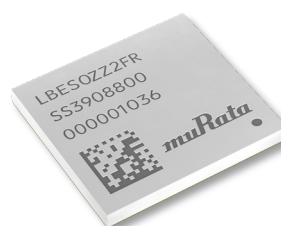


# Hostless Wi-Fi® 6 + Bluetooth® LE 5.4 / 802.15.4 Tri-Radio Module

NXP Chipset RW612 for 802.11a/b/g/n/ac/ax + Bluetooth LE  
5.4 / IEEE 802.15.4 Datasheet - Rev. D

- Design Name: Type 2FR
- P/N: LBES0ZZ2FR



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## About This Document

Murata's Type 2FR is a small and very high-performance module based on NXP RW612 combo chipset, supporting IEEE 802.11 a/b/g/n/ac/ax + Bluetooth LE 5.4 / 802.15.4. This data sheet describes Type 2FR module in detail.

## Audience & Purpose

The intended audience includes any customer looking to integrate this module into their product. In particular RF, hardware, software, and systems engineers.

## Document Conventions

**Table 1** describes the document conventions.

**Table 1: Document Conventions**

| Conventions                                                                         | Description                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <b>Warning Note</b><br>Indicates very important note. Users are strongly recommended to review.                                                                                                                                                                                                                                                                                           |
|  | <b>Info Note</b><br>Intended for informational purposes. Users should review.                                                                                                                                                                                                                                                                                                             |
|  | <b>Menu Reference</b><br>Indicates menu navigation instructions.<br><b>Example:</b> Insert → Tables → Quick Tables → Save Selection to Gallery                                                                                                                                                       |
|  | <b>External Hyperlink</b><br>This symbol indicates a hyperlink to an external document or website.<br><b>Example:</b> <a href="#">Murata</a> <br>Click on the text to open the external link.                                                                                                          |
|  | <b>Internal Hyperlink</b><br>This symbol indicates a hyperlink within the document.<br><b>Example:</b> <a href="#">Scope</a> <br>Click on the text to open the link.                                                                                                                                   |
| <code>Console input/output or<br/>code snippet</code>                               | <b>Console I/O or Code Snippet</b><br>This text <b>Style</b> denotes console input/output or a code snippet.                                                                                                                                                                                                                                                                              |
| <code># Console I/O comment<br/>// Code snippet comment</code>                      | <b>Console I/O or Code Snippet Comment</b><br>This text <b>Style</b> denotes a console input/output or code snippet comment. <ul style="list-style-type: none"> <li>Console I/O comment (preceded by "#") is for informational purposes only and does not denote actual console input/output.</li> <li>Code Snippet comment (preceded by "//") may exist in the original code.</li> </ul> |

## 1 Scope

This specification characterizes the Type 2FR hostless tri-radio IEEE 802.11 a/b/g/n/ac/ax + Bluetooth LE 5.4 / IEEE 802.15.4 IoT module.

## 2 Key Features

- ◆ NXP RW612 inside
- ◆ 260 MHz Arm® Cortex® -M33
- ◆ Supports IEEE 802.11a/b/g/n/ac/ax specification: Dual band 2.4 GHz and 5 GHz Wi-Fi 6
- ◆ SISO with 20 MHz channels; up to MCS9 data rates
- ◆ Supports Bluetooth specification version 5.4
- ◆ Supports IEEE 802.15.4
- ◆ 1.2 MB SRAM; 16MB Flash; External PSRAM interface for system memory expansion up to 128 MB
- ◆ 64 GPIOs, FlexSPI, SDIO 3.0, Ethernet, USB, USART, I2C, SPI, I2S, PCM, ACOMP, DAC, ADC, JTAG
- ◆ RF signal from pin pad
- ◆ Temperature Range: -40 °C to 85 °C
- ◆ Dimensions: 12.0 mm x 11.0 mm x 1.55 mm (maximum)
- ◆ Weight: 0.54 g
- ◆ MSL: 3
- ◆ Surface-mount type
- ◆ RoHS compliant

## 3 Ordering Information

The part number and associated ordering information is shown in **Table 2**.

**Table 2: Sample Ordering Information**

| Ordering Part Number | Description            |
|----------------------|------------------------|
| LBES0ZZ2FR-SMP       | Type 2FR module sample |
| LBES0ZZ2FR-580       | Type 2FR module        |
| LBES0ZZ2FR-EVK       | Type 2FR EVK           |

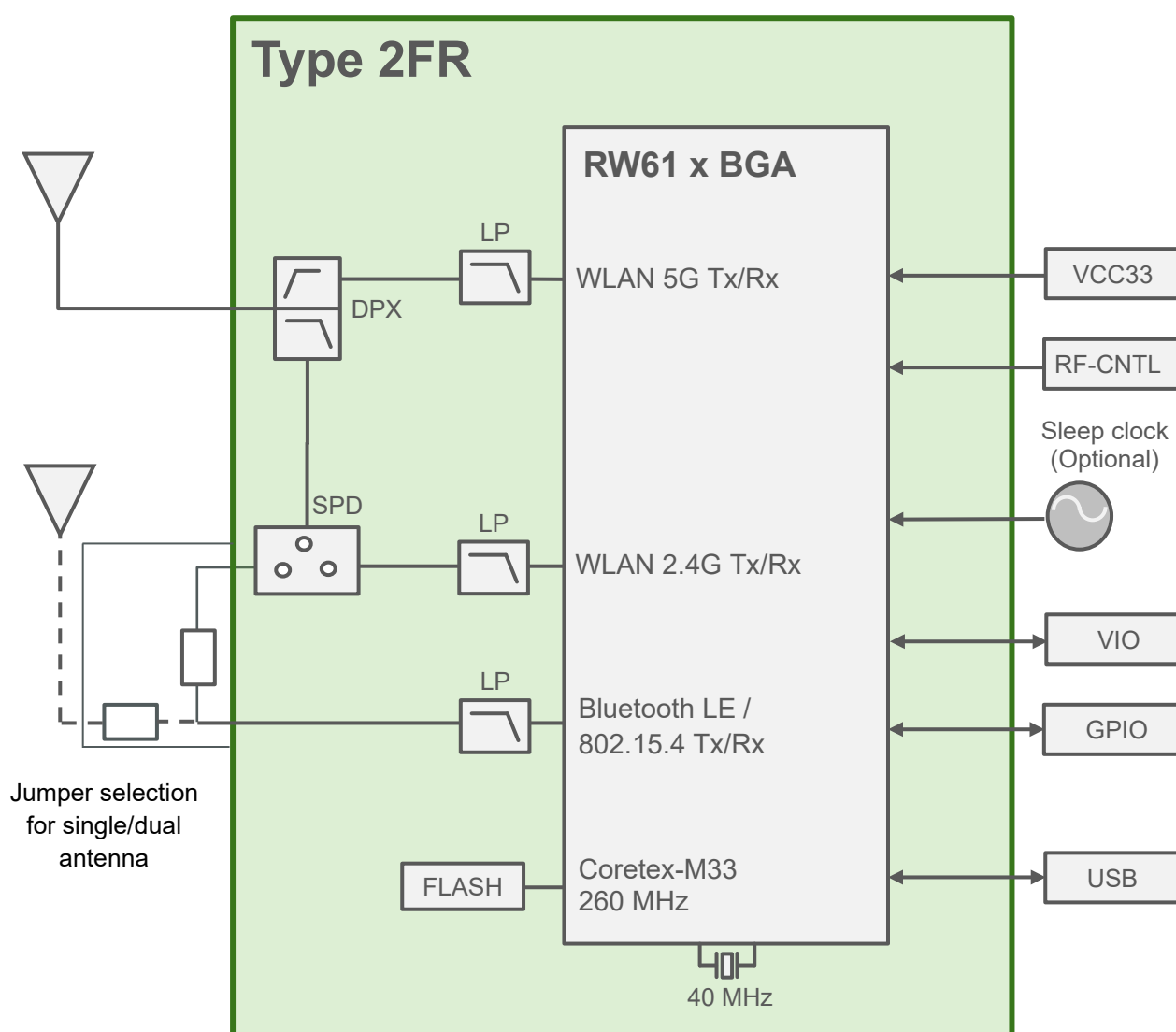
## 4 Product Overview

Type 2FR is a highly integrated wireless module based on NXP RW612 Wireless MCU. It measures just 12mm x 11mm and delivers class-leading integration, efficiency, and multiple radio capabilities. Type 2FR supports dual-band Wi-Fi 6, Bluetooth® Low Energy (LE) 5.4, IEEE 802.15.4, and ethernet. This versatility ensures seamless connectivity and operational efficiency. Further, it supports Matter Network over Wi-Fi, Thread, and ethernet. This simplifies device interoperability and management.

### 4.1 Block Diagram

**Figure 1** shows the block diagram.

**Figure 1: Block Diagram**



## 4.2 Microcontroller (MCU)

The NXP RW612 wireless SoC integrates an Arm Cortex-M33 MCU for user applications, see [RW612 Datasheet](#) .

- 260 MHz Arm Cortex-M33 with TrustZone-M
- CoreMark® score: 1,033; 3.97 CoreMark/MHz
- 1.2 MB integrated SRAM

## 4.3 Memory and Flash

Type 2FR module integrates 16MB flash memory through FlexSPI interface to RW612. The module supports external flash or external memory through FlexSPI interface.

For details, please refer to [RW612 Datasheet](#)  and [Type 2FR EVK Schematic](#) .

## 4.4 Peripheral Interfaces

Type 2FR supports total 64 GPIOs and rich peripheral interfaces for user application.

- Up to five configurable universal serial interface modules (FlexComm interfaces). Configurable as SPI/I2C/I2S/UART
- SDIO 3.0
- High Speed USB 2.0 On-The-Go (OTG) with integrated PHY
- IEEE 1588 RMI/ Fast Ethernet interface
- QVGA (320 x 240) LCD interface supporting SPI and 8080 interfaces
- 16-bit ADC and 10-bit DAC
- 32-bit general purpose timers/PWM
- 4 x digital microphone support

For details, please refer to [RW612 Datasheet](#) .

## 4.5 Built-in Security Features

Type 2FR inherited all the built-in advanced security features from RW612 chip.

- NXP EdgeLock™ Assurance
- NXP EdgeLock 2GO Trust Provisioning
- Trusted execution environment (TEE) based on Arm TrustZone-M
- Hardware root of trust
- Hardware cryptography accelerators (symmetric, asymmetric, secure hash, KDF, etc.)
- True Random Number Generator (TRNG)
- Physically Unclonable Function (PUF)
- OTP-based device configuration and life cycle management
- Secure boot, software update and debug



- On-chip tamper detection for voltage level and glitch, temperature and reset

For details, please refer to [RW612 Datasheet](#) .

## 4.6 Type 2FR and Type 2FP

Type 2FR and Type 2FP family are based on NXP RW61x family IC. The **Table 3** below shows the comparison of these two modules. Type 2FR and Type 2FP are drop-in replacement for each other.

**Table 3: Comparison of Type 2FR and Type 2FP**

|            | Type 2FR                                                   | Type 2FP                                        |
|------------|------------------------------------------------------------|-------------------------------------------------|
| IC         | NXP RW612                                                  | NXP RW610                                       |
| Radios     | Dual band Wi-Fi 6(802.11ax)<br>Bluetooth LE 5.4/ IEEE 15.4 | Dual band Wi-Fi 6(802.11ax)<br>Bluetooth LE 5.4 |
| Dimensions | 12.0 mm x 11.0 mm x 1.55 mm (maximum)                      |                                                 |
| Footprint  | Share the same footprint                                   |                                                 |
| Pin-out    | Share the same pin-out                                     |                                                 |
| Antenna    | Support the same antenna selections                        |                                                 |
| Software   | Same SDK from NXP                                          |                                                 |

## 5 Certification Information

This section describes the radio and Bluetooth certification.

### 5.1 Radio Certification

**Table 4** describes the radio certification information.

**Table 4: Radio Certification Information**

| Country | ID                    | Country Code | Tx Power Limit File |
|---------|-----------------------|--------------|---------------------|
| US      | FCC ID: HSW2FR        | US           |                     |
| Canada  | IC ID: 4492A-2FR      | CA           |                     |
| Europe  |                       | DE           |                     |
| Japan   | TELEC ID: R201-240517 | JP           |                     |

### 5.2 Bluetooth Qualification

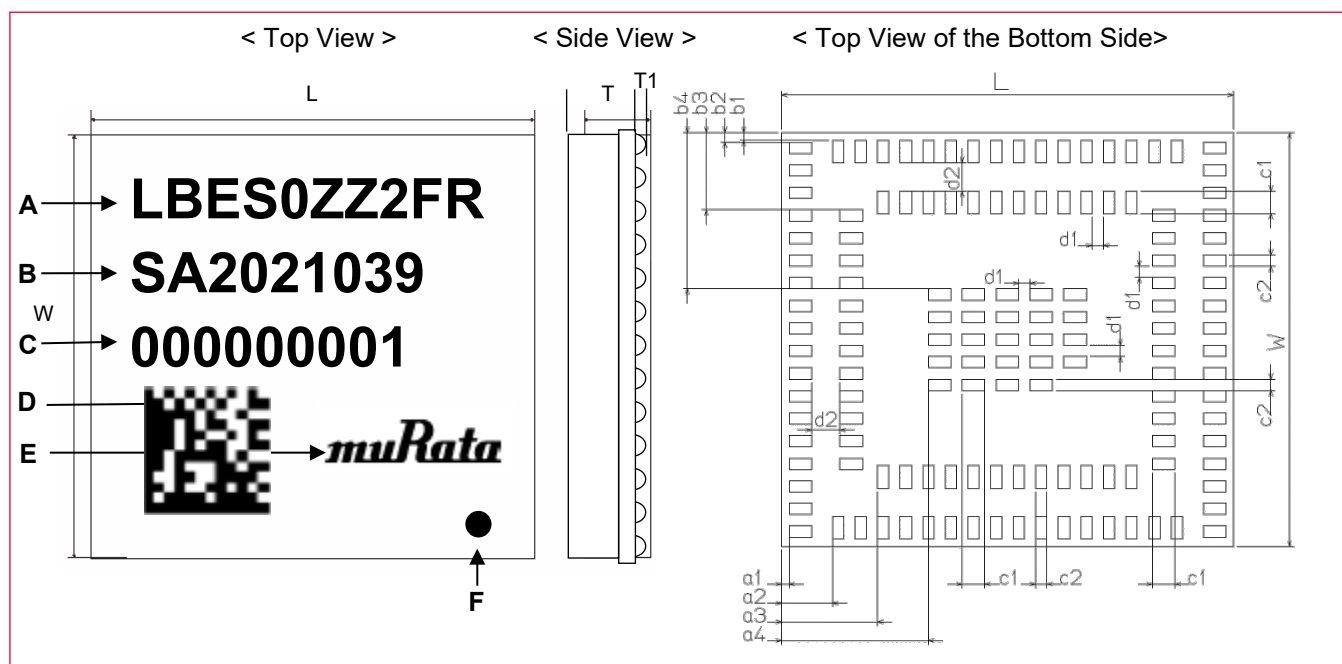
QDID: Q321062

DID/DN: D068386

## 6 Dimensions, Marking, and Terminal Configurations

This section provides information about dimensions, markings, and terminal configuration for Type 2FR and the related parameters. **Figure 2** shows the dimensions, marking, and terminal configurations.

**Figure 2: Dimensions, Markings, and Terminal Configurations**



**Table 4** describes the marking labels for the top and bottom view as shown in **Figure 2**.

**Table 5: Markings (Top View)**

| Labels | Meaning           |
|--------|-------------------|
| A      | Module Type       |
| B      | Inspection Number |
| C      | Serial Number     |
| D      | 2D code           |
| E      | Murata Logo       |
| F      | Pin 1 Marking     |

**Table 6** describes the markings.

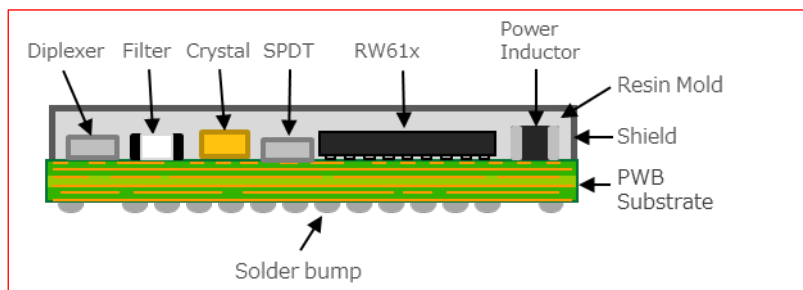
**Table 6: Markings (Bottom View)**

| Labels | Dimensions    | Labels | Dimensions          | Labels | Dimensions    |
|--------|---------------|--------|---------------------|--------|---------------|
| L      | 12.0 +/- 0.20 | W      | 11.0 +/- 0.20       |        |               |
| T      | 1.55 maximum  | T1     | 0.04 typical (Bump) |        |               |
| a1     | 0.20 +/- 0.20 | b1     | 0.20 +/- 0.20       | c1     | 0.60 +/- 0.10 |
| a2     | 1.35 +/- 0.20 | b2     | 0.25 +/- 0.20       | c2     | 0.30 +/- 0.10 |
| a3     | 2.55 +/- 0.20 | b3     | 2.05 +/- 0.20       | d1     | 0.30 +/- 0.10 |
| a4     | 3.90 +/- 0.20 | b4     | 4.15 +/- 0.20       | d2     | 0.75 +/- 0.10 |

## 6.1 Structure

**Figure 3** shows the module structure.

**Figure 3: Structure**

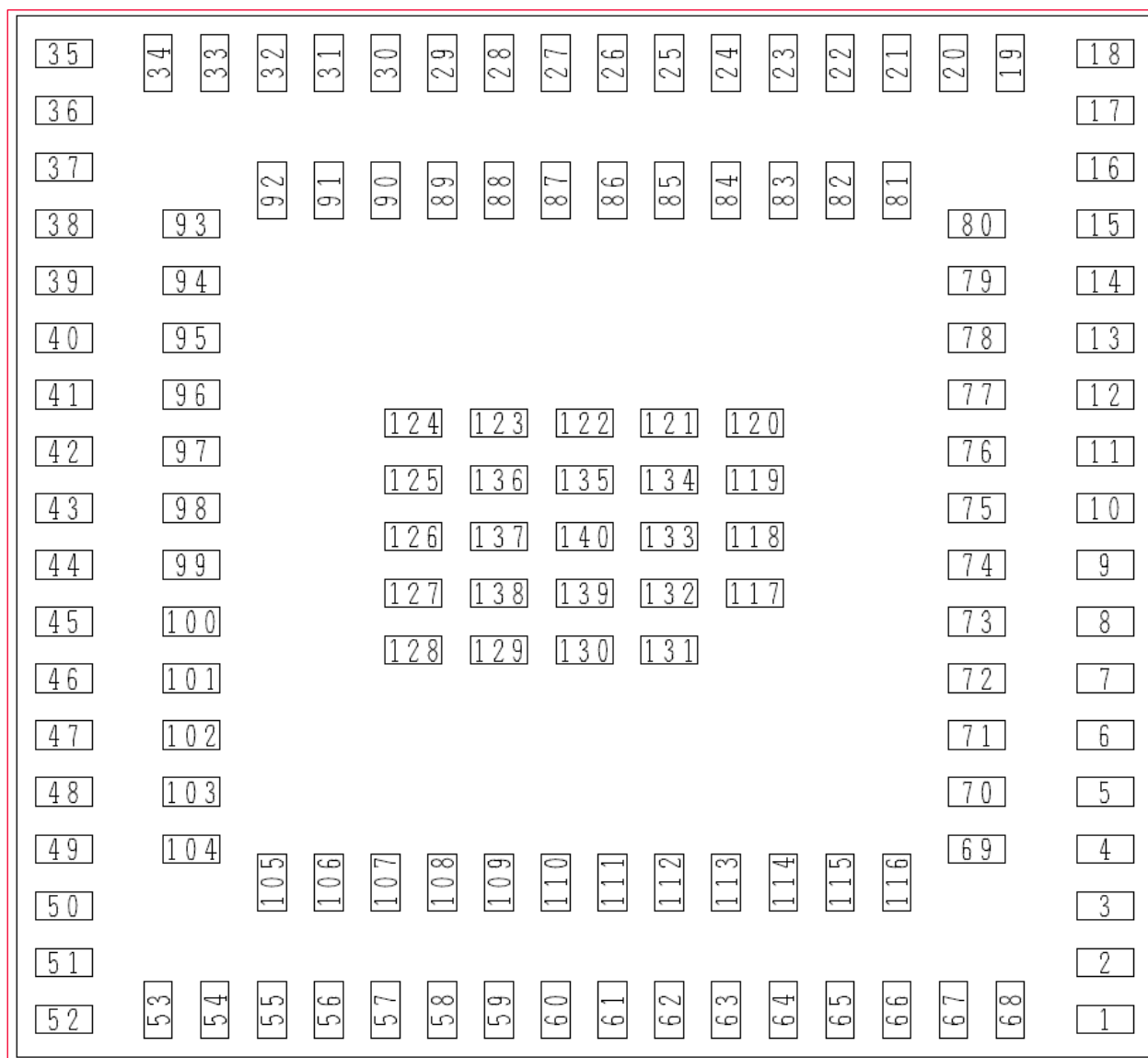


## 7 Module Pin Descriptions

This section has the Pin descriptions of Type 2FR and pin assignments layout descriptions.

Type 2FR pin-assignment top view is presented in **Figure 4**.

**Figure 4: Pin Assignments - Top View**



The pin names/terminal names are listed in **Table 7**.

Table 7: Type 2FR Terminal Descriptions

| No. | Terminal Name | No. | Terminal Name | No. | Terminal Name |
|-----|---------------|-----|---------------|-----|---------------|
| 1   | GND           | 48  | GPIO_19       | 95  | GPIO_38       |
| 2   | VIO_RF        | 49  | GPIO_11       | 96  | GPIO_27       |
| 3   | GND           | 50  | GND           | 97  | GPIO_24       |
| 4   | RF_CNTL_0     | 51  | VIO_1         | 98  | GPIO_28       |
| 5   | GND           | 52  | GND           | 99  | GPIO_26       |
| 6   | RF_MAIN       | 53  | RF_CNTL_1     | 100 | GPIO_15       |
| 7   | GND           | 54  | GND           | 101 | GPIO_21       |
| 8   | GPIO_58       | 55  | RF_CNTL_2     | 102 | GPIO_16       |
| 9   | GPIO_2        | 56  | GND           | 103 | GPIO_10       |
| 10  | GPIO_4        | 57  | BT_OUT        | 104 | GPIO_1        |
| 11  | PDn           | 58  | GND           | 105 | GPIO_9        |
| 12  | GPIO_47       | 59  | RF_CNTL_3     | 106 | GPIO_14       |
| 13  | GPIO_30       | 60  | GPIO_6        | 107 | GND           |
| 14  | GPIO_32       | 61  | GPIO_5        | 108 | GPIO_8        |
| 15  | GPIO_31       | 62  | GPIO_12       | 109 | GPIO_55       |
| 16  | GND           | 63  | GPIO_51       | 110 | GND           |
| 17  | VIO_6         | 64  | GPIO_52       | 111 | GPIO_45       |
| 18  | GND           | 65  | GPIO_7        | 112 | GPIO_54       |
| 19  | VDD18         | 66  | GND           | 113 | GPIO_53       |
| 20  | GND           | 67  | BT_IN         | 114 | GND           |
| 21  | GPIO_62       | 68  | GND           | 115 | GPIO_44       |
| 22  | GPIO_56       | 69  | EXT_REQ       | 116 | GPIO_50       |
| 23  | GPIO_3        | 70  | EXT_GNT       | 117 | GND           |
| 24  | GPIO_57       | 71  | EXT_PRI       | 118 | GND           |
| 25  | GND           | 72  | EXT_FREQ      | 119 | GND           |
| 26  | VCC33         | 73  | GPIO_43       | 120 | GND           |
| 27  | VCC33         | 74  | GPIO_42       | 121 | GND           |
| 28  | GND           | 75  | GPIO_46       | 122 | GND           |
| 29  | USB_DP        | 76  | GPIO_60       | 123 | GND           |
| 30  | USB_DM        | 77  | GPIO_59       | 124 | GND           |
| 31  | GND           | 78  | GPIO_34       | 125 | GND           |
| 32  | USB_ID        | 79  | GPIO_33       | 126 | GND           |
| 33  | USB_VBUS      | 80  | CS_Int_Flash  | 127 | GND           |
| 34  | VIO_3         | 81  | GPIO_49       | 128 | GND           |
| 35  | GND           | 82  | GPIO_48       | 129 | GND           |
| 36  | VIO_2         | 83  | GPIO_63       | 130 | GND           |
| 37  | VIO_5         | 84  | GND           | 131 | GND           |
| 38  | GPIO_40       | 85  | GPIO_61       | 132 | GND           |
| 39  | GPIO_41       | 86  | GND           | 133 | GND           |
| 40  | GPIO_39       | 87  | GPIO_25       | 134 | GND           |
| 41  | GPIO_37       | 88  | GPIO_22       | 135 | GND           |
| 42  | GPIO_29       | 89  | GND           | 136 | GND           |
| 43  | GPIO_13       | 90  | GND           | 137 | GND           |
| 44  | GPIO_17       | 91  | GND           | 138 | GND           |
| 45  | GPIO_20       | 92  | GPIO_23       | 139 | GND           |
| 46  | GPIO_18       | 93  | GPIO_36       | 140 | GND           |
| 47  | GPIO_0        | 94  | GPIO_35       |     |               |

## 7.1 Pin Descriptions

**Table 8** lists the pin descriptions of Type 2FR.

**Table 8: Type 2FR Pin Descriptions**

| No. | Pin name  | Connection to IC                  |                                                                 | Type  | Supply Domain | Description                                             |
|-----|-----------|-----------------------------------|-----------------------------------------------------------------|-------|---------------|---------------------------------------------------------|
|     |           | Ball #                            | Ball Name                                                       |       |               |                                                         |
| 1   | GND       |                                   |                                                                 | Power |               |                                                         |
| 2   | VIO_RF    | R6                                | VIO_RF                                                          | Power |               |                                                         |
| 3   | GND       |                                   |                                                                 | Power |               |                                                         |
| 4   | RF_CNTL_0 | N3                                | RF_CNTL0                                                        | I/O   | VIO_RF        | Wi-Fi RF front-end control line 0                       |
| 5   | GND       |                                   |                                                                 | Power |               |                                                         |
| 6   | RF_MAIN   |                                   |                                                                 | RF    |               | Main RF port                                            |
| 7   | GND       |                                   |                                                                 | Power |               |                                                         |
| 8   | GPIO_58   | G11                               | GPIO[58]                                                        | I/O   | VIO_6         |                                                         |
| 9   | GPIO_2    | F10                               | GPIO[2]                                                         | I/O   | VIO_6         |                                                         |
| 10  | GPIO_4    | F8                                | GPIO[4]                                                         | I/O   | VIO_6         |                                                         |
| 11  | PDn       | E9                                | PDN                                                             | I/O   |               |                                                         |
| 12  | GPIO_47   | E13                               | GPIO[47]                                                        | I/O   | VIO_6         |                                                         |
| 13  | GPIO_30   | F3                                | GPIO[30]                                                        | I/O   | VIO_4         |                                                         |
| 14  | GPIO_32   | F2                                | GPIO[32]                                                        | I/O   | VIO_4         |                                                         |
| 15  | GPIO_31   | D3                                | GPIO[31]                                                        | I/O   | VIO_4         |                                                         |
| 16  | GND       |                                   |                                                                 | Power |               |                                                         |
| 17  | VIO_6     | B15                               | VIO_6                                                           | Power |               |                                                         |
| 18  | GND       |                                   |                                                                 | Power |               |                                                         |
| 19  | VDD18     | B12                               | VDD18                                                           | Power |               | Power from internal DCDC 1.8V for appropriate IO domain |
| 20  | GND       |                                   |                                                                 | Power |               |                                                         |
| 21  | GPIO_62   | B14                               | GPIO[62]                                                        | I/O   | VIO_6         |                                                         |
| 22  | GPIO_56   | A14                               | GPIO[56]                                                        | I/O   | VIO_6         |                                                         |
| 23  | GPIO_3    | C13                               | GPIO[3]                                                         | I/O   | VIO_6         |                                                         |
| 24  | GPIO_57   | B13                               | GPIO[57]                                                        | I/O   | VIO_6         |                                                         |
| 25  | GND       |                                   |                                                                 | Power |               |                                                         |
| 26  | VCC33     | R8,<br>R15,<br>B10,<br>A10,<br>B8 | VPA[R8],<br>VPA[R15],<br>VBAT[B10],<br>VBAT(A10),<br>AVDD33_USB | Power |               | Main power supply                                       |
| 27  | VCC33     | R8,<br>R15,<br>B10,<br>A10,<br>B8 | VPA[R8],<br>VPA[R15],<br>VBAT[B10],<br>VBAT(A10),<br>AVDD33_USB | Power |               | Main power supply                                       |
| 28  | GND       |                                   |                                                                 | Power |               |                                                         |
| 29  | USB_DP    | D8                                | USB_DP                                                          | I/O   |               |                                                         |
| 30  | USB_DM    | C7                                | USB_DM                                                          | I/O   |               |                                                         |
| 31  | GND       |                                   |                                                                 | Power |               |                                                         |
| 32  | USB_ID    | B7                                | USB_ID                                                          | I/O   |               |                                                         |
| 33  | USB_VBUS  | D6                                | USB_VBUS                                                        | Power |               |                                                         |
| 34  | VIO_3     | A5                                | VIO_3                                                           | Power |               |                                                         |
| 35  | GND       |                                   |                                                                 | Power |               |                                                         |
| 36  | VIO_2     | F1                                | VIO_2                                                           | Power |               |                                                         |
| 37  | VIO_5     | A4                                | VIO_5                                                           | Power |               |                                                         |

| No. | Pin name     | Connection to IC |                     | Type  | Supply Domain | Description                              |
|-----|--------------|------------------|---------------------|-------|---------------|------------------------------------------|
|     |              | Ball #           | Ball Name           |       |               |                                          |
| 38  | GPIO_40      | A1               | GPIO[40]            | I/O   | VIO_5         |                                          |
| 39  | GPIO_41      | B1               | GPIO[41]            | I/O   | VIO_5         |                                          |
| 40  | GPIO_39      | A2               | GPIO[39]            | I/O   | VIO_5         |                                          |
| 41  | GPIO_37      | B2               | GPIO[37]            | I/O   | VIO_5         |                                          |
| 42  | GPIO_29      | D2               | GPIO[29]            | I/O   | VIO_4         |                                          |
| 43  | GPIO_13      | G5               | GPIO[13]            | I/O   | VIO_2         |                                          |
| 44  | GPIO_17      | H2               | GPIO[17]            | I/O   | VIO_2         |                                          |
| 45  | GPIO_20      | K2               | GPIO[20]            | I/O   | VIO_2         |                                          |
| 46  | GPIO_18      | K3               | GPIO[18]            | I/O   | VIO_2         |                                          |
| 47  | GPIO_0       | M1               | GPIO[0]             | I/O   | VIO_1         |                                          |
| 48  | GPIO_19      | L3               | GPIO[19]            | I/O   | VIO_2         |                                          |
| 49  | GPIO_11      | M2               | GPIO[11]            | I/O   | VIO_1         |                                          |
| 50  | GND          |                  |                     | Power |               |                                          |
| 51  | VIO_1        | K1               | VIO_1               | Power |               |                                          |
| 52  | GND          |                  |                     | Power |               |                                          |
| 53  | RF_CNTL_1    | P5               | RF_CNTL1            | I/O   | VIO_RF        |                                          |
| 54  | GND          |                  |                     | Power |               |                                          |
| 55  | RF_CNTL_2    | P6               | RF_CNTL2            | I/O   | VIO_RF        |                                          |
| 56  | GND          |                  |                     | Power |               |                                          |
| 57  | BT_OUT       |                  |                     | RF    |               | BT/Zigbee from RW610                     |
| 58  | GND          |                  |                     | Power |               |                                          |
| 59  | RF_CNTL_3    | P7               | RF_CNTL3            | I/O   | VIO_RF        |                                          |
| 60  | GPIO_6       | L5               | GPIO[6]             | I/O   | VIO_1         |                                          |
| 61  | GPIO_5       | L7               | GPIO[5]             | I/O   | VIO_1         |                                          |
| 62  | GPIO_12      | N8               | GPIO[12]            | I/O   | VIO_RF        |                                          |
| 63  | GPIO_51      | M8               | GPIO[51]            | I/O   | VIO_1         |                                          |
| 64  | GPIO_52      | K8               | GPIO[52]            | I/O   | VIO_1         |                                          |
| 65  | GPIO_7       | L9               | GPIO[7]             | I/O   | VIO_1         |                                          |
| 66  | GND          |                  |                     | Power |               |                                          |
| 67  | BT_IN        |                  |                     | RF    |               | BT/Zigbee to RF main                     |
| 68  | GND          |                  |                     | Power |               |                                          |
| 69  | EXT_REQ      | M12              | EXT_REQ             | I/O   | AVDD18        |                                          |
| 70  | EXT_GNT      | L13              | EXT_GNT             | I/O   | AVDD18        |                                          |
| 71  | EXT_PRI      | K13              | EXT_PRI             | I/O   | AVDD18        |                                          |
| 72  | EXT_FREQ     | J13              | EXT_FREQ/WCI-2_SOUT | I/O   | AVDD18        |                                          |
| 73  | GPIO_43      | H12              | GPIO[43]            | I/O   | VIO_6         |                                          |
| 74  | GPIO_42      | G13              | GPIO[42]            | I/O   | VIO_6         |                                          |
| 75  | GPIO_46      | F12              | GPIO[46]            | I/O   | VIO_6         |                                          |
| 76  | GPIO_60      | E11              | GPIO[60]            | I/O   | VIO_6         |                                          |
| 77  | GPIO_59      | D12              | GPIO[59]            | I/O   | VIO_6         |                                          |
| 78  | GPIO_34      | E3               | GPIO[34]            | I/O   | VIO_4         |                                          |
| 79  | GPIO_33      | G3               | GPIO[33]            | I/O   | VIO_4         |                                          |
| 80  | CS_Int_Flash |                  |                     | I/O   |               | Connect to GPIO_28 for internal flash CS |
| 81  | GPIO_49      | D14              | GPIO[49]            | I/O   | VIO_6         |                                          |
| 82  | GPIO_48      | D13              | GPIO[48]            | I/O   | VIO_6         |                                          |
| 83  | GPIO_63      | A15              | GPIO[63]            | I/O   | VIO_6         |                                          |
| 84  | GND          |                  |                     | Power |               |                                          |
| 85  | GPIO_61      | A13              | GPIO[61]            | I/O   | VIO_6         |                                          |
| 86  | GND          |                  |                     | Power |               |                                          |



| No. | Pin name | Connection to IC |           | Type  | Supply Domain | Description                       |
|-----|----------|------------------|-----------|-------|---------------|-----------------------------------|
|     |          | Ball #           | Ball Name |       |               |                                   |
| 87  | GPIO_25  | E7               | GPIO[25]  | I/O   | VIO_3         |                                   |
| 88  | GPIO_22  | B6               | GPIO[22]  | I/O   | VIO_3         |                                   |
| 89  | GND      |                  |           | Power |               |                                   |
| 90  | GND      |                  |           | Power |               |                                   |
| 91  | GND      |                  |           | Power |               |                                   |
| 92  | GPIO_23  | B5               | GPIO[23]  | I/O   | VIO_3         |                                   |
| 93  | GPIO_36  | B4               | GPIO[36]  | I/O   | VIO_5         |                                   |
| 94  | GPIO_35  | B3               | GPIO[35]  | I/O   | VIO_5         |                                   |
| 95  | GPIO_38  | C3               | GPIO[38]  | I/O   | VIO_5         |                                   |
| 96  | GPIO_27  | C5               | GPIO[27]  | I/O   | VIO_3         |                                   |
| 97  | GPIO_24  | E5               | GPIO[24]  | I/O   | VIO_3         |                                   |
| 98  | GPIO_28  | F4               | GPIO[28]  | I/O   | VIO_4         | For external or internal flash CS |
| 99  | GPIO_26  | F6               | GPIO[26]  | I/O   | VIO_3         |                                   |
| 100 | GPIO_15  | H3               | GPIO[15]  | I/O   | VIO_2         |                                   |
| 101 | GPIO_21  | H4               | GPIO[21]  | I/O   | VIO_2         |                                   |
| 102 | GPIO_16  | J3               | GPIO[16]  | I/O   | VIO_2         |                                   |
| 103 | GPIO_10  | M3               | GPIO[10]  | I/O   | VIO_1         |                                   |
| 104 | GPIO_1   | N2               | GPIO[1]   | I/O   | VIO_1         |                                   |
| 105 | GPIO_9   | M4               | GPIO[9]   | I/O   | VIO_1         |                                   |
| 106 | GPIO_14  | K4               | GPIO[14]  | I/O   | VIO_2         |                                   |
| 107 | GND      |                  |           | Power |               |                                   |
| 108 | GPIO_8   | M6               | GPIO[8]   | I/O   | VIO_1         |                                   |
| 109 | GPIO_55  | K6               | GPIO[55]  | I/O   | VIO_1         |                                   |
| 110 | GND      |                  |           | Power |               |                                   |
| 111 | GPIO_45  | H10              | GPIO[45]  | I/O   | VIO_6         |                                   |
| 112 | GPIO_54  | M10              | GPIO[54]  | I/O   | VIO_1         |                                   |
| 113 | GPIO_53  | L11              | GPIO[53]  | I/O   | VIO_1         |                                   |
| 114 | GND      |                  |           | Power |               |                                   |
| 115 | GPIO_44  | J11              | GPIO[44]  | I/O   | VIO_6         |                                   |
| 116 | GPIO_50  | K12              | GPIO[50]  | I/O   | VIO_6         |                                   |
| 117 | GND      |                  |           | Power |               |                                   |
| 118 | GND      |                  |           | Power |               |                                   |
| 119 | GND      |                  |           | Power |               |                                   |
| 120 | GND      |                  |           | Power |               |                                   |
| 121 | GND      |                  |           | Power |               |                                   |
| 122 | GND      |                  |           | Power |               |                                   |
| 123 | GND      |                  |           | Power |               |                                   |
| 124 | GND      |                  |           | Power |               |                                   |
| 125 | GND      |                  |           | Power |               |                                   |
| 126 | GND      |                  |           | Power |               |                                   |
| 127 | GND      |                  |           | Power |               |                                   |
| 128 | GND      |                  |           | Power |               |                                   |
| 129 | GND      |                  |           | Power |               |                                   |
| 130 | GND      |                  |           | Power |               |                                   |
| 131 | GND      |                  |           | Power |               |                                   |
| 132 | GND      |                  |           | Power |               |                                   |
| 133 | GND      |                  |           | Power |               |                                   |
| 134 | GND      |                  |           | Power |               |                                   |
| 135 | GND      |                  |           | Power |               |                                   |
| 136 | GND      |                  |           | Power |               |                                   |

| No. | Pin name | Connection to IC |           | Type  | Supply Domain | Description |
|-----|----------|------------------|-----------|-------|---------------|-------------|
|     |          | Ball #           | Ball Name |       |               |             |
| 137 | GND      |                  |           | Power |               |             |
| 138 | GND      |                  |           | Power |               |             |
| 139 | GND      |                  |           | Power |               |             |
| 140 | GND      |                  |           | Power |               |             |

## 7.2 Pin States

**Table 9: Pin Power Down States (PDn = 0)**

| Pin              | Power down state (PDn = 0) |
|------------------|----------------------------|
| RF_CNTL_0        | Drive low                  |
| RF_CNTL_1        | Drive high                 |
| RF_CNTL_2        | Drive low                  |
| RF_CNTL_3        | Drive high                 |
| GPIO_0 ~ GPIO_63 | Tristate                   |

## 8 Absolute Maximum Ratings

**Table 10** Shows the absolute maximum rating values.

**Table 10: Absolute Maximum Rating**

| Parameter           |                | Minimum | Maximum | Unit |
|---------------------|----------------|---------|---------|------|
| Storage Temperature |                | -40     | +125    |      |
| Supply Voltage      | VCC33          |         | 3.96    | V    |
| I/O Voltage         | 3.3 I/O Supply |         | 3.96    | V    |
|                     | 1.8 I/O Supply |         | 2.16    | V    |

## 9 Operating Condition

**Table 11** shows the operating conditions for Type 2FR module.

**Table 11: Operating Conditions**

| Parameter             |                | Minimum | Typical | Maximum | Unit |
|-----------------------|----------------|---------|---------|---------|------|
| Operating Temperature |                | -40     |         | +85     | C    |
| Supply Voltage        |                | 3.14    | 3.3     | 3.46    | V    |
| I/O Voltage           | 3.3 I/O Supply | 3.14    | 3.3     | 3.46    | V    |
|                       | 1.8 I/O Supply | 1.71    | 1.8     | 1.89    | V    |

## 9.1 External Sleep Clock Specifications

**Table 12** describes the external sleep clock specifications.

**Table 12: External Sleep Clock Specifications**

| Parameter                                                                                                                                                                     | Minimum | Typical | Maximum | Unit     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|----------|
| Clock frequency range/accuracy <ul style="list-style-type: none"> <li>CMOS input clock signal type</li> <li><math>\pm 250</math> ppm (initial, aging, temperature)</li> </ul> |         | 32.768  |         | KHz      |
| Phase noise requirement (@ 100 kHz)                                                                                                                                           |         | -125    |         | dBc/Hz   |
| Cycle jitter                                                                                                                                                                  |         | 1.5     |         | ns (RMS) |
| Slew Rate Limit (10-90%)                                                                                                                                                      |         |         | 100     | ns       |
| Duty Cycle Tolerance                                                                                                                                                          | 20      |         | 80      | %        |

## 9.2 Digital I/O Requirements

Digital I/O requirement parameters for 1.8V operation are listed in **Table 13**.

**Table 13: Digital I/O Requirement Parameters - 1.8V Operation**

| Symbol           | Parameter              | Condition | Minimum               | Typical | Maximum               | Unit |
|------------------|------------------------|-----------|-----------------------|---------|-----------------------|------|
| V <sub>IO</sub>  | I/O pad supply voltage |           | 1.71                  | 1.8     | 1.89                  | V    |
| V <sub>IH</sub>  | Input high voltage     |           | 0.7 * V <sub>IO</sub> |         | V <sub>IO</sub> + 0.4 | V    |
| V <sub>IL</sub>  | Input low voltage      |           | -0.4                  |         | 0.3 * V <sub>IO</sub> | V    |
| V <sub>HYS</sub> | Input hysteresis`      |           | 100                   |         |                       | mV   |
| V <sub>OH</sub>  | Output high voltage    |           | V <sub>IO</sub> - 0.4 |         |                       | V    |
| V <sub>OL</sub>  | Output low voltage     |           |                       |         | 0.4                   | V    |

Digital I/O requirement parameters for 3.3V operation are listed in **Table 14**.

**Table 14: Digital I/O Requirement Parameters - 3.3V Operation**

| Symbol           | Parameter              | Condition | Minimum               | Typical | Maximum               | Unit |
|------------------|------------------------|-----------|-----------------------|---------|-----------------------|------|
| V <sub>IO</sub>  | I/O pad supply voltage |           | 3.14                  | 3.3     | 3.46                  | V    |
| V <sub>IH</sub>  | Input high voltage     |           | 0.7 * V <sub>IO</sub> |         | V <sub>IO</sub> + 0.4 | V    |
| V <sub>IL</sub>  | Input low voltage      |           | -0.4                  |         | 0.3 * V <sub>IO</sub> | V    |
| V <sub>HYS</sub> | Input hysteresis       |           | 100                   |         |                       | mV   |
| V <sub>OH</sub>  | Output high voltage    |           | V <sub>IO</sub> - 0.4 |         |                       | V    |
| V <sub>OL</sub>  | Output low voltage     |           |                       |         | 0.4                   | V    |

## 10 DC/RF Characteristics

### 10.1 Wi-Fi Radio Specification

#### 10.1.1 Wi-Fi Receiver Performance - 2.4 GHz

**Conditions:** 25 °C, VCC33 = 3.3V, VIO\_RF = 3.3V, at module pad



The performance values are preliminary information subject to change based on the final device characterization results.

**Table 15: Wi-Fi Receiver Performance - 2.4 GHz**

| Parameter                                 | Condition                  | Minimum | Typical | Maximum | Unit |
|-------------------------------------------|----------------------------|---------|---------|---------|------|
| RF frequency range                        |                            | 2400    |         | 2483.5  | MHz  |
| RF signal bandwidth                       |                            | 20      |         | 20      | MHz  |
| <b>Receivers Sensitivity</b>              |                            |         |         |         |      |
| Receiver Sensitivity 802.11b              | 20 MHz 1 Mbps              |         | -98.2   |         | dBm  |
| Receiver Sensitivity 802.11b              | 20 MHz 11 Mbps             |         | -90.9   |         | dBm  |
| Receiver Sensitivity 802.11g              | 20 MHz 6 Mbps              |         | -92.9   |         | dBm  |
| Receiver Sensitivity 802.11g              | 20 MHz 54 Mbps             |         | -76.2   |         | dBm  |
| Receiver Sensitivity 802.11n              | 20 MHz MCS0 Nss1 BCC       |         | -92.9   |         | dBm  |
| Receiver Sensitivity 802.11n              | 20 MHz MCS7 Nss1 BCC       |         | -74.2   |         | dBm  |
| Receiver Sensitivity 802.11ax             | 4x3.2 20 MHz MCS0 Nss1 BCC |         | -92.5   |         | dBm  |
| Receiver Sensitivity 802.11ax             | 4x3.2 20 MHz MCS9 Nss1 BCC |         | -67.9   |         | dBm  |
| <b>Receiver Maximum Input Level (MIL)</b> |                            |         |         |         |      |
| Receiver Maximum Input Level DSS          | 802.11b DSSS MIL           |         | -0.2    |         | dBm  |
| Receiver Maximum Input Level OFDM         | 802.11b CCK MIL            |         | -0.2    |         | dBm  |
| Receiver Maximum Input Level OFDM         | OFDM MIL                   |         | -5      |         | dBm  |

#### 10.1.2 Wi-Fi Receiver Performance - 5 GHz

**Conditions:** 25 °C, VCC33 = 3.3V, VIO\_RF = 3.3V, at module pad



The performance values are preliminary information subject to change based on the final device characterization results.

**Table 16: Wi-Fi Receiver Performance - 5 GHz**

| Parameter                    | Condition     | Minimum | Typical | Maximum | Unit |
|------------------------------|---------------|---------|---------|---------|------|
| RF Frequency Range           |               | 4900    |         | 5895    | MHz  |
| RF Signal Bandwidth          |               | 20      |         | 20      | MHz  |
| <b>Receivers Sensitivity</b> |               |         |         |         |      |
| Receiver Sensitivity 802.11a | 20 MHz 6 Mbps |         | -92.3   |         | dBm  |

| Parameter                     | Condition                  | Minimum | Typical | Maximum | Unit |
|-------------------------------|----------------------------|---------|---------|---------|------|
| Receiver Sensitivity 802.11a  | 20 MHz 54 Mbps             |         | -75.3   |         | dBm  |
| Receiver Sensitivity 802.11n  | 20 MHz MCS0 Nss1 BCC       |         | -91.5   |         | dBm  |
| Receiver Sensitivity 802.11n  | 20 MHz MCS7 Nss1 BCC       |         | -72.7   |         | dBm  |
| Receiver Sensitivity 802.11ac | 20 MHz MCS0 Nss1 BCC       |         | -91.5   |         | dBm  |
| Receiver Sensitivity 802.11ac | 20 MHz MCS8 Nss1 BCC       |         | -68.8   |         | dBm  |
| Receiver Sensitivity 802.11ax | 4x3.2 20 MHz MCS0 Nss1 BCC |         | -91.5   |         | dBm  |
| Receiver Sensitivity 802.11ax | 4x3.2 20 MHz MCS9 Nss1 BCC |         | -66.6   |         | dBm  |

### 10.1.3 Wi-Fi Transmitter Performance - 2.4 GHz

**Conditions:** 25 °C, VCC33 = 3.3V, VIO\_RF = 3.3V, at module pad



The performance values are preliminary information subject to change based on the final device characterization results.

**Table 17: Wi-Fi Transmitter Performance - 2.4 GHz**

| Parameter                                         | Condition       | Minimum | Typical | Maximum | Unit |
|---------------------------------------------------|-----------------|---------|---------|---------|------|
| RF Frequency Range                                | 2.4 GHz         | 2412    |         | 2484    | MHz  |
| Maximum Linear Output Power With 20 MHz Bandwidth | 802.11b 1 Mbps  |         | 18      |         | dBm  |
|                                                   | 802.11b 11 Mbps |         | 18      |         | dBm  |
|                                                   | 802.11g 6 Mbps  |         | 18      |         | dBm  |
|                                                   | 802.11g 54 Mbps |         | 17      |         | dBm  |
|                                                   | 802.11n MCS7    |         | 16      |         | dBm  |
|                                                   | 802.11ax MCS9   |         | 15      |         | dBm  |
| Transmit Carrier Suppression                      |                 |         | -40     |         | dBc  |
| Transmit Frequency Error                          |                 |         | -20     | 20      | PPM  |
| Modulation Accuracy                               | 802.11b 1 Mbps  |         |         | 35      | %    |
|                                                   | 802.11b 11 Mbps |         |         | 35      | %    |
|                                                   | 802.11g 6 Mbps  |         |         | -5      | dB   |
|                                                   | 802.11g 54 Mbps |         |         | -25     | dB   |
|                                                   | 802.11n MCS7    |         |         | -27     | dB   |
|                                                   | 802.11 ax MCS9  |         |         | -32     | dB   |

### 10.1.4 Wi-Fi Transmitter Performance - 5 GHz

**Conditions:** 25 °C, VCC33 = 3.3V, VIO\_RF = 3.3V, at module pad



The performance values are preliminary information subject to change based on the final device characterization results.

**Table 18: Wi-Fi Transmitter Performance - 5 GHz**

| Parameter                                         | Condition       | Minimum | Typical | Maximum | Unit |
|---------------------------------------------------|-----------------|---------|---------|---------|------|
| RF Frequency Range                                | 5 GHz           | 4900    |         | 5895    | MHz  |
| Maximum linear output power with 20 MHz bandwidth | 802.11a 6 Mbps  |         | 18      |         | dBm  |
|                                                   | 802.11a 54 Mbps |         | 17      |         | dBm  |
|                                                   | 802.11n MCS7    |         | 16      |         | dBm  |
|                                                   | 802.11ax MCS9   |         | 13      |         | dBm  |

| Parameter                    | Condition       | Minimum | Typical | Maximum | Unit |
|------------------------------|-----------------|---------|---------|---------|------|
| Transmit Carrier Suppression |                 |         | -40     |         | dBc  |
| Transmit Frequency Error     |                 | -20     |         | 20      | PPM  |
| Modulation Accuracy          | 802.11a 6 Mbps  |         |         | -5      | dB   |
|                              | 802.11a 54 Mbps |         |         | -25     | dB   |
|                              | 802.11n MCS7    |         |         | -27     | dB   |
|                              | 802.11ax MCS9   |         |         | -32     | dB   |

## 10.2 Bluetooth LE Radio Specification

### 10.2.1 Bluetooth LE Receiver Performance

**Conditions:** 25 °C, VCC33 = 3.3V, VIO\_RF = 3.3V, at module pad



The performance values are preliminary information subject to change based on the final device characterization results.

**Table 19: Bluetooth LE Receiver Performance**

| Parameter                                  | Condition | Minimum | Typical | Maximum | Unit |
|--------------------------------------------|-----------|---------|---------|---------|------|
| RF frequency range                         |           | 2400    |         | 2483.5  | MHz  |
| <b>Receivers Sensitivity</b>               |           |         |         |         |      |
| Bluetooth LE 1 Mbps                        |           |         | -97.7   |         | dBm  |
| Bluetooth LE 2 Mbps                        |           |         | -95.5   |         | dBm  |
| Bluetooth LR 125 Kbps                      |           |         | -106    |         | dBm  |
| Bluetooth LR 500 Kbps                      |           |         | -99.3   |         | dBm  |
| <b>Receivers Maximum Input Level (MIL)</b> |           |         |         |         |      |
| Bluetooth LE 1 Mbps                        |           |         | -3      |         | dBm  |
| Bluetooth LE 2 Mbps                        |           |         | -3      |         | dBm  |
| Bluetooth LR 125 Kbps                      |           |         | -3      |         | dBm  |
| Bluetooth LR 500 Kbps                      |           |         | -3      |         | dBm  |

### 10.2.2 Bluetooth LE Transmitter Performance

**Conditions:** 25 °C, VCC33 = 3.3V, VIO\_RF = 3.3V, at module pad



The performance values are preliminary information subject to change based on the final device characterization results.

**Table 20: Bluetooth LE Transmitter Performance**

| Parameter                         | Condition | Minimum | Typical | Maximum | Unit |
|-----------------------------------|-----------|---------|---------|---------|------|
| Center Frequency                  |           | 2400    |         | 2483.5  | MHz  |
| Channel Spacing                   |           |         | 2       |         | MHz  |
| Number of RF Channels             |           |         | 40      |         |      |
| Max Output Power                  |           |         | 12      |         | dBm  |
| <b>Modulation Characteristics</b> |           |         |         |         |      |

| Parameter                                         | Condition | Minimum | Typical | Maximum | Unit |
|---------------------------------------------------|-----------|---------|---------|---------|------|
| $\Delta f_{1\text{avg}}$                          |           | 225     |         | 275     | kHz  |
| $\Delta f_{2\text{max}}$ (at 99.9%)               |           | 185     |         |         | kHz  |
| $\Delta f_{2\text{avg}} / \Delta f_{1\text{avg}}$ |           | 0.8     |         |         |      |
| <b>Carrier Frequency Offset and Drift</b>         |           |         |         |         |      |
| • Frequency offset: $ f_n - f_{TX} $              |           |         |         | 150     | kHz  |
| • Frequency drift: $ f_0 - f_n $                  |           |         |         | 50      | kHz  |
| • Drift rate #0: $ f_1 - f_0 $                    |           |         |         | 20      | kHz  |
| • Drift rate #n: $ f_n - f_{n-5} $                |           |         |         | 20      | kHz  |

## 10.3 IEEE 802.15.4 Radio Specification

### 10.3.1 Receiver Performance - 802.15.4

**Conditions:** 25 °C, VCC33 = 3.3V, VIO\_RF = 3.3V, at module pad



The performance values are preliminary information subject to change based on the final device characterization results.

**Table 21: Receiver Performance - 802.15.4**

| Parameter                                 | Condition          | Minimum | Typical | Maximum | Unit |
|-------------------------------------------|--------------------|---------|---------|---------|------|
| RF Frequency Range                        |                    | 2400    |         | 2483.5  | MHz  |
| <b>Receiver Sensitivity</b>               |                    |         |         |         |      |
| Receiver Sensitivity                      | Nominal conditions |         | -104.7  |         | dBm  |
| <b>Receiver Maximum Input Level (MIL)</b> |                    |         |         |         |      |
| Receivers MIL                             |                    |         | 3       |         | dBm  |

### 10.3.2 Transmitter Performance - 802.15.4

**Conditions:** 25 °C, VCC33 = 3.3V, VIO\_RF = 3.3V, at module pad



The performance values are preliminary information subject to change based on the final device characterization results.

**Table 22: Transmitter Performance - 802.15.4**

| Parameter              | Condition | Minimum | Typical | Maximum | Unit |
|------------------------|-----------|---------|---------|---------|------|
| RF Frequency Range     |           | 2400    |         | 2483.5  | MHz  |
| Transmit Maximum Power |           |         | 12      |         | dBm  |

## 11 Land Pattern

We recommend the host PCB land pattern be the same as the module pin pad pattern.

## 12 Reference Circuit

Please reference to [Type 2FR EVK Schematic](#) and [Type 2FR EVK BOM](#).

## 13 Tape and Reel Packing

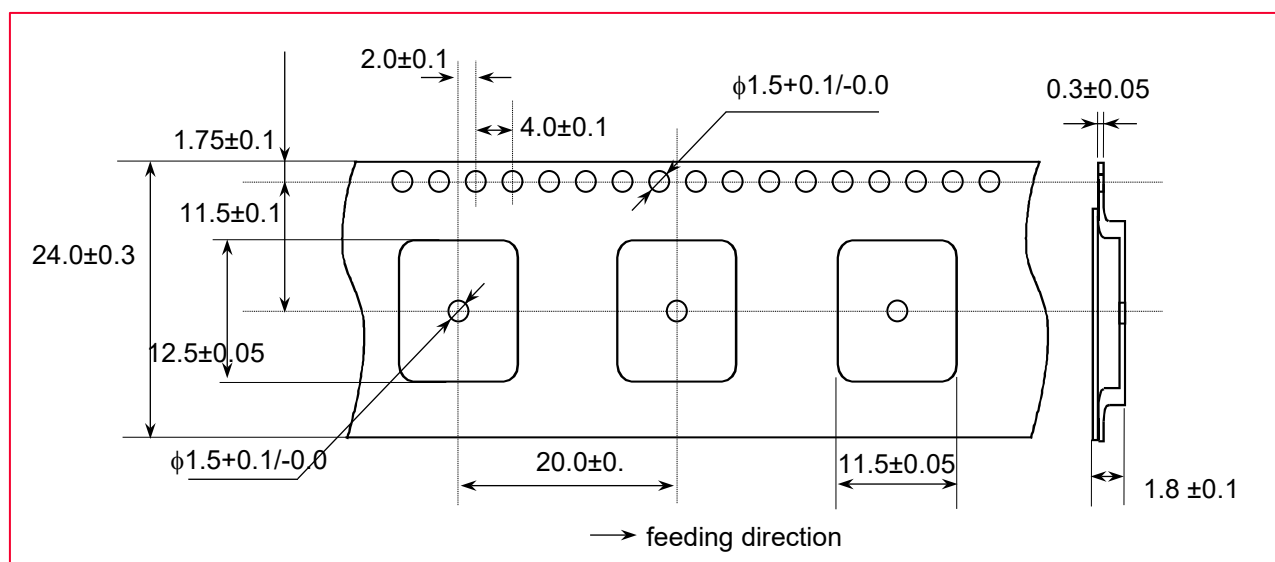
This section contains the following topics:

- Dimensions of Tape (Plastic tape)
- Dimensions of Reel
- Taping Diagrams
- Leader and tail tape
- Packaging

### 13.1 Dimensions of Tape (Plastic Tape)

**Figure 5** is a graphical representation of the tape dimension (plastic tape).

**Figure 5: Dimensions of Tape (Plastic Tape)**



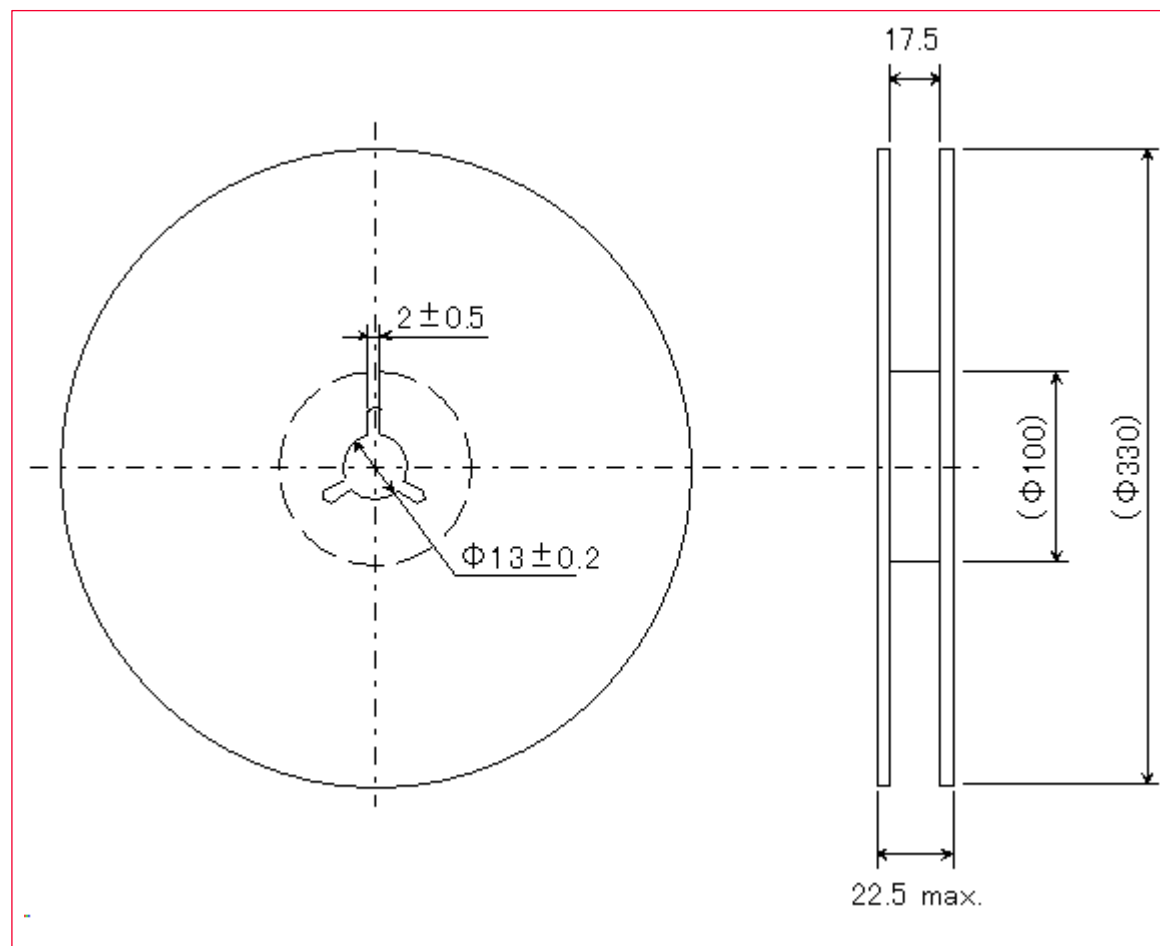
Cumulative tolerance of maximum 40 +/- 0.15 mm for every 10 pitches.



## 13.2 Dimensions of Reel

Figure 6 shows the reel dimensions.

Figure 6: Dimensions of Reel (Unit: Millimeters)



## 13.3 Taping Diagrams

Figure 7 shows the taping diagrams.

Figure 7: Taping Diagrams

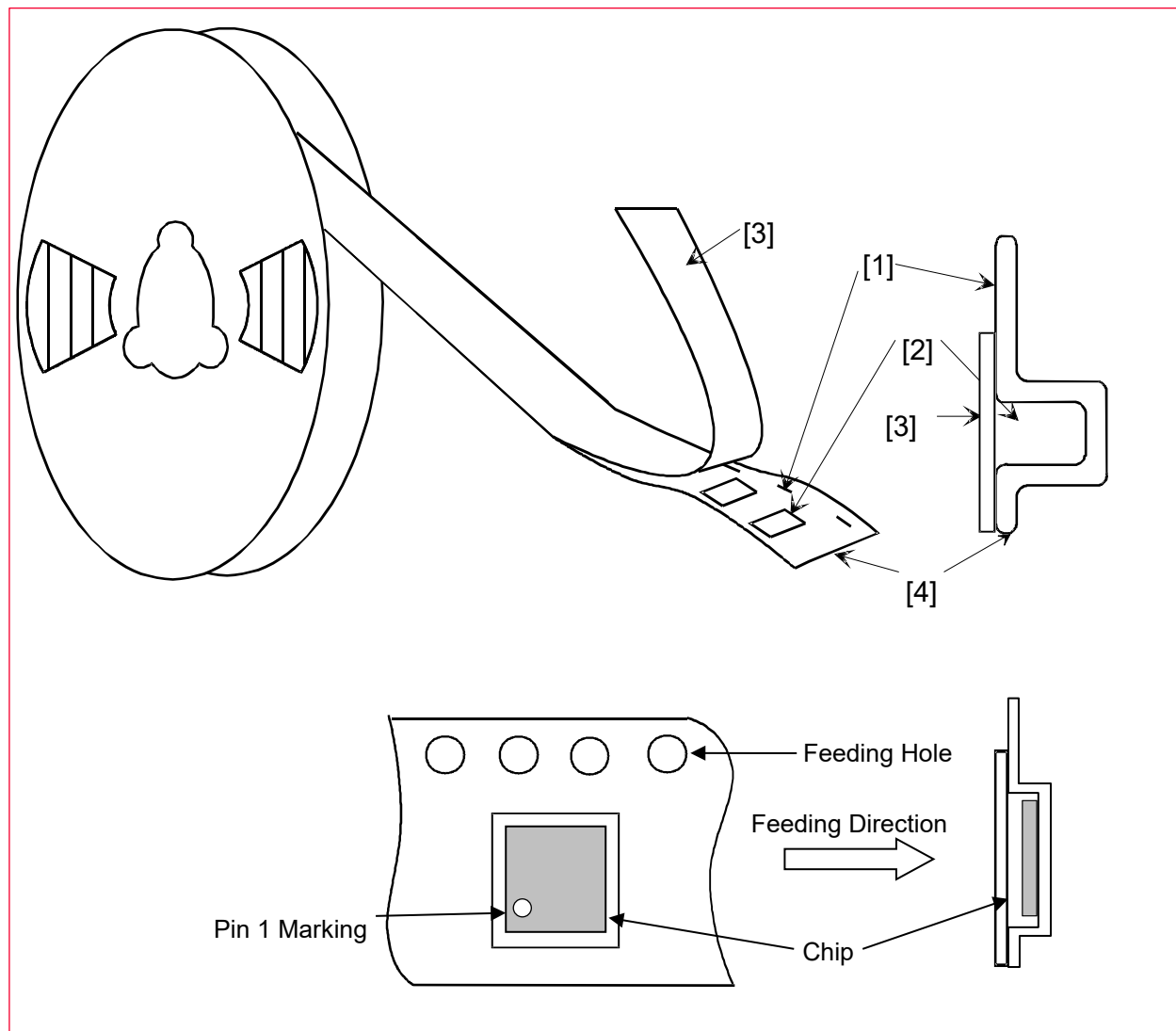


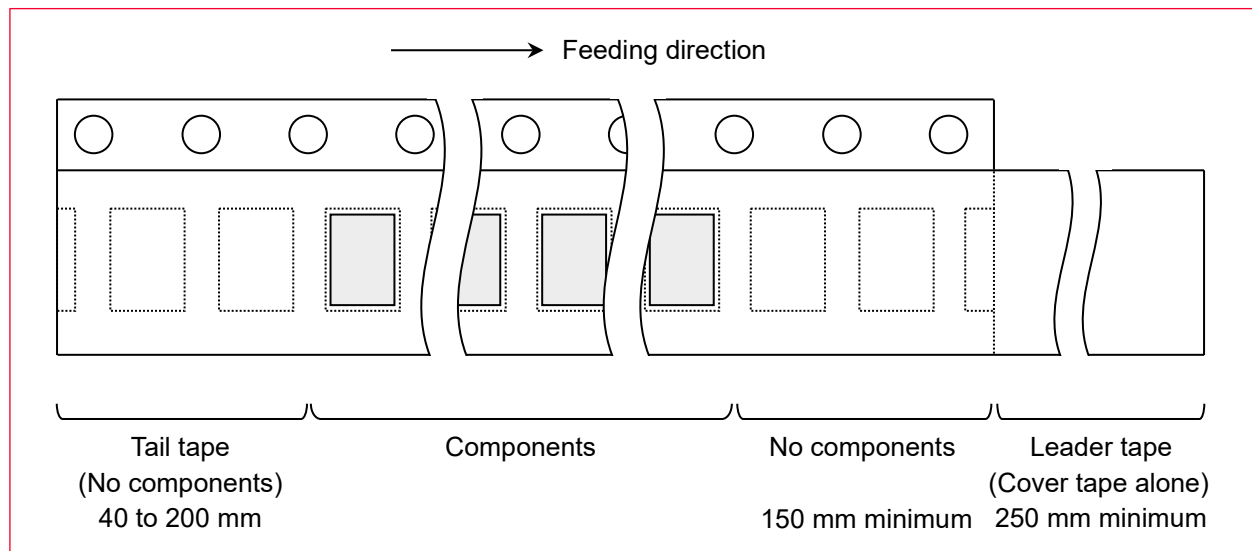
Table 23: Taping Specifications

| Mark | Description                                                                         |
|------|-------------------------------------------------------------------------------------|
| 1    | Feeding Hole. As specified in <a href="#">Dimensions of Tape (Plastic Tape)</a> ☞.  |
| 2    | Hole for chip. As specified in <a href="#">Dimensions of Tape (Plastic Tape)</a> ☞. |
| 3    | Cover tape. 62 μm in thickness.                                                     |
| 4    | Base tape. As specified in <a href="#">Dimensions of Tape (Plastic Tape)</a> ☞.     |

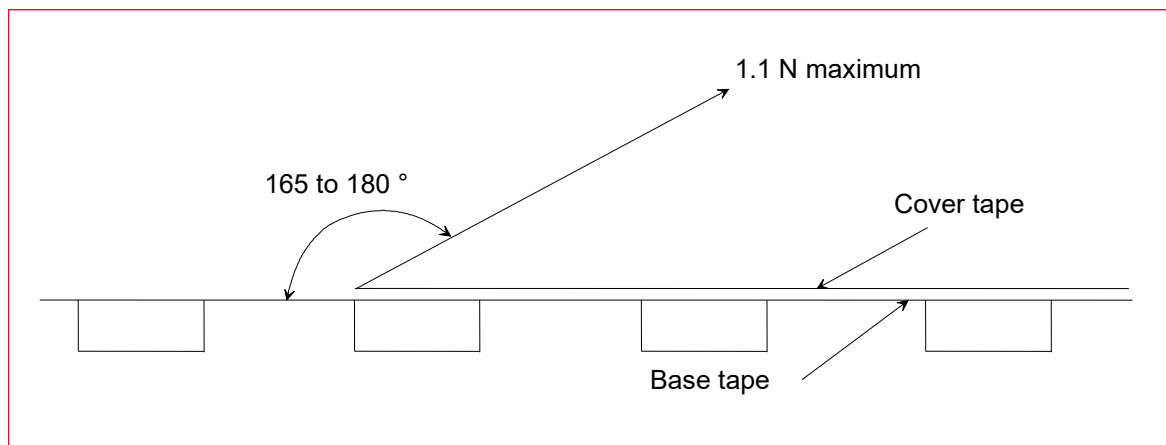
## 13.4 Leader and Tail Tape

The leader and tail tape are shown in **Figure 8**.

**Figure 8: Leader and Tail Tape**

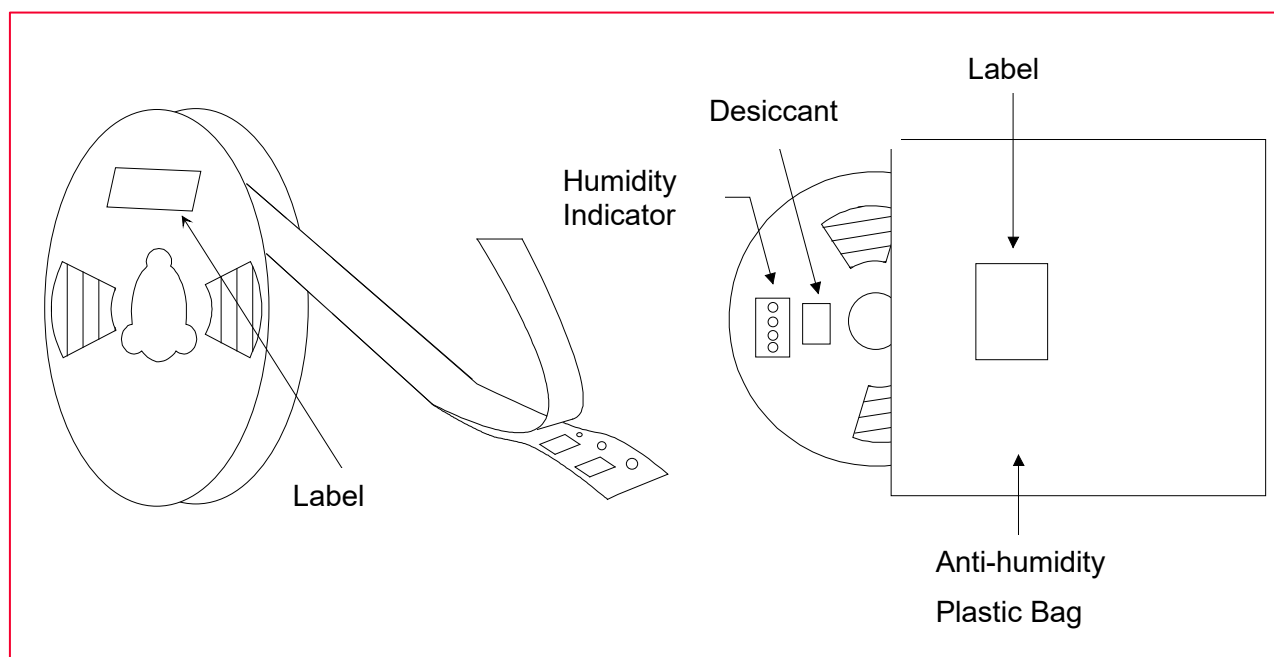


- The tape for chips is wound clockwise, the feeding holes to the right side as the tape is pulled toward the user.
- The cover tape and base tape are not adhered at no components area for 250 mm minimum.
- Tear off strength against pulling of cover tape: 5 N minimum.
- Packaging unit: 1000 pcs./ reel
- Material
- Base tape: Plastic
- Real: Plastic
- Cover tape, cavity tape and reel are made the anti-static processing.
- Peeling off force: 1.1 N maximum. in the direction of peeling as shown in **Figure 9**.

**Figure 9: Peeling Force**

## 13.5 Packaging (Humidity Proof Packing)

The packaging is shown in **Figure 10**.

**Figure 10: Humidity Proof Packing**

Tape and reel must be sealed with the anti-humidity plastic bag. The bag contains the desiccant and the humidity indicator.

## 14 Notice

Please use this product within 6 months after receipt.

- The product shall be stored without opening the packing under the ambient temperature from 5 to 35 °C and humidity from 20 ~ 70 %RH.



Packing materials may be deformed at the temperature over 40 °C.

- The product left more than 6 months after reception, it needs to be confirmed the solderability before used.
- The product shall be stored in noncorrosive gas (Cl<sub>2</sub>, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>x</sub>, etc.).
- Any excess mechanical shock including, but not limited to, sticking the packing materials by sharp object and dropping the product, shall not be applied in order not to damage the packing materials.

This product is applicable to MSL3 (Based on IPC/JEDEC J-STD-020)

- After the packing opened, the product shall be stored at <30 °C / <60 %RH and the product shall be used within 168 hours.
- When the color of the indicator in the packing changed, the product shall be baked before soldering.
  - **Baking condition:** 125 +5/-0 °C, 24 hours, 1 time



The products must be baked on the heat-resistant tray because the material (Base Tape, Reel Tape and Cover Tape) is not heat-resistant.

### 14.1 Handling Conditions

Be careful in handling or transporting products because excessive stress or mechanical shock may break products.

Handle with care if products may have cracks or damages on their terminals, the characteristics of products may change. Do not touch products with bare hands that may result in poor solder ability and destroy by static electrical charge.

### 14.2 Standard PCB Design (Land Pattern and Dimensions)

All the ground terminals should be connected to the ground patterns. Furthermore, the ground pattern should be provided between IN and OUT terminals. Please refer to the specifications for the standard land dimensions.

The recommended land pattern and dimensions is as Murata's standard. The characteristics of products may vary depending on the pattern drawing method, grounding method, land dimensions, land forming method of the NC terminals and the PCB material and thickness. Therefore, be sure to verify the characteristics in the actual set. When using non-standard lands, contact Murata beforehand.

## 14.3 Notice for Chip Placer

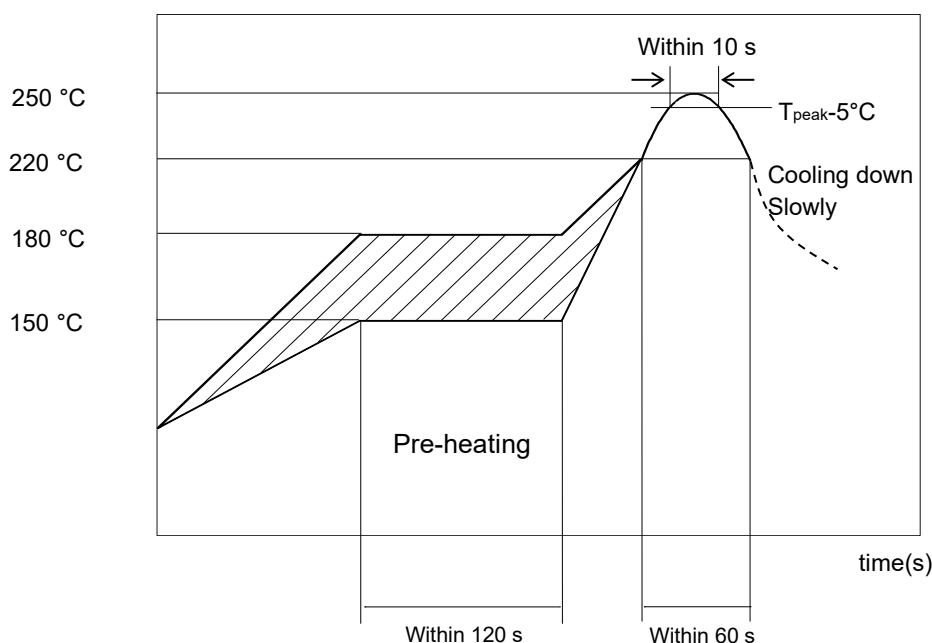
When placing products on the PCB, products may be stressed and broken by uneven forces from a worn-out chucking locating claw or a suction nozzle. To prevent products from such damages, make sure to follow the specifications for the maintenance of the chip placer being used. For the positioning of products on the PCB, be aware that mechanical chucking may damage products.

## 14.4 Soldering Conditions

The recommendation conditions of soldering are as shown in **Figure 11**.

Soldering must be carried out by the above-mentioned conditions to prevent products from damage. Set up the highest temperature of reflow within 260 °C. Contact Murata before use if concerning other soldering conditions.

**Figure 11: Reflow Soldering Standard Conditions (Example)**



Please use the reflow within 2 times.  
Use rosin type flux or weakly active flux with a chlorine content of 0.2 wt % or less.

## 14.5 Cleaning

Since this Product is Moisture Sensitive, any cleaning is not recommended. If any cleaning process is done the customer is responsible for any issues or failures caused by the cleaning process.

## 14.6 Operational Environment Conditions

Products are designed to work for electronic products under normal environmental conditions (ambient temperature, humidity, and pressure). Therefore, products have no problems to be used under the similar conditions to the above-mentioned. However, if products are used under the

following circumstances, it may damage products and leakage of electricity and abnormal temperature may occur.

- In an atmosphere containing corrosive gas (Cl<sub>2</sub>, NH<sub>3</sub>, SO<sub>x</sub>, NO<sub>x</sub> etc.).
- In an atmosphere containing combustible and volatile gases.
- Dusty place.
- Direct sunlight place.
- Water splashing place.
- Humid place where water condenses.
- Freezing place.

If there are possibilities for products to be used under the preceding clause, consult with Murata before actual use.

As it might be a cause of degradation or destruction to apply static electricity to products, do not apply static electricity or excessive voltage while assembling and measuring.

## 15 Preconditions to Use Our Products



PLEASE READ THIS NOTICE BEFORE USING OUR PRODUCTS.

Please make sure that your product has been evaluated and confirmed from the aspect of the fitness for the specifications of our product when our product is mounted to your product.

All the items and parameters in this product specification/datasheet/catalog have been prescribed on the premise that our product is used for the purpose, under the condition and in the environment specified in this specification. You are requested not to use our product deviating from the condition and the environment specified in this specification.

Please note that the only warranty that we provide regarding the products is its conformance to the specifications provided herein. Accordingly, we shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this specification.

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The product shall not be used in any application listed below which requires especially high reliability for the prevention of such defect as may directly cause damage to the third party's life, body or property. You acknowledge and agree that, if you use our products in such applications, we will not be responsible for any failure to meet such requirements.

Furthermore, YOU AGREE TO INDEMNIFY AND DEFEND US AND OUR AFFILIATES AGAINST ALL CLAIMS, DAMAGES, COSTS, AND EXPENSES THAT MAY BE INCURRED, INCLUDING WITHOUT LIMITATION, ATTORNEY FEES AND COSTS, DUE TO THE USE OF OUR PRODUCTS IN SUCH APPLICATIONS.

- Aircraft equipment.
- Aerospace equipment.
- Undersea equipment.
- Power plant control equipment.
- Medical equipment.
- Transportation equipment (vehicles, trains, ships, elevator, etc.).
- Traffic signal equipment.
- Burning / explosion control equipment.
- Disaster prevention / crime prevention equipment.
- Application of similar complexity and/ or reliability requirements to the applications listed in the above.

Even in the unlikely event that an abnormality or malfunction occurs in this product under operating conditions that conform to the specifications, be sure to add an appropriate fail-safe function to the system to prevent secondary accidents.

We expressly prohibit you from analyzing, breaking, Reverse-Engineering, remodeling altering, and reproducing our product. Our product cannot be used for the product which is prohibited from being manufactured, used, and sold by the regulations and laws in the world.

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If you can't agree the above contents, you should inquire our sales.

## 16 References

16.1 RW612 Wireless MCU with Integrated Tri-radio Wi-Fi 6 + Bluetooth Low Energy 5.4 / 802.15.4 Product data sheet, Rev.7, 6 February 2024, NXP

16.2 Type 2FR EVK Schematic, Murata

16.3 Type 2FR EVK BOM, Murata

## Revision History

| Revision | Date          | Author | Change Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|---------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A        | Aug 24, 2023  | YF     | Initial Release                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| B        | Oct 12, 2023  | YF     | Updated Wi-Fi RF characteristic data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| C        | Sept 10, 2024 | YF     | Updated following items: <ul style="list-style-type: none"><li>• The Key Features</li><li>• Module weight</li><li>• Markings (Table 5)</li><li>• Added Product Overview section</li><li>• Certification Information</li><li>• Tape and Reel Information</li><li>• Pin State Information</li><li>• Maximum TX Power Information</li><li>• Added Reference Circuit Section</li><li>• Added References</li><li>• Module Structure Diagram</li><li>• Added references section.</li><li>• Corrected reel size: 1000 pcs./ reel</li></ul> |
| D        | Dec 10, 2024  | YF     | Updated the BT SIG certification information<br>Updated the section 15.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |



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