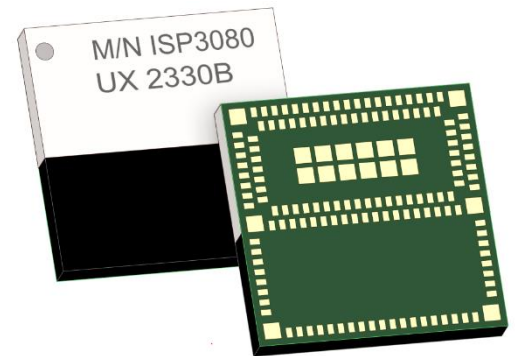


## Ultra-Wide Band and Bluetooth Low Energy Built-in Antennas Smart Module

This highly miniaturized LGA module, 12 x 12 x 1.5 mm, is based on the QM33110 UWB transceiver and nRF52833 BLE chip. Using a simple user interface via the SPI connection and integrating a Cortex™ M4 CPU, flash and RAM memory combined with optimized antennas, ISP3080 offers the perfect stand-alone ranging module solution for RTLS, access control and indoor positioning applications. The module also includes a 3D accelerometer to allow for low power modes with wake up dictated by movement.



### Key Features

- UWB IEEE 802.15.4z
- Bluetooth Low Energy 5.1  
Direction Finding and Long Range
- BT Mesh, Thread, Zigbee, ANT+ NFC
- Fira Compatible – Near Field Interaction
- Fully integrated RF Matching and Antenna  
UWB 6.5 GHz band 5 and 8.0 GHz band 9  
BLE 2.4 GHz
- Integrated 32 MHz & 32 kHz Clocks
- Integrated ultra-low-power high-performance  
accelerometer MEMS LIS2DE12
- DC/DC converter with loading circuit
- Based on Nordic Semiconductor nRF52
- UWB section based on Qorvo QM33110
- BLE section based on Nordic Semi nRF52833
- Configurable 23 GPIOs including 5 ADCs
- 8 QM33110 GPIOs for UWB functions
- Digital interfaces  
USB, QSPI, SPI, UART, I<sup>2</sup>S, PDM, PWM
- Power supply 2.4 to 3.6V
- Very small size 12 x 12 x 1.5 mm
- Temperature -40 to +85 °C



### Applications

- Find Me applications with accurate distance
- Precision Real Time Location Systems (RTLS)  
for Healthcare, Sport and Wellness
- Consumer, Industrial...
- Security bubble
- Access control
- Indoor positioning

### Pending Certifications

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

## Document Revision History

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| Revision | Date       | Ref   | Change Description  |
|----------|------------|-------|---|
| R0       | 17/08/2022 | cb pg | Initial preliminary release   |
| R1       | 22/02/2023 | cb pg | Updated for ISP3080B version, pad numbering and sizes changed       |
| R2       | 13/09/2023 | er cb | Updated for ISP3080C version, pad numbering and sizes changed       |
| R3       | 25/09/23   | cb pg | ISP3080C changes to pinout and addition of detail for Accelerometer |

## Contents

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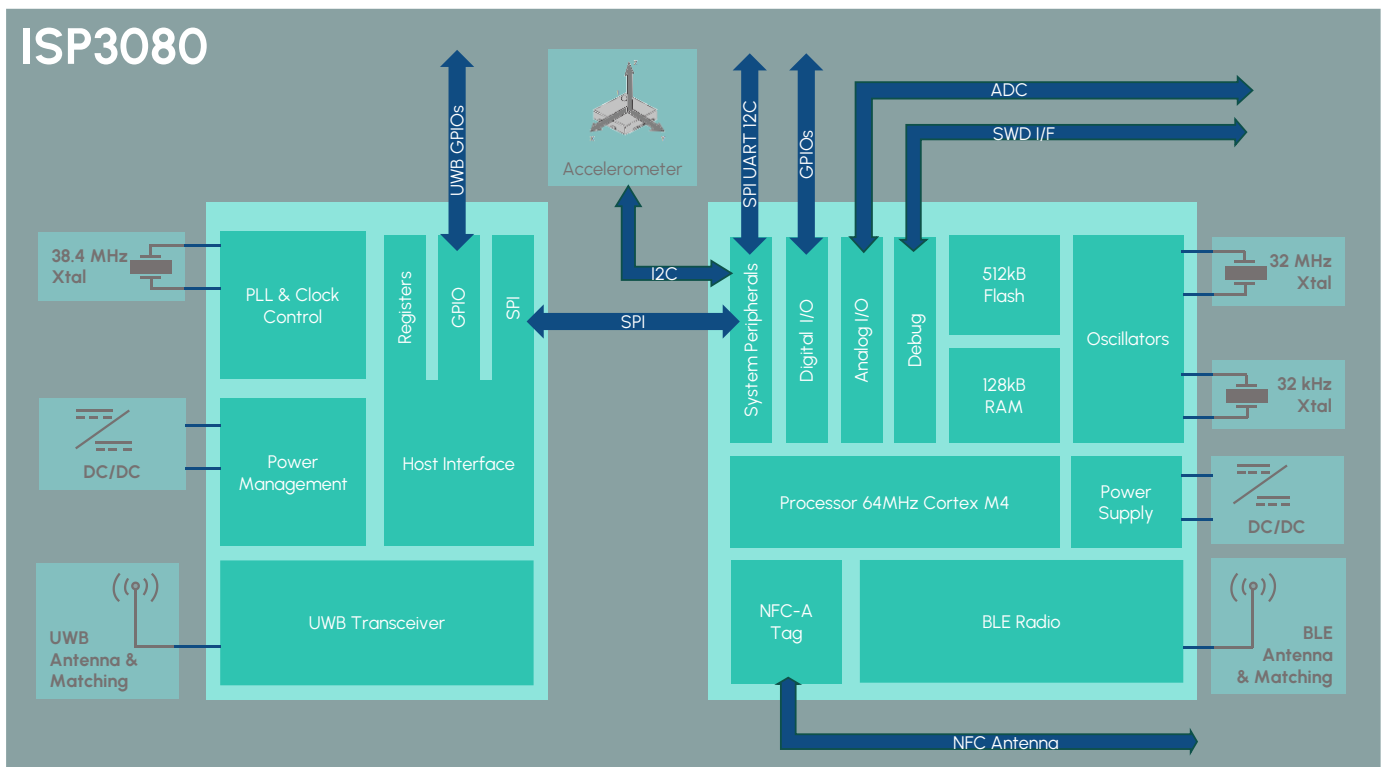
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## 1. Block Diagram & Features

This module is based on Qorvo / DecaWave QM33110 single-chip UWB transceiver and nRF52833 Nordic Semiconductor 2.4GHz wireless System on Chip (SoC). It integrates a 32-bit ARM Cortex™ M4 CPU, 512 kB flash memory, 64 kB RAM as well as analog and digital peripherals. Despite the small size of 12 x 12 x 1.0 mm, the module integrates decoupling capacitors, 38.4 MHz crystal for UWB, 32 MHz and 32.768kHz crystals for BLE, DC-DC converters, RF matching circuits and two antennas in addition to the wireless SoCs. Low power consumption and advanced power management enables battery lifetimes up to several months on a coin cell battery.

UWB communication is compliant to IEEE 802.15.4. Using a simple user interface controlled over the air by Bluetooth, ISP3080 offers the perfect stand-alone ranging module solution for RTLS (Precision Real Time Location Systems), indoor positioning, access control and security bubble applications. For long range applications with typically few hundred meters distance, ISP3080 can be used in conjunction with an external UWB antenna.

BLE connectivity is compliant with Bluetooth 5.1 standards, enabling Direction finding and Long range features over Bluetooth. ISP3080 BLE section can be used either in Peripheral or Central roles for BLE.



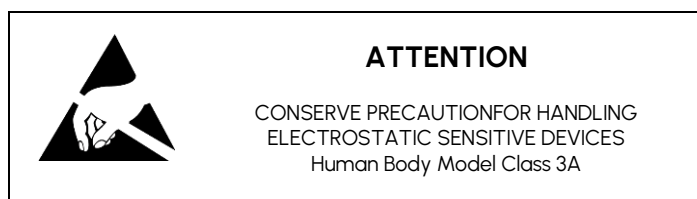
## 2. Specifications

### 2.1. General Notice

The electrical specifications of the module are directly related to the Nordic Semiconductor specifications for nRF52833 chipset series and the Qorvo specifications for QM33110 chipset. Below 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 and Qorvo websites.

### 2.2. Absolute Maximum Ratings

| Parameter                                   | Min  | Max       | Unit   |
|---|------|-----------|--------|
| Supply Voltage VDD                          | -0.3 | 3.9       | V      |
| USB Supply Voltage respect to ground – VBUS | -0.3 | 5.8       | V      |
| IO Pin Voltage                              | -0.3 | VDD + 0.3 | V      |
| UWB RF Input Level to receiver              |      | 14        | dBm    |
| BLE RF Input Level                          |      | 10        | dBm    |
| NFC Antenna pin current                     |      | 80        | mA     |
| Storage Temperature                         | -40  | +85       | °C     |
| Moisture Sensitivity Level                  |      | 3         | -      |
| ESD (Human Body Model)                      |      | 2000      | V      |
| Flash Endurance                             |      | 10000     | cycles |



### 2.3. Operating Conditions

| Parameter                                   | Min  | Typ | Max | Unit |
|---|------|-----|-----|------|
| Operating Supply Voltage VCC                | 2.4  | 3.3 | 3.6 | V    |
| Operating Input Voltage IO Pins P0.xx,P1.yy | 0    |     | VCC | V    |
| VBUS Supply Voltage                         | 4.35 | 5.0 | 5.5 | V    |
| Operating Temperature Range                 | -40  | +25 | +85 | °C   |

## 2.4. Power Consumption

The figures below are given as an indication of overall current consumption. These figures will be updated after measurements during the qualification phase of development.

| Parameter   | Min | Typ  | Max | Unit |
|---|-----|------|-----|------|
| UWB receiver CH5  |     | 72   |     | mA   |
| UWB receiver CH9  |     | 88   |     | mA   |
| UWB transmitter CH5   |     | 48   |     | mA   |
| UWB transmitter CH9   |     | 59   |     | mA   |
| UWB idle mode   |     | 8    |     | mA   |
| UWB sleep mode  |     | 260  |     | nA   |
| UWB deep sleep mode   |     | 100  |     | nA   |
| BLE Peak current, Receiver active <sup>(1)</sup>                        |     | 4.6  |     | mA   |
| BLE Peak current, Transmitter active +8 dBm Output Power <sup>(1)</sup> |     | 14.2 |     | mA   |
| BLE Peak current, Transmitter active 0 dBm Output Power <sup>(1)</sup>  |     | 4.9  |     | mA   |
| CPU System OFF current, no RAM retention                                |     | 0.6  |     | µA   |
| CPU System ON base current, full RAM retention                          |     | 1.8  |     | µA   |

(1) DCDC enable, Power supply 3V, 1 Mbps

## 2.5. Clock Sources

| Parameter  | Min | Typ | Max   | Unit |
|--|-----|-----|-------|------|
| Internal High Frequency Clock for RF Stability:<br>38.4 MHz Crystal Frequency Tolerance <sup>(1)</sup>         |     |     | ± 30  | ppm  |
| 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>(2)</sup> |     |     | ± 40  | ppm  |
| Internal Low Frequency Clock for BLE Synchronization:<br>RC Oscillator <sup>(3)</sup>                          |     |     | ± 250 | ppm  |
| RF Frequency tolerance:<br>For UWB operation Channel 5   |     |     | ± 30  | ppm  |
| RF Frequency tolerance:<br>For BLE operation Channels0 to 39   |     |     | ± 40  | ppm  |

(1) Including initial tolerance, drift, aging, temperature, and frequency pulling

(2) Including initial tolerance, drift, aging, and frequency pulling

(3) Frequency tolerance after calibration

## 2.6. Radio Specifications

| Parameter                                       | Min  | Typ    | Max   | Unit     |
|---|------|--------|-------|----------|
| UWB channel 5 center frequency                  |      | 6489.6 |       | MHz      |
| UWB channel 9 center frequency                  |      | 7987.2 |       | MHz      |
| UWB channel bandwidth                           |      | 499.2  |       | MHz      |
| UWB Rx sensitivity Level for BER <1%            |      | -93    |       | dBm      |
| UWB Output Power spectral density EIRP          |      |        | -41.3 | dBm/MHz  |
| UWB Antenna Gain channel 5                      |      | 2      |       | dBi      |
| UWB Antenna Gain channel 9                      |      | 2      |       | dBi      |
| UWB Load impedance                              |      | 50     |       | $\Omega$ |
| UWB Range Open field @ 1 m height (1)           |      | 50     |       | m        |
| BLE Frequency Range                             | 2402 |        | 2480  | MHz      |
| BLE Channel 0 to 39 Spacing                     |      | 2      |       | MHz      |
| BLE Output Power Channels 0 to 39               | -20  |        | +8    | dBm      |
| BLE Rx sensitivity Level for BER <0,1% ideal Tx | -96  |        |       | dBm      |
| BLE Max Antenna Gain on small ground plane      |      | -3.1   |       | dBi      |
| BLE EIRP  | -43  |        | 5     | dBm      |
| BLE Range Open field @1m height                 |      | 70     |       | m        |

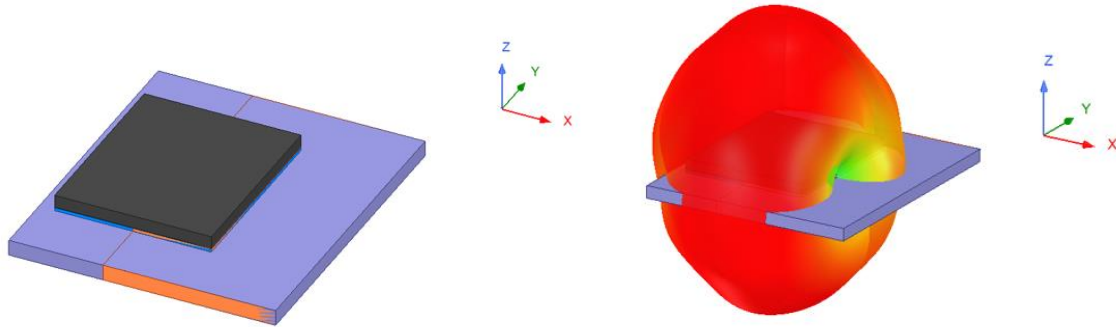
(1) 6.8Mbps / Preamble 128

## 2.7. UWB Antenna Performance

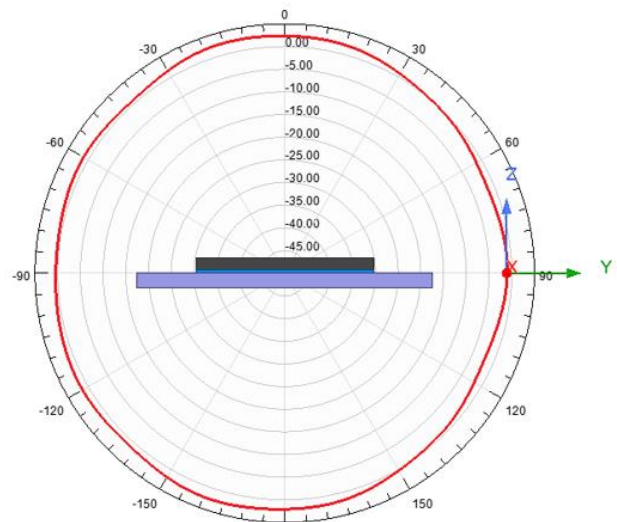
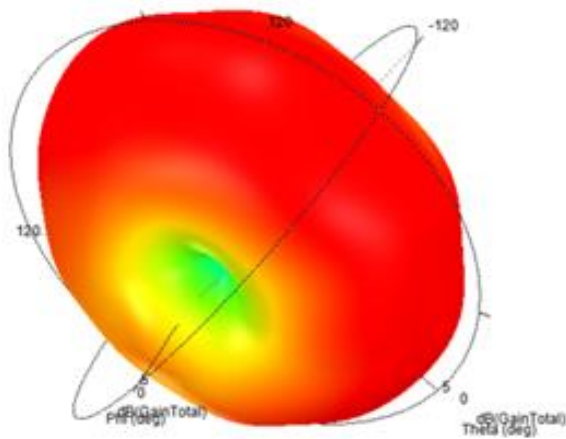
The internal antenna has a maximum absolute gain of 2 dBi. The RF output power of the module is set at 2 dB below the nominal value of -41.3 dBm/MHz to compensate for this antenna gain. The maximum output power rating is -43.3 dBm/MHz at the antenna input.

Note that the patterns shown below are for a small ground plane as shown. Larger ground planes will tend to create a less omnidirectional pattern.

3D Radiation Patterns at 8 GHz

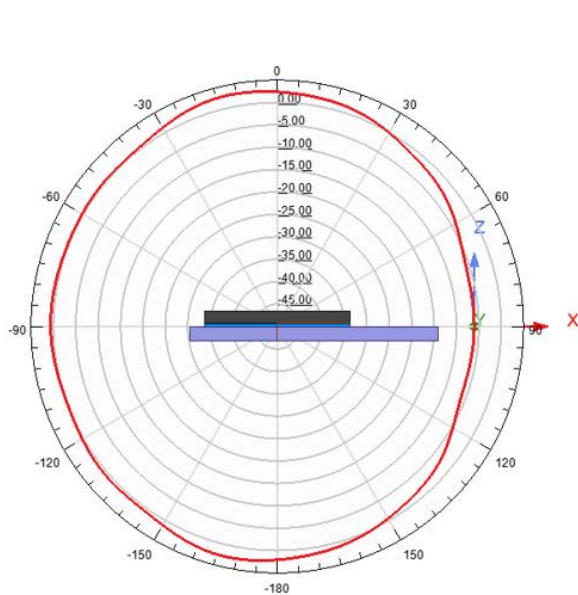


2D Radiation Patterns at 8 GHz

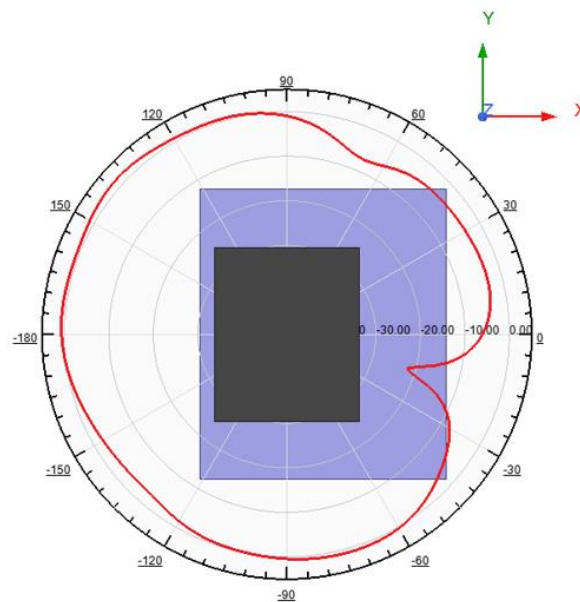


UWB Radiation pattern 2D plot (Theta,Phi=90°)





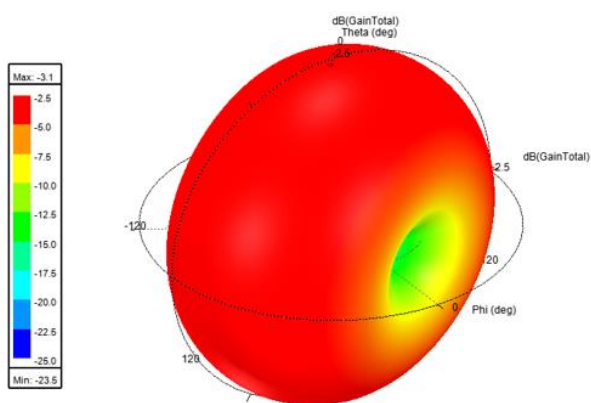
UWB Radiation pattern 2D plot (Theta,Phi=0°)



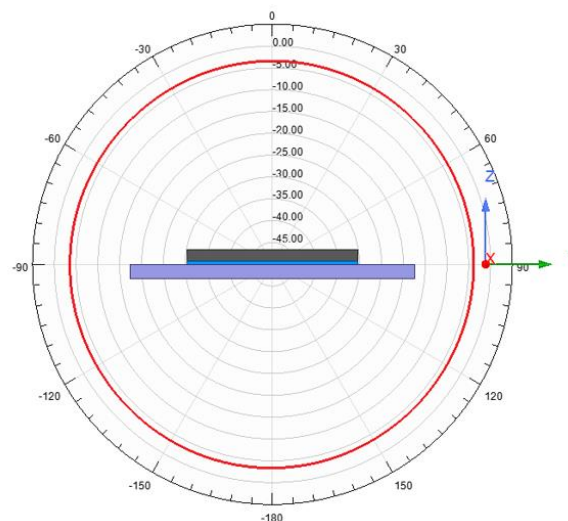
UWB Radiation pattern 2D plot (Phi, Theta=90°)

## 2.8. BLE Antenna Performance

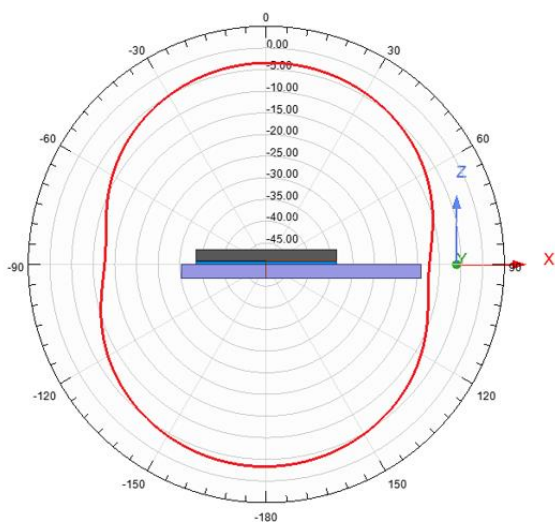
### Radiation Patterns at 2.4 GHz



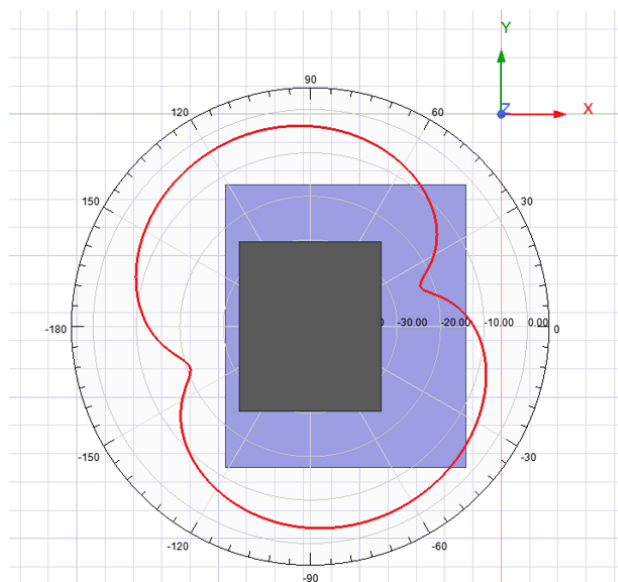
BLE Radiation pattern 3D plot



BLE Radiation pattern 2D plot (Theta, Phi=90°)



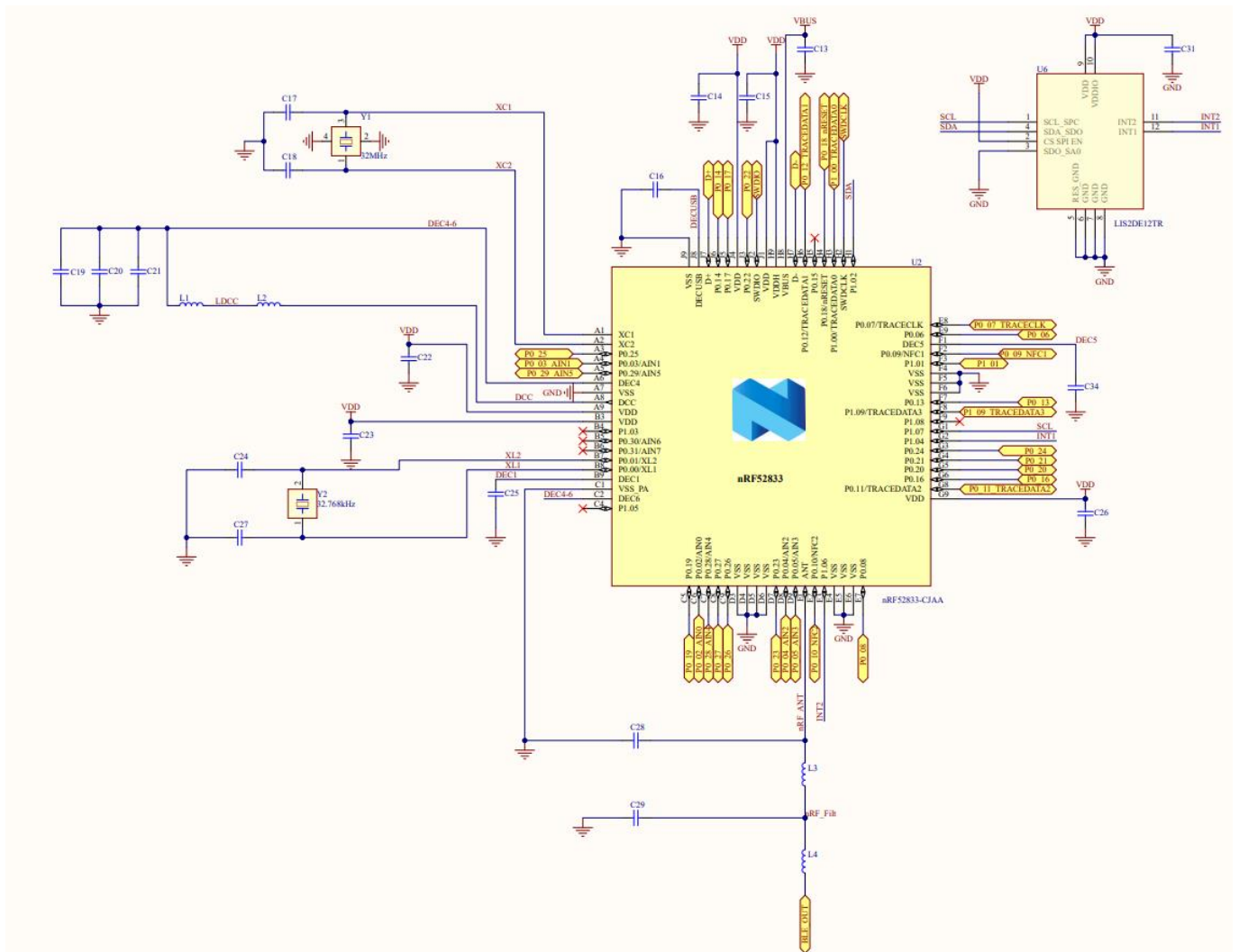
BLE Radiation pattern 2D plot (Theta, Phi=0°)



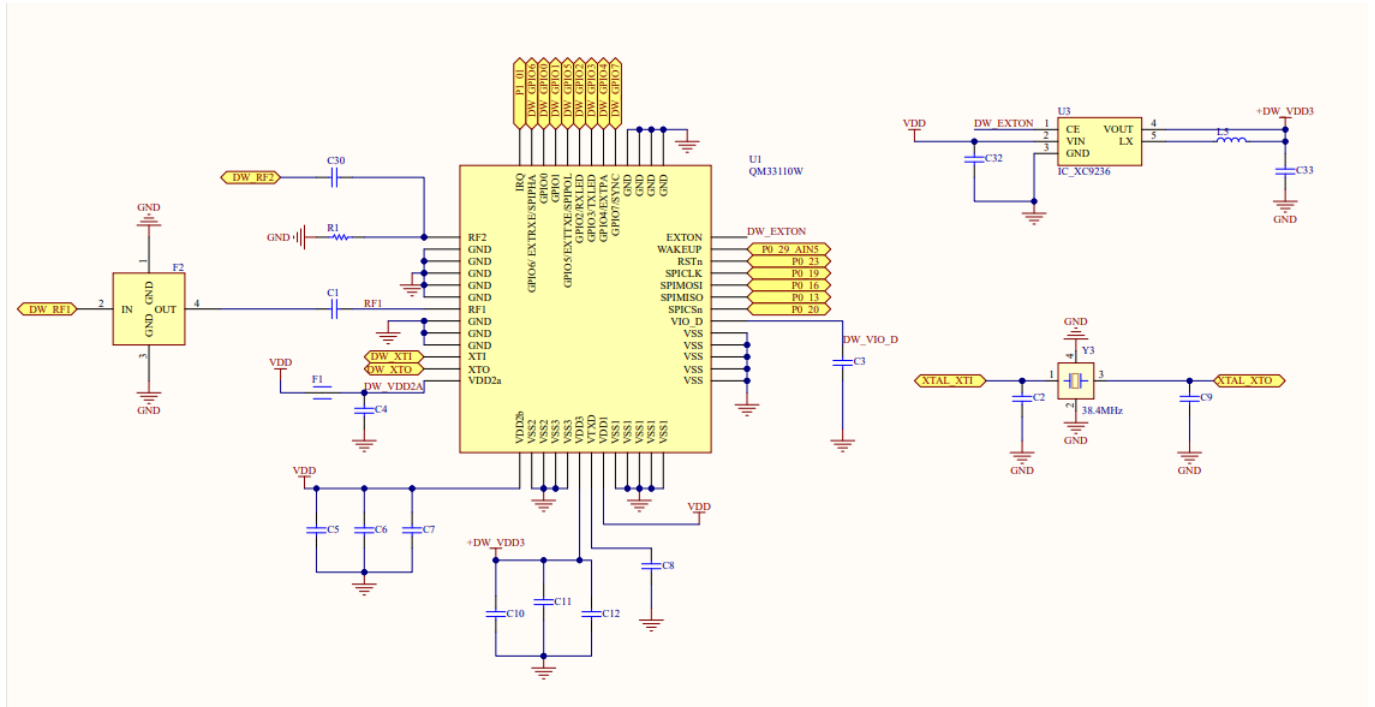
BLE Radiation pattern 2D plot (Phi, Theta=90°)

**2.9. Electrical Schematic**

Electrical schematic showing ISP3080 module connections



Schematic of the BLE Part of the module



Schematic of the UWB part of the module

### 2.10. Internal connections

The following nRF52 pins are used to communicate with the QM33110 and therefore must be configured as shown.

| nRF Pin Name | DW3000 Pin Name | Description                |
|--------------|-----------------|----------------------------|
| PO_29        | WAKEUP          | Wake up                    |
| PO_23        | RSTn            | Reset active low           |
| PO_19        | SPICLK          | SPI Clock                  |
| PO_16        | SPIMOSI         | SPI Master Output          |
| PO_13        | SPIMISO         | SPI Master Input           |
| PO_20        | SPICSn          | SPI Chip Select active low |
| PI_01        | IRQ             | Interrupt line             |

The following nRF52 pins are used to communicate with the accelerometer LIS2DE12 and therefore must be configured as shown or left floating if the accelerometer is not used.

| nRF Pin Name | Accelerometer Pin | Description   |
|--------------|-------------------|---|
| PI_07        | SCL               | I2C Clock Pin must be configured with Internal Pull Up                                |
| PI_02        | SDA               | I2C Data Pin must be configured with Internal Pull Up                                 |
| PO_24        | INT1              | Interrupt 1 – can be configured as an interrupt                                       |
| PI_04        | INT2              | Interrupt 2 – can be configured as an interrupt                                       |
| PI_06        | ACCEL_EN          | Accelerometer Enable Pin should be configured as Output High to enable accelerometer. |

### 3. Pin Description

The module uses an LGA format on a 0.50 mm pitch. The pad layout follows the QFN Jedec standard for 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   | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 2   | DW_GPIO0 | Digital I/O  | DW3000 general purpose I/O pin<br>RXOKLED – Pin may be configured to go high on reception of good frame to control Rx LED   |
| 3   | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 4   | DW_GPIO1 | Digital I/O  | DW3000 general purpose I/O pin<br>SFDLED – Pin may be configured to go high on reception of Start Frame Delimiter (SFD) to control SFD LED                                |
| 5   | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 6   | DW_GPIO5 | Digital I/O  | DW3000 general purpose I/O pin<br>EXTTXE/SPIPOL At power on selects SPI polarity. The pin may be configured as External Transmitter Enable (EXTTXE). State High during Tx |
| 7   | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 8   | DW_GPIO3 | Digital I/O  | DW3000 general purpose I/O pin<br>TXLED Pin may be configured to go high after a transmission to control a LED  |
| 9   | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 10  | DW_GPIO2 | Digital I/O  | DW3000 general purpose I/O pin<br>RXLED Pin may be configured to go high during receive mode to control RX LED  |
| 11  | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 12  | DW_GPIO4 | Digital I/O  | DW3000 general purpose I/O pin<br>EXTPA Pin may be configured to control an External Power Amplifier  |
| 13  | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 14  | DW_GPIO7 | Digital I/O  | DW3000 general purpose I/O pin<br>SYNC This pin is used for external synchronization. It has internal pull down and can be reconfigures as a GPIO                         |
| 15  | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 16  | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 17  | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 18  | DW_RF2   | N/C          | N/C Reserved for future use   |
| 19  | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 20  | GND      | Ground       | Ground – Must be connected to ground on application PCB   |

| Pin    | Name          | Pin Function  | Description  |
|--------|---------------|---------------|--|
| 21     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 22     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 23     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 24     | UWB_ANT       | RF I/O        | Internal UWB antenna RF I/O pin<br>Should be connected to UWB_MOD for normal operation |
| 25     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 26     | DW_RFI        | RF I/O        | UWB RF I/O pin of the module.  |
| 27     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 28     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 29     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 30     | DW_XTI        | Clock         | DW3000 clock input   |
| 31     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 32     | XTAL_XTI      | Clock         | 38MHz XTAL input   |
| 33     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 34     | DW_XTO        | Clock         | DW3000 clock output  |
| 35     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 36     | XTAL_XTO      | Clock         | 38MHz XTAL output  |
| 37     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 38     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 39     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 40     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 41     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 42     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 43     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 44     | BLE_ANT       | RF I/O        | Internal BLE antenna RF I/O pin<br>Should be connected to BLE_MOD for normal operation |
| 45     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 46     | BLE_OUT       | RF I/O        | BLE RF I/O pin of the module<br>Should be connected to BLE_ANT for normal operation    |
| 47 -55 | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 56     | PO_09<br>NFC1 | Digital I/O   | nRF52 general purpose I/O pin  |
| 57     | PO_10<br>NFC2 | Digital I/O   | nRF52 general purpose I/O pin  |
| 58     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 59     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 60     | VDD           | Power         | External supply for ISP3080  |
| 61     | PO_22         | Digital I/O   | nRF52 general purpose I/O pin  |
| 62     | SWDIO         | Digital I/O   | nRF52 Serial Wire Debug I/O for debug and programming                                  |
| 63     | GND           | Ground        | Ground – Must be connected to ground on application PCB                                |
| 64     | SWDCLK        | Digital Input | nRF52 Serial Wire Debug clock input for debug and programming                          |

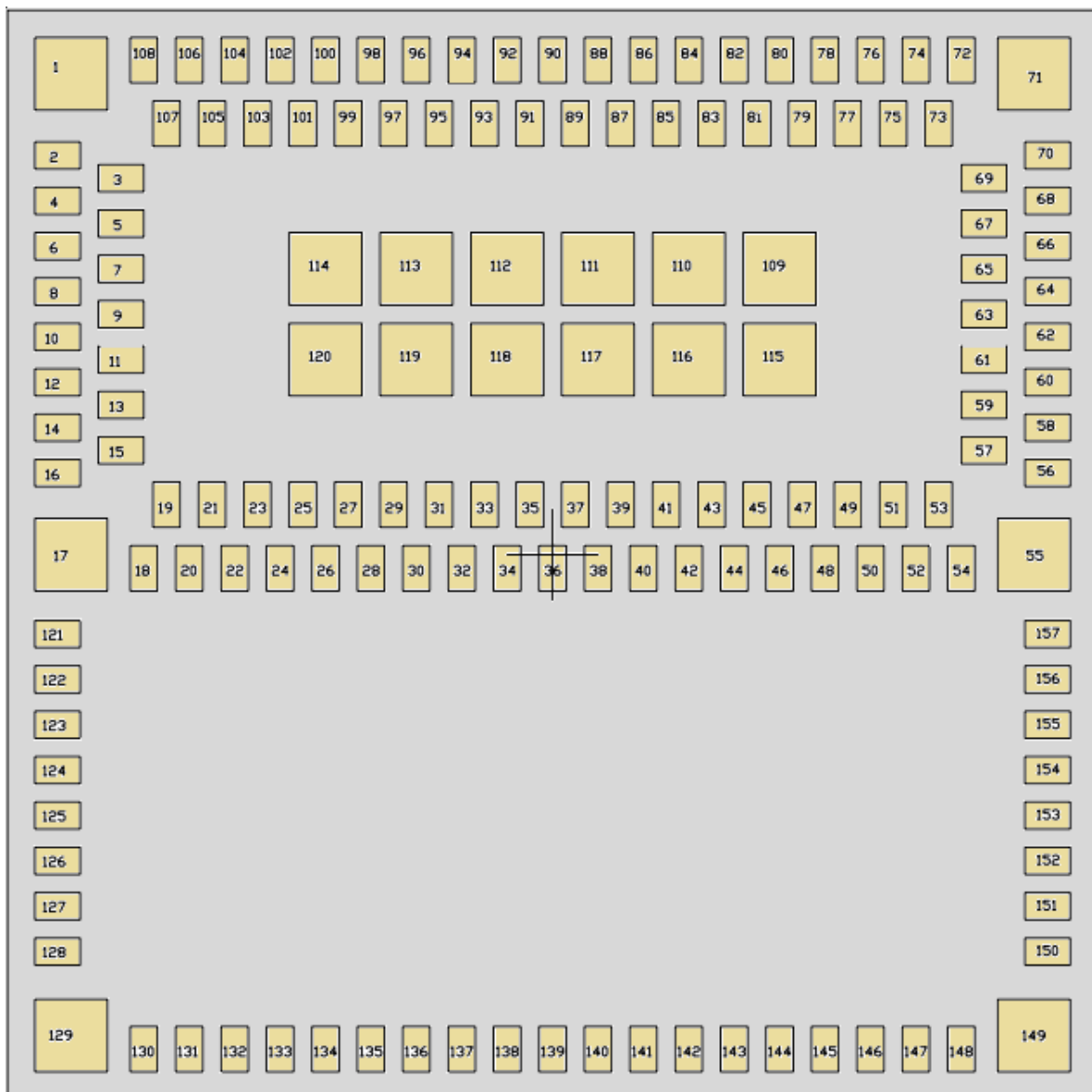


| Pin    | Name                | Pin Function | Description   |
|--------|---------------------|--------------|---|
| 65     | PO_17               | Digital I/O  | nRF52 general purpose I/O pin                           |
| 66     | PO_18<br>nRESET     | Digital I/O  | nRF52 general purpose I/O pin                           |
| 67     | PO_14               | Digital I/O  | nRF52 general purpose I/O pin                           |
| 68     | D+                  | USB Data     | USB D+  |
| 69     | PO_28<br>AIN4       | Digital I/O  | nRF52 general purpose I/O pin                           |
| 70     | D-                  | USB Data     | USB D-  |
| 71     | GND                 | Ground       | Ground – Must be connected to ground on application PCB |
| 72     | VBUS                | Power        | USB power supply  |
| 73     | PO_21               | Digital I/O  | nRF52 general purpose I/O pin                           |
| 74     | PO_06               | Digital I/O  | nRF52 general purpose I/O pin                           |
| 75     | PO_25               | Digital I/O  | nRF52 general purpose I/O pin                           |
| 76     | PO_05<br>AIN3       | Digital I/O  | nRF52 general purpose I/O pin                           |
| 77     | PO_27               | Digital I/O  | nRF52 general purpose I/O pin                           |
| 78     | PO_04<br>AIN2       | Digital I/O  | nRF52 general purpose I/O pin                           |
| 79     | PO_26               | Digital I/O  | nRF52 general purpose I/O pin                           |
| 80     | PO_02<br>AIN0       | Digital I/O  | nRF52 general purpose I/O pin                           |
| 81     | GND                 | Ground       | Ground – Must be connected to ground on application PCB |
| 82     | PO_03<br>AIN1       | Digital I/O  | nRF52 general purpose I/O pin                           |
| 83     | GND                 | Ground       | Ground – Must be connected to ground on application PCB |
| 84     | PO_11<br>TRACEDATA2 | Digital I/O  | nRF52 general purpose I/O pin                           |
| 85     | GND                 | Ground       | Ground – Must be connected to ground on application PCB |
| 86     | PO_07<br>TRACECLK   | Digital I/O  | nRF52 general purpose I/O pin                           |
| 87     | GND                 | Ground       | Ground – Must be connected to ground on application PCB |
| 88     | PI_09<br>TRACEDATA3 | Digital I/O  | nRF52 general purpose I/O pin                           |
| 89     | GND                 | Ground       | Ground – Must be connected to ground on application PCB |
| 90     | PO_08               | Digital I/O  | nRF52 general purpose I/O pin                           |
| 91     | GND                 | Ground       | Ground – Must be connected to ground on application PCB |
| 92     | PO_12<br>TRACEDATA1 | Digital I/O  | nRF52 general purpose I/O pin                           |
| 93     | GND                 | Ground       | Ground – Must be connected to ground on application PCB |
| 94     | PI_00<br>TRACEDATA0 | Digital I/O  | nRF52 general purpose I/O pin                           |
| 95-107 | GND                 | Ground       | Ground – Must be connected to ground on application PCB |



| Pin     | Name     | Pin Function | Description   |
|---------|----------|--------------|---|
| 108     | DW_GPIO6 | Digital I/O  | DW3000 general purpose I/O pin<br>EXTRE/SPIPHA power up SPI Phase selection, may also be configured as External Receiver Enable |
| 109-120 | GND      | Ground       | Ground – Must be connected to ground on application PCB   |
| 121-157 | NC       | Mechanical   | These pins must be left NC on the application PCB   |

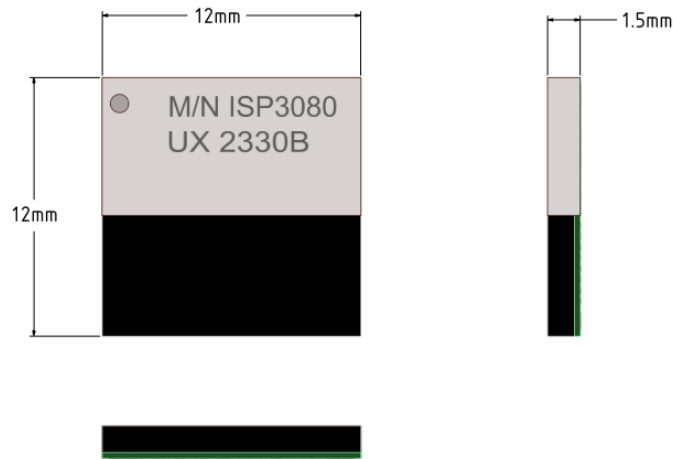
**ISP3080 Pinout Top View**



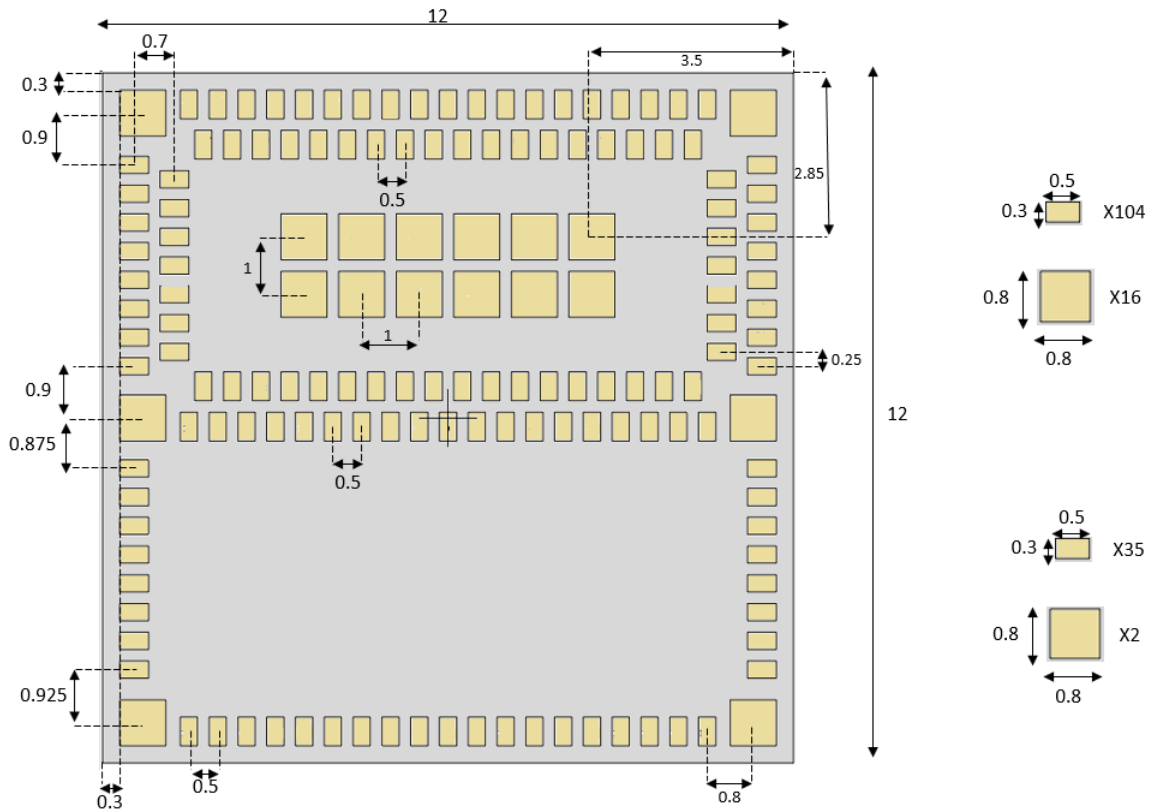
## 4. Mechanical Outline

### 4.1. Mechanical Dimensions

Package dimensions (in mm)



Dimensional drawing for 157-Pad LGA Package (in mm)



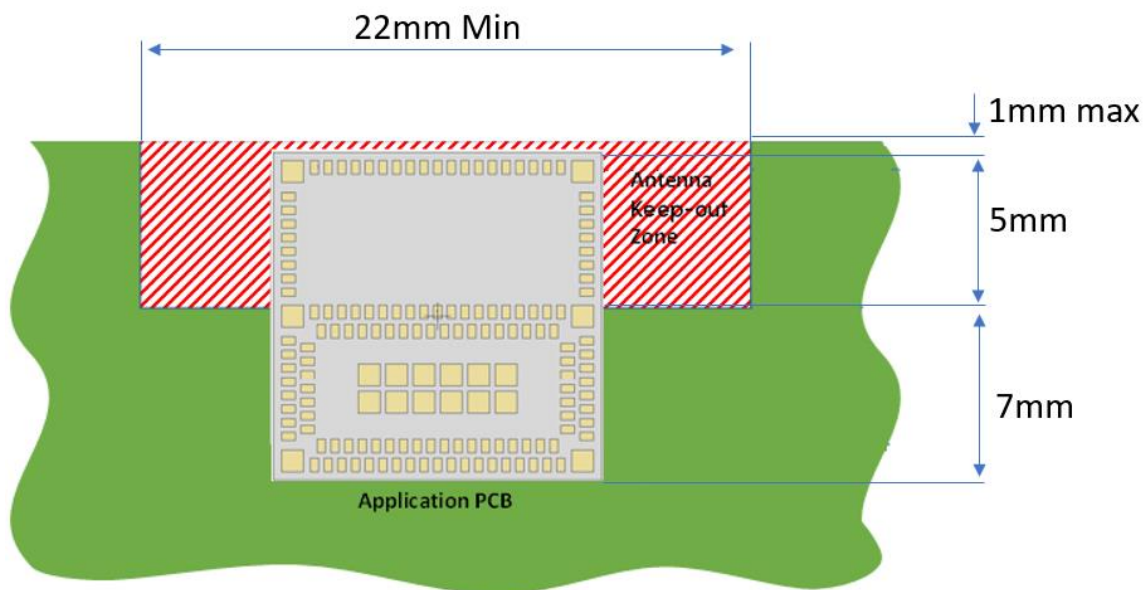
### 4.2. SMT Assembly Guidelines

For PCB Land Patterns and Solder Mask layout, Insight SiP recommends the use of the same dimensions as the module pads, i.e. 0.3 x 0.5 mm for standard and antenna mechanical 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.

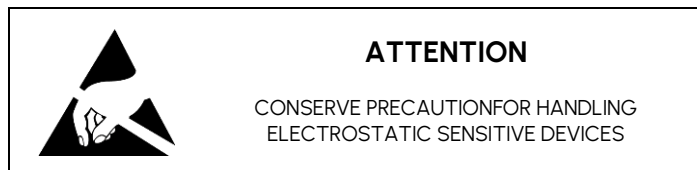


## 5. Storage & Soldering information

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### 5.1. 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



### 5.2. Moisture Sensitivity

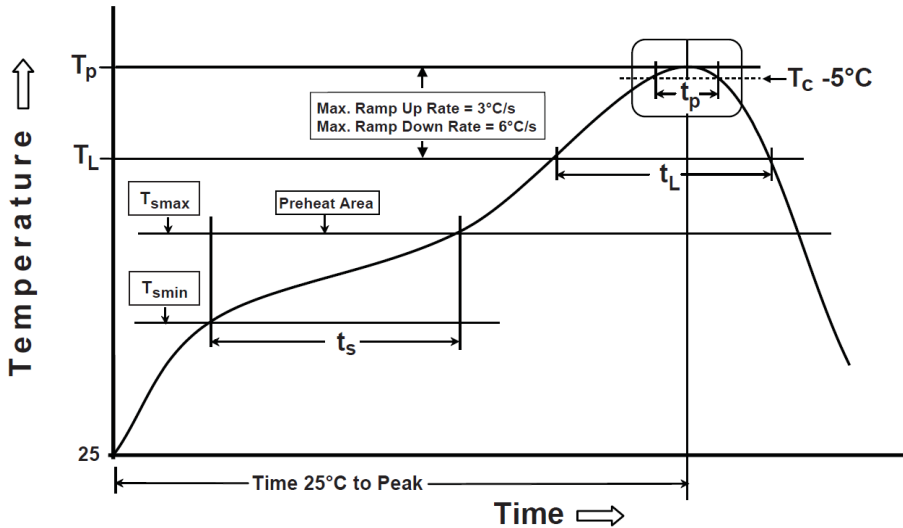
All plastic packages absorb moisture. During typical solder reflow operations when SMDs are mounted onto a PCB, the entire PCB and device population are exposed to a rapid change in ambient temperature. Any absorbed moisture is quickly turned into superheated steam. This sudden change in vapor pressure 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.

The product is qualified to MSL 3.

**5.3. 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 $T_c-5$ °C | 30 sec             |
| Ramp-down rate ( $T_p$ to $T_L$ )          | 6 °C/sec max       |
| Time 25 °C to peak temperature             | 8 mn max           |

## 6. Quality & User information

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### 6.1. Certifications

- CE – Certification pending
- FCC – Certification pending
- IC – Certification pending
- TELEC – Certification pending
- Bluetooth SIG – Certification pending
- RoHS3 compliant
- Reach compliant
- Minerals responsible initiative compliant

Further paragraphs will be added to this data sheet once the product is fully certified.

### 6.2. 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.

### 6.3. 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.

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