



RN52e DataSheet

v1.2.0-en

Contents

1. Revision History	3
2. Overview	4
2.1. Features	6
2.2. Application	8
2.3. Block Diagram	9
3. Pin Assignments and Functions	10
4. Module Layout	12
5. Module Schematics	14
6. Module Reference	15

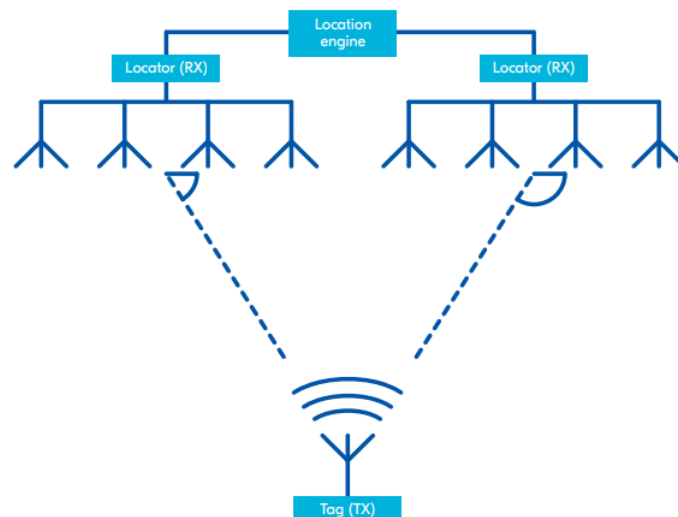
1. Revision History

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)

2. Overview



The RN52e module based on the nRF52811 SoC is the 4th addition to the nRF52 Series, and adds capabilities for Bluetooth® 5.1 Direction Finding. Direction Finding enables positioning solutions to not only rely on received signal strength indicator (RSSI), but also the actual direction of a signal. This improves accuracy significantly and opens new possibilities for applications in this segment. There are two types of methods for determining direction, angle of arrival (AoA), where the direction of the received signal is calculated, and angle of departure (AoD), where the direction of the transmitted signal is calculated.



Real time locating system

Above you see an example of a real time location system (RTLS) where the principle of AoA is used to determine the location of an tag. The tag is just a simple beacon, broadcasting.

Each locator determines which direction the signal is coming from and together with the location engine they are able to calculate the location of the tag.

Enhancing beacon applications

The RN52e SoC gives the opportunity to enhance beacon applications to leverage the Long Range feature introduced in Bluetooth 5, in addition to Direction Finding introduced in Bluetooth 5.1. It achieves longer range without adding more costly components, providing an ideal option for cost-sensitive beacon applications.

The ultimate network processor

The RN52e offers comprehensive connectivity with a long list of capabilities and features. It is capable of all the latest features of Bluetooth, including Long Range and Direction Finding, but also 802.15.4, Thread and Zigbee. This comprehensive connectivity offer makes it the ultimate network processor, and paired with a companion MCU, it offers great value in for example gateway and router applications for smart home.

Get started today

The RN52e is supported by the nRF5 SDK, providing all the necessary examples, libraries and drivers to get started with development. SoftDevice S112, a Bluetooth 5 protocol stack, is already qualified for it, providing high throughput with 2 Mbps and improved coexistence with channel selection algorithm #2.

In addition, a Thread connectivity solution is available in the nRF5 SDK for Thread and Zigbee.

2.1. Features

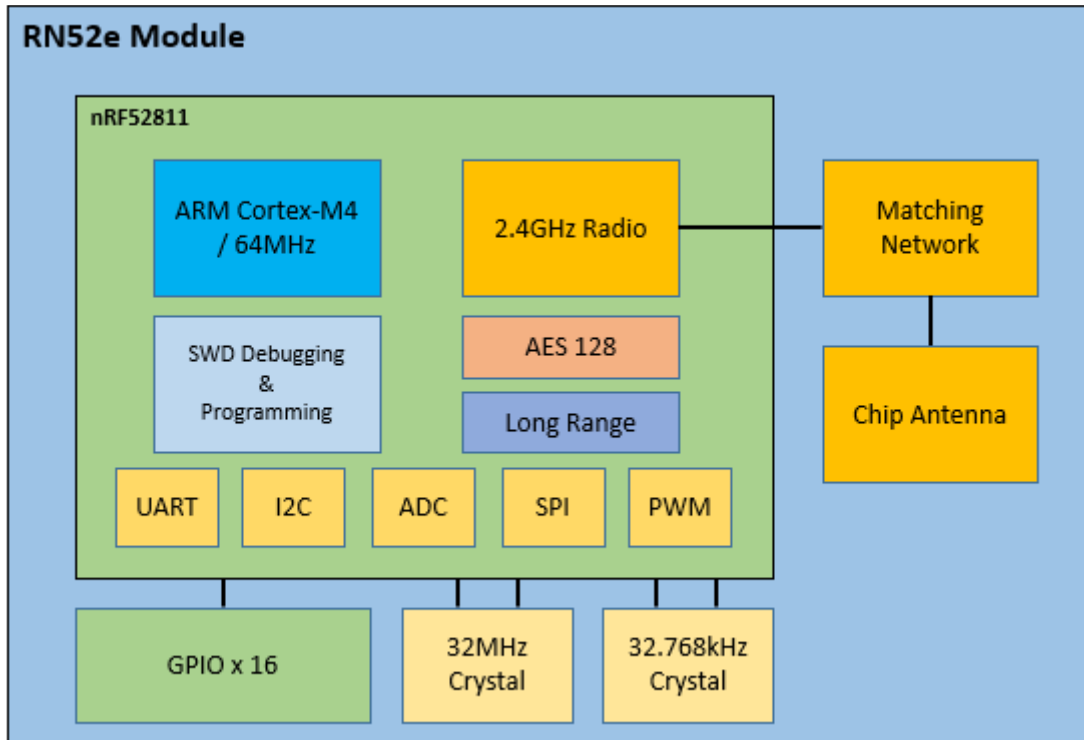
- Bluetooth 5.1, IEEE 802.15.4-2006, 2.4 GHz transceiver
 - -97 dBm sensitivity in 1 Mbps Bluetooth low energy mode
 - -104 dBm sensitivity in 125 kbps Bluetooth low energy mode (long range)
 - -20 to +4 dBm TX power, configurable in 4 dB steps
 - On-air compatible with nRF52, nRF51, nRF24L, and nRF24AP 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)
 - 4.6 mA peak current in TX (0 dBm)
 - 4.6 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
 - 34.4 μ A/MHz running CoreMark from flash memory
 - 32.8 μ A/MHz running CoreMark from RAM memory
 - Serial wire debug (SWD)
- Flexible power management
 - 1.7 V to 3.6 V supply voltage range
 - Fully automatic LDO and DC/DC regulator system
 - Fast wake-up using 64 MHz internal oscillator
- 192 kB flash and 24 kB RAM
- Nordic SoftDevice ready
- Support for concurrent multi-protocol
- 12-bit, 200 ksps ADC - 8 configurable channels with programmable gain

- 64 level comparator
- Temperature sensor
- 4-channel pulse width modulator (PWM) unit with EasyDMA
- Digital microphone interface (PDM)
- 3x 32-bit timer with counter mode
- 2x SPI master/slave with EasyDMA
- I2C compatible 2-wire master/slave
- UART (CTS/RTS) with EasyDMA
- Programmable peripheral interconnect (PPI)
- Quadrature decoder (QDEC)
- AES HW encryption with EasyDMA
- 2x real-time counter (RTC)

2.2. Application

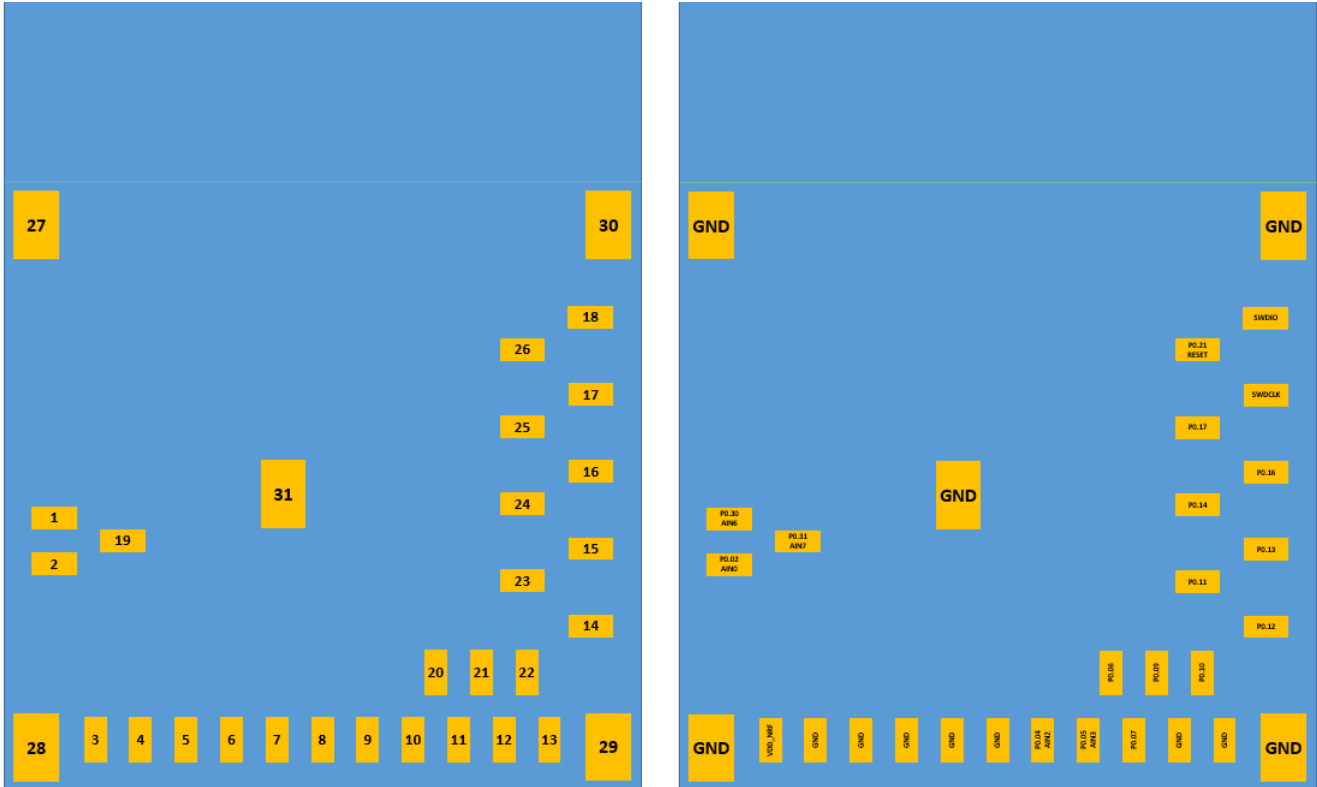
- Internet of Things (IoT)
 - Home automation
 - Sensor networks
 - Building automation
 - Industrial
 - Retail
- Computer peripherals and I/O devices
 - Mouse
 - Keyboard
 - Multi-touch trackpad
- Interactive entertainment devices
 - Remote control
 - Gaming controller
- Beacons
- Personal Area Networks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

2.3. Block Diagram



The RN52e module includes a matching network for chip antenna and external 32.768k crystal.

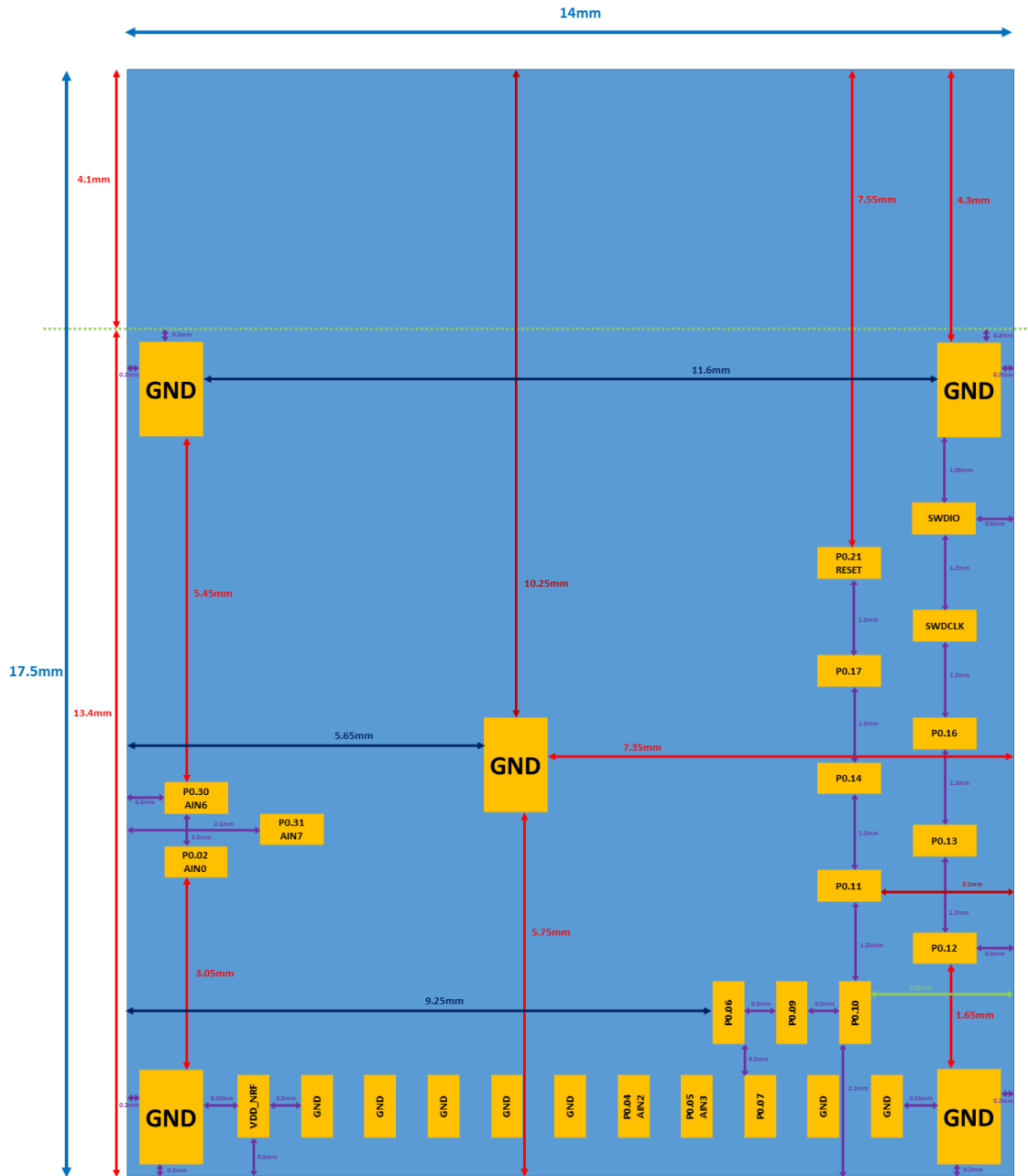
3. Pin Assignments and Functions (Top View)



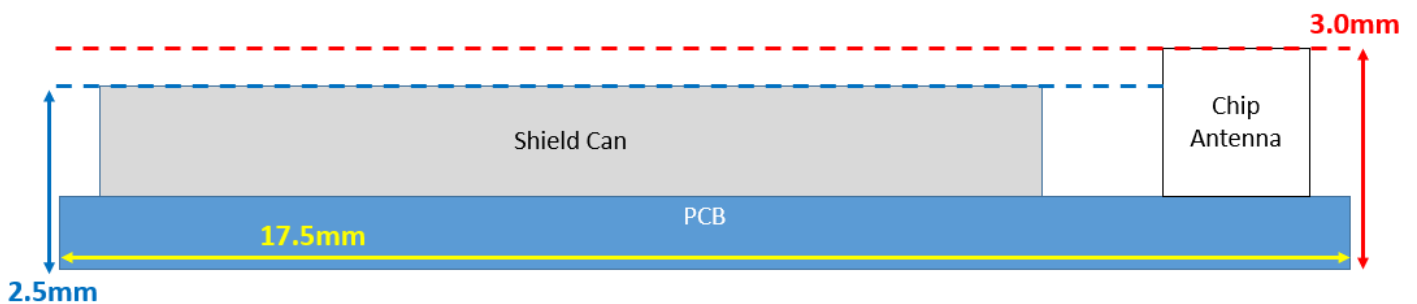
Pin	Pin Name	Pin Function	Description
1	P0.30 AIN6	Digital I/O Analog input	General purpose I/O COMP input SAADC input
2	P0.02 AIN0	Digital I/O Analog input	General purpose I/O COMP input SAADC input
3	VDD_NRF	Power	Power supply.
4	GND	Power	Ground (0 V).
5	GND	Power	Ground (0 V).
6	GND	Power	Ground (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



RN52e Dimension and Bottom Pad (Top View)



The recommended metal mask sizes for the bottom pad type of the RN52e module are shown below.

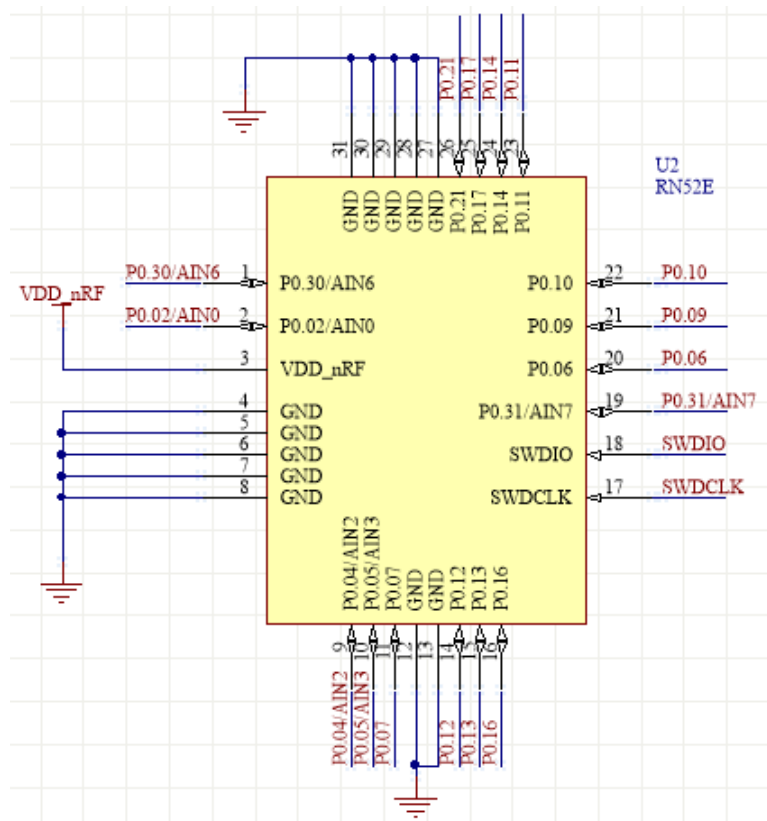
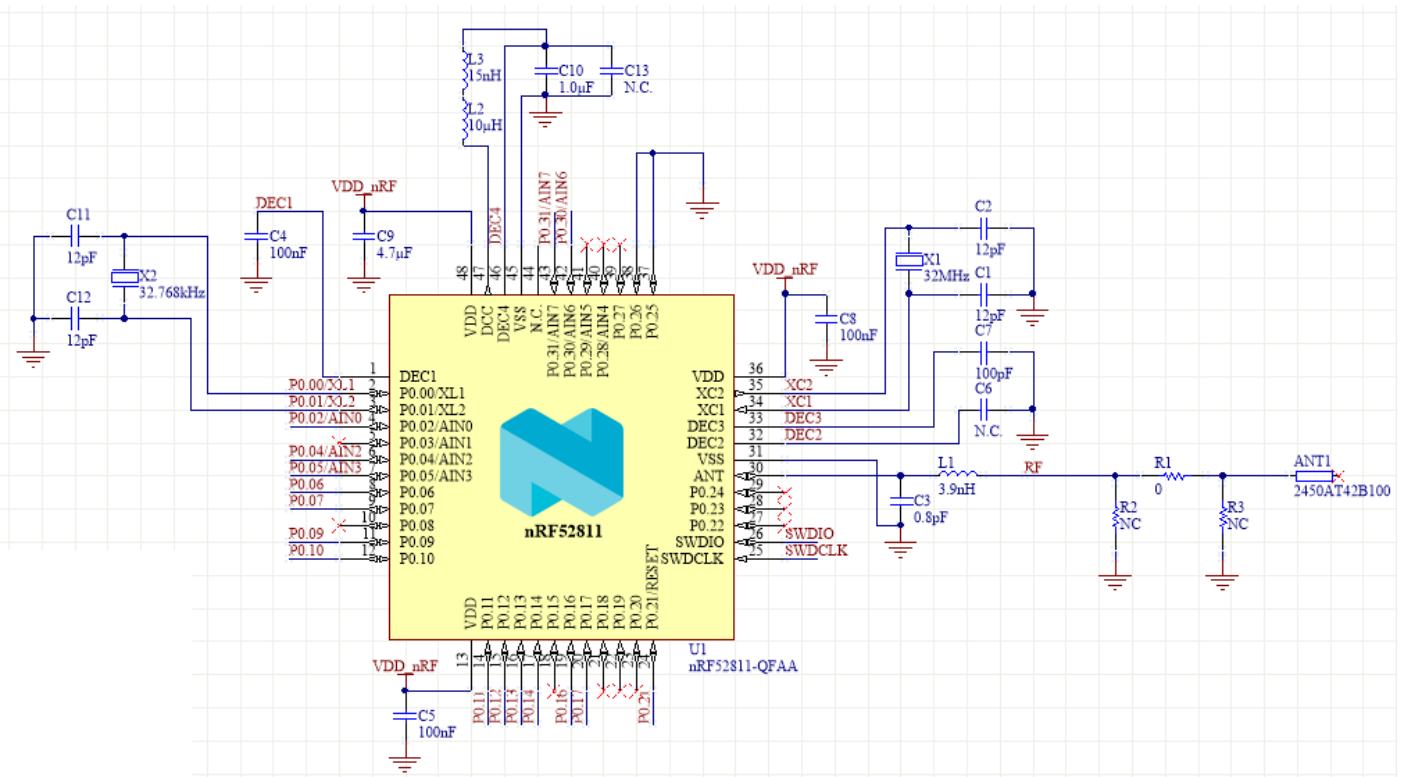
<Recommended metal mask for solder printing>

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

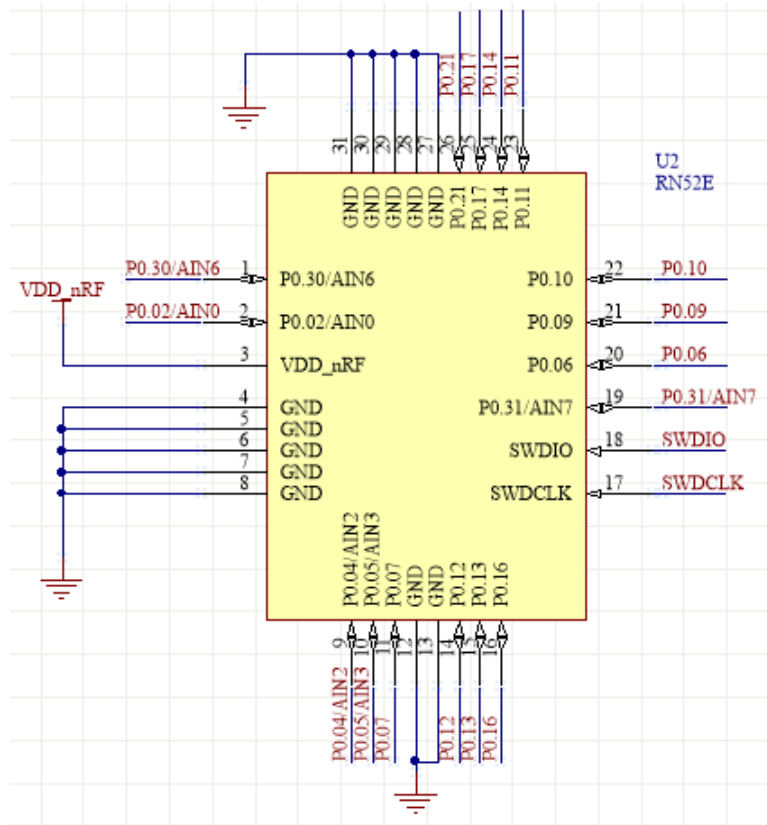
The metal mask thickness : t = 0.1mm

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 RN52e module can operate only by connecting VDD and GND.