

# Datasheet

产品名称 (Product): BT 5.1 module

产品型号 (Model No.): HOLYIOT-21052 -nRF52820

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# 1. Description

nRF52820 is an ultra-low power *Bluetooth*® 5.2 System on Chip (SoC) with built-in USB supporting Bluetooth Low Energy, Bluetooth mesh, Thread, and Zigbee.

The nRF52820 device compliments the extensive nRF52 Series platform with a lower-end option offering built-in USB and a fully-featured 2.4 GHz multiprotocol radio. It is capable of all advanced Bluetooth Low Energy features including Long Range, high-speed 2 Mbps, and Direction Finding.

nRF52820 features a 64 MHz Arm® Cortex®-M4 processor with 256 kB of flash memory and 32 kB of RAM. A wide range of analog and digital interfaces is integrated, such as an analog comparator, SPI, UART, TWI, QDEC, and USB. With a supply voltage of 1.7 V to 5.5 V, the device is enabled to be powered by rechargeable batteries or USB. It is qualified for operating at an extended temperature range of -40°C to 105°C.

Multiprotocol radio (bluetooth low energy, ANT, 2.4G proprietary)

## Hardware :

SWD programmer (SWDIO,SWCLK,VDD,GND)

nRF52820 -QDAA

Size : 9.20mm\*15.04mm

BLE stack & RF 2.4Ghz

## Features :

- *Bluetooth* 5.1, IEEE 802.15.4-2006, 2.4 GHz transceiver
  - -95 dBm sensitivity in 1 Mbps Bluetooth Low Energy mode
  - Max. peak power: 3dBm
  - -103 dBm sensitivity in 125 kbps Bluetooth Low Energy mode (long range)
  - -20 to +8 dBm TX power, configurable in 4 dB steps
  - On-air compatible with nRF52, nRF51, nRF24L, and nRF24AP Series

- Supported data rates:
    - Bluetooth 5.1 – 2 Mbps, 1 Mbps, 500 kbps, and 125 kbps
    - IEEE 802.15.4-2006 – 250 kbps
    - Proprietary 2.4 GHz – 2 Mbps, 1 Mbps
  - Angle-of-arrival (AoA) and angle-of-departure (AoD) direction finding using Bluetooth
  - Single-ended antenna output (on-chip balun)
  - 128-bit AES/ECB/CCM/AAR co-processor (on-the-fly packet encryption)
  - 4.9 mA peak current in TX (0 dBm)
  - 4.7 mA peak current in RX
  - RSSI (1 dB resolution)
- 
- Arm® Cortex®-M4 32-bit processor, 64 MHz
    - 144 EEMBC CoreMark® score running from flash memory
    - 33 µA/MHz running CoreMark from flash memory
    - 33 µA/MHz running CoreMark from RAM
    - Serial wire debug (SWD)

#### Flexible power management

- 1.7 V to 5.5 V supply voltage range
- On-chip DC/DC and LDO regulators with automated low current modes
- Automated peripheral power management
- Fast wake-up using 64 MHz internal oscillator
- 0.3 µA at 3 V in System OFF mode, no RAM retention
- 1.2 µA at 3 V in System ON mode, no RAM retention, wake on RTC
- 256 kB flash and 32 kB RAM
- Advanced on-chip interfaces
  - USB 2.0 full speed (12 Mbps) controller
  - Programmable peripheral interconnect (PPI)
  - 18 general purpose I/O pins
  - EasyDMA automated data transfer between memory and peripherals
- Nordic SoftDevice ready with support for concurrent multiprotocol
- 64 level comparator
- Temperature sensor
- 4x 32-bit timer with Counter mode
- Up to 2x SPI master/slave with EasyDMA
- Up to 2x I2C compatible two-wire master/slave
- UART (CTS/RTS) with EasyDMA
- Quadrature decoder (QDEC)
- 2x real-time counter (RTC)
- Single crystal operation
- Operating temperature from -40 to 105 °C
- Package variants
  - QFN40 package, 5 x 5 mm
  - WLCSP package, 2.531 x 2.531 mm

## Application:

Advanced computer peripherals and I/O devices

- Mouse
- Keyboard
- Multi-touch trackpad
- Internet of things (IoT)
  - Smart home sensors and controllers
  - Industrial IoT sensors and controllers
- Interactive entertainment devices
  - Remote controls
  - Gaming controllers

## 2. Introduction

### 2.1 Programmer

HOLYIOT-21052 module use the Serial Wire Debug(SWD port ), the module which layout the SWDIO, SWCLK, VDD, GND for debug and flash your own firmware, more info about the SWD, please visit [https://www.silabs.com/community/mcu/32-bit/knowledge-base.entry.html/2014/10/21/serial\\_wire\\_debugs-qKCT](https://www.silabs.com/community/mcu/32-bit/knowledge-base.entry.html/2014/10/21/serial_wire_debugs-qKCT)

You can using the Jlink or Jtag for programmer.

### 2.2 Software development Tool

It supports the standard Nordic Software Development Tool-chain using Segger Embedded Studio, Keil, IAR and GCC. More info please visit <https://www.nordicsemi.com/Software-and-Tools/Development-Tools>

## 2.3 Protocols

This module support Bluetooth 5, Bluetooth Low Energy,Bluetooth mesh,Thread,802.15.4,ANT, 2.4GHz proprietary. So we can use different protocols for different situations.

### Software Development Kit

Nordic Semiconductor's Software Development Kits (SDK) are your starting point for software development on the nRF51 and nRF52 Series. It contains source code libraries and example applications covering wireless functions, libraries for all peripherals, bootloaders, wired and OTA FW upgrades, RTOS examples, serialization libraries.

More info please visit <https://www.nordicsemi.com/Software-and-Tools/Software/nRF5-SDK>

You can also download the SDK for coding development .

## 2.4 SoftDevices

Nordic Semiconductor protocol stacks are known as SoftDevices. SoftDevices are pre-compiled, pre-linked binary files. SoftDevices can be programmed in nRF5 series devices, and are freely downloadable from the Nordic website. Please download that here:

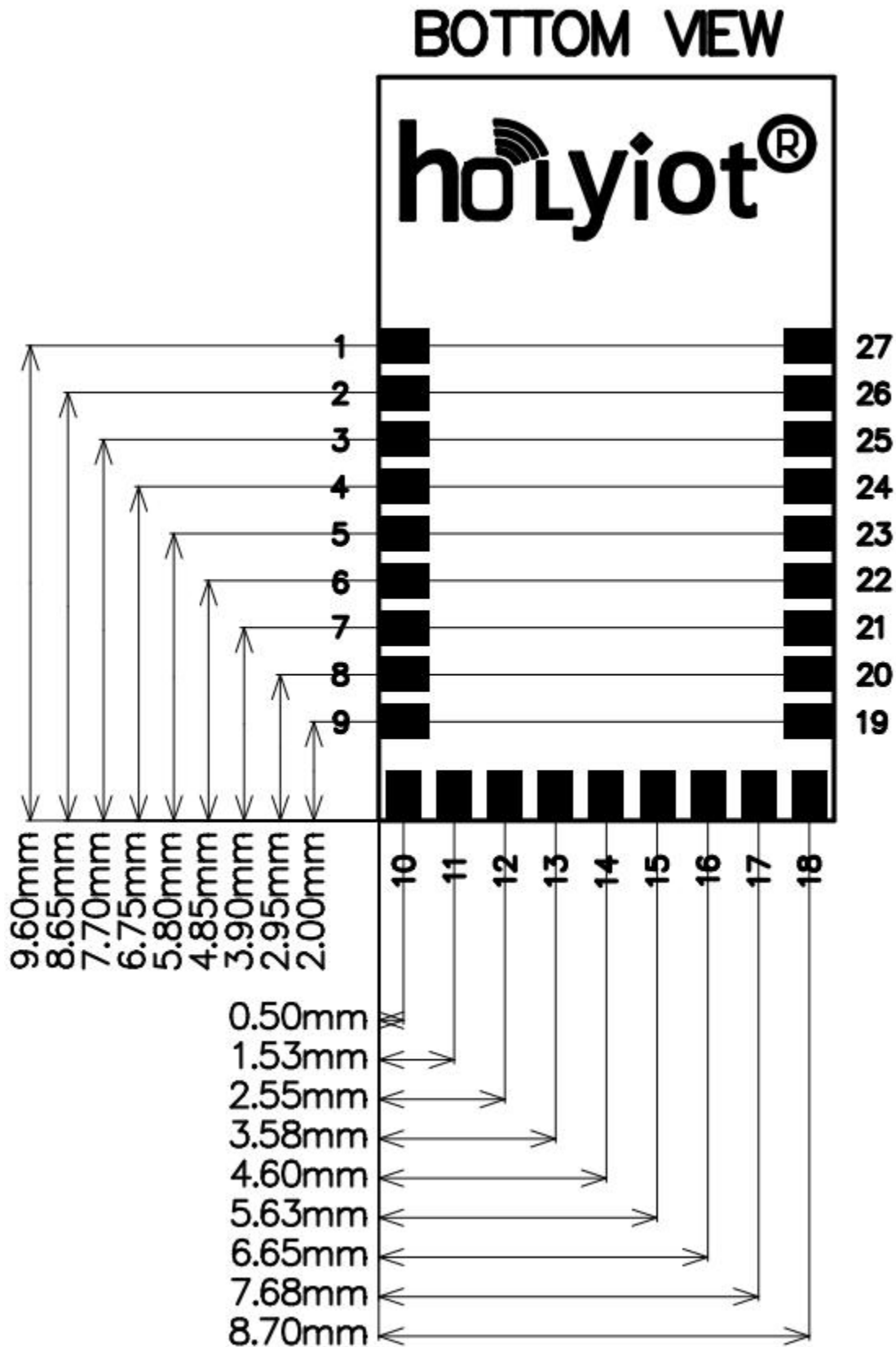
<https://www.nordicsemi.com/Software-and-Tools/Software/S132>

### Over-The-Air DFU

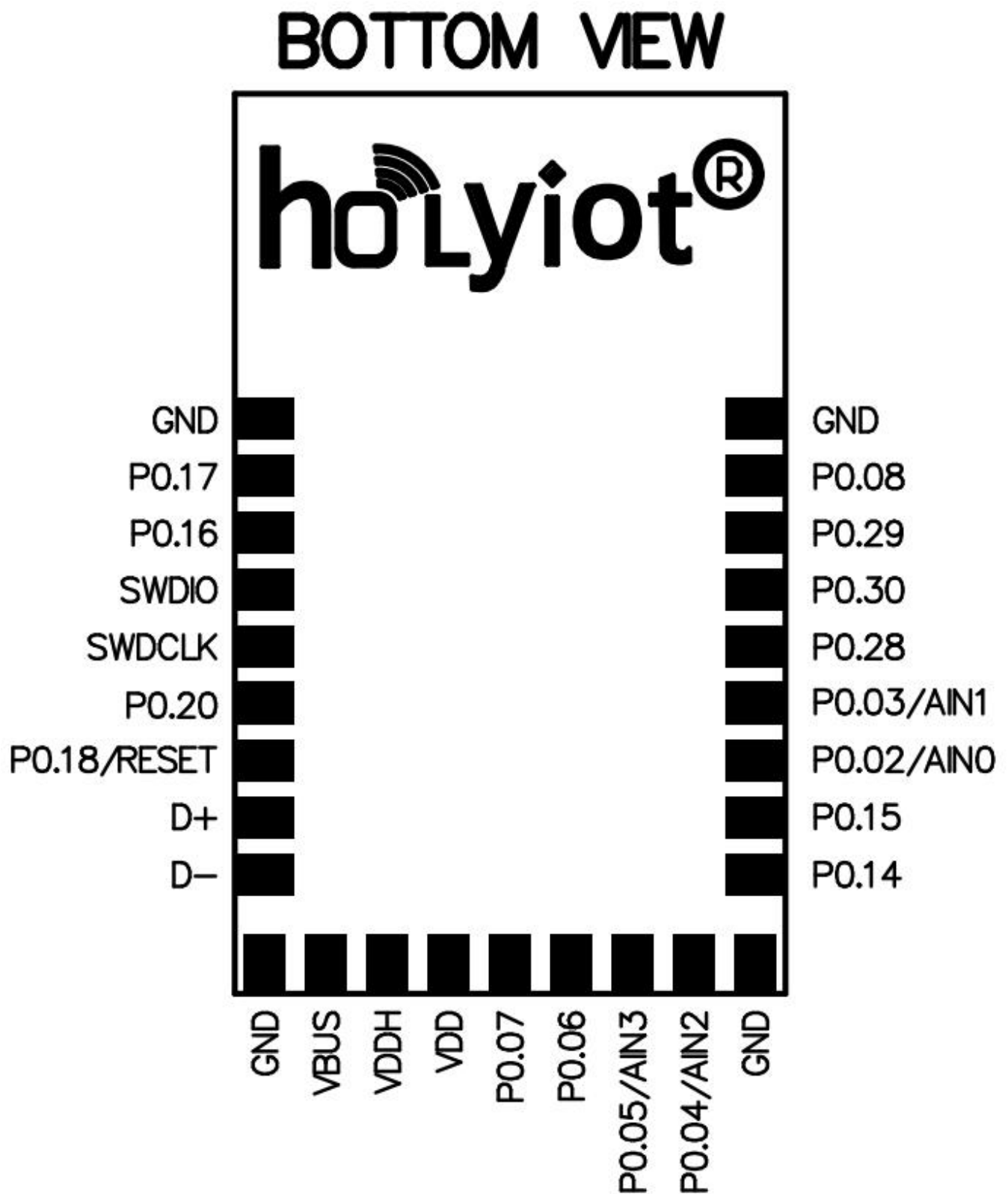
The SoC is supported by an Over-The-Air Device Firmware Upgrade (OTA DFU) feature. This allows for in the field updates of application software and SoftDevice.

## 3. Product Descriptions

### 3.1 Mechanical drawings



### 3.2 Pin assignments



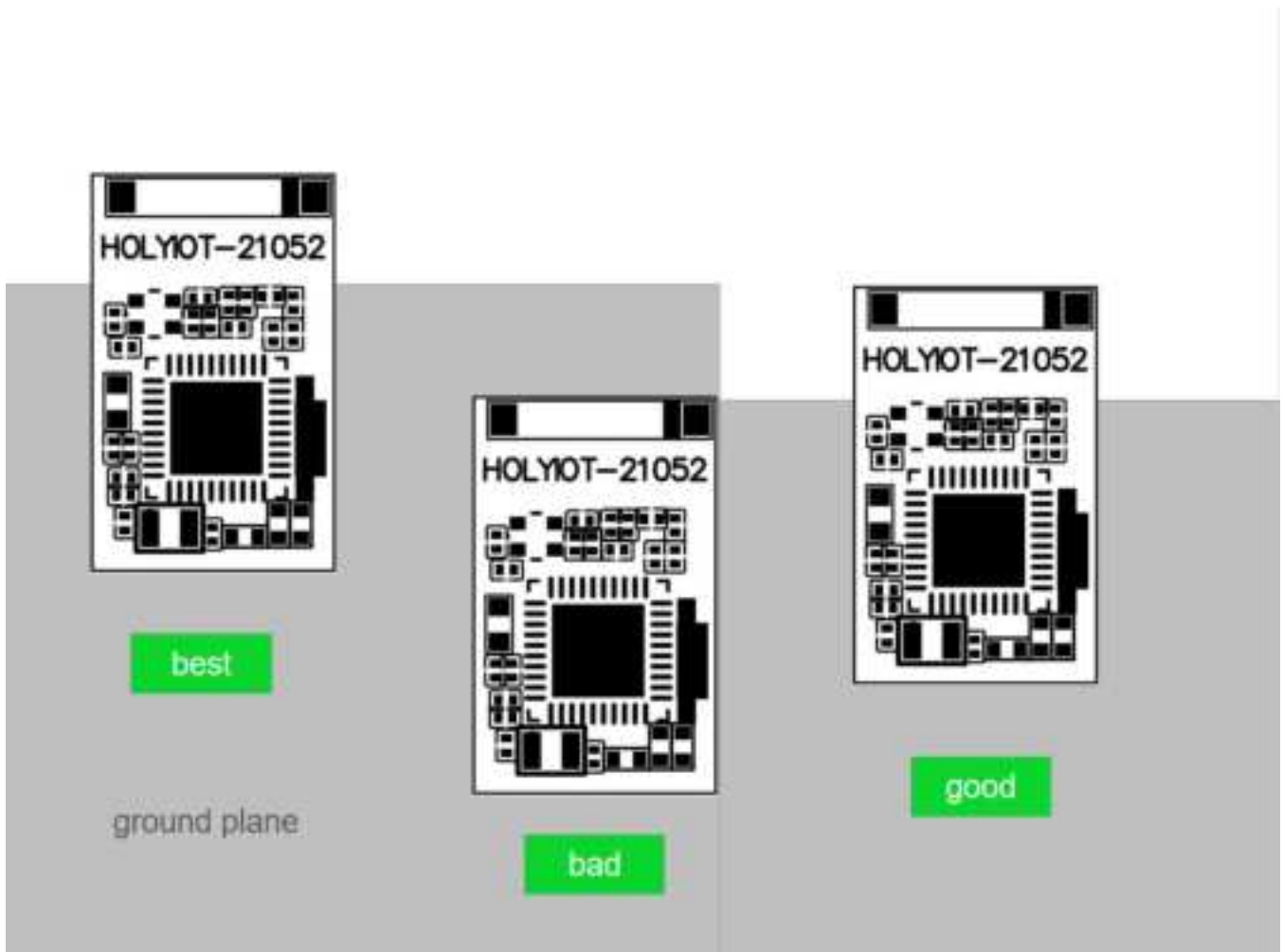


PIN No.	PIN define	Functions
1	GND	Ground
2	P0.17	General purpose I/O
3	P0.16	General purpose I/O
4	SWDIO	Serial wire debug I/O for debug and programming
5	SWDCLK	Serial wire debug clock input for debug and programming
6	P0.20	General purpose I/O
7	P0.18 nRESET	General purpose I/O Configurable as pin RESET
8	D+	USB D+
9	D-	USB D-
10	GND	Ground
11	VBUS	5 V input for USB 3.3 V regulator
12	VDDH	High voltage power supply
13	VDD	Power supply
14	P0.07	General purpose I/O
15	P0.06	General purpose I/O
16	P0.05 AIN3	General purpose I/O Analog input
17	P0.04 AIN2	General purpose I/O Analog input
18	GND	Ground
19	P0.14	General purpose I/O
20	P0.15	General purpose I/O
21	P0.02 AIN0	General purpose I/O Analog input
22	P0.03 AIN1	General purpose I/O Analog input
23	P0.28	General purpose I/O
24	P0.30	General purpose I/O
25	P0.29	General purpose I/O
26	P0.08	General purpose I/O
27	GND	Ground

## 4. Mounting our board on the host PCBA

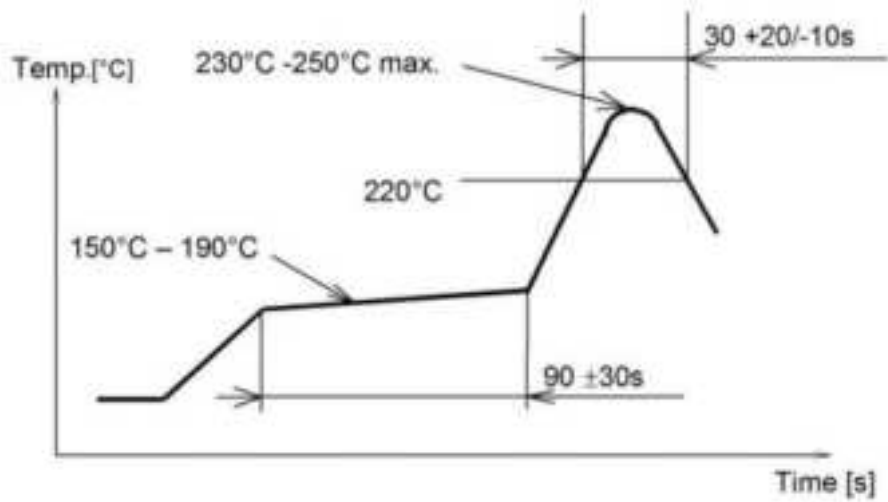
We suggest that you mount our RF board(HOLYIOT-21052 -52820) on the board like that:

1. For the best Bluetooth performance, the antenna of the area need to extend about several mm without ground under the antenna of the edge of the host PCB.
2. The second choice is that place our board at the corner of host PCB, the antenna of board need to extend several mm outside of the Ground plane of the host PCB.



## 5. Miscellaneous

Soldering Temperature-Time Profile for Re-Flow Soldering. Maximum number of cycles for re-flow is 2. No opposite side re-flow is allowed due to module weight.



## 6. Absolute maximum ratings

Maximum ratings are the extreme limits to which the chip can be exposed for a limited amount of time without permanently damaging it. Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability of the device.

Absolute maximum ratings:

	Note	Min.	Max.	Unit
<b>Supply voltages</b>				
VDD		-0.3	+3.9	V
VDDH		-0.3	+5.8	V
VBUS		-0.3	+5.8	V
VSS			0	V
<b>I/O pin voltage</b>				
V <sub>IO</sub> , VDD ≤3.6 V		-0.3	VDD + 0.3	V
V <sub>IO</sub> , VDD >3.6 V		-0.3	3.9	V
<b>Environmental QFN40 package</b>				
Storage temperature		-40	+125	°C
MSL	Moisture Sensitivity Level		2	
ESD HBM	Human Body Model		3	kV
ESD HBM Class	Human Body Model Class		2	
ESD CDM	Charged Device Model		1	kV
<b>Environmental WLCSP 2.531 x 2.531 mm package</b>				
Storage temperature		-40	+125	°C
MSL	Moisture Sensitivity Level		1	
ESD HBM	Human Body Model		3	kV
ESD HBM Class	Human Body Model Class		2	
ESD CDM	Charged Device Model		1	kV
<b>Flash memory</b>				
Endurance		10 000		write/erase cycles
Retention at 85 °C		10		years
Retention at 105 °C	Limited to 1000 write/erase cycles	3		years
Retention at 105 °C-85 °C, execution split	Limited to 1000 write/erase cycles	6.7		years
75% execution time at 85 °C or less				



## **FCC Statement**

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: 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 important announcement

## **Radiation Exposure Statement**

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

## **Important Note:**

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

## **End Product Labeling**

The final end product must be labeled in a visible area with the following "Contains FCC ID:2ALGY-21052".

## **Manual Information to the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

## **Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01**

### **2.2 List of applicable FCC rules**

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter.

### **2.3 Specific operational use conditions**

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

### **2.4 Limited module procedures**

Not applicable

### **2.5 Trace antenna designs**

Not applicable

### **2.6 RF exposure considerations**

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

### **2.7 Antennas**

This radio transmitter 2ALGY-21052 has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Model	Type	Peak Gain(dBi)
2400-2500MHz	ceramic antenna	2.0 dBi

### **2.8 Label and compliance information**

The final end product must be labeled in a visible area with the following "Contains FCC ID:2ALGY-21052".

### **2.9 Information on test modes and additional testing requirements**

Host manufacturer which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C:15.247 and 15.209 requirement, only if the test result comply with FCC part 15.247 and 15.209 requirement, then the host can be sold legally.

### **2.10 Additional testing, Part 15 Subpart B disclaimer**

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.