mobile application. This device should be installed and operated with minimum distance 20cm between the radiator & your body.

## Host Product labeling

The module is labeled with its own FCC. If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case, the final end product must be labeled in a visible area with the following:

"Contains FCC ID: 2AAQS-ISP1807"

## 8.4. Canada – User information

This intends to inform how to specify the IC ID of our module "ISP1807" on the product. According to Canadian standards "RSS-210" and "RSS-Gen", the host device should have a label which indicates that it contains our module. The label should use below example wording or any similar wording that expresses the same meaning:

"Contains IC: 11306A-ISP1807"

The label of the host device should also include the below IC Statement. When it is not possible, this information should be included in the User Manual of the host device:

*"This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."*

*Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."*

## 8.5. RF Exposure Information

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET-65 and RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that it is deemed to comply without maximum permissive exposure evaluation (MPE).

## 8.6. Informations concernant l'exposition aux fréquences radio (RF)

La puissance de sortie émise par l'appareil de sans-fil est inférieure à la limite d'exposition aux fréquences radio d'Industrie Canada (IC). Ce module a également été évalué et démontré conforme aux limites d'exposition aux RF d'IC dans des conditions d'exposition à des appareils mobiles et/ou portables.

## 8.7. Discontinuity

Normally a product will continue to be manufactured as long as all of the following are true:

- The manufacturing method is still available.
- There are no replacement products.
- There is demand for it in the market.

In case of obsolescence, Insight SiP will follow Jedec Standard JSD-48. A Product Discontinuation Notice (PDN) will be sent to all distributors and made available on our website. After this, the procedure goes as follows:

- Last Order Date will be 6 months after the PDN was published.
- Last Shipment Date will be 6 months after Last Order Date, i.e. 12 months after PDN.

## 8.8. Disclaimer

Insight SiP's products are designed and manufactured for general consumer applications, so testing and use of the product shall be conducted at customer's own risk and responsibility. Please conduct validation and verification and sufficient reliability evaluation of the products in actual condition of mounting and operating environment before commercial shipment of the equipment. Please also pay attention (i) to apply soldering method that don't deteriorate reliability, (ii) to minimize any mechanical vibration, shock, exposure to any static electricity, (iii) not to overstress the product during and after the soldering process.

The products are not designed for use in any application which requires especially high reliability where malfunction of these products can reasonably be expected to result in personal injury or damage to the third party's life, body or property, including and not limited to (i) aircraft equipment, (ii) aerospace equipment, (iii) undersea equipment, (iv) power plant control equipment, (v) medical equipment, (vi) transportation equipment, (vii) traffic signal equipment, (viii) disaster prevention / crime prevention equipment.

The only warranty that Insight SiP provides regarding the products is its conformance to specifications provided in datasheets. Insight SiP hereby disclaims all other warranties regarding the products, express or implied, including without limitation any warranty of fitness for a particular purpose, that they are defect-free, or against infringement of intellectual property rights. Insight SiP customers agree to indemnify and defend Insight SiP against all claims, damages, costs and expenses that may be incurred, including without any limitation, attorney fees and costs, due to the use of products.