

# Datasheet

产品名称 (Product): HOLYIOT-21069-5340

产品型号 (Model No.): 21069

1. Description.....	3
Hardware.....	3
Features.....	3
Application core.....	4
Network core.....	4
Applications.....	5
2. Introduction.....	6
2.1 Programmer.....	7
2.2 Software development Tool.....	7
2.3 Protocols.....	7
3. Product Descriptions.....	8
3.1 Mechanical drawings.....	8
3.2 Pin assignments.....	9
4. Mounting our board on the host PCBA.....	13
5. Miscellaneous.....	13
6. Absolute maximum ratings.....	14
7. List of Holyiot module.....	15

# 1. Description

HOLYIOT-21069 module is based on Nordic nRF5340 SoC, nRF5340 Soc is an ultra-low power wireless System on Chip (SoC) with two Arm® Cortex®-M33 processors and a multiprotocol 2.4 GHz transceiver. The two flexible processors, combined with advanced security features and an operating temperature of up to 105°C, make nRF5340 a great choice for LE Audio, professional lighting, advanced wearables and other complex IoT applications.

The nRF5340 SoC supports an extensive range of wireless protocols. It supports Bluetooth Low Energy and is capable of all angle-of-arrival (AoA) and angle-of-departure (AoD) roles in Bluetooth Direction Finding. In addition, it supports LE Audio, high-throughput 2 Mbps, Advertising Extensions and Long Range. Mesh protocols like Bluetooth mesh, Thread and Zigbee can be run concurrently with Bluetooth LE, enabling smartphones to provision, commission, configure and control mesh nodes. NFC, ANT, 802.15.4 and 2.4 GHz proprietary protocols are also supported.

## Hardware

SWD programmer (SWDIO, SWCLK, VDD, GND)

nRF5340 QKAA

Size: 19mm\*13.5mm

Bluetooth® 5.2, IEEE 802.15.4-2006, 2.4 GHz transceiver

## Features

- 1.7 V to 5.5 V supply voltage range
- Single 32 MHz crystal operation
- Package variants
- 1.8 V to 3.3 V regulated supply for external components
- Operating temperature from -40 to +105°C
- 48 general purpose I/O pins

- Distributed programmable peripheral interconnect (DPPI) Distributed programmable peripheral interconnect (DPPI)
- Inter-processor communication (IPC)
- Mutually exclusive peripheral (MUTEX)

## **Application core**

- Arm® Cortex®-M33 with TrustZone® technology
- 1 MB flash and 512 kB low leakage RAM
- Arm TrustZone CryptoCell™-312 security subsystem
- Two-way set associative cache towards flash and QSPI XIP code regions
- QSPI peripheral for communicating with an external flash memory device
- Near field communication (NFC-A) tag with wake-on field
- Up to 5x SPI master/slave with EasyDMA
- Up to 4x I2C compatible two-wire master/slave with EasyDMA
- Up to 4x UART (CTS/RTS) with EasyDMA
- Audio peripherals: I2S, digital microphone interface (PDM)
- Up to 4x pulse width modulator (PWM) units with EasyDMA
- 12-bit, 200 ksps ADC with EasyDMA - eight configurable channels with programmable gain
- Up to 3x 32-bit timer with counter mode
- Up to 2x 24-bit real-time counter (RTC)
- Up to 2x Quadrature decoder (QDEC)

## **Network core**

- Arm Cortex-M33
- 256 kB flash
- 64 kB low leakage RAM
- Bluetooth® 5.2, IEEE 802.15.4-2006, 2.4 GHz transceiver
- SPI master/slave with EasyDMA
- I2C compatible two-wire master/slave with EasyDMA
- UART (CTS/RTS) with EasyDMA

- Up to 3x 32-bit timer with counter mode
- Up to 2x real-time counter (RTC)
- Temperature sensor
- Distributed programmable peripheral interconnect (DPPI)
- Inter-processor communication (IPC)
- Mutually exclusive peripheral (MUTEX)

## Applications

- Advanced computer peripherals and I/O devices
  - Multi-touch trackpad
- Advanced wearables
  - Health/fitness sensor and monitor devices
  - Wireless payment enabled devices
- Wireless audio devices
  - Bluetooth Low Energy Audio
  - True wireless earbuds
  - Headphones, microphones, and speakers
- Internet of things (IoT)
  - Smart home sensors and controllers
  - Industrial IoT sensors and controllers
- Interactive entertainment devices
  - Remote controls
  - Gaming controllers
- Professional lighting
  - Wireless connected luminaire
- Medical
- Asset tracking and RTLS

## 2. Introduction

HOLYIOT-21069 module is based on Nordic nRF5340 SoC, the nRF5340 SoC is a wireless, ultra-low power multicore System on Chip (SoC), integrating two fully programmable Arm Cortex-M33 processors, advanced security features, a range of peripherals, and a multiprotocol 2.4 GHz transceiver. The transceiver supports Bluetooth Low Energy, ANT™, and 802.15.4 for, among others, Thread and Zigbee protocols. It also allows the implementation of proprietary 2.4 GHz protocols.

The two Arm Cortex-M33 processors share the power, clock, and peripheral architecture with Nordic Semiconductor nRF51, nRF52, and nRF91 Series of SoCs, ensuring minimal porting efforts. The application core is a full-featured Arm Cortex-M33 processor including DSP instructions and FPU and running at up to 128 MHz with 1 MB of flash and 512 kB of RAM. The option to run the application processor at 64 MHz allows the CPU to increase energy efficiency. The network core is an Arm Cortex-M33 processor with a reduced feature set, designed for ultra-low power operation. It runs at a fixed 64 MHz frequency and contains 256 kB of flash and 64 kB of RAM.

The peripheral set offers a variety of analog and digital functionality enabling single-chip implementation of a wide range of applications. Arm TrustZone technology, Arm CryptoCell-312, and supporting blocks for system protection and key management are embedded for the advanced security needed for IoT applications.

## 2.1 Programmer

HOLYIOT-21069 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 use 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

nRF Connect SDK is a scalable and unified software development kit for building products based on all our nRF52, nRF53 and nRF91 Series wireless devices. It offers developers an extensible framework for building size-optimized software for memory-constrained devices as well as powerful and complex software for more advanced devices and applications. It integrates the the Zephyr RTOS and a wide range of samples, application protocols, protocol stacks, libraries and hardware drivers.

For developing Bluetooth Low Energy, Thread and Zigbee products, the nRF Connect SDK contains all needed software, including protocol stacks

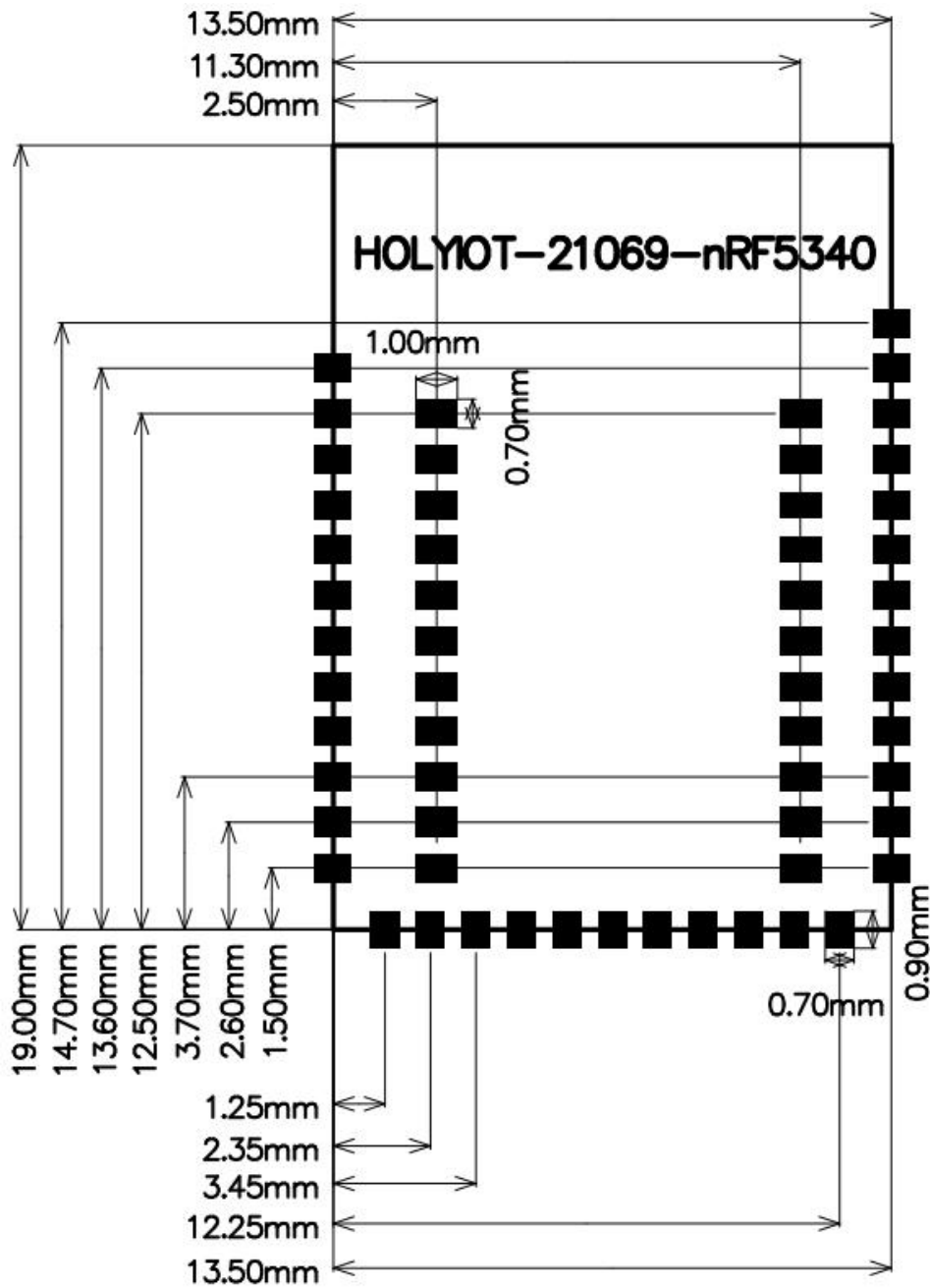
Get Started: <https://www.nordicsemi.com/Software-and-tools/Development-Kits/nRF5340-DK/GetStarted#infotabs>

More info please visit <https://www.nordicsemi.com/Software-and-tools/Software/nRF-Connect-SDK>

You can also download the SDK for coding development.

### 3. Product Descriptions

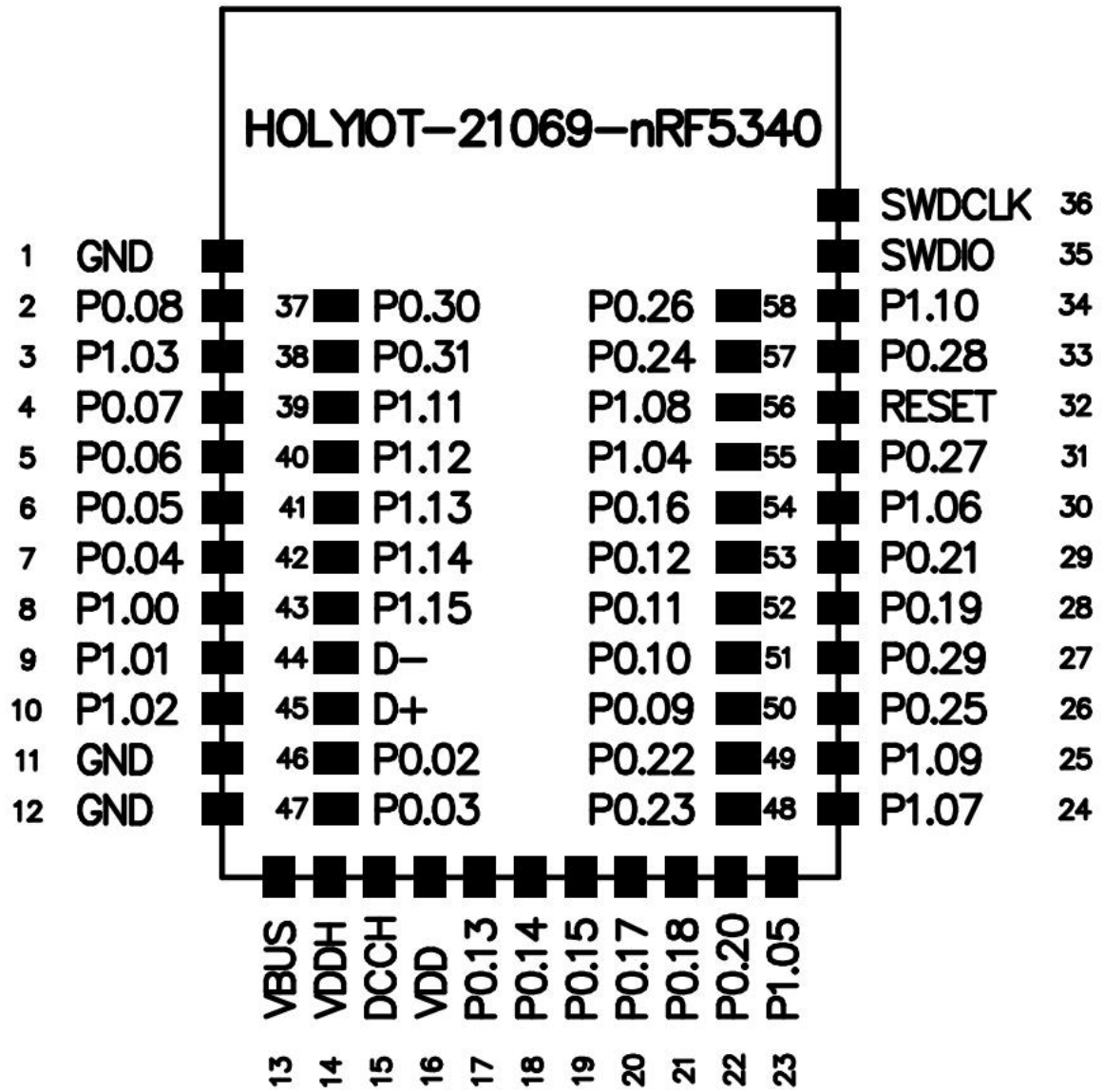
#### 3.1 Mechanical drawings



**TOP VIEW**



### 3.2 Pin assignments



**TOP VIEW**

<b>PIN No.</b>	<b>PIN define</b>	<b>Functions</b>
1	GND	Ground pad
2	P0.08 TRACEDATA3 SCK	General purpose I/O Trace buffer TRACEDATA[3] Dedicated pin for high-sp
3	P1.03 TWI	General purpose I/O High-speed pin for 1 Mbps TWI
4	P0.07 AIN3	General purpose I/O Analog input
5	P0.06 AIN2	General purpose I/O Analog input
6	P0.05 AIN1	General purpose I/O Analog input
7	P0.04 AIN0	General purpose I/O Analog input
8	P1.00	General purpose I/O
9	P1.01	General purpose I/O
10	P1.02 TWI	General purpose I/O High-speed pin for 1 Mbps TWI
11	GND	Ground pad
12	GND	Ground pad
13	VBUS	5 V input for USB 3.3 V regulator
14	VDDH	High voltage power supply
15	DCCH	DC/DC converter output
16	VDD	Power supply
17	P0.13 IO0	General purpose I/O Dedicated pin for Quad SPI
18	P0.14 IO1	General purpose I/O Dedicated pin for Quad SPI
19	P0.15 IO2	General purpose I/O Dedicated pin for Quad SPI
20	P0.17 SCK	General purpose I/O Dedicated pin for Quad SPI
21	P0.18 CSN	General purpose I/O Dedicated pin for Quad SPI
22	P0.20	General purpose I/O

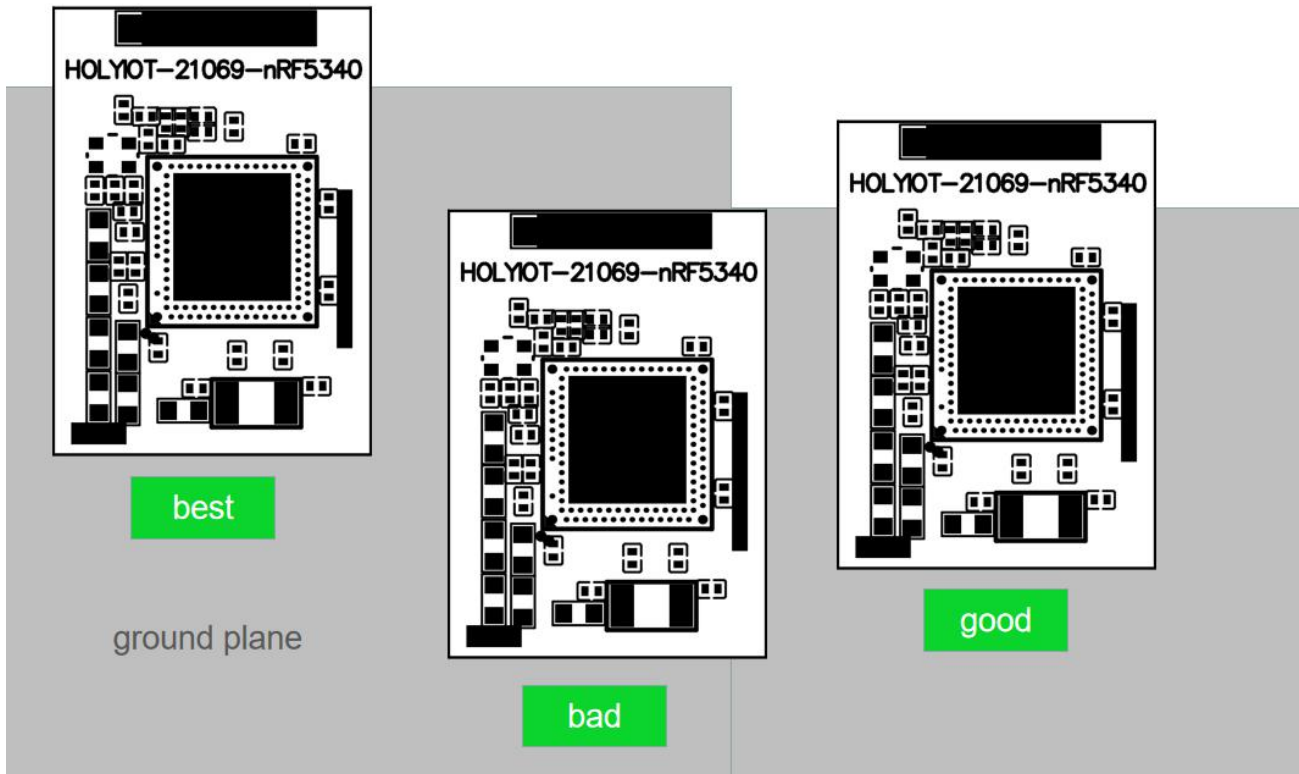
23	P1.05	General purpose I/O
24	P1.07	General purpose I/O
25	P1.09	General purpose I/O
26	P0.25 AIN4	General purpose I/O Analog input
27	P0.29	General purpose I/O
28	P0.19	General purpose I/O
29	P0.21	General purpose I/O
30	P1.06	General purpose I/O
31	P0.27	General purpose I/O
32	RESET	Pin RESET with internal pull-up resistor
33	P0.28 AIN7	General purpose I/O Analog input
34	P1.10	General purpose I/O
35	SWDIO	Serial wire debug I/O for debug and programming
36	SWDCLK	Serial wire debug clock input for debug and programming
37	P0.30	General purpose I/O
38	P0.31	General purpose I/O
39	P1.11	General purpose I/O
40	P1.12	General purpose I/O
41	P1.13	General purpose I/O
42	P1.14	General purpose I/O
43	P1.15	General purpose I/O
44	D-	USB D-
45	D+	USB D+
46	P0.02 NFC1	General purpose I/O NFC antenna connection
47	P0.03 NFC2	General purpose I/O NFC antenna connection
48	P0.23	General purpose I/O
49	P0.22	General purpose I/O
50	P0.09 TRACEDATA2 MOSI	General purpose I/O Trace buffer TRACEDATA[2] Dedicated pin for high-speed SPI

51	P0.10 TRACEDATA1 MISO	General purpose I/O Trace buffer TRACEDATA[1] Dedicated pin for high-speed SPI
52	P0.11 TRACECLK CSN	General purpose I/O Trace buffer TRACEDATA[0] Dedicated pin for high-speed SPI
53	P0.12 TRACECLK DCX	General purpose I/O Trace buffer clock Dedicated pin for high-speed SPI
54	P0.16 IO3	General purpose I/O Dedicated pin for Quad SPI
55	P1.04	General purpose I/O
56	P1.08	General purpose I/O
57	P0.24	General purpose I/O
58	P0.26 AIN5	General purpose I/O Analog input

## 4. Mounting our board on the host PCBA

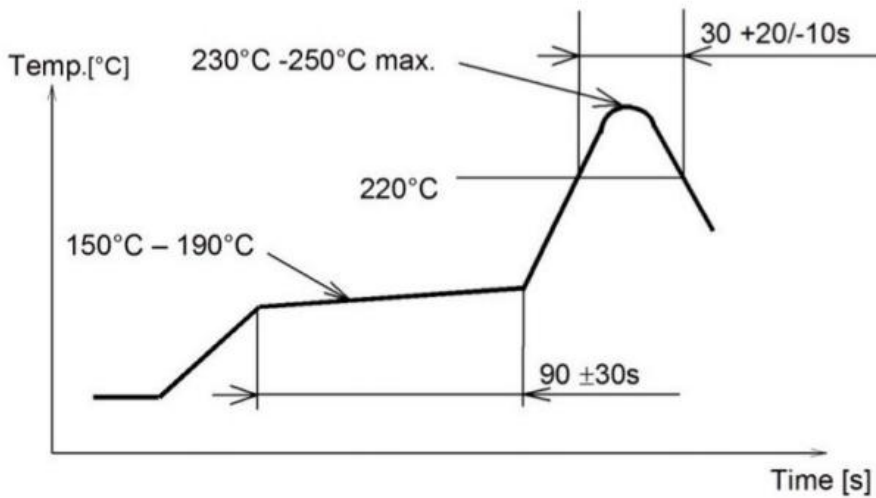
We suggest that you mount our RF board (HOLYIOT-20046) on the board like that:

1. For the best Bluetooth performance, the antenna of the area needs 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 needs 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.



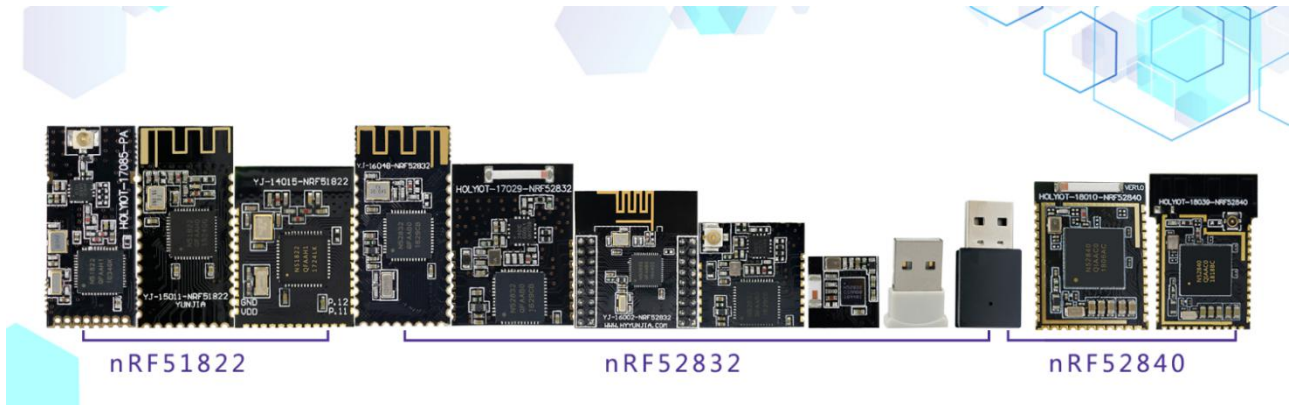
## 6. Absolute maximum ratings











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.

	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>			
$V_{I/O}, VDD \leq 3.6\text{ V}$	-0.3	$VDD + 0.3$	V
$V_{I/O}, VDD > 3.6\text{ V}$	-0.3	3.9	V
<b>Environmental aQFN package</b>			
Storage temperature	-40	+125	°C
Moisture Sensitivity Level (MSL)		2	
ESD Human Body Model (HBM)		2	kV
		(all pins except DECR and DECN, rated at 1.4 kV)	
ESD Charged Device Model (CDM)		500	V
<b>Flash memory</b>			
Endurance	10 000 write/erase cycles		
Retention	10 years at 40°C		



## 7. List of Holyiot module



Part No.	Nordic chip	Holyiot No.	PA	Antenna	Picture
1	nRF51822	Holyiot-17085-PA	✓	IPX antenna	 
2	nRF51822	YJ-15011-nRF51822	✗	PCB antenna	 
3	nRF51822	YJ-14015-nRF51822	✗	PCB antenna	 
4	nRF52832	YJ-16048-nRF52832	✗	PCB antenna	 
5	nRF52832	YJ-17029-nRF52832	✓	Ceramic antenna	 

6	nRF52832	YJ-16002-nRF52832	×	PCB antenna	 
7	nRF52832	YJ-17024-nRF52832	✓	IPX antenna	 
8	nRF52832	YJ-17095-nRF52832	×	Ceramic antenna	 
9	nRF52832	YJ-17017-USB	×	Ceramic antenna	 
10	nRF52832	YJ-17076-USB	×	PCB antenna	 
11	nRF52840	YJ-17120-USB	×	PCB antenna	 
12	nRF52840	YJ-18010-nRF52840	×	Ceramic antenna	 
13	nRF52840	YJ-18039-nRF52840	×	IPX antenna & PCB antenna	 



## FCC WARNING

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20

cm between the radiator and your body.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

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

antenna or transmitter.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.

The firmware setting is not accessible by the end user.

The final end product must be labelled in a visible area with the following:

“Contains Transmitter Module “2ALGY21069”

## **Requirement per KDB996369 D03**

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

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.<sup>3</sup>

**Explanation:** This module meets the requirements of FCC part 15C (15.247). It specifically identified AC Power Line Conducted Emission, Radiated Spurious emissions, Band edge and RF Conducted Spurious Emissions, Conducted Peak Output Power, Bandwidth, Power Spectral Density, Antenna Requirement.

### **2.3 Summarize the specific operational use conditions**

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

**Explanation:** The product antenna uses an irreplaceable antenna with a gain of 1dBi

### **2.4 Single Modular**

If a modular transmitter is approved as a "Single Modular," then the module manufacturer is responsible for approving the host environment that the Single Modular is used with. The manufacturer of a Single Modular must describe, both in the filing and in the installation instructions, the alternative means that the Single Modular manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A Single Modular manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited

module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This Single Modular procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited

module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

**Explanation:** The module is a single module.

## 2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

- a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
- b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- d) Appropriate parts by manufacturer and specifications;
- e) Test procedures for design verification; and
- f) Production test procedures for ensuring compliance

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application

## 2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

**Explanation:** The module complies with FCC radiofrequency radiation exposure limits for uncontrolled environments. The device is installed and operated with a distance of more than 20 cm between the radiator and your body." This module follows FCC statement design, FCC ID :2ALGY21069

## **2.7 Antennas**

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type").

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product.

The module manufacturers shall provide a list of acceptable unique connectors.

**Explanation:** The product antenna uses an irreplaceable antenna with a gain of 1dBi

## **2.8 Label and compliance information**

Grantees are responsible for the continued compliance of their modules to the FCC rules. This

includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

**Explanation:** The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: 2ALGY21069

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

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

**Explanation:** Ningde linyang Electronic Technology Co., Ltd. can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

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

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product

as being Part 15

Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

**Explanation:** The module without unintentional-radiator digital circuitry, so the module does not require an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.