

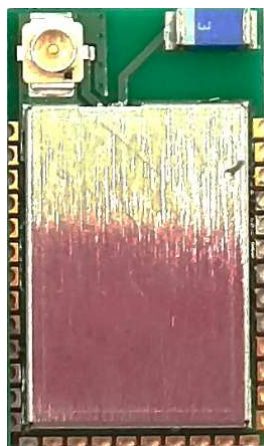


# BLE Module

**Datasheet**

**DFBM-NQ62X-DT0R**

*A Bluetooth Low Energy System On Chip Module.*





## Contents

|      |                                                        |    |
|------|--------------------------------------------------------|----|
| 1.   | Features .....                                         | 3  |
| 1-1. | General.....                                           | 3  |
| 1-2. | Bluetooth.....                                         | 3  |
| 2.   | Model No. Definition .....                             | 4  |
| 3.   | Block Diagram .....                                    | 6  |
| 4.   | General Specification.....                             | 7  |
| 5.   | Electrical Characteristics.....                        | 8  |
| 5-1. | Absolute Maximum Rating.....                           | 8  |
| 5-2. | Recommended Operating Conditions.....                  | 8  |
| 6.   | RF Characteristics .....                               | 9  |
| 6-1. | Bluetooth RF characteristics.....                      | 9  |
| 6-2. | Antenna Performance.....                               | 9  |
| 7.   | Pin Description.....                                   | 10 |
| 8.   | Reference Circuit .....                                | 12 |
| 8-1. | Standard Mode.....                                     | 12 |
| 9.   | Module Dimensions .....                                | 13 |
| 10.  | Recommend Soldering Conditions .....                   | 14 |
| 11.  | Layout Guide.....                                      | 15 |
| 12.  | Recommended Land Pattern .....                         | 16 |
| 13.  | Required End Product Labeling.....                     | 17 |
| 14.  | Manual Information to the End User .....               | 17 |
| 15.  | Federal Communications Commission (FCC) Statement..... | 17 |



## DFBM-NQ62X-DT0R BLE SoC Module

---

This document describes the DFBM-NQ62X-DT0R wireless BLE SoC module hardware specification. The modules provide cost effective, low power, and flexible platform to add BLE for embedded devices for a variety of applications, such as wireless sensors and thermostats. It uses BLE SoC, which integrating the 2.4GHz transceiver, a 32 bit ARM® Cortex M4F CPU, flash memory, and analog and digital peripherals.

## 1. Features

### 1-1. General

- BLE chip with a single chip antenna or an external RF connector
- Integrate a 32 bit ARM® Cortex M4F CPU, 512KB flash memory and 64KB RAM
- Extra 512KB flash memory for user data storage (Optional)
- 32.768KHz Real Time Clock (Optional)
- 12-bit 200kspc ADC - 8 configurable channels with programmable gain
- 30 General Purpose I/O Pins
- Two-wire Master (I2C compatible) support 100K bps and 400K bps
- UART baud rate up to 921600 bps
- SPI bit rate up to 4M bps
- Quadrature Decoder (QDEC)
- LGA 36 pin package
- Dimension 19.0mm(L) x 11.0mm(W) x 1.8 mm(H)
- RoHS compliant

### 1-2. Bluetooth

- Bluetooth 4.2 specification compliant
- AES HW encryption



**D F B M - N Q 6 2 X - DT 0 R**

|  |  |  |                                                            |                                                                                                                                            |
|--|--|--|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  | E = Pb free<br>R = RoHS<br>N = NG<br>L = Process with Lead |                                                                                                                                            |
|  |  |  | Lead Free                                                  |                                                                                                                                            |
|  |  |  | Serial Number                                              | 0 = Consumer Application                                                                                                                   |
|  |  |  | Customer code                                              | DT = Delta                                                                                                                                 |
|  |  |  | Version                                                    | 0 = Chip Ant+ Flash+ RTC<br>1 = RF Connector+ Flash+ RTC<br>2 = Chip Ant+ RTC<br>3 = RF Connector+ RTC<br>4 = Chip Ant<br>5 = RF Connector |
|  |  |  | Dimension                                                  | 2 = Class 2                                                                                                                                |
|  |  |  | Version                                                    | 6 = V4.2                                                                                                                                   |
|  |  |  | Chip Type                                                  | Q = QFN                                                                                                                                    |
|  |  |  | BT Chip                                                    | N = Nordic                                                                                                                                 |
|  |  |  | Product-typ                                                | M = Module                                                                                                                                 |
|  |  |  | Property                                                   | B = Bluetooth                                                                                                                              |
|  |  |  | Substrate                                                  | F = FR4                                                                                                                                    |
|  |  |  | Company                                                    | D = DELTA                                                                                                                                  |



## DFBM-NQ62X-DT0R

### Detail Part Number of Module

| Part Number              | Antenna Type |              | Storage Flash<br>(512KB) | Real Time<br>Clock (RTC) |
|--------------------------|--------------|--------------|--------------------------|--------------------------|
|                          | Chip Antenna | RF Connector |                          |                          |
| DFBM-NQ62 <b>0</b> -DT0R | O            |              | O                        | O                        |
| DFBM-NQ62 <b>1</b> -DT0R |              | O            | O                        | O                        |
| DFBM-NQ62 <b>2</b> -DT0R | O            |              |                          | O                        |
| DFBM-NQ62 <b>3</b> -DT0R |              | O            |                          | O                        |
| DFBM-NQ62 <b>4</b> -DT0R | O            |              |                          |                          |
| DFBM-NQ62 <b>5</b> -DT0R |              | O            |                          |                          |

## 3. Block Diagram

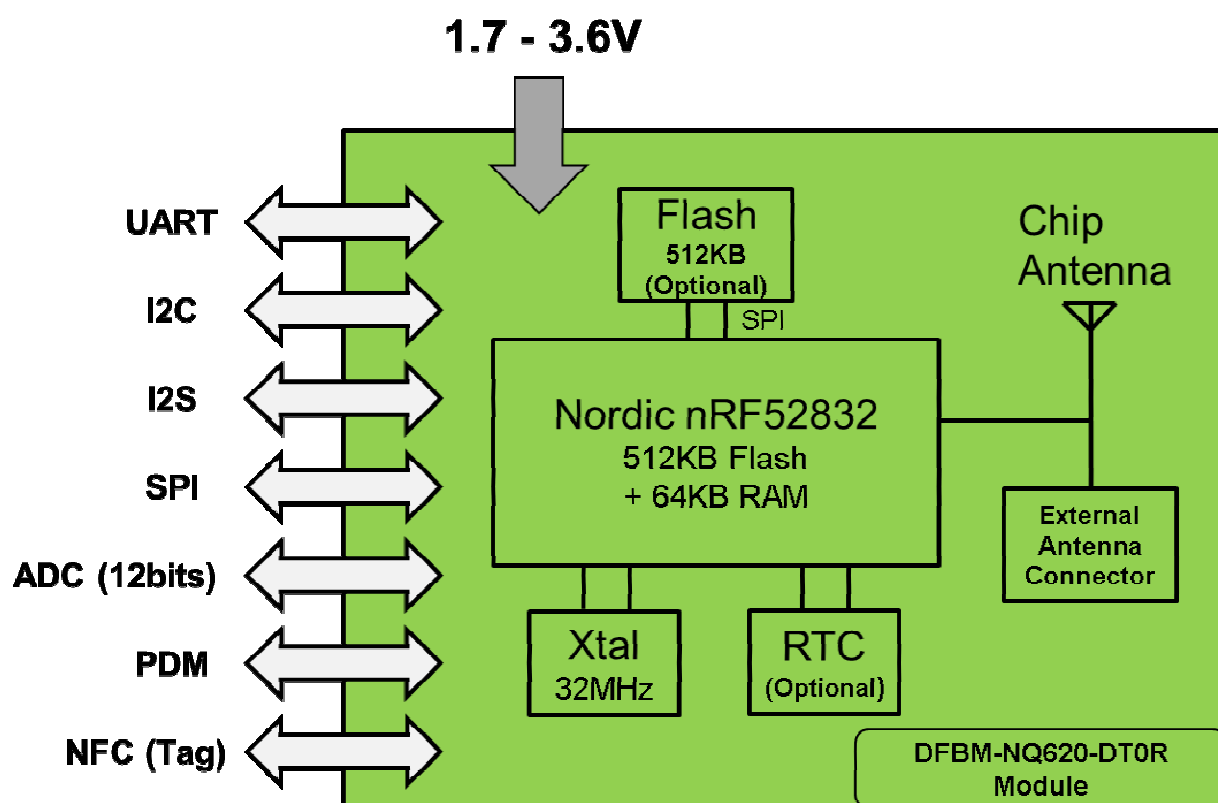


Figure 3-1. DFBM-NQ620-DT0R Block Diagram

## 4. General Specification

|                              |                      |
|------------------------------|----------------------|
| <b>Standard</b>              | Bluetooth: V4.2      |
| <b>Frequency</b>             | 2.402 ~ 2.48 GHz     |
| <b>Modulation</b>            | GFSK                 |
| <b>Data Rate</b>             | BLE: 0.25, 1, 2 Mbps |
| <b>Operating Temperature</b> | -40~+85 °C           |
| <b>Storage Temperature</b>   | -40~+125 °C          |
| <b>Antenna Impedance</b>     | 50 ohm               |
| <b>Package Size</b>          | 19.0 X 11.0 X 1.8 mm |
| <b>Host Interface</b>        | UART, SPI, I2C       |

Table 4-1. General Specification

## 5. Electrical Characteristics

### 5-1. Absolute Maximum Rating

| Symbol            | Min. | Max. | Units |
|-------------------|------|------|-------|
| VDD_3V3           | -0.3 | 3.9  | V     |
| V <sub>GPIO</sub> | -0.3 | 3.9  | V     |
| ESD-HBM           |      | 4    | KV    |
| ESD-CDM           |      | 750  | V     |

Table 5-1. Absolute Maximum Rating

### 5-2. Recommended Operating Conditions

| Symbol  | Parameter                                       | Min. | Typ. | Max. | Unit |
|---------|-------------------------------------------------|------|------|------|------|
| VDD_3V3 | Supply Voltage                                  | 1.7  | 3.3  | 3.6  | V    |
|         | System On, Standby mode                         |      | 3.5  |      | mA   |
|         | TX Current at POUT = +0 dBm                     |      | 6.5  |      | mA   |
|         | RX Current                                      |      | 7.0  |      | mA   |
|         | Current in SYSTEM OFF, no RAM retention.        |      | 1.2  |      | uA   |
|         | Current in SYSTEM OFF mode 32 kB RAM retention. |      | 1.0  |      | uA   |
|         | SYSTEM-ON base current with 32 kB RAM enabled.  |      | 1.5  |      | uA   |

Table 5-2. Bluetooth Power Consumption



## 6. RF Characteristics

### 6-1. Bluetooth RF characteristics

Condition: VDD\_3V3=VIO=3.3V, T=25°C

| Item                               | Condition                  | Min. | Typ. | Max. | Unit |
|------------------------------------|----------------------------|------|------|------|------|
| <b>RF Characteristics</b>          |                            |      |      |      |      |
| Output Power                       |                            | -20  | 0    | 4    | dBm  |
| Initial Frequency Offset           |                            | -75  |      | 75   | KHz  |
| Carrier Frequency Offset and Drift | CFOD                       | -150 |      | 150  | KHz  |
| Modulation Characteristics         | Modulation Index (F1 / F2) | 0.8  |      |      | N/A  |
|                                    | F1 Average                 | 225  |      | 275  | KHz  |
|                                    | F2 Maximum                 | 185  |      |      | KHz  |
| Sensitivity                        | PER < 30.8%                | -96  |      | -70  | dBm  |
| Maximum Input Level                | PER < 30.8%                | -10  |      |      | dBm  |

Table 6-4. Bluetooth RF Characteristics

### 6-2. Antenna Performance

| Item                    | Specification                                  |
|-------------------------|------------------------------------------------|
| Working Frequency Range | 2450 ± 50 MHz                                  |
| Peak Gain (dBi)         | Chip Antenna: +2dBi<br>External Antenna: +2dBi |
| Antenna Type            | Chip Antenna / External Antenna (Dipole)       |
| VSWR                    | Less than 2.8                                  |

Table 6-5. Antenna Characteristics



## 7. Pin Description

| Pin | Definition | Function    | Description                       |
|-----|------------|-------------|-----------------------------------|
| 1   | GND        | Gnd         | Ground                            |
| 2   | P0.25      | Digital I/O | Bluetooth general purpose I/O pin |
| 3   | P0.26      | Digital I/O | Bluetooth general purpose I/O pin |
| 4   | P0.27      | Digital I/O | Bluetooth general purpose I/O pin |
| 5   | P0.28      | Digital I/O | Bluetooth general purpose I/O pin |
| 6   | P0.29      | Digital I/O | Bluetooth general purpose I/O pin |
| 7   | P0.30      | Digital I/O | Bluetooth general purpose I/O pin |
| 8   | P0.31      | Digital I/O | Bluetooth general purpose I/O pin |
| 9   | GND        | Gnd         | Ground                            |
| 10  | VDD_3V3    | Power       | VDD power supply input            |
| 11  | GND        | Gnd         | Ground                            |
| 12  | GND        | Gnd         | Ground                            |
| 13  | GND        | Gnd         | Ground                            |
| 14  | P0.02      | Digital I/O | Bluetooth general purpose I/O pin |
| 15  | P0.03      | Digital I/O | Bluetooth general purpose I/O pin |
| 16  | P0.04      | Digital I/O | Bluetooth general purpose I/O pin |
| 17  | P0.09      | Digital I/O | Bluetooth general purpose I/O pin |
| 18  | P0.10      | Digital I/O | Bluetooth general purpose I/O pin |
| 19  | P0.11      | Digital I/O | Bluetooth general purpose I/O pin |
| 20  | P0.12      | Digital I/O | Bluetooth general purpose I/O pin |
| 21  | P0.13      | Digital I/O | Bluetooth general purpose I/O pin |
| 22  | P0.14      | Digital I/O | Bluetooth general purpose I/O pin |
| 23  | P0.15      | Digital I/O | Bluetooth general purpose I/O pin |
| 24  | GND        | Gnd         | Ground                            |



## DFBM-NQ62X-DT0R

|    |        |               |                                                                          |
|----|--------|---------------|--------------------------------------------------------------------------|
| 25 | P0.16  | Digital I/O   | Bluetooth general purpose I/O pin                                        |
| 26 | P0.17  | Digital I/O   | Bluetooth general purpose I/O pin                                        |
| 27 | P0.18  | Digital I/O   | Bluetooth general purpose I/O pin                                        |
| 28 | P0.19  | Digital I/O   | Bluetooth general purpose I/O pin                                        |
| 29 | P0.20  | Digital I/O   | Bluetooth general purpose I/O pin                                        |
| 30 | P0.21  | Digital I/O   | Bluetooth general purpose I/O pin                                        |
| 31 | SWDCLK | Digital input | Hardware debug and flash programming I/O                                 |
| 32 | SWDIO  | Digital I/O   | System reset (active low). Also hardware debug and flash programming I/O |
| 33 | P0.22  | Digital I/O   | Bluetooth general purpose I/O pin                                        |
| 34 | P0.23  | Digital I/O   | Bluetooth general purpose I/O pin                                        |
| 35 | P0.24  | Digital I/O   | Bluetooth general purpose I/O pin                                        |
| 36 | GND    | Gnd           | Ground                                                                   |

Table 7-1. Pin Description

## 8. Reference Circuit

### 8-1. Standard Mode

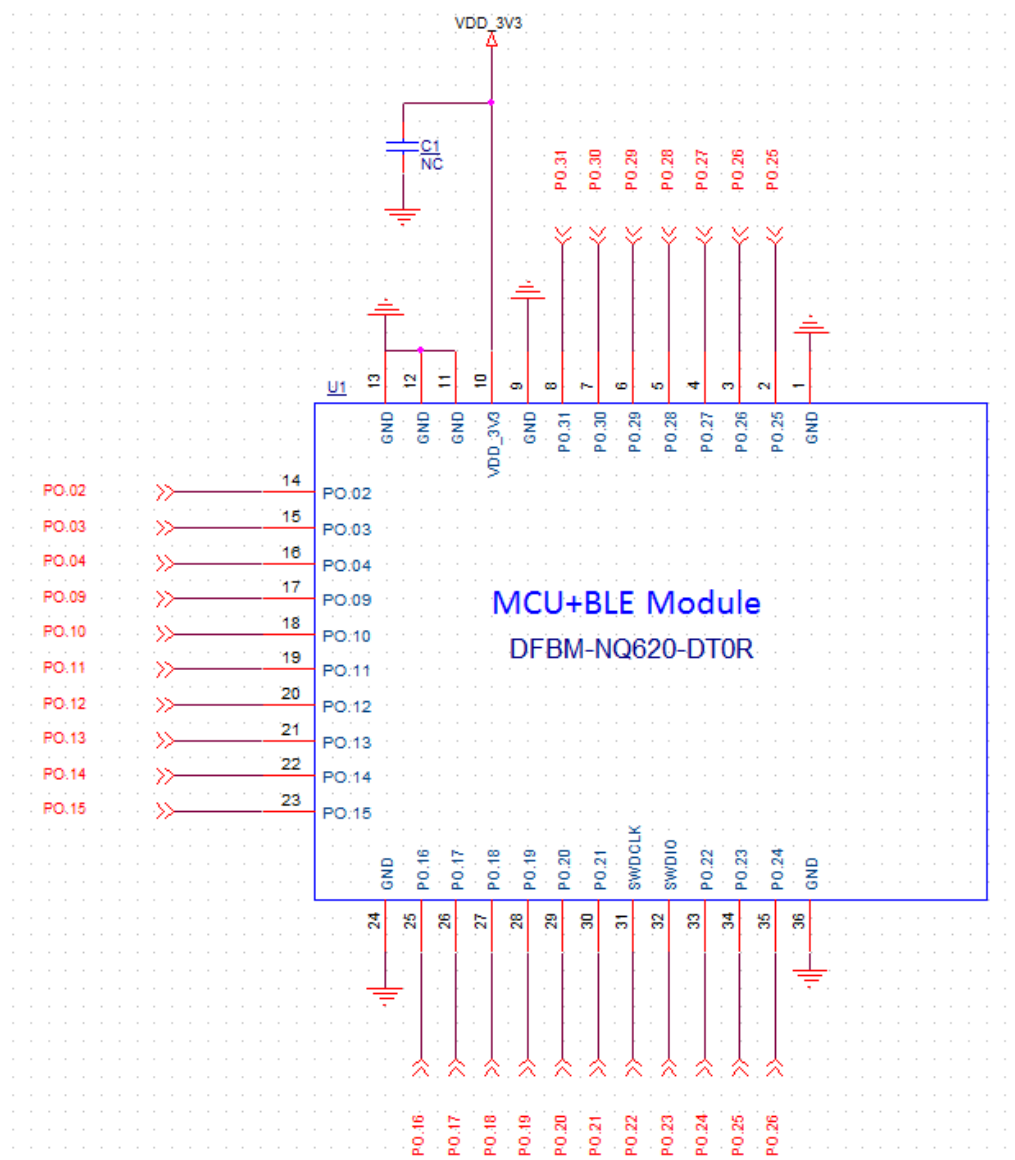


Figure 8-1. DFBM-NQ62X-DT0R Reference Circuit

## 9. Module Dimensions

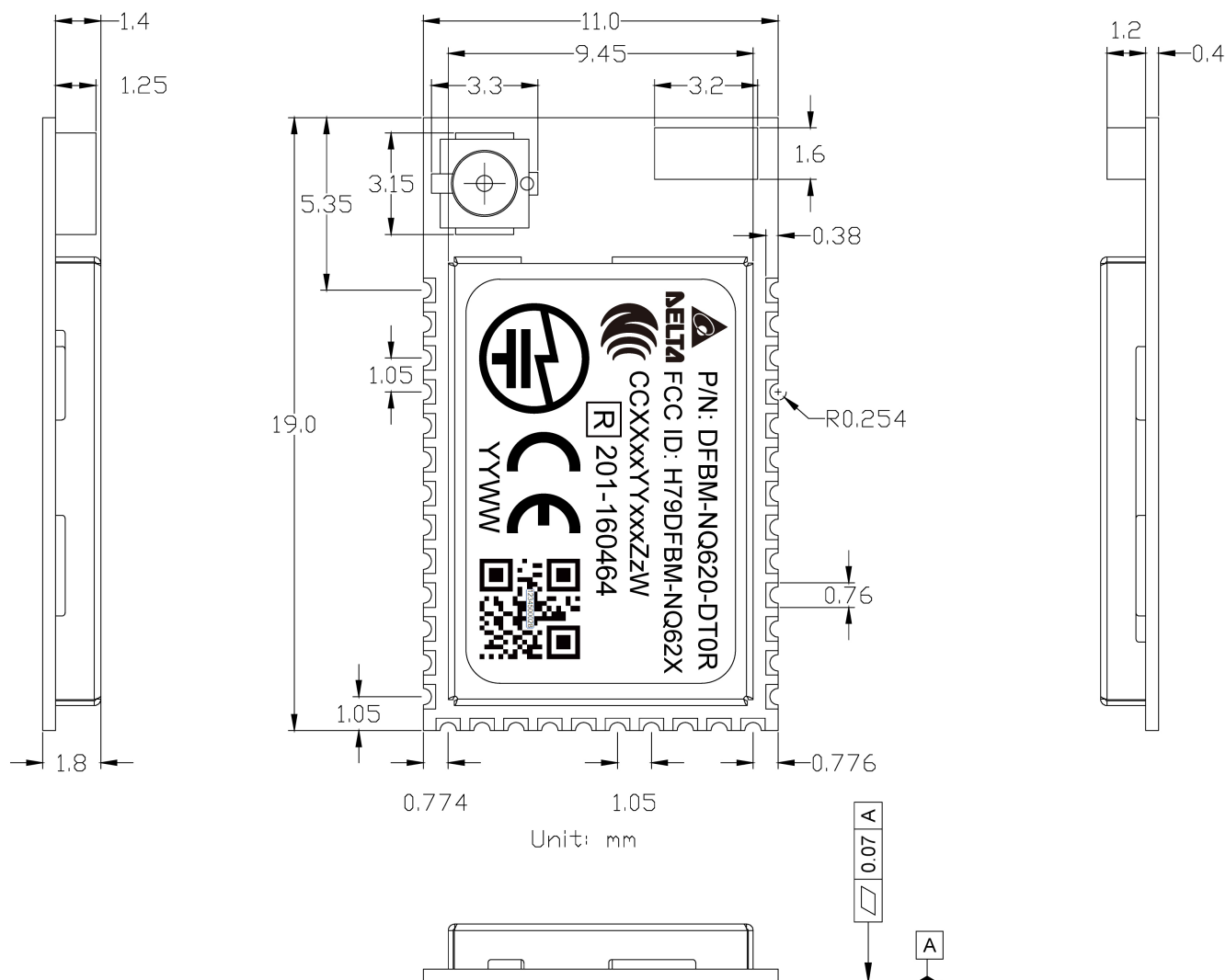


Figure 9-1. DFBM-NQ62X-DT0R Module Dimension

## 10. Recommend Soldering Conditions

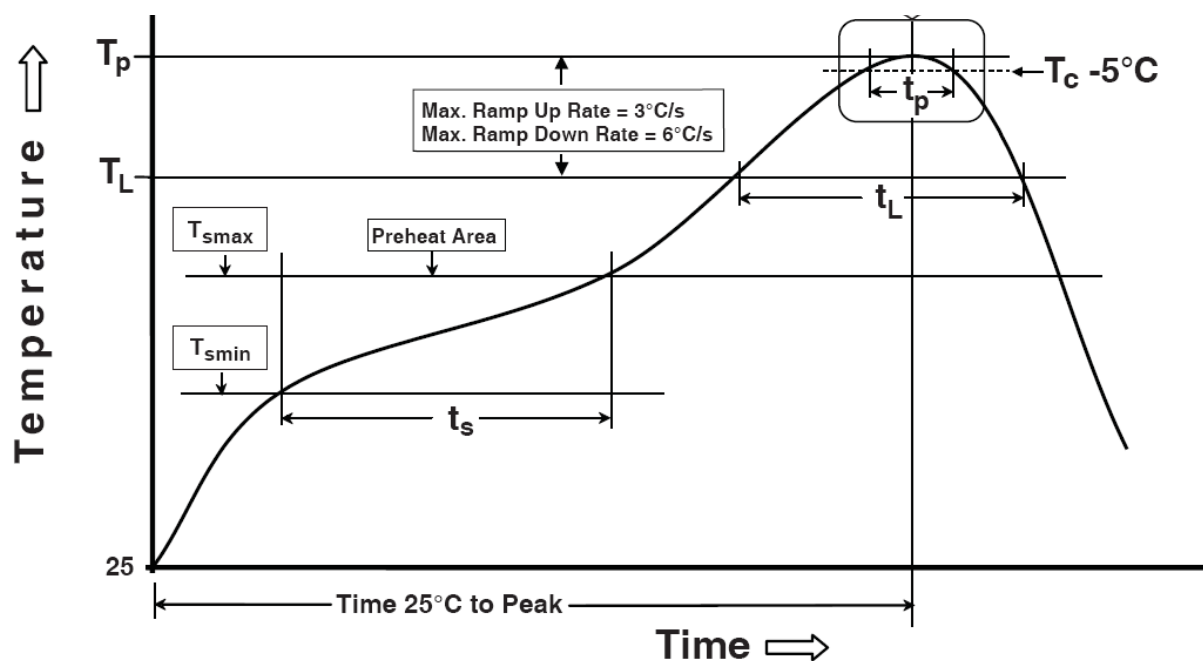


Figure 10-1. Reflow temperature Profile

| No. | Item       | Temperature (°C)                                       | Time (sec)                |
|-----|------------|--------------------------------------------------------|---------------------------|
| 1   | Pre-heat   | T <sub>smin</sub> : 150 °C ~ T <sub>smax</sub> : 200°C | t <sub>s</sub> : 60 ~ 120 |
| 2   | Soldering  | T <sub>L</sub> : >= 217°C                              | t <sub>L</sub> : 60~150   |
| 3   | Peak-Temp. | T <sub>p</sub> : 260 °C                                | t <sub>p</sub> : 30       |

Table 10-2. Reflow temperature Profile Parameters

## 11. Layout Guide

1. All traces can fan out directly.
2. To have basic radiation performance. Recommend to keep antenna area (below red block, 11.0 mm x 4.2 mm) clean and 5 mm extended.
3. To have better radiation performance, more clearance area is needed. Recommend to keep any metal out from antenna clearance and 20 mm extended.
4. Thickness of system board will make antenna resonant frequency shift. Recommend thickness of system board is 1.0mm which resonant frequency is 2.5GHz. Resonant frequency will be close to 2.45GHz after assembly in plastic housing.

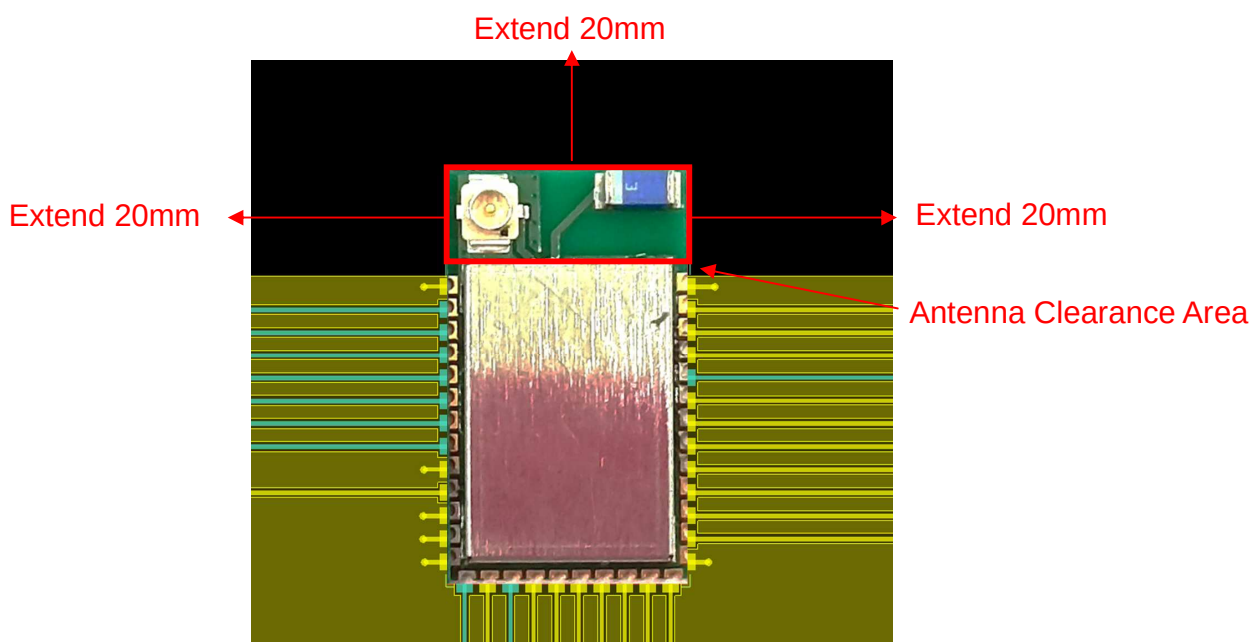


Figure 11-1. Layout Guide

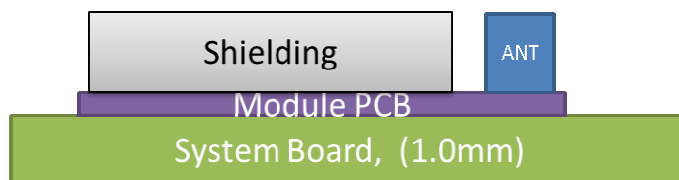


Figure 11-2. Thickness of system board



Technical drawing of a U-shaped frame structure. The overall dimensions are 11.0 (width) and 19.0 (height). The frame is composed of 10 vertical segments and 10 horizontal segments. The vertical segments are spaced 1.05 units apart, and the horizontal segments are spaced 0.774 units apart. The corner segments are 0.76 units thick. The drawing includes dimension lines and arrows indicating the measurements.

Figure 12-1. Recommended Stencil Aperture



### 13. Required End Product Labeling

Any device incorporating this module must include an external, visible, permanent marking or label which states: "Contains FCC ID: H79DFBM-NQ62X."

### 14. Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as shown in this manual.

### 15. Federal Communications Commission (FCC) Statement

#### 15.21

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

#### 15.105(b)

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:



## DFBM-NQ62X-DT0R

---

- 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.

This device complies with part 15 of the FCC Rules. 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.

### **RF Radiation Exposure Statement:**

This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.