# GX805

# Smart Connect
# Bluetooth Low Energy Module


## Datasheet

**Ver 1.0**

# ** Revision History

| No | Version | Page | Description | Date |
|---|---|---|---|---|
| 1 | 1.0 | All | First release | 2025/01/07 |
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# Contents

# 1. GX805


**GX805 is a compact size, highly flexible, ultra-low power wireless BLE 5.0 Module based on nRF52805 SoC with an ARM® Cortex™ M4F CPU, embedded 2.4GHz transceiver, and integrated antenna. The nRF52805 SoC is a highly flexible, ultra-low power, multi-protocol SoC ideally suited for Bluetooth®lowenergy.**

**Key Features :**

- Bluetooth 5 : 2Mbps, CSA#2
- Wide supply voltage range : 1.7 V to 3.6 V
- ARM® Cortex®-M4 32-bit processor(64MHz), 192kB Flash and 24kB RAM
- Full set of digital interfaces including : SPI, TWI, UART
- 12-bit, 200ksps ADC
- Individual power management for all peripherals
- On-chip DC/DC buck converter
- Quadrature decoder
- I2C compatible 2-wire master/slave
- Dimension(mm) : 13.8 x 8.8 x 1.8
- 10 GPIOs

**Applications:**

- IoT devices
- Smart home applications
- Personal area networks
- Industrial automation
- Beacon technology
- Environmental monitoring

# 1.1 Features

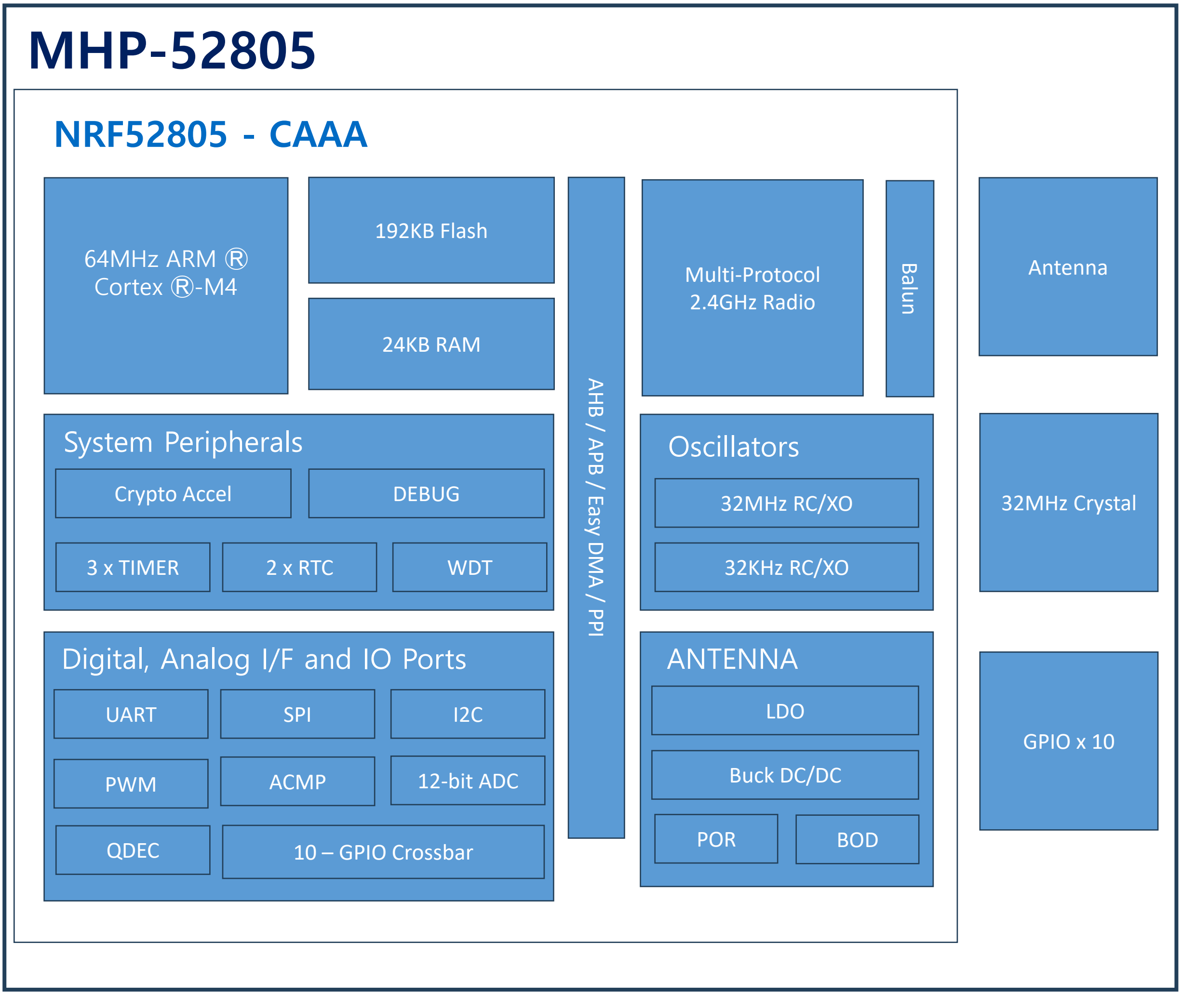
- Multi-protocol 2.4GHz radio
- 32-bit ARM Cortex – M4 processor
- 192KB flash programmed memory and 24KB RAM
- Software stacks available as downloads
- Application development independent from protocol stack
- On-air compatible with nRF51, nRF24AP and nRF24L series
- Programmable output power from +4dBm to -20dBm
- RSSI
- RAM mapped FIFOs using EasyDMA
- Flexible and configurable 10 pin GPIO
- Programmable peripheral interface - PPI
- Full set of digital interface all with Easy DMA including:
  - 1 x Hardware SPI master ; 1 x Hardware SPI slave
  - 1 x two-wire master ; 1 x two-wire slave
  - 1 x UART (CTS / RTS)
- 2 channel 12-bit / 200KSPS ADC
- 128-bit AES ECB / CCM / AAR co-processor
- Low power 32MHz crystal and RC oscillators
- Wide supply voltage range 1.7V to 3.6V
- On-chip DC/DC buck converter
- Individual power management for all peripherals
- Timer counter
  - 3x 32-bit
  - 2 x 24-bit RTC

# 1.2 Product Specifications(NRF52805)

| Detail | Description |
|---|---|
| **Bluetooth** | |
| Feature | Bluetooth® Low Energy<br>1M LE PHY<br>2M LE PHY CSA #2 |
| Security | AES-128 |
| LE connections | Concurrent peripheral and broadcaster roles |
| **Radio** | |
| Frequency | 2360MHz - 2500MHz |
| Modulations | GFSK at 1 Mbps/2 Mbps |
| Transmit power | +4 dBm maximum<br>Configurable down to -40dBm |
| Receiver sensitivity | -97 dBm at Bluetooth® LE/2.4GHz 1 Mbps mode<br>-94 dBm at Bluetooth® LE/2.4GHz 2 Mbps mode<br>-94 dBm at 1 Mbps ANT mode |
| Antenna | MK14A - PCB trace antenna<br>MK14B - External 2.4Ghz antenna |
| **Current consumption** | |
| TX only (DCDC enabled, 3V) @ +4dBm / 0dBm / -4dBm/-20dBm/-40dBm | 7mA / 4.6mA / 3.6mA / 2.5mA / 2.1mA |
| TX only @ +4dBm / 0dBm / -4dBm / -20dBm / -40dBm | 15.4mA / 10.1mA / 7.8mA / 5.4mA / 4.3mA |
| RX only (DCDC enabled, 3V) @1Msps BLE | 4.6mA |
| RX only @ 1Msps BLE | 10.0mA |
| RX only (DCDC enabled, 3V) @2Msps BLE | 5.2mA |
| RX only @ 2Msps BLE | 11.2mA |
| System OFF mode(3V) | 0.3uA |
| System OFF mode with full 24kB RAM retention(3V) | 0.5uA |
| System ON mode with full 24 kB RAM retention, wake on RTC (3V) | 1.1uA |
| System ON mode, no RAM retention, wake on RTC(3V) | 1.0uA |

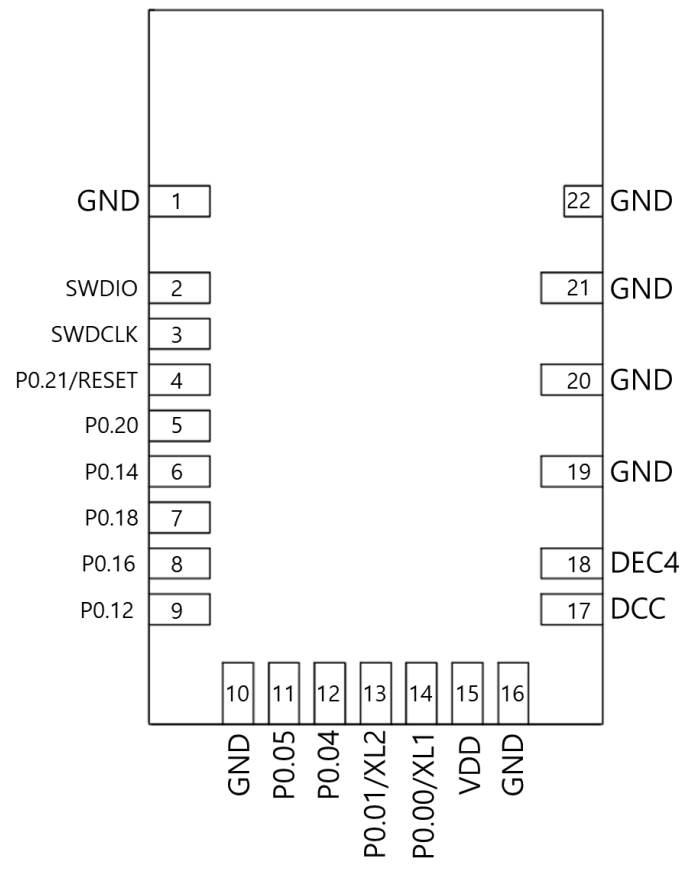
| Detail | Description |
|---|---|
| **Mechanical design** | |
| Dimensions | Length: 13.95mm±0.2mm<br>Width: 8.8mm±0.2mm<br>Height: 1.8mm+0.1mm/-0.15mm |
| Package | 22-Lead LGA Package |
| PCB material | FR-4 |
| Impedance | 50Ω |
| **Hardware** | |
| CPU | ARM® Cortex®-M4 32-bit processor with FPU, 64 MHz |
| Memory | 192kB flash, 24 kB RAM |
| Interfaces | SPI master/slave with EasyDMA<br>UART (CTS/RTS) with EasyDMA<br>2x 12-bit, 200ksps ADC<br>10 GPIOs |
| Power supply | 1.7V to 3.6V |
| Operating temperature range<br>Storage temperature range | -40 to 85°C<br>-40 to 125°C |
| Clock control | 32.768 kHz +/-20 ppm crystal oscillator |
| Power regulator | DC/DC regulator setup |
| **Certifications** | |
| Kor (KC) | KC modular certification |

# 2. Module Block Diagram



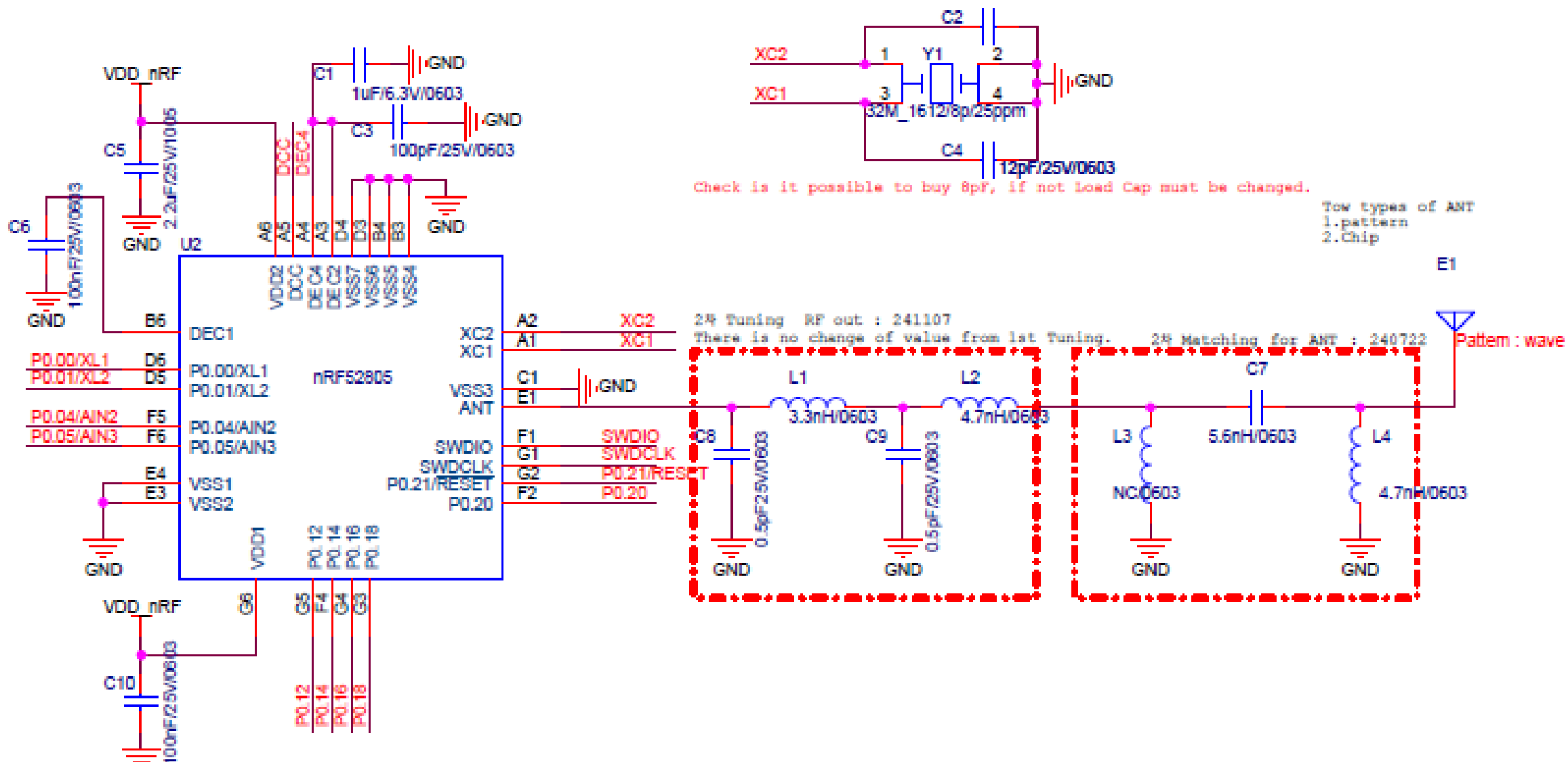
# 3. Pin Assignment

TOP VIEW

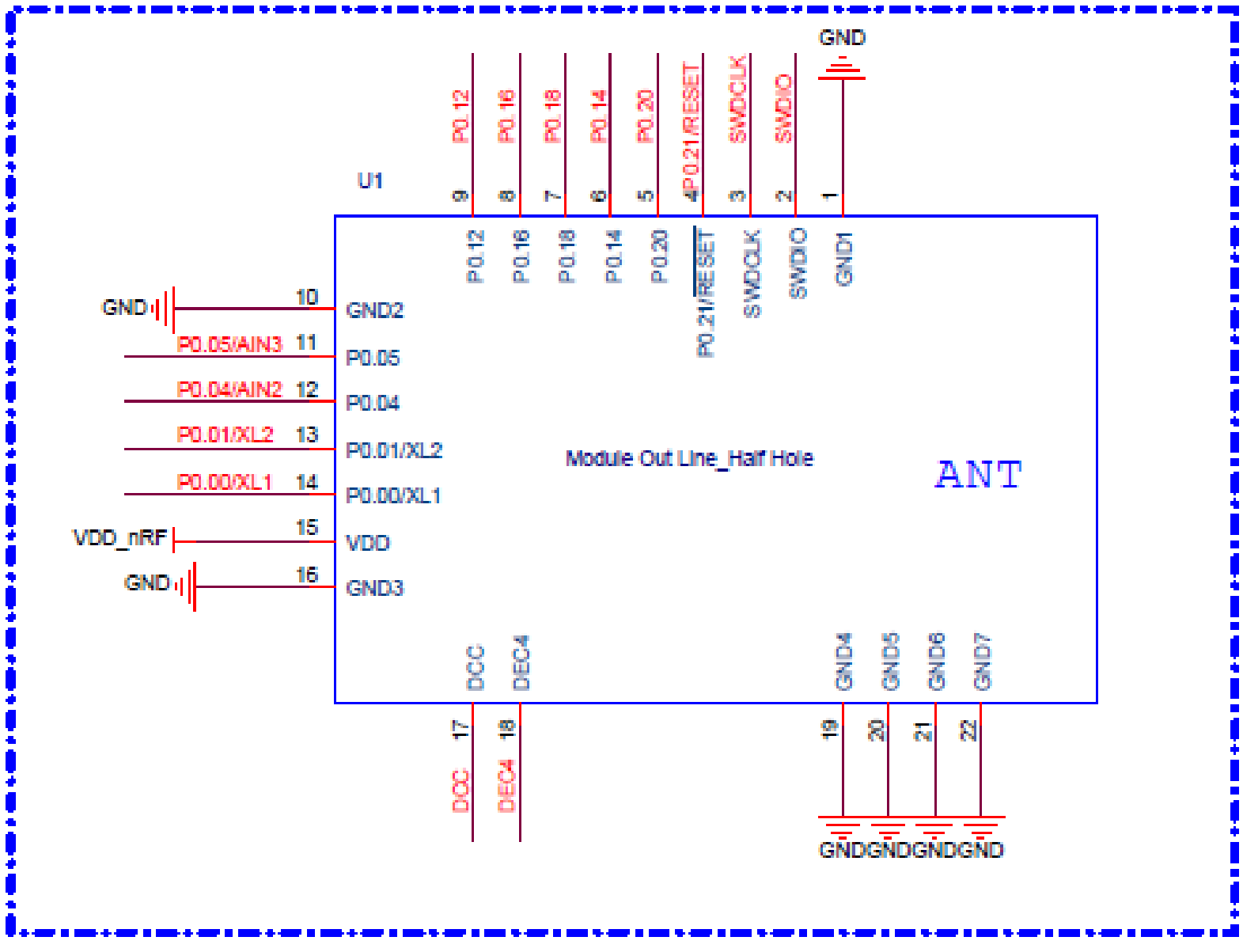



| Pin No. | Name | Pin function | Description |
|---|---|---|---|
| 1, 19, 20, 21, 22 | GND | Ground | The pad must be connected to a solid ground plane |
| 2 | SWDIO | Digital I/O | Serial wire debug I/O for debug and programming |
| 3 | SWDCLK | Digital input | Serial wire debug clock input for debug and program ming |
| 4 | P21<br>RESET | Digital I/O | General purpose I/O<br>Configurable as system RESET pin |
| 5 | P20 | Digital I/O | General purpose I/O |
| 6 | P14 | Digital I/O | General purpose I/O |
| 7 | P18 | Digital I/O | General purpose I/O |
| 8 | P16 | Digital I/O | General purpose I/O |
| 9 | P12 | Digital I/O | General purpose I/O |
| 10 | GND | Ground | The pad must be connected to a solid ground plane |
| 11 | P05 | Digital I/O | General purpose I/O |
| 12 | P04 | Digital I/O | General purpose I/O |
| 13 | P0.01<br>XL2 | Digital I/O<br>Analog input | General purpose I/O<br>Connection to 32.768KHz Crystal(LFXO) |
| 14 | P0.00<br>XL2 | Digital I/O<br>Analog input | General purpose I/O<br>Connection to 32.768KHz Crystal(LFXO) |
| 15 | VDD | Power | Power-supply pin |
| 16 | GND | Ground | The pad must be connected to a solid ground plane |
| 17 | DCC | Power | DC/DC converter output pin |
| 18 | DEC4 | Power | 1V 3regulator supply decoupling. Input from DC/DC converter. Output from 1V 3LDO |

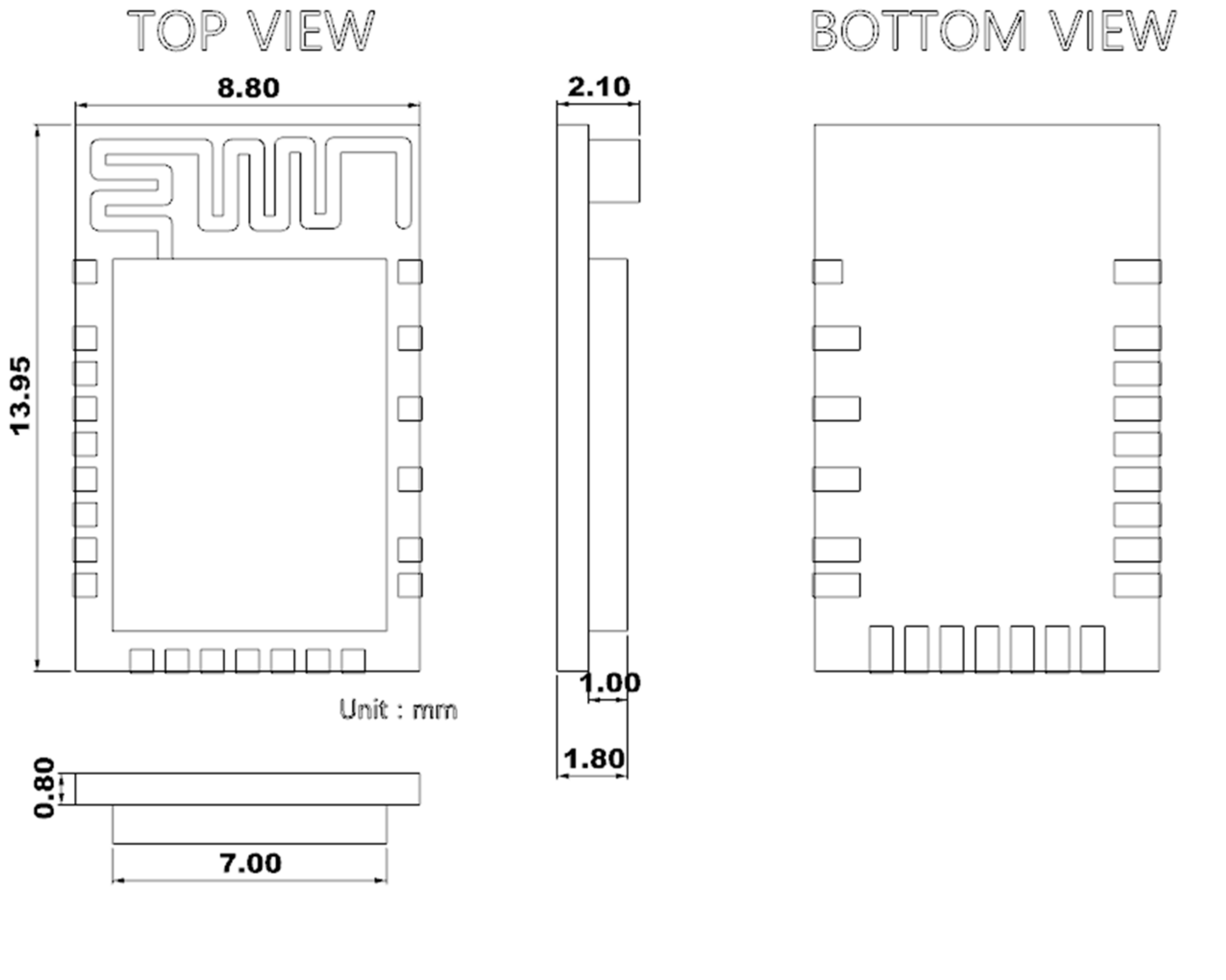
# 4. Circuit Diagram



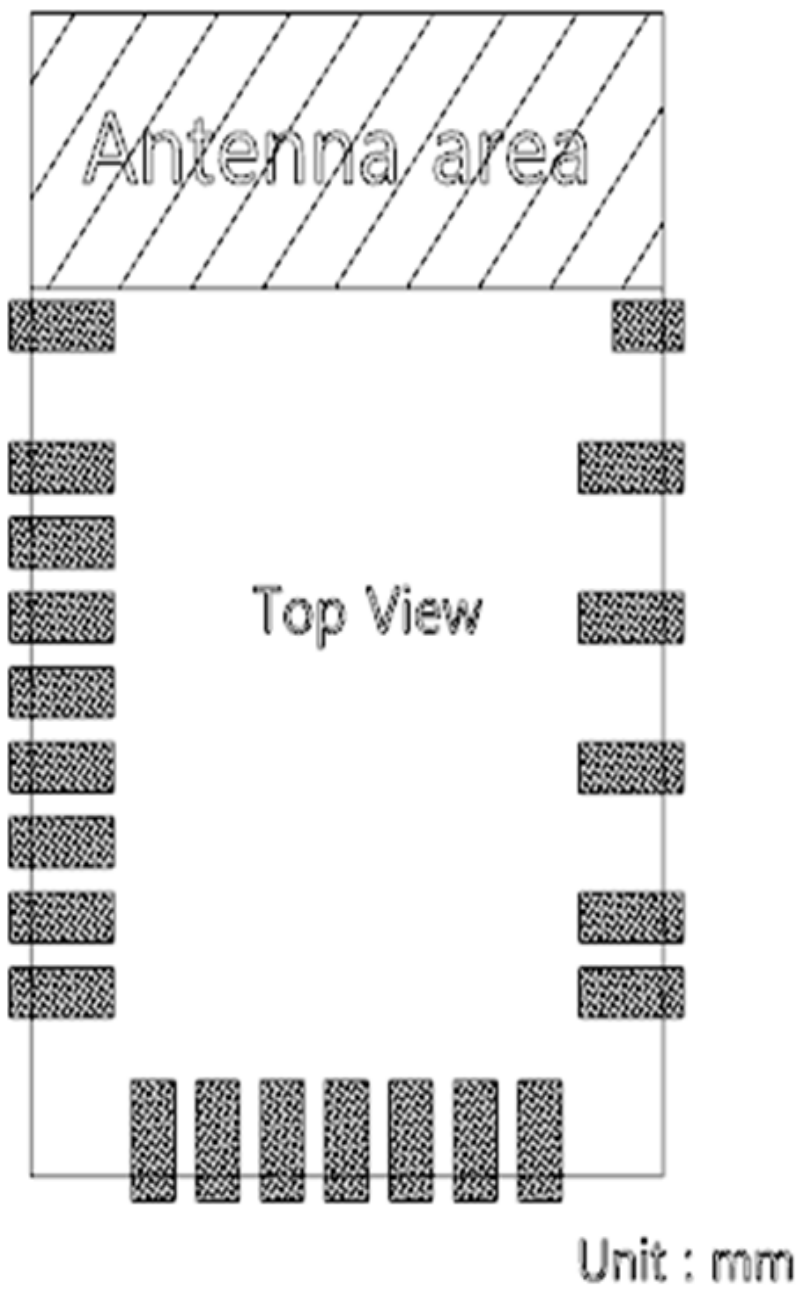

## Solder Half Holes on Outline

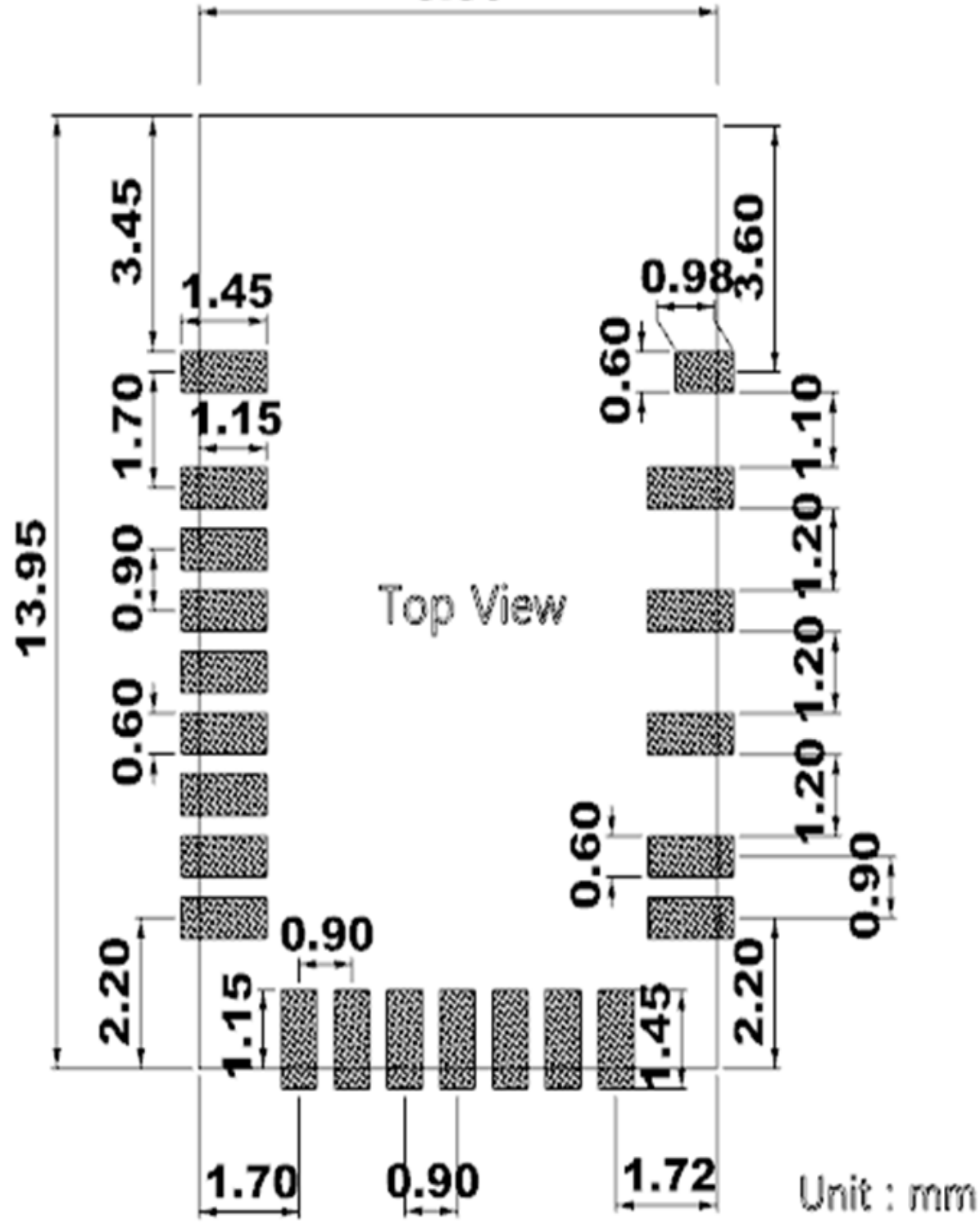


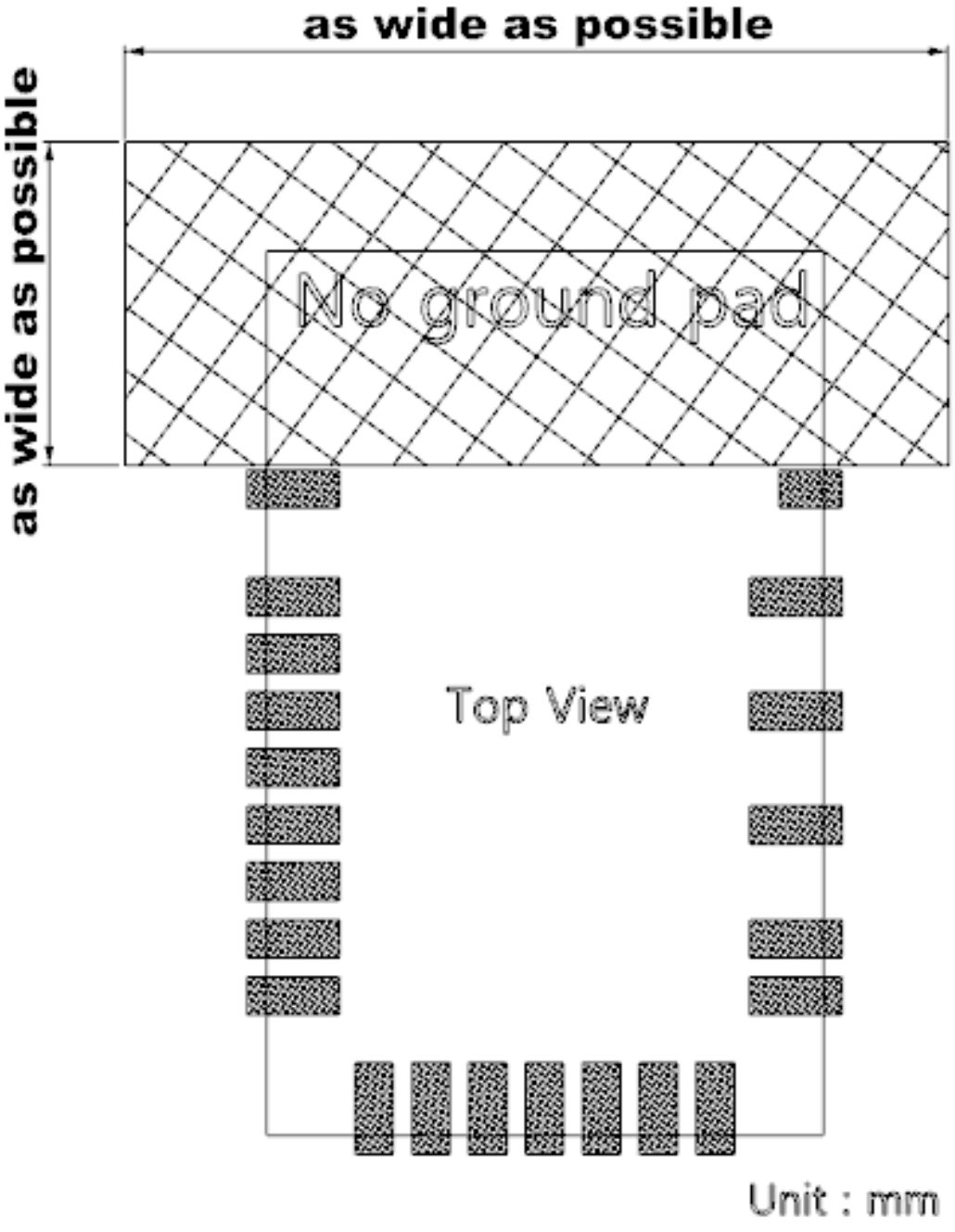
# 5. Product Dimension

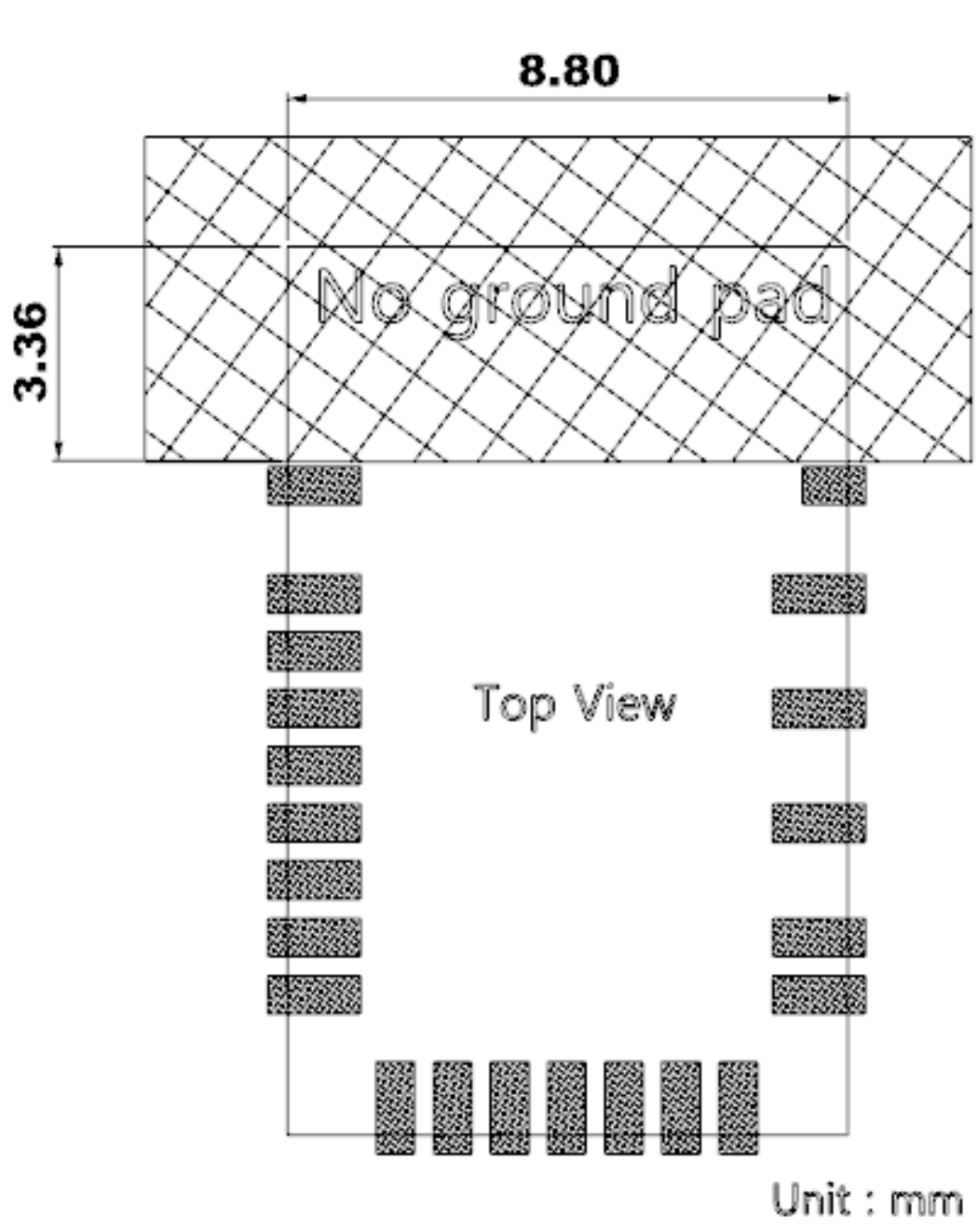


# * Layout


Antenna area
Top View
Unit : mm


8.80
13.95
3.45
1.45
1.70
1.15
0.90
0.60
2.20
0.90
1.15
1.70
0.90
1.72
1.45
0.60
0.98
3.60
0.60
1.10
1.20
1.20
0.60
0.90
2.20
Top View
Unit : mm




## ** Basic guidelines

1. Never place the ground plane or route copper traces directly underneath the antenna portion of the module

2. Never place the antenna close to metallic objects

3. Keep wiring, components, and objects away from antenna

4. Do not place the antenna in a metallic or metalized plastic enclosure

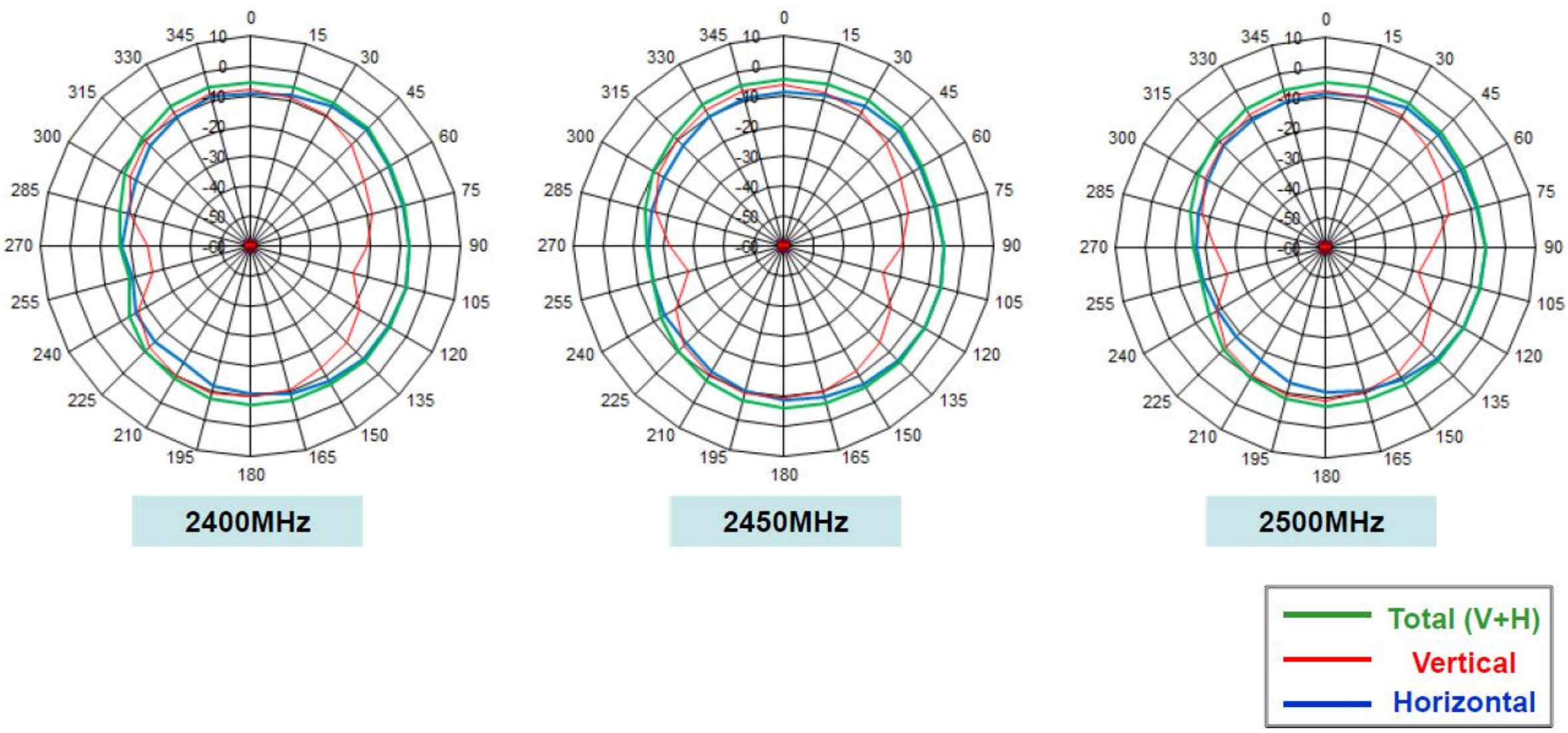
5. Enclosure walls should be 1cm or more away from the antenna in all directions

# 6. Antenna

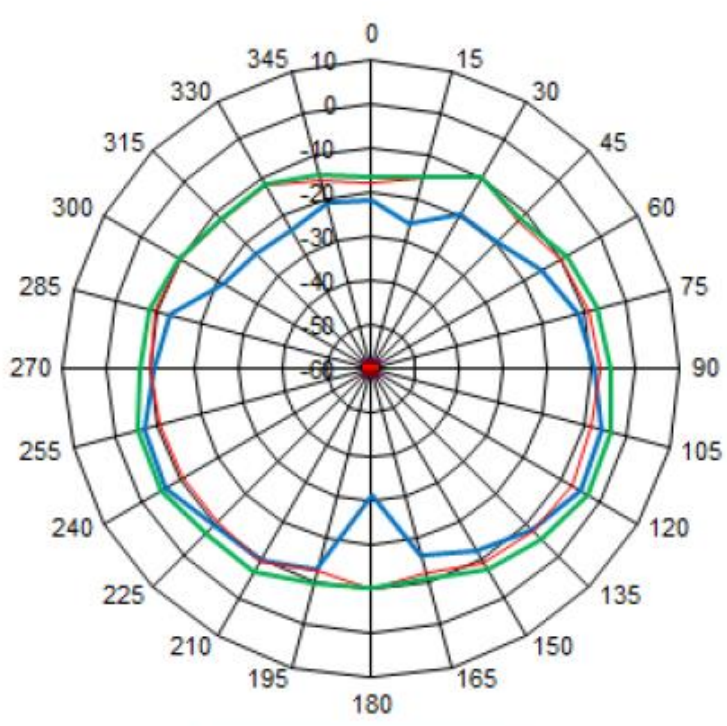
## * Passive data

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Frequency [MHz]** | **2400** | **2410** | **2420** | **2430** | **2440** | **2450** | **2460** | **2470** | **2480** | **2490** | **2500** |
| **Efficiency [dB]** | **-7.30** | **-7.35** | **-7.27** | **-6.80** | **-6.58** | **-6.49** | **-6.66** | **-6.95** | **-7.03** | **-7.41** | **-7.98** |
| **Efficiency [%]** | **18.6** | **18.4** | **18.8** | **20.9** | **22.0** | **22.4** | **21.6** | **20.2** | **19.8** | **18.2** | **15.9** |
| H-Plane | -8.85 | -8.94 | -8.76 | -8.15 | -8.19 | -8.18 | -8.24 | -8.35 | -8.12 | -8.34 | -9.19 |
| E1-Plane, AVG [dB] | -10.26 | -10.62 | -10.52 | -9.90 | -9.51 | -9.59 | -9.75 | -10.18 | -10.33 | -10.90 | -11.73 |
| E2-Plane, AVG [dB] | -9.28 | -9.38 | -9.30 | -9.05 | -8.74 | -8.93 | -9.12 | -9.45 | -9.55 | -10.04 | -10.65 |
| Peak Gain [dBi] | -2.74 | -2.82 | -3.07 | -2.79 | -1.98 | -1.93 | -2.08 | -2.42 | -2.35 | -2.97 | -3.31 |
| Directivity [dB] | 4.55 | 4.54 | 4.20 | 4.01 | 4.60 | 4.57 | 4.58 | 4.52 | 4.68 | 4.43 | 4.67 |
| Minimum Gain [dBi] | -20.04 | -19.82 | -17.64 | -19.07 | -18.01 | -18.65 | -18.56 | -18.76 | -20.39 | -22.40 | -27.58 |
| **Average Efficiency** | **-7.05 dB,** | | **19.70 %** | | | | | | | | |

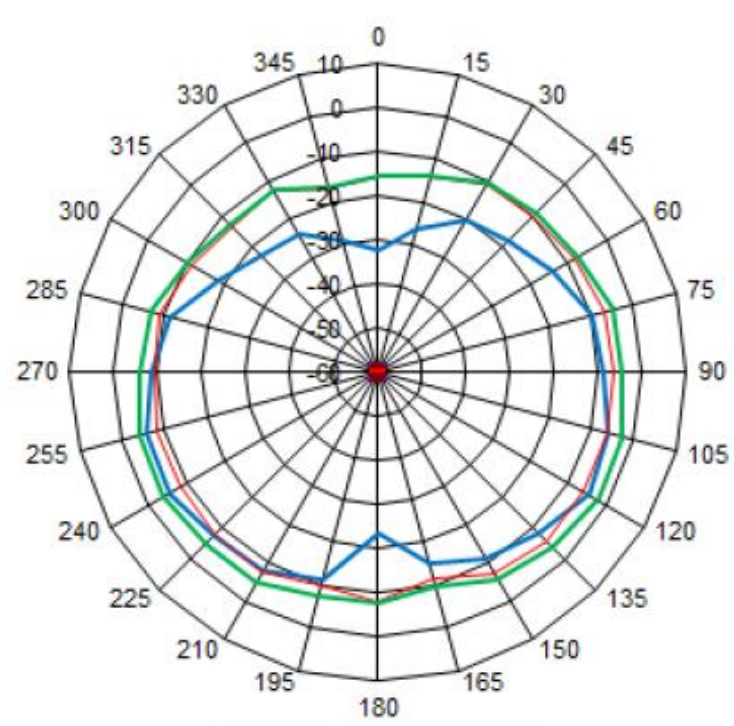
## * 2D Pattern Data (H-Plane)



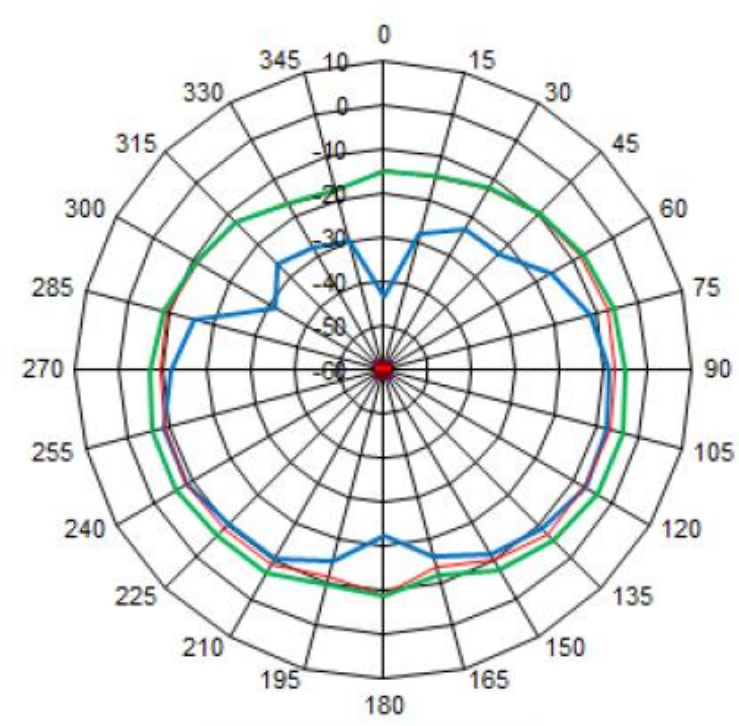
## * 2D Pattern Data (E1-Plane)



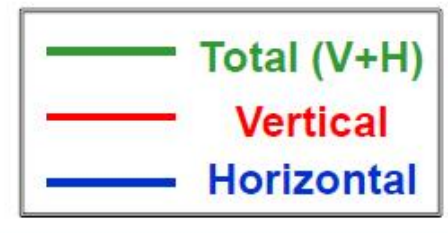

2400MHz



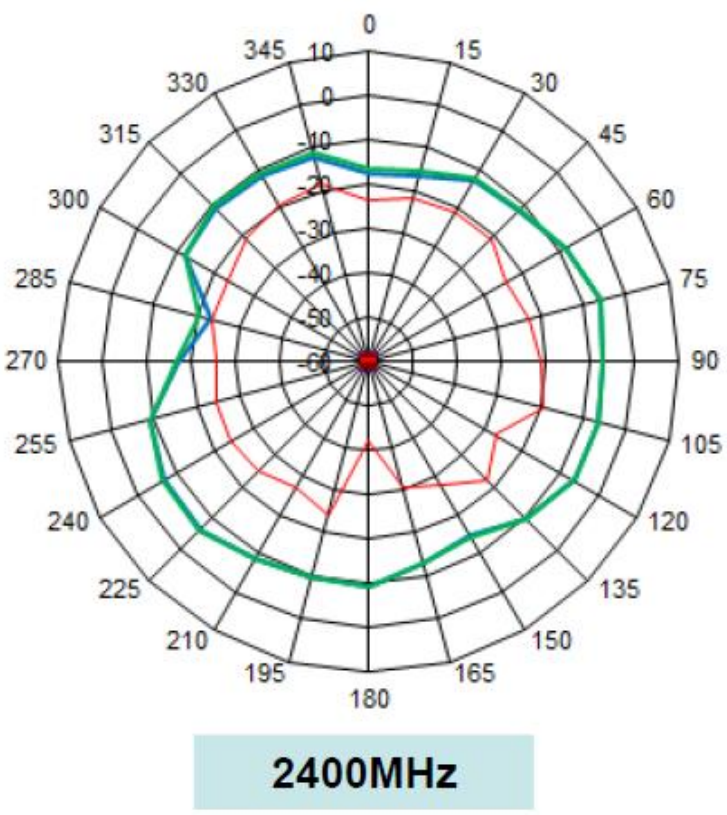

2450MHz



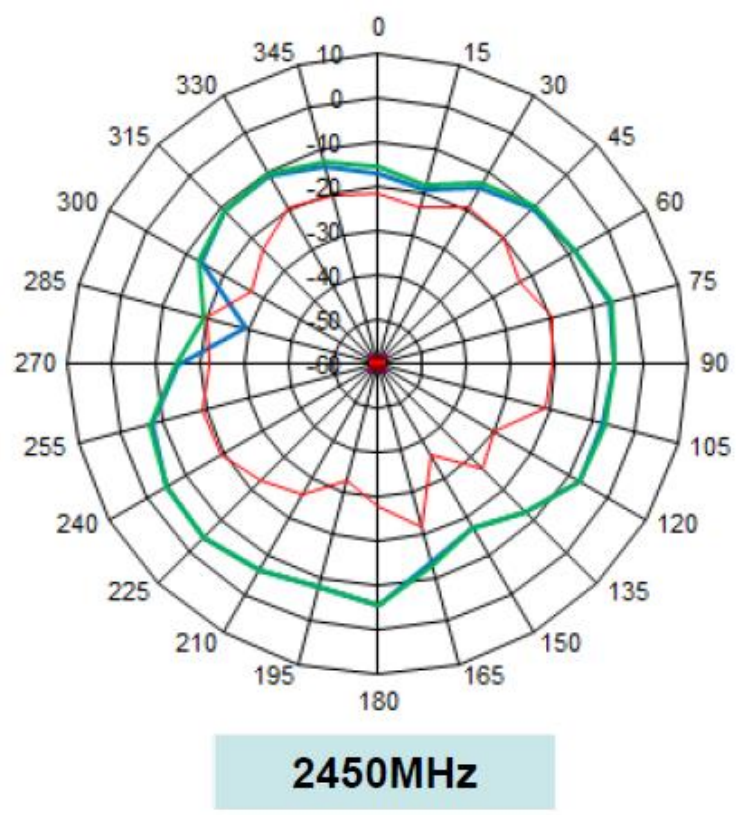

2500MHz



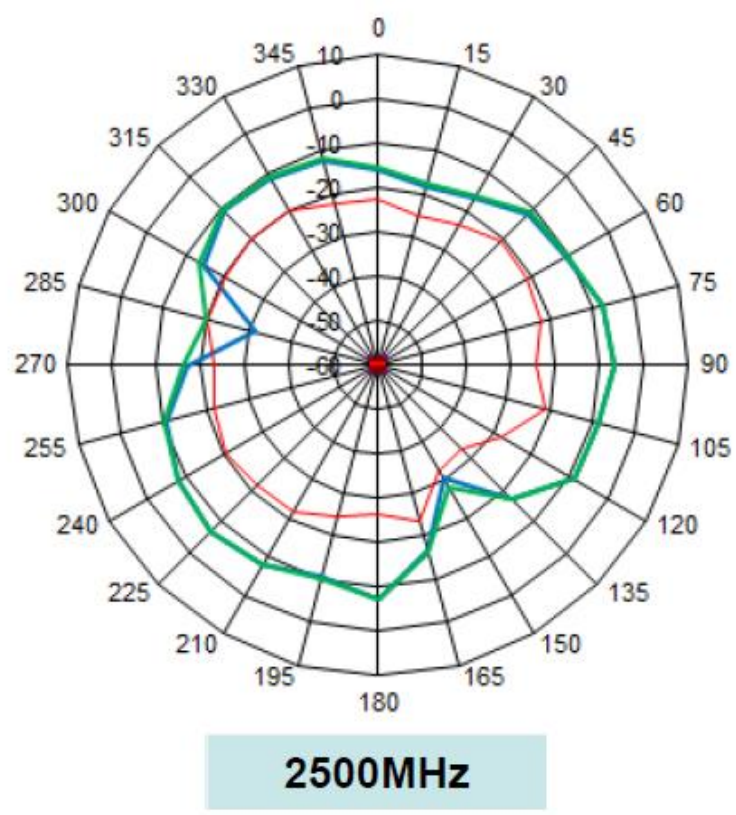

## * 2D Pattern Data (E2-Plane)



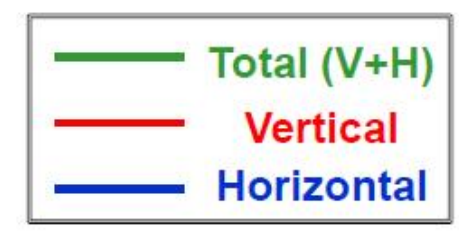

2400MHz




2450MHz




2500MHz



# 7. Certification

BAC9-AA31-7A5A-3C6A

## 방송통신기자재등의 적합등록 필증

*Registration of Broadcasting and Communication Equipments*

| | |
|---|---|
| 상호 또는 성명<br>Trade Name or Registrant | **(주)가람웨이브** |
| 기자재명칭(제품명칭)<br>Equipment Name | **블루투스모듈** |
| 기기부호/추가 기기부호<br>Equipment code<br>/Additional Equipment code | **LARN8** |
| 기본모델명<br>Basic Model Number | **GX805** |
| 파생모델명<br>Series Model Number | |
| 등록번호<br>Registration No. | **R-R-GXM-GX805** |
| 제조자/제조국가<br>Manufacturer/Country of Origin | **(주)가람웨이브/한국** |
| 등록연월일<br>Date of Registration | **2024-12-19** |
| 기타<br>Others | |

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It is verified that foregoing equipment has been registered under the Clause 3, Article 58-2 of Radio Waves Act.

2024년(Year) 12월(Month) 19일(Day)

국립전파연구원장 국립전파연구원장인

Director General of National Radio Research Agency

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