RN52m DataSheet

v1.2.1-en

Contents

1. Revision History

Date	Version	Description
2020/01	1.0.0	First Release
2021/08	1.1.0	Change dimension data to high resolution
2021/11	1.2.0	Change dimension data (Chip Antenna)
2022/04	1.2.1	Change Module 3D Picture

2. Overview

The RN52m module (based nRF52832 SoC) is a powerful, highly flexible ultra-low power multiprotocol SoC ideally suited for Bluetooth® low energy (previously called Bluetooth Smart), ANT and 2.4GHz ultra low-power wireless applications. The RN52m is built around a 32-bit ARM® Cortex™-M4F CPU with 512kB + 64kB RAM. The embedded 2.4GHz transceiver supports Bluetooth low energy, ANT and proprietary 2.4 GHz protocol stack. It is on air compatible with the nRF51 Series, nRF24L and nRF24AP Series products from Nordic Semiconductor.

Bluetooth 5

The RN52m has hardware support on-chip for Bluetooth 5. This includes high throughput and advertising extension.

Processing power

The RN52m incorporates a powerful Cortex-M4F processor enabling the most demanding applications with complex arithmetic requirements to be realized in a single chip solution. The IC supports DSP instructions, a Floating Point Unit (FPU), single-cycle multiply and accumulate, and hardware divide for energy-efficient process of computationally complex operations.

Multiprotocol radio

The 2.4GHz radio supports multiple protocols including Bluetooth low energy, ANT and 2.4GHz proprietary. The radio has high definition RSSI and highly automated functionality, including EasyDMA for direct memory access during packet send and retrieve. Nordic provides protocol stacks for Bluetooth low energy. ANT protocol stacks are available from ANT here: www.thisisant.com.

Power Efficiency

The RN52m module is an extremely power efficient device that can run from a supply between 1.7V and 3.6V. All individual peripherals and clocks offer complete flexibility of power down when not required for task operation thus minimizing power consumption to a minimum. The IC has a comprehensive system of automated and adaptive power management features. These features range across the entire IC's operation from power supply switching to peripheral bus/EasyDMA memory management, to automated shut down of all but the absolute essential peripherals required to perform a task.

SoftDevice

The RN52m is supported by the S132 SoftDevice, a Bluetooth 5 pre-qualified protocol stack.

2.1. Features

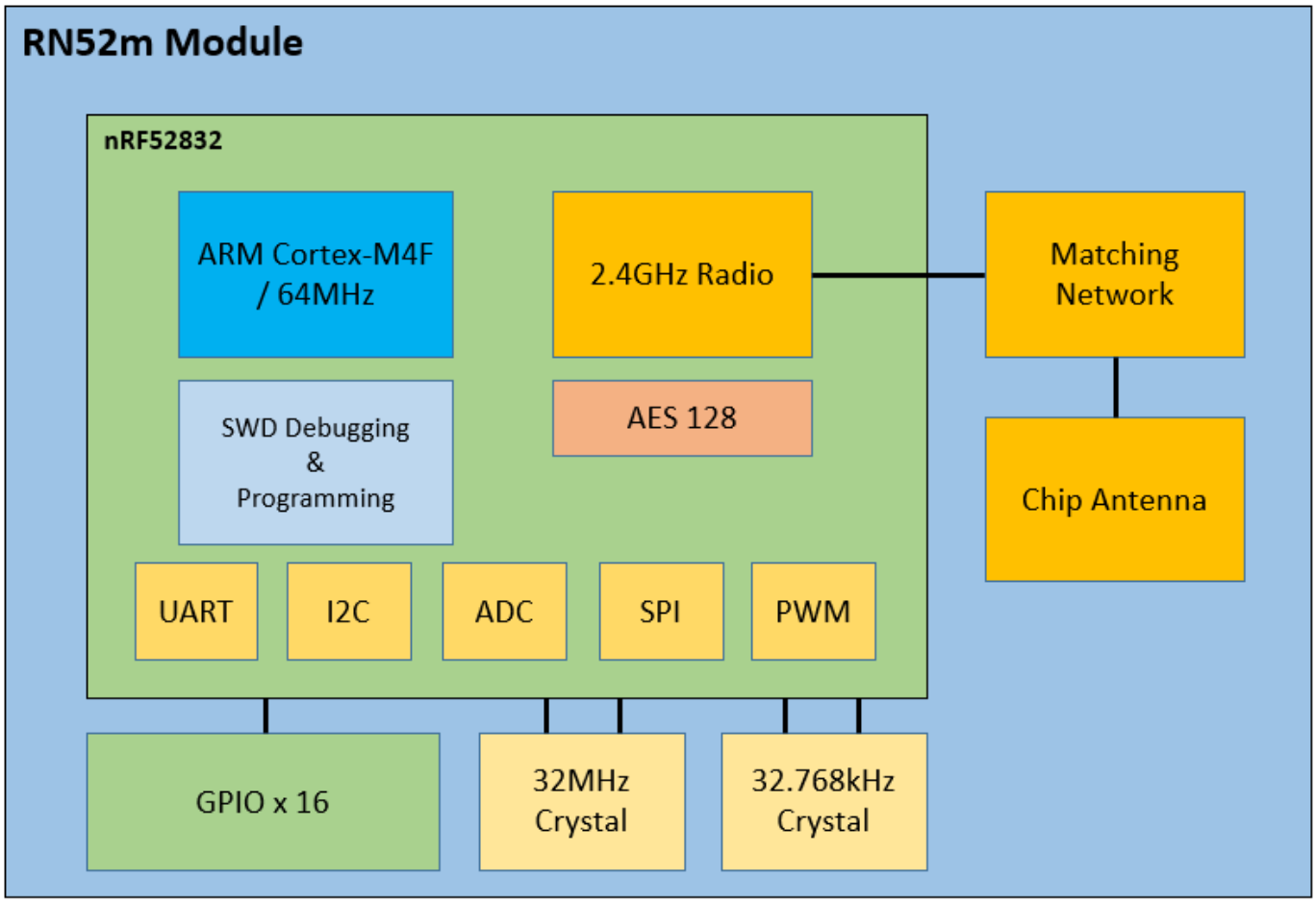
- 2.4 GHz transceiver
    - -96 dBm sensitivity in Bluetooth® low energy mode
    - Supported data rates: 1 Mbps, 2 Mbps Bluetooth® low energy mode
    - -20 to +4 dBm TX power, configurable in 4 dB steps
    - On-chip balun (single-ended RF)
    - 5.3 mA peak current in TX (0 dBm)
    - 5.4 mA peak current in RX
    - RSSI (1 dB resolution)
- ARM® Cortex®-M4 32-bit processor with FPU, 64 MHz
    - 215 EEMBC CoreMark® score running from flash memory
    - Serial wire debug (SWD)
    - Trace port
- Flexible power management
    - 1.7 V–3.6 V supply voltage range
    - Fast wake-up using 64 MHz internal oscillator
- Memory
    - 512 kB flash/64 kB RAM
- Nordic SoftDevice ready
- Support for concurrent multi-protocol
- 12-bit, 200 ksps ADC - 8 configurable channels with programmable gain
- 64 level comparator
- 15 level low power comparator with wakeup from System OFF mode
- Temperature sensor
- 30 general purpose I/O pins
- 3x 4-channel pulse width modulator (PWM) unit with EasyDMA
- Digital microphone interface (PDM)
- 5x 32-bit timer with counter mode

- Up to 3x SPI master/slave with EasyDMA
- Up to 2x I2C compatible 2-wire master/slave
- I2S with EasyDMA
- UART (CTS/RTS) with EasyDMA
- Programmable peripheral interconnect (PPI)
- Quadrature decoder (QDEC)
- AES HW encryption with EasyDMA
- Autonomous peripheral operation without CPU intervention using PPI and EasyDMA
- 3x real-time counter (RTC)
- Single crystal operation

2.2. Application

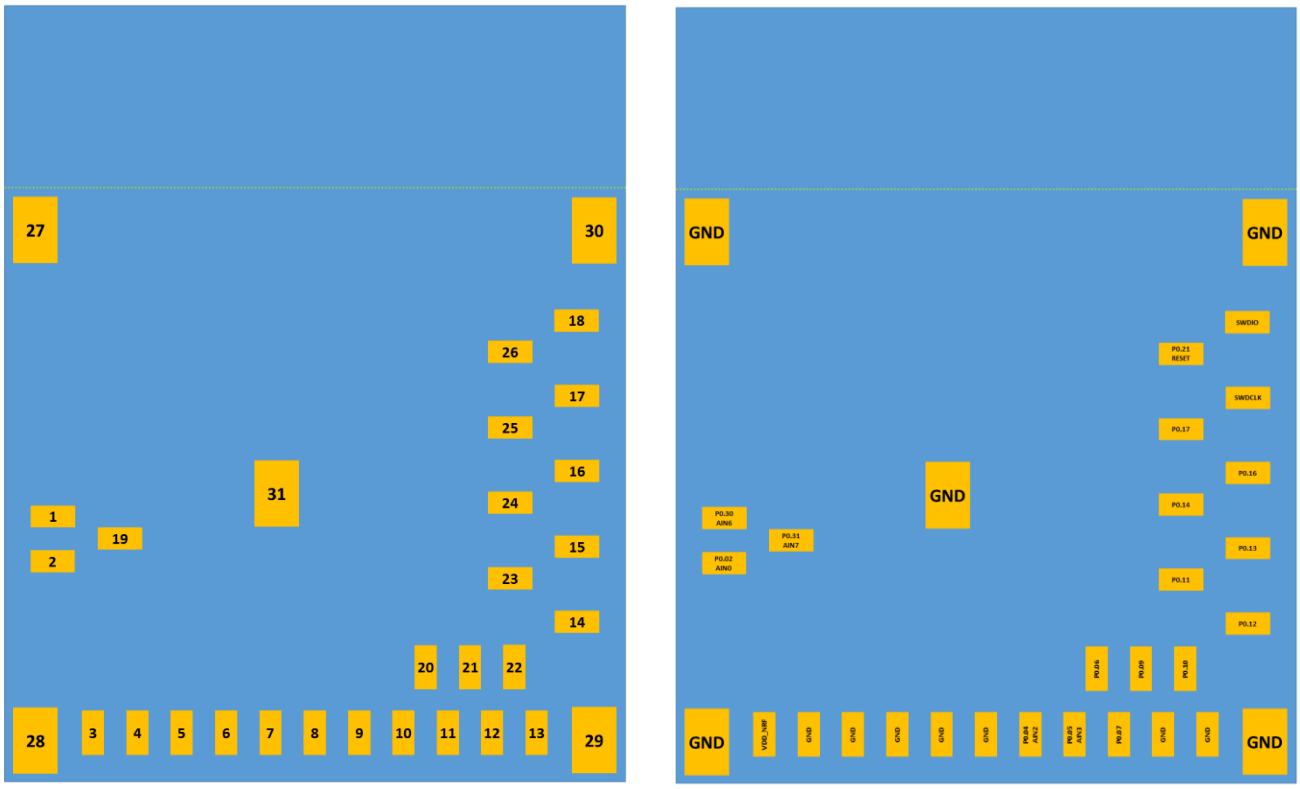
- Internet of Things (IoT)
    - Home automation
    - Sensor networks
    - Building automation
    - Industrial
    - Retail
- Computer peripherals and I/O devices
    - Mouse
    - Keyboard
    - Multi-touch trackpad
- Interactive entertainment devices
    - Remote control
    - Gaming controller
- Beacons
- Personal Area Networks
    - Health/fitness sensor and monitor devices
    - Medical devices
    - Key-fobs + wrist watches
- Remote control toys
- Wireless Mesh Network

2.3. Block Diagram



The RN52m module includes a matching network for chip antenna and external 32.768k crystal.

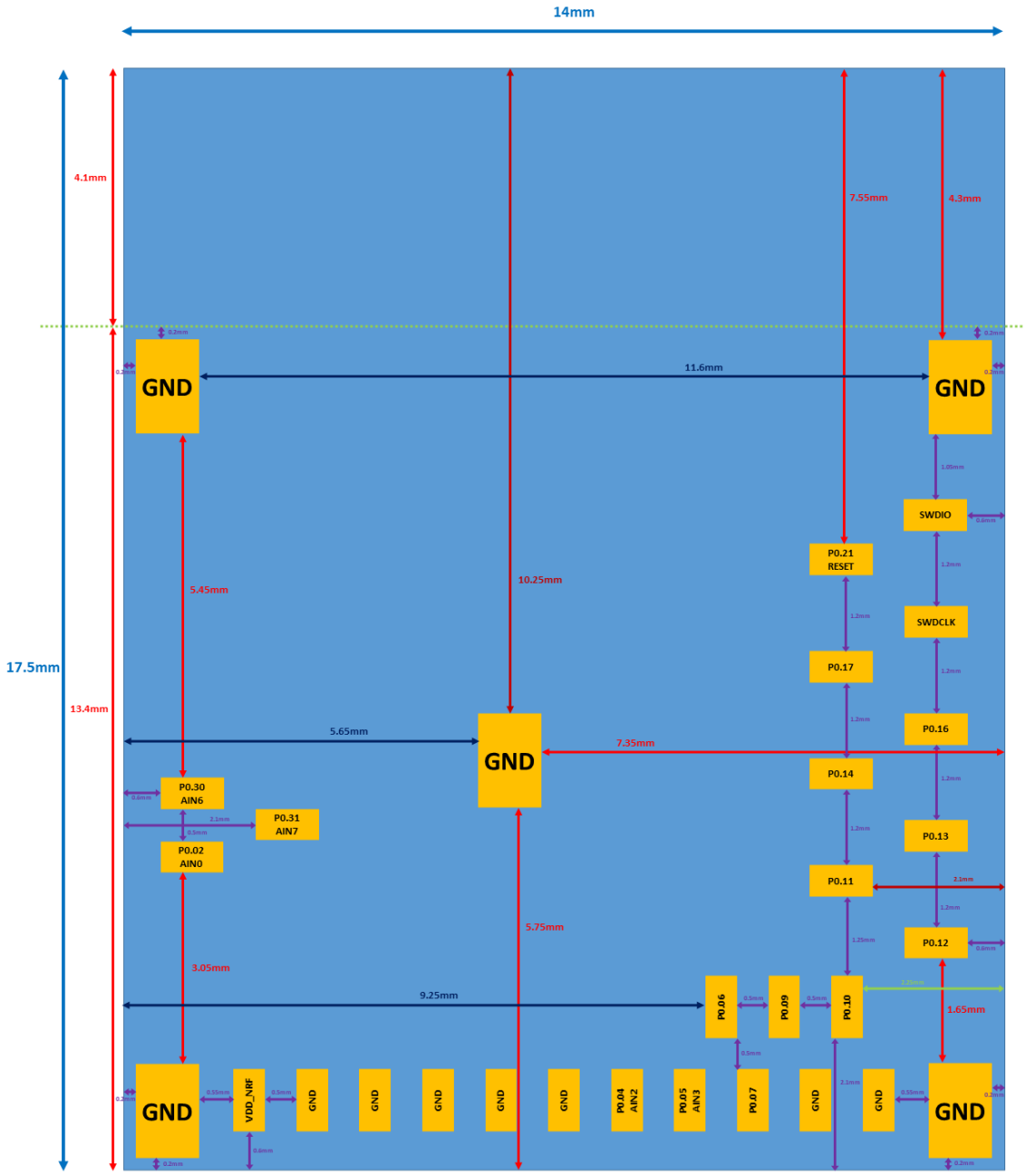
3. Pin Assignments and Functions (Top View)



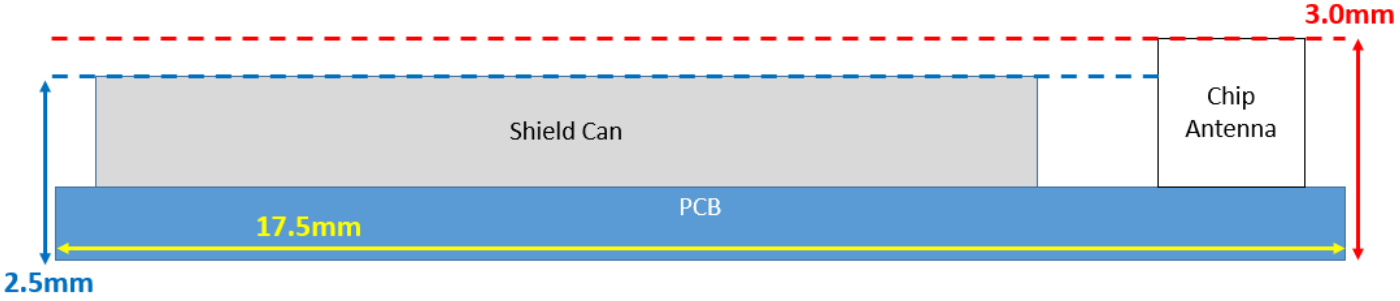
Pin	Pin Name	Pin Function	Description
1	P0.30 AIN6	Digital I/O Analog input	General purpose I/O COMP input SAADC input
2	P0.02 AIN0	Digital I/O Analog input	General purpose I/O COMP input SAADC input
3	VDD_NRF	Power	Power supply.
4	GND	Power	Ground (0 V).
5	GND	Power	Ground (0 V).
6	GND	Power	Ground (0 V).
7	GND	Power	Ground (0 V).
8	GND	Power	Ground (0 V).
9	P0.04 AIN2	Digital I/O Analog input	General purpose I/O COMP input SAADC input
10	P0.05 AIN3	Digital I/O Analog input	General purpose I/O COMP input SAADC input
11	P0.07	Digital I/O	General purpose I/O
12	GND	Power	Ground (0 V).

13	GND	Power	Ground (0 V).
14	P0.12	Digital I/O	General purpose I/O
15	P0.13	Digital I/O	General purpose I/O
16	P0.16	Digital I/O	General purpose I/O
17	SWDCLK	Digital Input	Serial wire debug clock input for debug and programming
18	SWDIO	Digital I/O	Serial wire debug I/O for debug and programming
19	P0.31 AIN7	Digital I/O Analog input	General purpose I/O COMP input SAADC input
20	P0.06	Digital I/O	General purpose I/O
21	P0.09	Digital I/O	General purpose I/O
22	P0.10	Digital I/O	General purpose I/O
23	P0.11	Digital I/O	General purpose I/O
24	P0.14	Digital I/O	General purpose I/O
25	P0.17	Digital I/O	General purpose I/O
26	P0.21 nRESET	Digital I/O	General purpose I/O. Configurable as system RESET.
27	GND	Power	Ground (0 V).
28	GND	Power	Ground (0 V).
29	GND	Power	Ground (0 V).
30	GND	Power	Ground (0 V).
31	GND	Power	Ground (0 V).

4. Module Layout



RN52m Dimension and Bottom Pad (Top View)



The recommended metal mask sizes for the bottom pad type of the RN52m module are shown below.

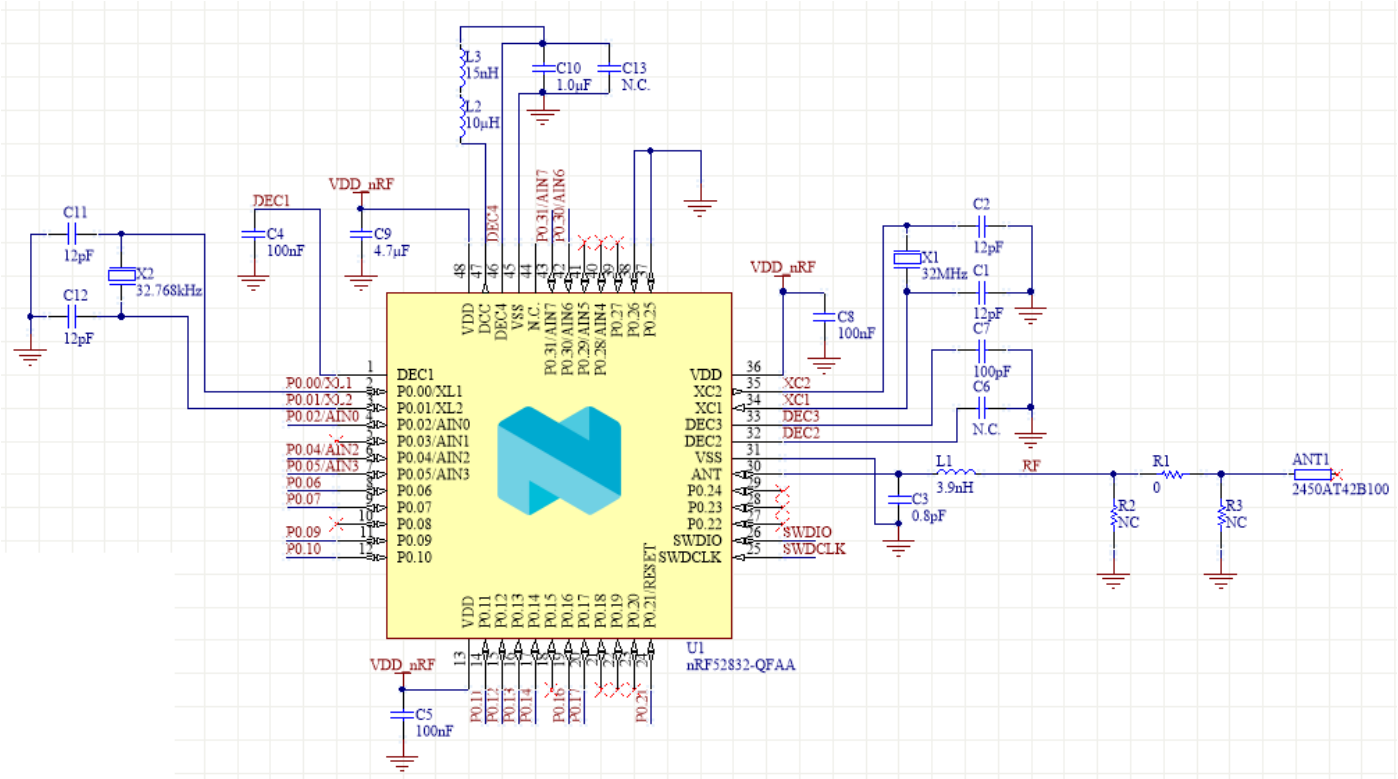
<Recommended metal mask for solder printing>

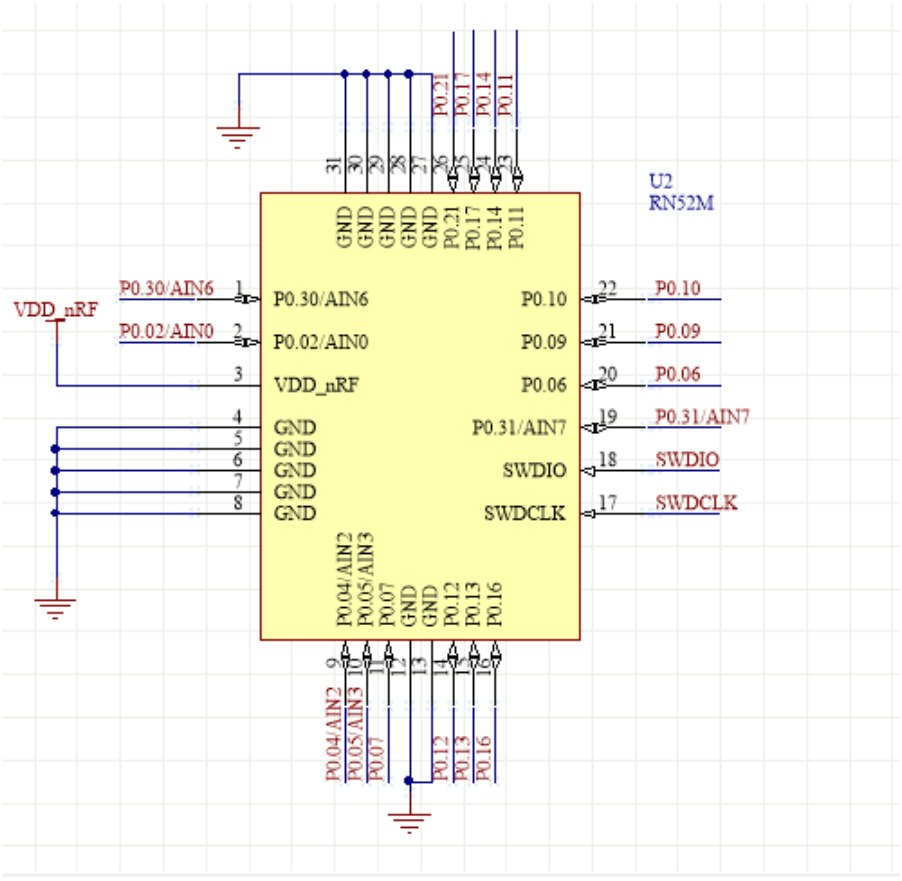
Pad	Pad size	Mask opening
Signal pad	0.5 x 1.0 mm & 1.0 x 0.5 mm	0.4 x 0.9 mm & 0.9 x 0.4 mm
Corner & Center pad	1.0 x 1.5 mm	0.7 x 1.0 mm

The metal mask thickness : t = 0.1mm

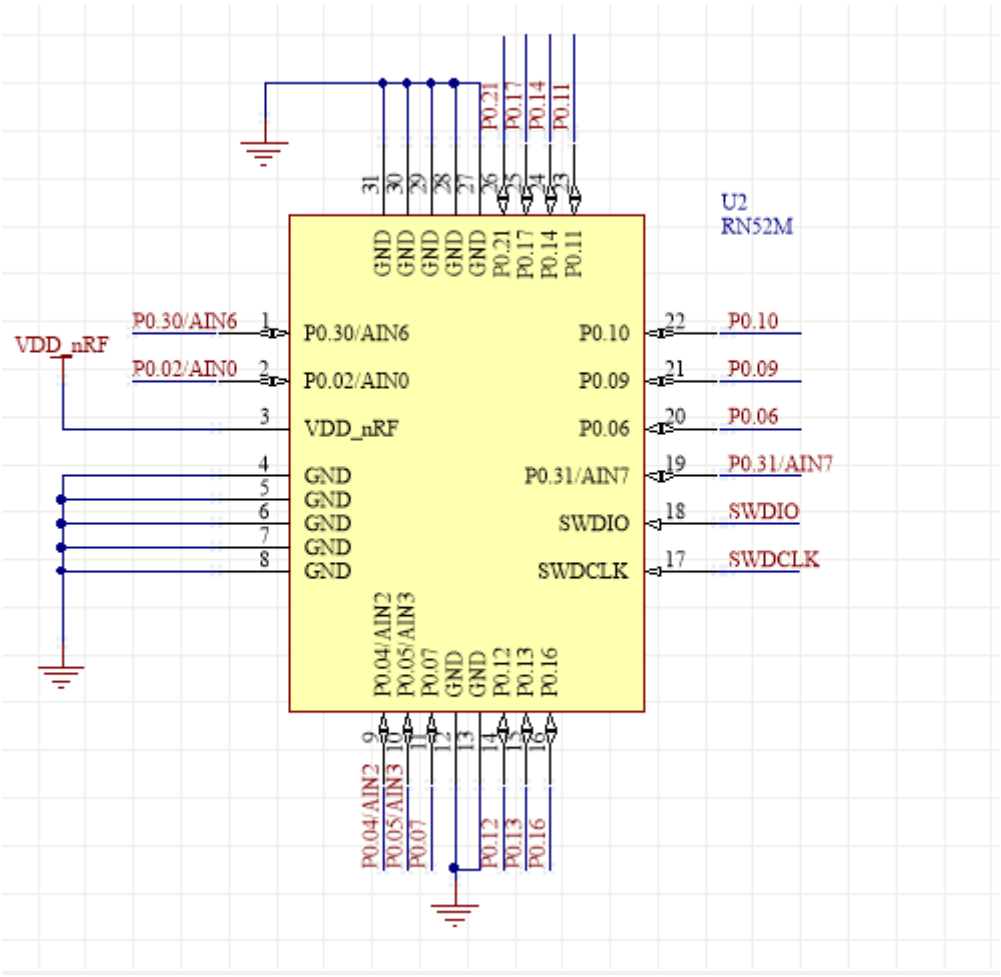
The solder volume should be same by changing the mask opening if different metal mask thickness is used.

5. Module Schematics



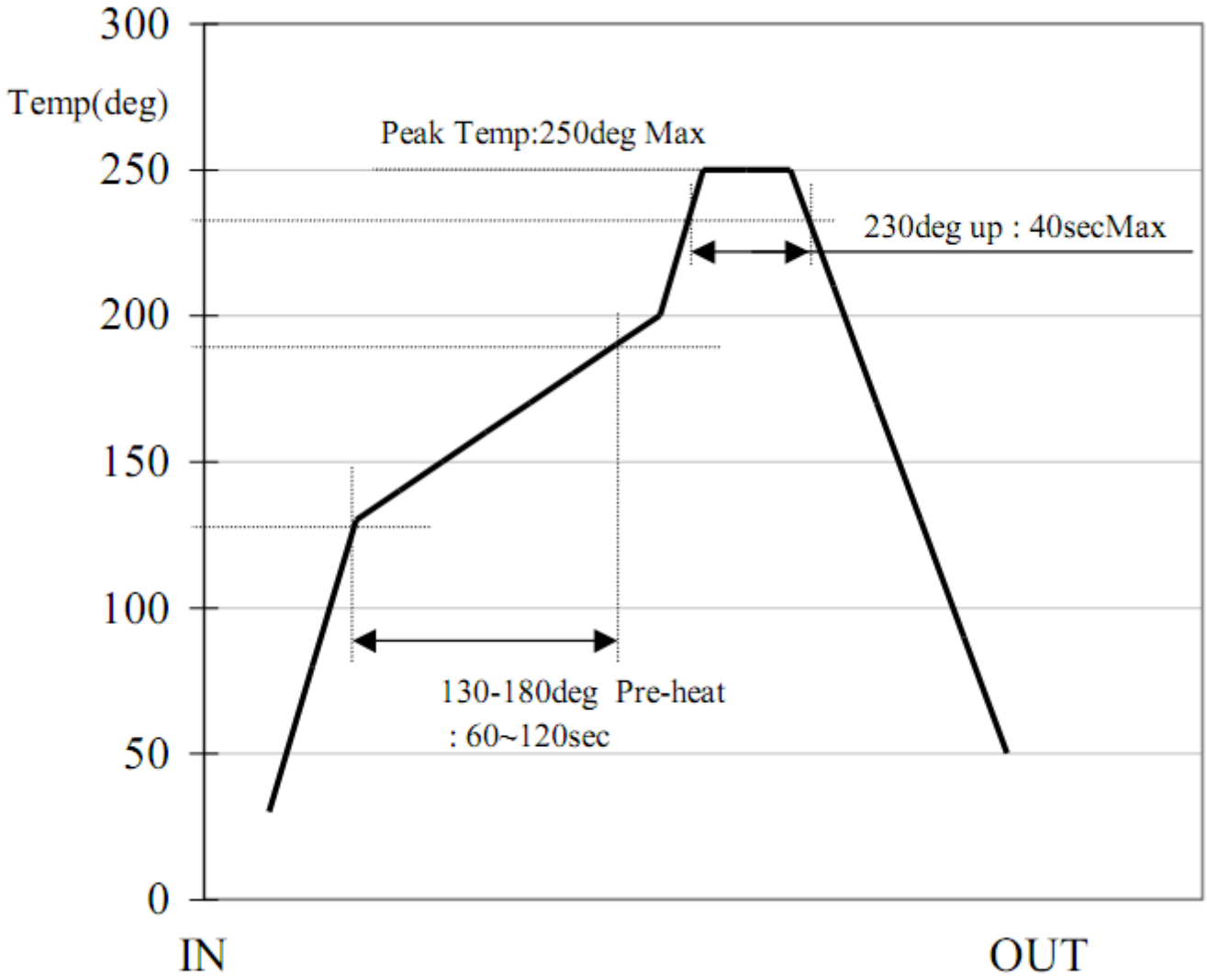


6. Module Reference



The RN52m module can operate only by connecting VDD and GND.

7. SMT Reflow Profile



FCC STATEMENT

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

FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 5mm between the radiator & your body.

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

2.2 List of applicable FCC rules
FCC Part 15 Subpart C 15.249 & 15.207 & 15.209

2.3 Specific operational use conditions
Operation Frequency:2402~2480MHz
Number of Channel:40 Channels
Modulation Type:GFSK
Antenna Type:Ceramic antenna
Antenna Gain(Peak):0 dBi (Provided by customer)
The module can be used for mobile or portable applications with a maximum 1dBi antenna. The host manufacturer installing this module into their product must ensure that the final composit product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operaition. The host manufacturer 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.

2.4 Limited module procedures
Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.

2.5 Trace antenna designs

Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

2.6 RF exposure considerations

The module must be installed in the host equipment such that at least 5mm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

2.7 Antennas

Antenna Specification are as follows:

Antenna Type:Ceramic antenna

Antenna Gain(Peak):0 dBi (Provided by customer)

This device is intended only for host manufacturers under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna;

The module shall be only used with the External antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

2.8 Label and compliance information

Host product manufacturers need to provide a physical or e-label stating “Contains FCC ID 2A7LK-RN52M With their finished product.

2.9 Information on test modes and additional testing requirements

Operation Frequency:2402~2480MHz
Number of Channel:40 Channels
Modulation Type:GFSK
Antenna Type:Ceramic antenna
Antenna Gain(Peak):0 dBi (Provided by customer)
Host manufacturer must perfom test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.
Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is **only** FCC authorized for FCC Part 15 Subpart C 15.249 & 15.207 & 15.209 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 circuity), 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.