Features

- Bluetooth® Classic (BR/EDR) and Low Energy (LE)
- Certified to FCC, ISED, MIC, KCC, NCC, and SRRC Radio Regulations
- European Radio Equipment Directive (RED) Assessed Radio Module
- Qualified for Bluetooth SIG v5.0 Core Specification
- Transparent UART mode for seamless serial data over Bluetooth Classic using Serial Port Profile (SPP), and Bluetooth Low Energy (BLE) using Generic Attribute (GATT) Profile
- Easily Programmable through ASCII Commands and easily configurable with available PIC® MCU driver library
- Firmware can be upgraded in the field over UART (Flash version)
- Integral Chip Antenna (RN4678)
- Integrated Crystal, Internal Voltage Regulator, and Matching Circuitry
- Available Configurable I/O Pins for Control or Status Indication
- Supports Apple® iPod® Accessory Protocol (iAP2) (only RN4678APL)
- Supports Bluetooth LE Secure Connections
- Bluetooth LE Data Packet Length Extension
- Small and Compact Surface Mount Module
- Castellated SMT Pads for easy and reliable PCB mounting
- Ideal for Portable Battery-Operated Devices

RF/Analog

- Frequency: 2.402 GHz to 2.480 GHz
- RX Sensitivity: -90 dBm (BR/EDR), -92 dBm (LE)
- Class 2 Output Power (+1.5 dBm typical)

Data Throughput

Data Throughput at 1 Mbps UART Baud Rate:
- BR/EDR: up to 32 Kbytes/s
- LE: up to 7 Kbytes/s

Data Throughput at 115200 bps UART Baud Rate
- BR/EDR: up to 10 Kbytes/s
- LE: up to 6 Kbytes/s

Operating Conditions

- Operating Voltage Range: 3.3V to 4.2V
- Operating Temperature Range: -20°C to +70°C

MAC/Baseband/Higher Layer Features

- Secure AES128 Encryption
- Bluetooth Classic: GAP, SPP, SDP, RFCOMM and L2CAP
- Bluetooth Low Energy: GAP, GATT, ATT, SMP and L2CAP

Applications

- Internet of Things (IoT)
- Secure Payment
- Home and Security
- Health and Fitness
- Industrial and Data Logger
- LED Lighting (16 configurations)

Description

The RN4678 module is a fully certified, Bluetooth v5.0 compliant (BR/EDR/LE) dual mode module available for customers to easily add dual mode Bluetooth wireless capability to their products. The RN4678 is built around Microchip's IS1678 Bluetooth dual mode chip. Refer to Section 8.0 “Ordering Information”.

The RN4678 provides a convenient method for cable replacement for smartphones or tablets for data transfer and control based on the Bluetooth protocols. Data transfer is achieved through the Bluetooth link by sending or receiving data through SPP in Bluetooth (BT) Classic mode and through Transparent UART in the BLE mode. The ASCII interface provides an easy way to learn the operation and to integrate the module with any microprocessor or Microcontroller (MCU) with a UART interface.
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1.0 DEVICE OVERVIEW

The RN4678 module is a fully certified, embedded Bluetooth (BR/EDR/LE) wireless module. The module includes an on-board Bluetooth stack, power management subsystem, a 2.4 GHz transceiver, and RF power amplifier. Customers can embed Bluetooth functionality into any application using the RN4678 module.

The RN4678 enables rapid product development and faster time to market, and it is designed to provide integrators with the following features:

- Simple integration and programming
- Reduced development time
- Superior wireless module with low-cost system
- Interoperability with Bluetooth host
- Wide range of applications

The RN4678 is a complete and fully regulatory certified module with an integral ceramic chip antenna and RF shield.

The RN4678 is a small, compact and surface mounted module with castellated pads for easy and reliable host PCB mounting. The module is compatible with standard pick-and-place equipment and can independently maintain a low-power wireless connection. Low-power usage and flexible power management maximize the lifetime of the RN4678 module in battery-operated devices. A wide operating temperature range enables its applications in indoor and outdoor environments.

Figure 1-1 illustrates the internal block diagram of the RN4678 module.
Table 1-1 provides the description of the various pins of the RN4678 module.

<table>
<thead>
<tr>
<th>Pin Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 GND</td>
<td>Power</td>
<td>Ground reference</td>
</tr>
<tr>
<td>2 GND</td>
<td>Power</td>
<td>Ground reference</td>
</tr>
<tr>
<td>3 GND</td>
<td>Power</td>
<td>Ground reference</td>
</tr>
<tr>
<td>4 BAT_IN</td>
<td>Power</td>
<td>Battery Input (3.3V to 4.2V) Main positive supply input Connect to 10 μF (X5R/X7R) capacitor</td>
</tr>
<tr>
<td>5 SW_BTN</td>
<td>DI</td>
<td>• Software Button  - H: Power On  - L: Power Off  • By default, this functionality is disabled. Refer to RN4678 Command Reference User Guide (DS50002506) to enable the feature</td>
</tr>
<tr>
<td>6 LDO33_O</td>
<td>Power</td>
<td>Internal 3.3V LDO output; can source no more than 50 mA</td>
</tr>
<tr>
<td>7 VDD_IO</td>
<td>Power</td>
<td>I/O positive supply input. For internal use only; do not connect to other devices.</td>
</tr>
<tr>
<td>8 LDO18_O</td>
<td>Power</td>
<td>Internal 1.8V LDO output. For internal use only; do not connect to other devices.</td>
</tr>
<tr>
<td>9 WAKEUP</td>
<td>DI</td>
<td>Wake-up from Sleep mode (active-low) (internal pull-up)</td>
</tr>
<tr>
<td>10 PMULDO_O</td>
<td>Power</td>
<td>Power management unit output. For internal use only; do not connect to other devices.</td>
</tr>
<tr>
<td>11 P0_4</td>
<td>DO</td>
<td>Status Indication pin. Indicates the current status of BLE data transmission. High: Data currently transmitting Low: No current data transmission</td>
</tr>
<tr>
<td>12 P1_5</td>
<td>DO</td>
<td>Status Indication pin. Indicates the current connection status. High: Powered On and not connected Low: Connected to peer device</td>
</tr>
<tr>
<td>13 P1_2</td>
<td>DO</td>
<td>GPIO pin. Internally pulled-up by default.</td>
</tr>
<tr>
<td>14 P1_3</td>
<td>DIO</td>
<td>GPIO pin. Internally pulled-up by default.</td>
</tr>
<tr>
<td>15 P1_7/CTS</td>
<td>DIO</td>
<td>Configurable Control or Indication pin or UART CTS (input)</td>
</tr>
<tr>
<td>16 P0_5</td>
<td>DIO</td>
<td>Configurable Control or Indication pin</td>
</tr>
<tr>
<td>17 P0_0/RTS</td>
<td>DIO</td>
<td>Configurable Control or Indication pin or UART RTS (output)</td>
</tr>
<tr>
<td>18 P2_0</td>
<td>DI</td>
<td>System configuration pin. Along with P2_4 and EAN pins, used to set the module in any of the following three modes: Application mode (for normal operation), Test mode (to change EEPROM values), and Write Flash mode (to enter the new firmware into the module); refer to Table 2-1.</td>
</tr>
<tr>
<td>19 P2_4</td>
<td>DI</td>
<td>System configuration pin. Along with P2_0 and EAN pins, used to set the module in any of the following three modes: Application mode (for normal operation), Test mode (to change EEPROM values), and Write Flash mode (to enter new firmware into the module); refer to Table 2-1.</td>
</tr>
<tr>
<td>20 EAN</td>
<td>DI</td>
<td>External address-bus negative pin. System configuration pin along with P2_0 and P2_4 pins, used to set the module in any of the following three modes: Application mode (for normal operation), Test mode (to change EEPROM values), and Write Flash mode (to enter new firmware into the module); refer to Table 2-1. Must be pulled down with 4.7 kΩ to GND.</td>
</tr>
<tr>
<td>21 RST_N</td>
<td>DI</td>
<td>Module Reset (internal pull-up). Apply a pulse of at least 63 ns.</td>
</tr>
<tr>
<td>22 RXD</td>
<td>DI</td>
<td>UART data input</td>
</tr>
</tbody>
</table>
**TABLE 1-1: PIN DESCRIPTION (CONTINUED)**

<table>
<thead>
<tr>
<th>RN4678</th>
<th>Pin Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>TXD</td>
<td>DO</td>
<td>UART data output</td>
</tr>
<tr>
<td>24</td>
<td>P3_1</td>
<td>DIO</td>
<td>Configurable Control or Indication pin (Internally pulled-up, if configured as an input)</td>
</tr>
<tr>
<td>25</td>
<td>P3_2</td>
<td>DIO</td>
<td>Configurable Control or Indication pin (Internally pulled-up, if configured as an input)</td>
</tr>
<tr>
<td>26</td>
<td>P3_3</td>
<td>DIO</td>
<td>Configurable Control or Indication pin (Internally pulled-up, if configured as an input)</td>
</tr>
<tr>
<td>27</td>
<td>P3_4</td>
<td>DIO</td>
<td>Configurable Control or Indication pin (Internally pulled-up, if configured as an input)</td>
</tr>
<tr>
<td>28</td>
<td>P3_6</td>
<td>DIO</td>
<td>Do not connect.</td>
</tr>
<tr>
<td>29</td>
<td>P3_7</td>
<td>DIO</td>
<td>Configurable Control or Indication pin (Internally pulled-up, if configured as an input)</td>
</tr>
<tr>
<td>30</td>
<td>LED</td>
<td>DO</td>
<td>Status LED, connect to LDO33_0</td>
</tr>
<tr>
<td>31</td>
<td>GND</td>
<td>Power</td>
<td>Ground reference</td>
</tr>
<tr>
<td>—</td>
<td>BT_RF</td>
<td>AIO</td>
<td>External antenna connection (50 ohms)</td>
</tr>
<tr>
<td>32</td>
<td>GND</td>
<td>Power</td>
<td>Ground reference</td>
</tr>
<tr>
<td>33</td>
<td>GND</td>
<td>Power</td>
<td>Ground reference</td>
</tr>
</tbody>
</table>

**Legend:**  
A = Analog  D = Digital  I = Input  O = Output

*Figure 1-2* illustrates the pin diagram of the RN4678 module.

**FIGURE 1-2: RN4678 PIN DIAGRAM**
2.0 APPLICATION INFORMATION

2.1 Module Configuration

For the I/O pins, P2_0, P2_4 and EAN, place the RN4678 into Operating mode. Each of these pins have internal pull-up and allow configuration settings and firmware to be updated from UART. Table 2-1 provides system configuration details.

2.2 Flow Control

Flow control is enabled by default on the RN4678 module. With the flow control enabled, the RTS and CTS lines need to be connected to the corresponding lines for the module to operate. To pause data flow from the RN4678, the CTS (RN4678 input pin) must be pulled high. The RN4678 pulls the RTS pin (output pin) low to indicate that it can accept data.

2.3 Control and Indication I/O Pins

The GPIO pins of the RN4678 module can be configured to different functions using the ASCII command interface. Table 2-2 shows the various pins in the RN4678 module that are available for configuration and their default configuration settings. Table 2-3 provides details on each of the functions available.

### TABLE 2-1: SYSTEM CONFIGURATION SETTINGS

<table>
<thead>
<tr>
<th>PIN Symbol</th>
<th>Operational Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Write FLASH</td>
</tr>
<tr>
<td>Low</td>
<td>Write EEPROM and Test mode</td>
</tr>
<tr>
<td>High</td>
<td>Normal Operational/Application mode</td>
</tr>
</tbody>
</table>

### TABLE 2-2: CONTROL AND INDICATION I/O PIN ASSIGNMENTS

<table>
<thead>
<tr>
<th>PIN Symbol</th>
<th>Default Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0_0</td>
<td>UART_RTS¹,²</td>
</tr>
<tr>
<td>P0_5</td>
<td>N/C</td>
</tr>
<tr>
<td>P1_7</td>
<td>UART_CTS¹,²</td>
</tr>
<tr>
<td>P3_1</td>
<td>INQUIRY CONTROL</td>
</tr>
<tr>
<td>P3_2</td>
<td>LINK_DROP_CONTROL(DISCONNECT)</td>
</tr>
<tr>
<td>P3_3</td>
<td>UART_RX_IND</td>
</tr>
<tr>
<td>P3_4</td>
<td>PAIRING_KEY</td>
</tr>
<tr>
<td>P3_7</td>
<td>LOW_BATTERY_IND</td>
</tr>
</tbody>
</table>

**Note 1:** The RTS pin can only be assigned to P0_0 and the CTS pin can only be assigned to P1_7.

**Note 2:** The RTS and CTS pins can be configured as GPIOs if flow control is disabled.

### TABLE 2-3: CONFIGURABLE FUNCTIONS AND DESCRIPTIONS

<table>
<thead>
<tr>
<th>Function Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Battery Indication</td>
<td>Pin output goes low when the battery level is below a specified level. Default battery low indication voltage level is 3.4V</td>
</tr>
<tr>
<td>RSSI Indication</td>
<td>Use this pin to indicate the quality of the link based on the RSSI level. If the RSSI level is lower than the specified values, then the RSSI indication pin goes low.</td>
</tr>
<tr>
<td>Link Drop Control</td>
<td>Use this pin to force the module to drop the current BLE link with a peer device. Pulling the Link Drop pin low forces to disconnect. The pin must be pulled low for at least 10 ms.</td>
</tr>
</tbody>
</table>
2.4 Power Tree

Figure 2-1 illustrates the power tree diagram of the RN4678.

**FIGURE 2-1: POWER TREE DIAGRAM**
2.5 Software Button (SW_BTN)

The Software Button (SW_BT) pin powers the main sections of the module into operation. If the SW_BT pin is low, the module is turned OFF. After turning the module ON via the SW_BT, the host MCU must wait for specific time before sending the first command. The timing diagrams for the SW_BT, other related pins, and the time delay are required before the host MCU sends the first command.

**Note:** By default, the SW_BT functionality is disabled and it can be enabled using the Host MCU commands. Refer to the *RN4678 Command Reference User Guide* (DS50002506) for more details.

**FIGURE 2-2: SW_BT TIME (HIGH) AT APP MODE**

*Note 1:* Time duration (475 ms) is for reference purposes only. Use the Status Indication pins to verify the exact time when the host MCU can start sending the commands.

*Note 2:* Reset pin is not connected.
FIGURE 2-3:   SW_BTN TIME (LOW) AT ACCESS STATES

Note 1:  Reset pin is not connected.

FIGURE 2-4:   SW_BTN TIME (LOW) AT LINK STATES

Note 1:  830 ms time duration is a typical value measured on iPhone® 6 and this time duration can vary from one smartphone to another.

2:  Reset pin is not connected.
2.6 WAKE-UP

The WAKEUP input pin wakes the RN4678 module from Deep-Sleep mode. The WAKEUP pin is active-low and puts module in Standby mode. Figure 2-5 illustrates the timing diagram of the RN4678 in the Wake-Up mode.

**FIGURE 2-5: WAKE-UP TIME**

![WAKE-UP TIME Diagram](image)

**Note 1:** The 85 ms is for reference time. Use the Status Indication pins to verify the exact results.

2.7 External Reset

The RN4678 provides an External Reset pin which resets the module. The Reset pin, RST_N, is active-low. Figure 2-6 shows the timing diagram for the RST_N pin of the RN4678 module.

**FIGURE 2-6: TIMING WAVEFORMS ON RESET**

![TIMING WAVEFORMS ON RESET Diagram](image)

**Note 1:** The RST_N state trigger must be greater than 63 ns.

2: Time duration (350 ms) is for reference purpose only. Use the Status Indication pins to verify the exact results.
2.8 LED Driver

The RN4678 has a dedicated LED driver and the LED can be connected directly to this pin as shown in Figure 2-7.

The maximum current sourcing for the LED is 5 mA. The brightness of this LED can be configured via an ASCII command.

FIGURE 2-7: LED DRIVER

2.9 Host MCU Interface over UART

Figure 2-8 illustrates an example of UART interface with host MCU and power scheme using 3.3V to the VDD. From the LDO33_O pin, voltage can be routed to the VDD_IO pin and the external circuitry including the MCU. This power scheme ensures that the RN4678 and the MCU I/O voltages are compatible.

Note: The internal 3.3V LDO current source must not exceed 50 mA (maximum).

FIGURE 2-8: POWER AND MCU INTERFACE EXAMPLE FOR RN4678

Note 1: Ensure that VDD_IO and MCU VDD voltages are compatible.

2: The control and indication ports are configurable.
2.10 Reference Circuit

Figure illustrates the reference schematic of the power supply design implemented for the RN4678.

FIGURE 2-9: RN4678 REFERENCE CIRCUIT
### 3.0 ELECTRICAL CHARACTERISTICS

This section provides an overview of the electrical characteristics of the RN4678 module. Additional information is provided in future revisions of this document as it becomes available.

Absolute maximum ratings for the RN4678 devices are listed below. Exposure to these maximum rating conditions for extended periods may affect device reliability. Functional operation of the device at these or any other conditions, above the parameters indicated in the operation listings of this specification, is *not* implied.

#### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature under bias</td>
<td>-20°C to +70°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40°C to +125°C</td>
</tr>
<tr>
<td>Voltage on VDD with respect to VSS</td>
<td>-0.3V to +3.6V</td>
</tr>
<tr>
<td>Maximum output current sunk by any I/O pin</td>
<td>12 mA</td>
</tr>
<tr>
<td>Maximum output current sourced by any I/O pin</td>
<td>12 mA</td>
</tr>
</tbody>
</table>

**Note:** Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions, above those indicated in the operation listings of this specification, is *not* implied. Exposure to maximum rating conditions for extended periods may affect device reliability.
Table 3-1 through Table 3-7 provide the recommended operating conditions and the electrical specifications of the module.

**TABLE 3-1: RECOMMENDED OPERATING CONDITIONS**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Operating Temperature Range</td>
<td>-20°C</td>
<td>+25°C</td>
<td>+70°C</td>
</tr>
<tr>
<td>Relative Humidity (Operating)</td>
<td>10%</td>
<td>—</td>
<td>90%</td>
</tr>
<tr>
<td>Relative Humidity (Storage)</td>
<td>10%</td>
<td>—</td>
<td>90%</td>
</tr>
<tr>
<td>ESD</td>
<td></td>
<td>±2 KV</td>
<td></td>
</tr>
<tr>
<td>HBM</td>
<td></td>
<td>±200V</td>
<td></td>
</tr>
<tr>
<td>MM</td>
<td></td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>HTOL (1)</td>
<td></td>
<td>1000 hrs</td>
<td></td>
</tr>
<tr>
<td>Supply Voltage: BAT_IN</td>
<td>3.3V</td>
<td>—</td>
<td>4.2V</td>
</tr>
<tr>
<td>Supply Voltage: VCC_RF, VDD_XO, AVDD_SAR</td>
<td>1.8V</td>
<td>1.9V</td>
<td>2.1V</td>
</tr>
<tr>
<td>SW_BTN</td>
<td>3.3V</td>
<td>—</td>
<td>4.2V</td>
</tr>
<tr>
<td>LED1</td>
<td></td>
<td>—</td>
<td>3.6V</td>
</tr>
<tr>
<td>Reset $V_{TH, res}$ threshold voltage</td>
<td></td>
<td>1.6V</td>
<td></td>
</tr>
<tr>
<td>$V_{IL}$ Input Logic Level Low</td>
<td>-0.3V</td>
<td>—</td>
<td>0.8V</td>
</tr>
<tr>
<td>$V_{IH}$ Input Logic Level High</td>
<td>2.0V</td>
<td>—</td>
<td>3.6V</td>
</tr>
<tr>
<td>$V_{OL}$ Output Logic Level Low (I_{OL} = 12 mA)</td>
<td></td>
<td>—</td>
<td>0.4V</td>
</tr>
<tr>
<td>$V_{OH}$ Output Logic Level High (I_{OH} = 12 mA)</td>
<td>2.4V</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>RF continuous TX mode</td>
<td></td>
<td>—</td>
<td>43 mA</td>
</tr>
<tr>
<td>RF continuous RX mode</td>
<td></td>
<td>—</td>
<td>37 mA</td>
</tr>
</tbody>
</table>

**Note 1:** HTOL life test condition: +125°C, BAT_IN = 4.2V, LDO33_O = 3.3V, LDO18_O = 1.9V

**TABLE 3-2: 3.3V LDO ELECTRICAL PARAMETERS (1,2)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-20</td>
<td>—</td>
<td>+70</td>
<td>°C</td>
</tr>
<tr>
<td>Output Current ($V_{IN} = 3.6V /load regulation with 100 mV drop)</td>
<td>—</td>
<td>100</td>
<td>—</td>
<td>mA</td>
</tr>
<tr>
<td>Quiescent Current ($V_{IN} = 3.6V$)</td>
<td>—</td>
<td>150</td>
<td>—</td>
<td>μA</td>
</tr>
</tbody>
</table>

**Note 1:** With 10 μF capacitor at LDO33_O as the condition for IP verification.

2: Output voltage can be calibrated using the MP tool.

**TABLE 3-3: PMU LDO (1,2)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-20</td>
<td>—</td>
<td>+70</td>
<td>°C</td>
</tr>
<tr>
<td>Output Current ($V_{IN} = 3.6V /load regulation with 0.3 mV drop)</td>
<td>—</td>
<td>100</td>
<td>—</td>
<td>μA</td>
</tr>
<tr>
<td>Quiescent Current ($V_{IN} = 3.6V$)</td>
<td>—</td>
<td>120</td>
<td>—</td>
<td>μA</td>
</tr>
</tbody>
</table>

**Note 1:** With 1μF capacitor at PMULDO_O as the condition for IP verification.

2: Output voltage can be calibrated by using the MP tool.
TABLE 3-4:  SAR-ADC AND BATTERY VOLTAGE DETECTOR

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-20</td>
<td></td>
<td>+70</td>
<td>°C</td>
</tr>
<tr>
<td>AVDD_SAR Power Supply</td>
<td></td>
<td>1.8</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>SAR_BAT Detection</td>
<td>3.3</td>
<td></td>
<td>4.2</td>
<td>V</td>
</tr>
<tr>
<td>Resolution</td>
<td></td>
<td>10</td>
<td></td>
<td>bit</td>
</tr>
<tr>
<td>Operating Current (including bandgap)</td>
<td></td>
<td></td>
<td>1</td>
<td>mA</td>
</tr>
<tr>
<td>Deep-Sleep Current</td>
<td></td>
<td></td>
<td>1</td>
<td>µA</td>
</tr>
</tbody>
</table>

**Note 1:** SAR_BAT is connected with BAT_IN internally for battery voltage detection.

TABLE 3-5:  INTENSITY CONTROLLABLE LED DRIVER

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-20</td>
<td></td>
<td>+70</td>
<td>°C</td>
</tr>
<tr>
<td>Open-Drain Voltage</td>
<td></td>
<td></td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Current Step</td>
<td></td>
<td>0.3</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Programmable Current Range</td>
<td>0</td>
<td></td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>Intensity Control</td>
<td></td>
<td>16</td>
<td></td>
<td>step</td>
</tr>
<tr>
<td>Power Down Open-Drain Current</td>
<td></td>
<td></td>
<td>1</td>
<td>µA</td>
</tr>
<tr>
<td>Deep-Sleep Current</td>
<td></td>
<td></td>
<td>1</td>
<td>µA</td>
</tr>
</tbody>
</table>

TABLE 3-6:  POWER CONSUMPTION-CLASSIC\(^{(1)}\)

<table>
<thead>
<tr>
<th>Test Condition</th>
<th>Current Consumption (avg.) (mA)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standby mode</td>
<td>2.543</td>
<td></td>
</tr>
<tr>
<td>Deep-Sleep mode</td>
<td>0.281</td>
<td></td>
</tr>
<tr>
<td>Connected+Sniff, Master (no data)</td>
<td>0.710</td>
<td>No data was transmitted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sniff interval = 500 ms</td>
</tr>
<tr>
<td>Connected+Sniff, Slave (no data)</td>
<td>0.70</td>
<td>No data was transmitted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sniff interval = 500 ms</td>
</tr>
<tr>
<td>Data, Master</td>
<td>14.08</td>
<td>Data transmitted at 115200 bps; block size = 500</td>
</tr>
<tr>
<td>Data, Slave</td>
<td>19.06</td>
<td>Data transmitted at 115200 bps; block size = 500</td>
</tr>
</tbody>
</table>

**Note 1:** Classic BR/EDR and RX_IND functions are enabled.
<table>
<thead>
<tr>
<th>Test Condition</th>
<th>Current Consumption (avg.) (mA)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep-Sleep mode</td>
<td>0.28</td>
<td>—</td>
</tr>
<tr>
<td>LE fast advertising</td>
<td>2.09</td>
<td>LE fast advertising interval = 100 ms</td>
</tr>
<tr>
<td></td>
<td>1.51</td>
<td>LE fast advertising interval = 160 ms</td>
</tr>
<tr>
<td></td>
<td>0.63</td>
<td>LE fast advertising interval = 500 ms</td>
</tr>
<tr>
<td></td>
<td>2.75</td>
<td>LE fast advertising interval = 100 ms +</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beacon 100 ms</td>
</tr>
<tr>
<td></td>
<td>0.83</td>
<td>LE fast advertising interval = 500 ms +</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beacon 500 ms</td>
</tr>
<tr>
<td>Reduced power advertising</td>
<td>0.62</td>
<td>LE Reduced Power advertising interval = 961 ms</td>
</tr>
<tr>
<td></td>
<td>1.65</td>
<td>LE Reduced Power advertising interval = 961 ms + Beacon 100 ms</td>
</tr>
<tr>
<td></td>
<td>0.84</td>
<td>LE Reduced Power advertising interval = 961 ms + Beacon 500 ms</td>
</tr>
<tr>
<td>Connected (No data)</td>
<td>0.57</td>
<td>Connection interval = 1500 ms</td>
</tr>
<tr>
<td></td>
<td>0.61</td>
<td>Connection interval = 600 ms</td>
</tr>
<tr>
<td>Connected (iPhone 6 to module)</td>
<td>0.45</td>
<td>Connection interval = 500 ms</td>
</tr>
<tr>
<td></td>
<td>0.60</td>
<td>Connection interval = 200 ms</td>
</tr>
<tr>
<td>Connected (module to iPhone 6)</td>
<td>6.6</td>
<td>Connection interval = 500 ms</td>
</tr>
<tr>
<td></td>
<td>7.0</td>
<td>Connection interval = 200 ms</td>
</tr>
</tbody>
</table>

**Note 1:** Low energy, RX_IND function is enabled.

**2:** Only low energy.
### 4.0 RADIO CHARACTERISTICS

Table 4-1 provides the transmitter performance characteristics of the RN4678 module.

**TABLE 4-1: TRANSMITTER PERFORMANCE (1,2)**

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Bluetooth Specification</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDR power</td>
<td>—</td>
<td>1.5</td>
<td>—</td>
<td>-6 ~ +4</td>
<td>dBm</td>
</tr>
<tr>
<td>EDR (2M/3M) power</td>
<td>—</td>
<td>-1</td>
<td>—</td>
<td>-6 ~ +4</td>
<td></td>
</tr>
<tr>
<td>LE power</td>
<td>—</td>
<td>0.5</td>
<td>—</td>
<td>-20 ~ +10</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** The RF Transmit power can be calibrated during production by using the MP Tool software and the MT8852 Bluetooth Test equipment.

**Note 2:** Test condition: VCC RF = 1.80V, temperature = 25°C.

Table 4-2 provides the receiver performance characteristics of the RN4678 module.

**TABLE 4-2: RECEIVER PERFORMANCE(1)**

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Typical</th>
<th>Max.</th>
<th>Bluetooth Specification</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDR Sensitivity</td>
<td>—</td>
<td>-90</td>
<td>—</td>
<td>—</td>
<td>dBm</td>
</tr>
<tr>
<td>EDR 2M Sensitivity</td>
<td>—</td>
<td>-90</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>EDR 3M Sensitivity</td>
<td>—</td>
<td>-82</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>LE Sensitivity</td>
<td>—</td>
<td>-92</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** Test condition: VCC RF = 1.80V, temperature = 25°C
5.0 PHYSICAL DIMENSIONS

Figure 5-1 illustrates the physical dimensions of the RN4678 module.

FIGURE 5-1: RN4678 MODULE DIMENSIONS

Dimensions are in millimeters
Tolerances:
PCB Thickness: +/- 0.06 mm
Figure 5-2 illustrates the recommended host PCB footprint.

**FIGURE 5-2: RN4678 RECOMMENDED PCB FOOTPRINT**

(Top View)

- **Top Copper Keep Out Area**
- **Silkscreen area**
- **Dimensions:**
  - 0.5mm
  - 1.5mm
  - 0.7mm
  - 1.1mm
  - 18.0
  - 16.0
  - 10.6
  - 9.5
  - 8.4
  - 7.3
  - 6.2
  - 5.1
  - 4.0
  - 2.9
  - 1.8
  - 0.0
  - 2.0
  - 9.2
  - 11.2
  - 22.0
  - 21.2
  - 20.1
  - 18.0
  - 13.9
  - 12.8
  - 11.7
  - 10.6
  - 9.5
  - 8.4
  - 7.3
  - 6.2
  - 5.1
  - 4.0
  - 2.9
  - 1.8
  - 0.0
  - 2.7
  - 3.8
  - 4.9
  - 6.0
  - 7.1
  - 8.2
  - 9.3
  - 12.0

- **Keep Out Area**
Figure 5-3 illustrates the recommendations for mounting the RN4678 on the host PCB, and also shows the minimum ground plane area to the left and right of the module for the best antenna performance. Avoid top copper layer near the test pin area. When designing the host PCB, the areas under the antenna must not contain any top, inner or bottom copper layer. A low-impedance ground plane ensures best radio performance (best range and lowest noise). The ground plane can be extended beyond the minimum recommended as required for the host PCB EMC noise reduction. For best range performance, keep all external metal at least 31 mm away from the ceramic chip antenna.
6.0 REFLOW PROFILE

The RN4678 is highly recommended to be assembled using a standard lead-free reflow profile, IPC/JEDEC J-STD-020. The RN4678 can be soldered to the host PCB by using the standard leaded and lead-free solder reflow profile.

To avoid damage to the module, follow these recommendations:

• Follow solder reflow recommendations provided in Microchip Technology Application Note AN233 Solder Reflow Recommendation (DS00233).
• Refer to the solder paste data sheet for specific reflow profile recommendations.
• Do not exceed the peak temperature ($T_p$) of 250°C.
• Use no-clean flux solder paste.
• Do not wash as moisture can be trapped under the shield.
• Use only one flow. If the PCB requires multiple flows, apply the module on the final flow.

- Standard: IPC/JEDEC J-STD-020
  - Average ramp-up rate (217 °C to peak): 3 °C/sec max.
  - Temperature maintained above 217 °C: 60–150 seconds.
  - Time within 5 °C of peak temperature: 30 ~ 40 seconds.
  - Peak temperature: 260 ±5/-0 °C.
  - Ramp-down rate (peak to 217): 6 °C/sec max.
  - Time 25 °C to peak temperature: 8 minutes max.
  - Cycle interval: 5 minutes

FIGURE 6-1: REFLOW PROFILE
7.0 MODULE PLACEMENT

For a Bluetooth wireless product, the antenna placement affects the performance of the whole system. The antenna requires free space to radiate the RF signal and it cannot be surrounded by the ground plane. Microchip recommends that the areas underneath the antenna on the host PCB must not contain copper on top, inner or bottom layer. Figure 7-1 illustrates an example of good and poor antenna placement on a host PCB with ground plane.

The ground plane can be extended beyond the minimum recommended as required for the main PCB EMC noise reduction. For the best range performance, keep all external metal away from the ceramic chip antenna, that is minimum 15 mm away.

FIGURE 7-1: MODULE PLACEMENT EXAMPLES

TABLE 7-1: RECOMMENDED ANTENNA

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturer Part Number</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT ANT3216A063R2400A PIFA 2.4 GHz L3.2W1.6</td>
<td>ANT3216A063R2400A</td>
<td>YAGEO</td>
</tr>
</tbody>
</table>
Figure 7-2 illustrates the RN4678 module mounted on the RN4678 Evaluation Board (EVB). It also shows the recommended keep out area for the antenna.

**FIGURE 7-2: KEEP OUT AREA RECOMMENDED FOR ANTENNA**

Note: For additional information on free space for antenna placement design, refer to the design rule document of the antenna manufacturer.
7.1 RN4678 Ceramic Chip Antenna

The RN4678 contains an integral ceramic chip antenna. Figure 7-3 illustrates the antenna radiation pattern of the ceramic chip antenna on the RN4678.

**FIGURE 7-3: RN4678 ANTENNA RADIATION PATTERN**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>2450 MHz</td>
</tr>
<tr>
<td>Peak Gain</td>
<td>1.63 dBi</td>
</tr>
<tr>
<td>Efficiency</td>
<td>71.55%</td>
</tr>
</tbody>
</table>
### 8.0 ORDERING INFORMATION

Table 8-1 provides ordering information for the RN4678 module.

<table>
<thead>
<tr>
<th>Device</th>
<th>Microchip IC</th>
<th>Antenna</th>
<th>Description</th>
<th>Shield</th>
<th>Regulatory Certification</th>
<th>Ordering Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN4678-V/RM100</td>
<td>IS1678SM</td>
<td>On-board</td>
<td>BT Dual Mode, Class 2</td>
<td>Yes</td>
<td>FCC, ISED, RED, MIC, KCC, NCC, SRRC</td>
<td>RN4678-V/RM100</td>
</tr>
<tr>
<td>RN4678APL-V/RM100</td>
<td>IS1678SM</td>
<td>On-board</td>
<td>BT Dual Mode, Class 2, Use with Apple MFI</td>
<td>Yes</td>
<td>FCC, ISED, RED, MIC, KCC, NCC, SRRC</td>
<td>RN4678APL-V/RM100</td>
</tr>
<tr>
<td>RN4678-V/RM113</td>
<td>IS1678SM</td>
<td>On-Board</td>
<td>BT Dual Mode, Class 2</td>
<td>Yes</td>
<td>FCC, ISED, RED, MIC, KCC, NCC, SRRC</td>
<td>RN4678-V/RM113</td>
</tr>
<tr>
<td>RN4678APL-V/RM113</td>
<td>IS1678SM</td>
<td>On-Board</td>
<td>BT Dual Mode, Class 2</td>
<td>Yes</td>
<td>FCC, ISED, RED, MIC, KCC, NCC, SRRC</td>
<td>RN4678APL-V/RM113</td>
</tr>
</tbody>
</table>

Go to [http://www.microchip.com](http://www.microchip.com) for current pricing and a list of distributors carrying Microchip products.
9.0 REGULATORY APPROVAL

This section outlines the regulatory information for the RN4678 module for the following countries:

• United States
• Canada
• Europe
• Japan
• Korea
• Taiwan
• Other Regulatory Jurisdictions

9.1 United States

The RN4678 module has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C “Intentional Radiators” single-modular approval in accordance with Part 15.212 Modular Transmitter approval. Single-modular transmitter approval is defined as a complete RF transmission sub-assembly, designed to be incorporated into another device, that must demonstrate compliance with FCC rules and policies independent of any host. A transmitter with a modular grant can be installed in different end-use products (referred to as a host, host product, or host device) by the grantee or other equipment manufacturer, then the host product may not require additional testing or equipment authorization for the transmitter function provided by that specific module or limited module device.

The user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.

A host product itself is required to comply with all other applicable FCC equipment authorization regulations, requirements, and equipment functions that are not associated with the transmitter module portion. For example, compliance must be demonstrated: to regulations for other transmitter components within a host product; to requirements for unintentional radiators (Part 15 Subpart B), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Verification or Declaration of Conformity) as appropriate (e.g., Bluetooth and Wi-Fi transmitter modules may also contain digital logic functions).

9.1.1 LABELING AND USER INFORMATION REQUIREMENTS

The RN4678 module has been labeled with its own FCC ID number, and if the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording as follows:

Contains Transmitter Module
FCC ID: A8TBM78ABCDEFGH
or
Contains FCC ID: A8TBM78ABCDEFGH

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

A user’s manual for the product should include the following statement:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

Additional information on labeling and user information requirements for Part 15 devices can be found in KDB Publication 784748 available at the FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) http://apps.fcc.gov/oetcf/kdb/index.cfm.
9.1.2 RF EXPOSURE

All transmitters regulated by FCC must comply with RF exposure requirements. KDB Publication 447498 General RF Exposure Guidance provides guidance in determining whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to Radio Frequency (RF) fields adopted by the Federal Communications Commission (FCC).

Output power listed is conducted. This grant is valid only when the module is sold to OEM integrators and must be installed by the OEM or OEM integrators. This transmitter is restricted for use with the specific antenna(s) tested in this application for Certification and must not be co-located or operating in conjunction with any other antenna or transmitters within a host device, except in accordance with FCC multi-transmitter product procedures. This module is approved for installation into mobile or/and portable host platforms.

9.1.3 HELPFUL WEB SITES

Federal Communications Commission (FCC):
http://www.fcc.gov

FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB):
http://apps.fcc.gov/oetcf/kdb/index.cfm

9.2 Canada

The RN4678 module has been certified for use in Canada under Innovation, Science and Economic Development Canada (ISED, formerly Industry Canada), Radio Standards Procedure (RSP) RSP-100, Radio Standards Specification (RSS) RSS-Gen and RSS-247. Modular approval permits the installation of a module in a host device without the need to recertify the device.

9.2.1 LABELING AND USER INFORMATION REQUIREMENTS

Labeling Requirements (from RSP-100, Issue 11, Section 3): The host product shall be properly labeled to identify the module within the host device.

The Innovation, Science and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host product, otherwise the host device must be labeled to display the Innovation, Science and Economic Development Canada certification number of the module, preceded by the word “Contains”, or similar wording expressing the same meaning, as follows:

Contains transmitter module
IC: 12246A-BM78SPPSSM2

User Manual Notice for License-Exempt Radio Apparatus (from Section 8.4, RSS-Gen, Issue 4, November 2014): User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both:

Guidelines on Transmitter Antenna for License Exempt Radio Apparatus:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be chosen so that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

9.2.2 RF EXPOSURE

All transmitters regulated by the Innovation, Science and Economic Development Canada (ISED) must comply with RF exposure requirements listed in RSS-102 - Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).

This transmitter is restricted for use with a specific antenna tested in this application for certification, and must not be co-located or operating in conjunction with any other antenna or transmitters, except in accordance with Innovation, Science and Economic Development Canada multi-transmitter guidelines.
The device operates at an output power level which is within the ISED SAR test exemption limits at any user distance.

9.2.3 HELPFUL WEB SITES


9.3 Europe

The RN4678 module is a Radio Equipment Directive (RED) assessed radio module that is CE marked and has been manufactured and tested with the intention of being integrated into a final product.

The RN4678 module has been tested to RED 2014/53/EU Essential Requirements for Health and Safety (Article (3.1(a)), Electromagnetic Compatibility (EMC) (Article 3.1(b)), and Radio (Article 3.2) and are summarized in Table 9-1 European Compliance Testing.

The ETSI provides guidance on modular devices in “Guide to the application of harmonised standards covering articles 3.1b and 3.2 of the RED 2014/53/EU (RED) to multi-radio and combined radio and non-radio equipment” document available at www.etsi.org.

Note: To maintain conformance to the testing listed in Table 9-1, the module shall be installed in accordance with the installation instructions in this data sheet and shall not be modified. When integrating a radio module into a completed product the integrator becomes the manufacturer of the final product and is therefore responsible for demonstrating compliance of the final product with the essential requirements against the RED.

9.3.1 LABELING AND USER INFORMATION REQUIREMENTS

The label on the final product which contains the RN4678 module must follow CE marking requirements.

### Table 9-1: EUROPEAN COMPLIANCE TESTING

<table>
<thead>
<tr>
<th>Certification</th>
<th>Standards</th>
<th>Article</th>
<th>Laboratory</th>
<th>Report Number</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>EN 300 328 V1.9.1</td>
<td></td>
<td></td>
<td>10052796 001</td>
<td>2015-12-21</td>
</tr>
<tr>
<td></td>
<td>EN 62479:2010</td>
<td></td>
<td></td>
<td>10052797 001</td>
<td>2015-12-21</td>
</tr>
<tr>
<td>EMC</td>
<td>EN 300 489-1 V1.9.1</td>
<td>[3.1(b)]</td>
<td></td>
<td>10052437 001</td>
<td>2015-09-14</td>
</tr>
<tr>
<td></td>
<td>EN 301 489-17 V2.2.1</td>
<td></td>
<td></td>
<td>10052437 002</td>
<td>2017-05-26</td>
</tr>
<tr>
<td></td>
<td>EN 301 489-1 V2.1.1</td>
<td></td>
<td></td>
<td>10052437 002</td>
<td>2017-05-26</td>
</tr>
<tr>
<td></td>
<td>EN 301 489-17 V3.1.1</td>
<td></td>
<td></td>
<td>10052437 002</td>
<td>2017-05-26</td>
</tr>
<tr>
<td></td>
<td>EN 301 489-17 V3.2.0</td>
<td></td>
<td></td>
<td>10052437 002</td>
<td>2017-05-26</td>
</tr>
<tr>
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<td>EN 300 328 V1.9.1</td>
<td>(3.2)</td>
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<td>10052796 001</td>
<td>2015-12-21</td>
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<td>EN 300 328 V2.1.1</td>
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<td>10052797 001</td>
<td>2015-12-21</td>
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<td>10052796 002</td>
<td>2017-05-26</td>
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<td></td>
<td></td>
<td></td>
<td>10052797 002</td>
<td>2017-05-26</td>
</tr>
</tbody>
</table>

9.3.2 CONFORMITY ASSESSMENT

From ETSI Guidance Note EG 203367, section 6.1 Non-radio products are combined with a radio product:

If the manufacturer of the combined equipment installs the radio product in a host non-radio product in equivalent assessment conditions (i.e. host equivalent to the one used for the assessment of the radio product) and according to the installation instructions for the radio product, then no additional assessment of the combined equipment against article 3.2 of the RED is required.

The European Compliance Testing listed in Table 9-1, was performed using the integral ceramic chip antenna.

9.3.2.1 SIMPLIFIED EU DECLARATION OF CONFORMITY

Hereby, Microchip Technology Inc. declares that the radio equipment type RN4678 is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity, for this product, is available at: http://www.microchip.com/design-centers/wireless-connectivity.
9.3.3 HELPFUL WEBSITES
A document that can be used as a starting point in understanding the use of Short Range Devices (SRD) in Europe is the European Radio Communications Committee (ERC) Recommendation 70-03 E, which can be downloaded from the European Communications Committee (ECC) at: http://www.ecodocdb.dk/

Additional helpful web sites are:

9.4 Japan
The RN4678 module has received type certification and is labeled with its own technical conformity mark and certification number as required to conform to the technical standards regulated by the Ministry of Internal Affairs and Communications (MIC) of Japan pursuant to the Radio Act of Japan.

Integration of this module into a final product does not require additional radio certification provided installation instructions are followed and no modifications of the module are allowed. Additional testing may be required:
- If the host product is subject to electrical appliance safety (for example, powered from an AC mains), the host product may require Product Safety Electrical Appliance and Material (PSE) testing. The integrator must contact their conformance laboratory to determine if this testing is required.
- There is a voluntary Electromagnetic Compatibility (EMC) test for the host product administered by VCCI: http://www.vcci.jp/vcci_e/index.html

9.4.1 LABELING AND USER INFORMATION REQUIREMENTS
The label on the final product which contains the RN4678 module must follow Japan marking requirements. The integrator of the module must refer to the labeling requirements for Japan available at the Ministry of Internal Affairs and Communications (MIC) website.

The RN4678 module is labeled with its own technical conformity mark and certification number. The final product in which this module is being used must have a label referring to the type certified module inside:

![Label](image)

9.4.2 HELPFUL WEB SITES
Ministry of Internal Affairs and Communications (MIC): http://www.tele.soumu.go.jp/e/index.htm
Association of Radio Industries and Businesses (ARIB): http://www.arib.or.jp/english/

9.5 Korea
The RN4678 module has received certification of conformity in accordance with the Radio Waves Act. Integration of this module into a final product does not require additional radio certification provided installation instructions are followed and no modifications of the module are allowed.

9.5.1 LABELING AND USER INFORMATION REQUIREMENTS
The label on the final product which contains the RN4678 module must follow KC marking requirements. The integrator of the module should refer to the labeling requirements for Korea available on the Korea Communications Commission (KCC) website.

The RN4678 module is labeled with its own KC mark. The final product requires the KC mark and certificate number of the module:

![Label](image)

9.5.2 HELPFUL WEB SITES

9.5.5 HELPFUL WEB SITES
Ministry of Knowledge Economy (MKE): http://www.mke.go.kr
National IT Standards Committee (NITSC): http://www.ntsc.go.kr
9.6  Taiwan

The RN4678 module has received compliance approval in accordance with the Telecommunications Act. Customers seeking to use the compliance approval in their product must contact Microchip Technology sales or distribution partners to obtain a Letter of Authority.

Integration of this module into a final product does not require additional radio certification provided installation instructions are followed and no modifications of the module are allowed.

9.6.1 LABELING AND USER INFORMATION REQUIREMENTS

For the RN4678 module, due to limited module size, the NCC mark and ID are displayed in the data sheet and/or packaging and cannot be displayed on the module label:

The user's manual must contain below warning (for RF device) in traditional Chinese:

注意！

依據低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，

公司、商號或使用者均不得擅自變更頻率、加大功率或

變更原設計

之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及

干擾合法通信；

經發現有干擾現象時，應立即停用，並改善至無干擾時

方得繼續使用。

前項合法通信，指依電信規定作業之無線電信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用

電波輻射性

電機設備之干擾。

9.7  China

The RN4678 module has received certification of conformity in accordance with the China MIIT Notice 2014-01 of State Radio Regulation Committee (SRRC) certification scheme. Integration of this module into a final product does not require additional radio certification, provided installation instructions are followed and no modifications of the module are allowed.

9.7.1 LABELING AND USER INFORMATION REQUIREMENTS

The RN4678 module is labeled with its own CMIIT ID as follows:

CMIIT ID: 2016DJ5735

When Host system is using an approved Full Modular Approval (FMA) radio: The host must bear a label containing the statement “This device contains SRRC approved Radio module CMIIT ID: 2016DJ5735”.

9.8  Other Regulatory Information

• For information on the other countries jurisdictions covered, refer to the http://www.microchip.com/design-centers/wireless-connectivity.

• Should other regulatory jurisdiction certification be required by the customer, or the customer need to recertify the module for other reasons, contact Microchip for the required utilities and documentation.

CMIIT ID: 2016DJ5735
APPENDIX A: REVISION HISTORY

Revision A (June 2016)
This is the initial released version of the document.

Revision B (January 2018)
• Updated Figure 1-1, Figure 1-2, and Figure 5-3.
• Updated Table 1-1.
• Added Section 2.2 “Flow Control”.
• Updated Section 8.0 “Ordering Information”
• Updated Section “Product Identification System”
• Removed Figure 1-3, Figure 2-9, Figure 5-4, Figure 5-5, and Figure 5-6.

Revision C (March 2019)
This revision includes the following changes and minor updates to text and formatting, which were incorporated throughout the document.

TABLE 9-1: MAJOR SECTION UPDATES

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
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<tbody>
<tr>
<td>Section “Features”</td>
<td>Updated certification information</td>
</tr>
<tr>
<td>Section “Data Throughput”</td>
<td>Updated kbytes/s</td>
</tr>
<tr>
<td>Section 1.0 “Device Overview”</td>
<td>Updated Figure 1-1 and Table 1-1</td>
</tr>
<tr>
<td>Chapter 2.0, Application Information</td>
<td>Updated Table 2-3</td>
</tr>
<tr>
<td></td>
<td>Added SW_BTN note in Section 2.5 “Software Button (SW_BTN)”</td>
</tr>
<tr>
<td>Chapter 3.0, Electrical Characteristics</td>
<td>Updated Storage temperature</td>
</tr>
<tr>
<td></td>
<td>Updated current consumption values in Table 3-6 and Table 3-7</td>
</tr>
<tr>
<td>Chapter 5.0, Physical Dimensions</td>
<td>Updated Figure 5-1 and Figure 5-2</td>
</tr>
<tr>
<td>Chapter 8.0, Ordering Information</td>
<td>Updated Table 8-1 with certification information</td>
</tr>
<tr>
<td>Chapter 9.0, Regulatory Approval</td>
<td>Updated IC to ISED in Section 9.2 “Canada”</td>
</tr>
<tr>
<td></td>
<td>Updated RED certification information in Section 9.3 “Europe”</td>
</tr>
<tr>
<td></td>
<td>Updated Section 9.6 “Taiwan”</td>
</tr>
<tr>
<td></td>
<td>Added Section 9.7 “China”</td>
</tr>
</tbody>
</table>

Revision D (May 2019)
Updated China labeling ID in 9.7.1 “LABELING AND USER INFORMATION REQUIREMENTS”.

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Microchip provides online support via our WWW site at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website contains the following information:

• **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user’s guides and hardware support documents, latest software releases and archived software

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• Technical Support

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**Technical support is available through the website at:** http://microchip.com/support
PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, for example, on pricing or delivery, refer to the factory or the listed sales office.

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>V Temperature Range</th>
<th>RM Package</th>
<th>XXX Firmware Revision Number</th>
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<tr>
<td>Device</td>
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<tr>
<td>Temperature Range</td>
<td>V = -20°C to +70°C (Various)</td>
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<td></td>
</tr>
<tr>
<td>Package</td>
<td>RM = Radio Module</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example:
RN4678-V/RM100: Various temperature
Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
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