INDIESEMIC

Datasheet

ISC-nRF7002-A

An advanced multiprotocol ultra-low power Wifi-6 module

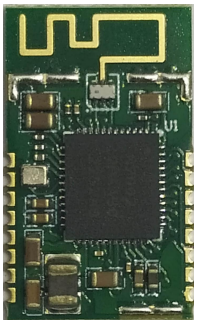
V0.1 Initial Draft

INDIESEMIC

ISC_nRF7002_A Compact, WiFi 6 Companion

ISC_NRF7002_A module is a powerful, highly flexible, ultra low power WiFi 6 module using NordicnRF7002 or nRF7001 SoC. With an integrated PCB trace antenna it allows faster time to market with reduced development cost.

A series of nRF52840 modules can manage WiFi 6 modules through QSPI/SPI interface.Some are certified or being certified for both BLE and Thread. The ideal modules for Matter applications.



Specifications:

- Nordic nRF7002/7001 SoC.
- Low-power and secure Wi-Fi for the IoT
- Ideal coexistence with Bluetooth LE
- Supports IEEE 802.11 a/b/g/n/ac/ax
- Supports Target Wake Time (TWT), Orthogonal Frequency Division Multiple Access (OFDMA, Downlink and Uplink), BSS coloring
- WiFi CERTIFIED 6TM, WiFi CERTIFIEDTM
- (a/b/g/n/ac), WiFi Enhanced OpenTM.
- Supports WPA3TM, WPA2TM, WPATM - Personal and Enterprise, Protected Management Frames.
- Supports WMM®, WMM-Power Save, WiFi Agile MultibandTM, WiFi Direct®.
- 2.4 GHz and 5 GHz dual-band or 2.4 GHz only
- Adjustable TX power from +5 to +19 dBm.
- SPI / QSPI
- Wi-Fi 6 Station (STA)
- 1 Spatial Stream (SS)
- 20 MHz channel bandwidth
- 64 QAM (MCS7), 86 Mbps PHY throughput
- Co-existence interfaces
- 16 castellated pins.
- Integrated shield to resist EMI
- 40 MHz main crystal on board.
- Operation voltage: 2.9V to 4.5V
- Operation temperature: -40°C to +85°C

Bluetooth Host Modules:

Matter applications, Certified or being certified for BLE and Thread.

- nRF52840: ISC_nRF5284

Current Consumption:

Symbol	Parameter	Nom.	Unit
$I_{RX,2.4GHz}$	Receive current listen (2.4 GHz)	60	ma
$I_{RX,5GHz}$	Receive current listen (5 GHz)	56	ma
$I_{2.4GHz,DTIM1}$	Average current consumption (2.4GHz,DTIM=1, beacon duration 3.8 ms)	3.47	ma
$I_{2.4GHz,DTIM3}$	Average current consumption (2.4GHz,DTIM=3, beacon duration 3.8 ms)	1.12	ma
$I_{2.4GHz,DTIM10}$	Average current consumption (2.4GHz,DTIM=10, beacon duration 3.8 ms)	0.34	ma
$I_{5GHz,DTIM1}$	Average current consumption (5GHz,DTIM=1, beacon duration 0.7 ms)	1.70	ma
$I_{5GHz,DTIM3}$	Average current consumption (5GHz,DTIM=3, beacon duration 0.7 ms)	0.56	ma
$I_{5GHz,DTIM10}$	Average current consumption (5GHz,DTIM=10, beacon duration 0.7 ms)	0.19	ma
$I_{2.4GHz,TWT,1\ min}$	Average current consumption (2.4GHz, TWT, target wake interval 1 min)[2]	29.5	ua
$I_{2.4GHz,TWT,1\ hour}$	Average current consumption (2.4GHz, TWT, target wake interval 1 hour)[2]	18.4	ua
$I_{2.4GHz,TWT,1\ day}$	Average current consumption (2.4GHz, TWT, target wake interval 1 day)[2]	18.2	ua
$I_{5GHz,TWT,1\ min}$	Average current consumption (5GHz, TWT, target wake interval 1 min)[2]	28.9	ua
$I_{5GHz,TWT,1\ hour}$	Average current consumption (5GHz, TWT, target wake interval 1 hour)[2]	18.2	ua
$I_{5GHz,TWT,1\ day}$	Average current consumption (5GHz, TWT, target wake interval 1 day)[2]	18.0	ua
I_{OFF}	Shutdown current	1.7	ua
I_{SLEEP}	Sleep current (with RTC)	15	ua
I_{SCAN}	Average current consumption during scan operation	60	ma

Note: The exact current depends on the number of APs detected during scan. The value quoted aligns with ~100 APs.

Table Of Contents

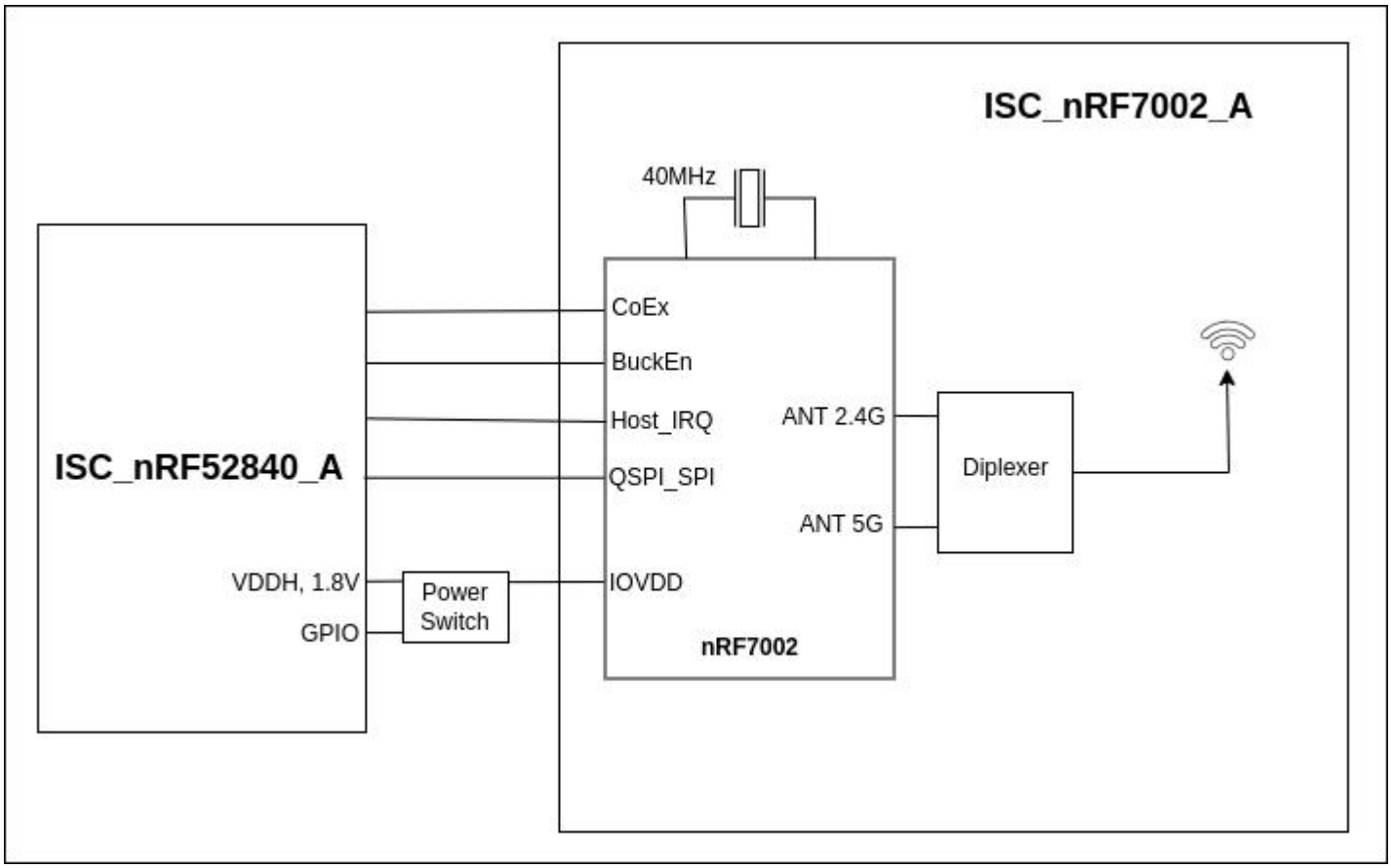
1 Introduction

ISC_NRF7002_A module uses a Nordic nRF7002 SoC. It supports 802.11 a/b/g/n/ac/ax in the 2.4 GHzand 5 GHz bands.

Nordic application examples use an nRF52840 SoC to manage nRF7002. Indiesemic offers ISC_nRF52840_A

1.1 ISC_NRF7002_A Block Diagram

The block diagram of ISC_NRF7002_A and ISC_nRF52840_A is below.



1.2 ISC_NRF7002_A Block Diagram

- Uses an nRF7002.
- Supports 802.11 a/b/g/n/ac/ax.
- Both 2.4 GHz and 5GHz bands.
- 16 castellated pins
- Integrated chip antenna
- Size: 12x18.2x1.9mm.

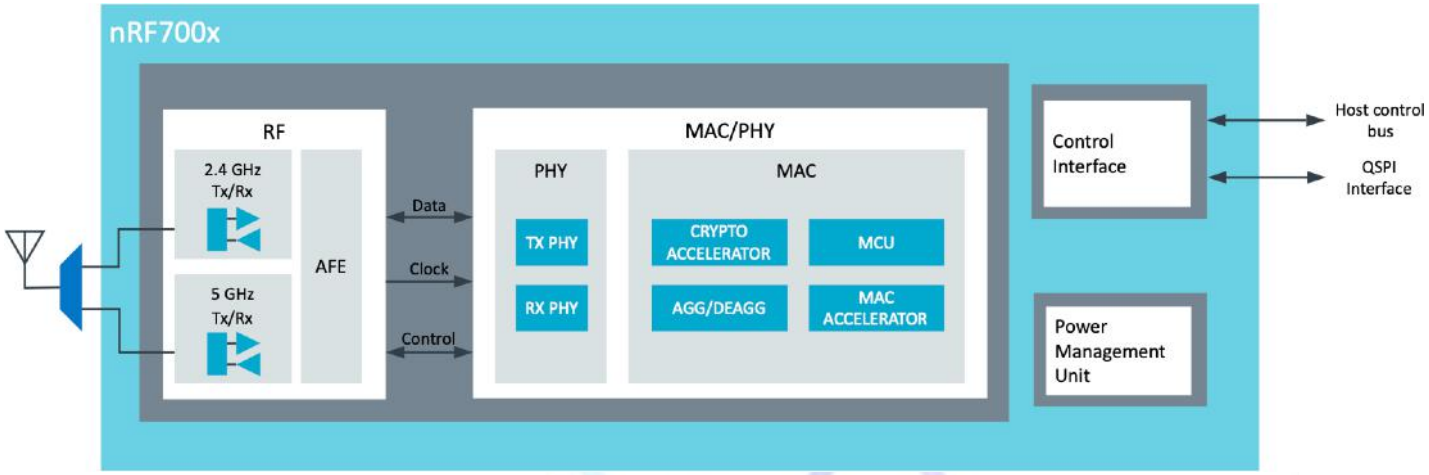
2 Product Descriptions

Brief description of nR7002 SoC is provided. For full description of the SoC, please download from NordicSemiconductor website.

https://www.nordicsemi.com/Products/nRF7002

2.1 Block Diagram of nRF7002

The following is a block diagram of Nordic nRF7002 WiFi 6 SoC.



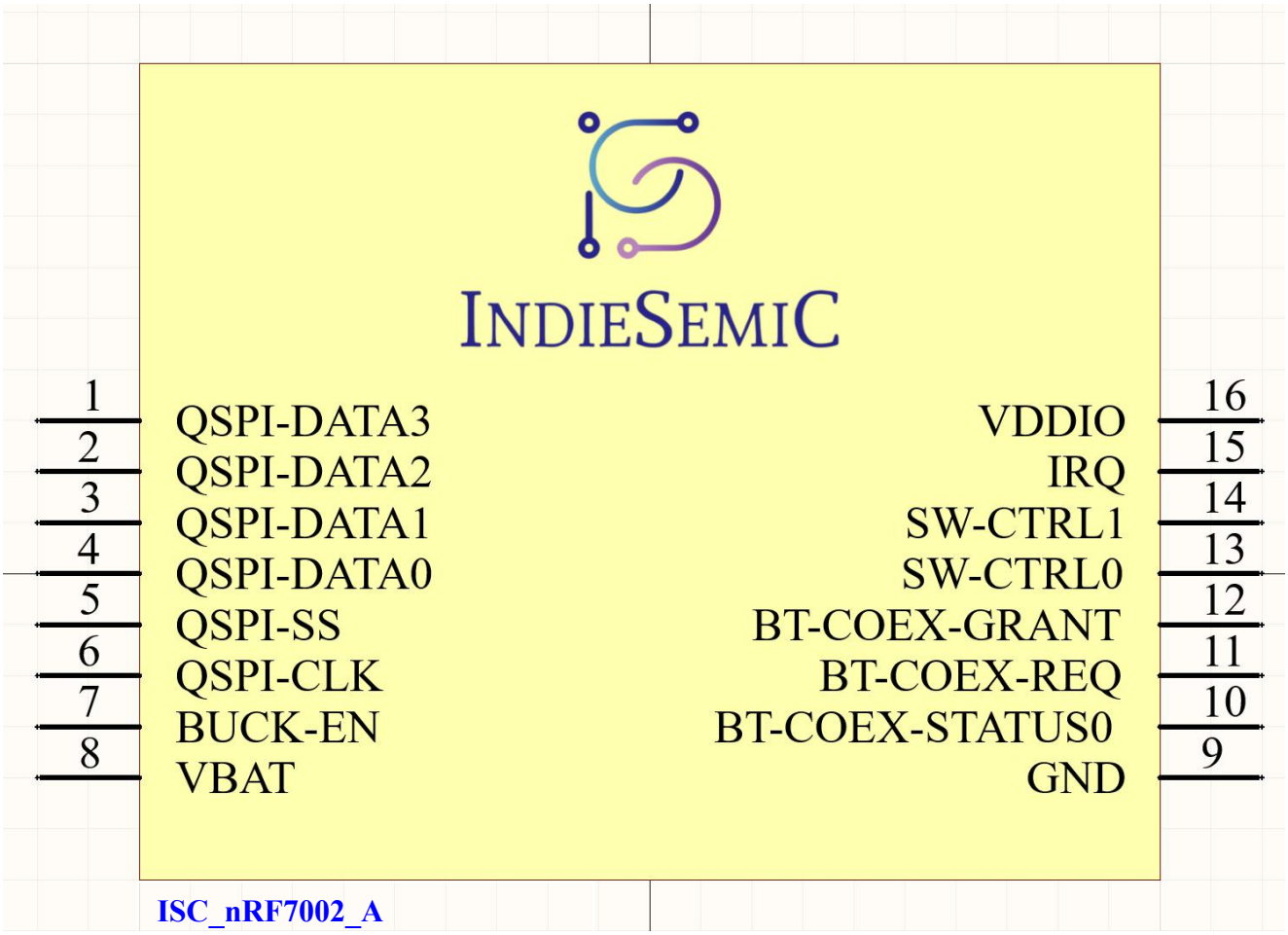
2.2 Low-power, advanced security, seamless coexistence

The nRF7002 is a companion IC, providing seamless Wi-Fi connectivity and Wi-Fi-based locationing (SSID sniffing of local Wi-Fi hubs). It is designed to be used alongside Nordic's existing nRF52® and nRF53® Series Bluetooth Systems-on-Chip (SoCs), and nRF91® Series cellular IoT Systems-in-Package (SiPs). The nRF7002 can also be used in conjunction with non-Nordic host devices.

The nRF7002 is the first device in our portfolio of unique Wi-Fi products that will combine seamlessly with Nordic's existing ultra-low power technologies. Nordic brings their decades of ultra-low-power wireless IoT and silicon design expertise to Wi-Fi. With Wi-Fi 6 we bring added benefits to IoT applications including further efficiency gains that supportlong-life, battery-powered Wi-Fi operation.

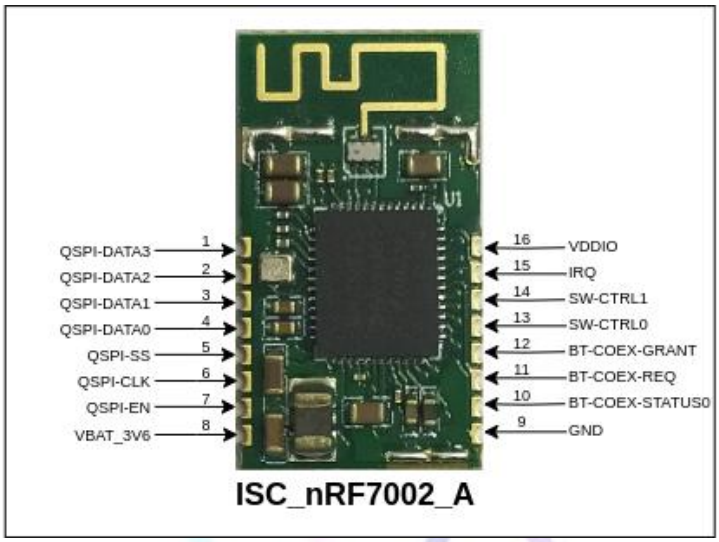
With Wi-Fi 6 we will support all wireless protocols used in Matter, Bluetooth LE for commissioning, Thread for low powermesh, and Wi-Fi for high-throughput. Matter is a protocol championed by Apple, Amazon, Google, Nordic Semiconductor, Samsung, and hundreds of other companies in consumer IoT.

2.3 Module Symbol (Pinout)



2.4 PCB Footprint & Pin Description

The followings are ISC_NRF7002_A pin assignment. Pin functions are in a table in next section. Please refer to Nordic nRF7002 Product Specifications for detailed descriptions and features supported.



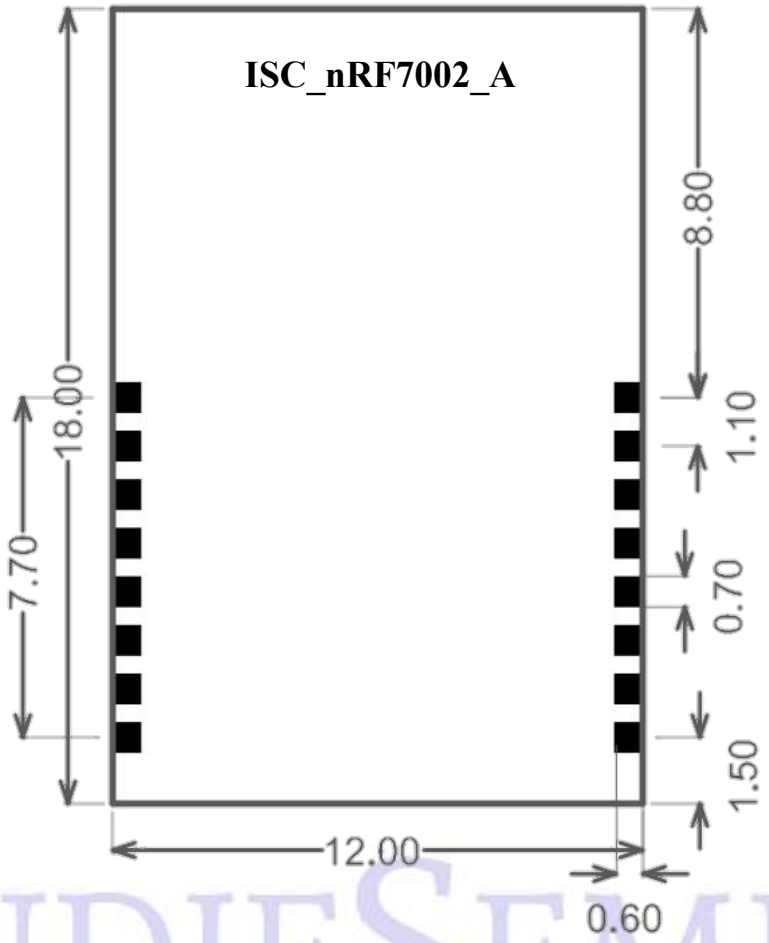
Please contact ISC technical team for Altium / OrCAD Allegro SCH andPCB library symbol or email to sales@indiesemic.com or nikul.shah@indiesemic.com

2.5 Pin Function.

ISC	ISC_NRF7002_A	Description
pin#	pin name	Descriptions
1	QSPI-Data3	QSPI Data 3
2	QSPI-Data2	QSPI Data 2
3	DSPI-Data1	QSPI Data 1
4	QSPI-Data0	QSPI Data 0
5	QSPI-SS	GPIO, digital
6	QSPI-CLK	GPIO, digital
7	BuckEn	GPIO, digital
8	Vbat	VDD power supply voltage, 2.9 to 4.5V, typically 3.6V.
9	GND	Ground
10	BT-CoEx-Status0	Indicates if the SR transaction is TX or RX.
11	BT-CoEx-REQ	SR device requesting a TX/RX transaction
12	BT-CoEx-Grant	Indicates that the SR device is granted access for this transaction.
13	SW-CTRL0	Used for antenna switch control in shared antenna mode.
14	SW-CTRL1	In 4-wire mode, this carries the SR 1 bit priority signal. In 3-wire shared antenna mode, this can be optionally used as antenna switch control.
15	IRQ	Host processor interrupt request.
16	IOVDD	IO VDD power supply

2.6 Mechanical Drawings

The followings are mechanical drawings of ISC_nRF7002_A. Size is 12x18mm. It has 16 castellated pins. Top view of module is below.



2.7 Powering Up Sequence

Supply VBAT/BUCKVBAT/BUCKVBATS/AFEVBAT

Wait ≥ 6 ms

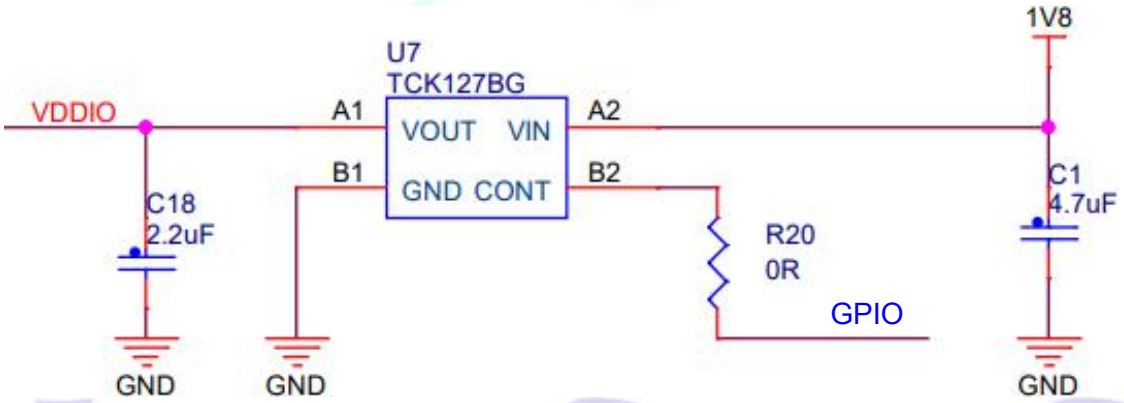
Assert BUCKEN

Wait ≥ 1 ms

Supply IOVDD

2.8 Powering Down Sequence

De-assert BUCKEN and power down IOVDD and Power down VBAT.
Note : There are no specifics timing delay requirements as long as the sequence is correct.
See below powering sequence for the ISC_nRF7002_A module using port P0.31 of ISC_nRF52840_A module.



Please email to nikul.shah@indiesemic.com for more information.

3 Mounting ISC_NRF7002_A on the Host PCB

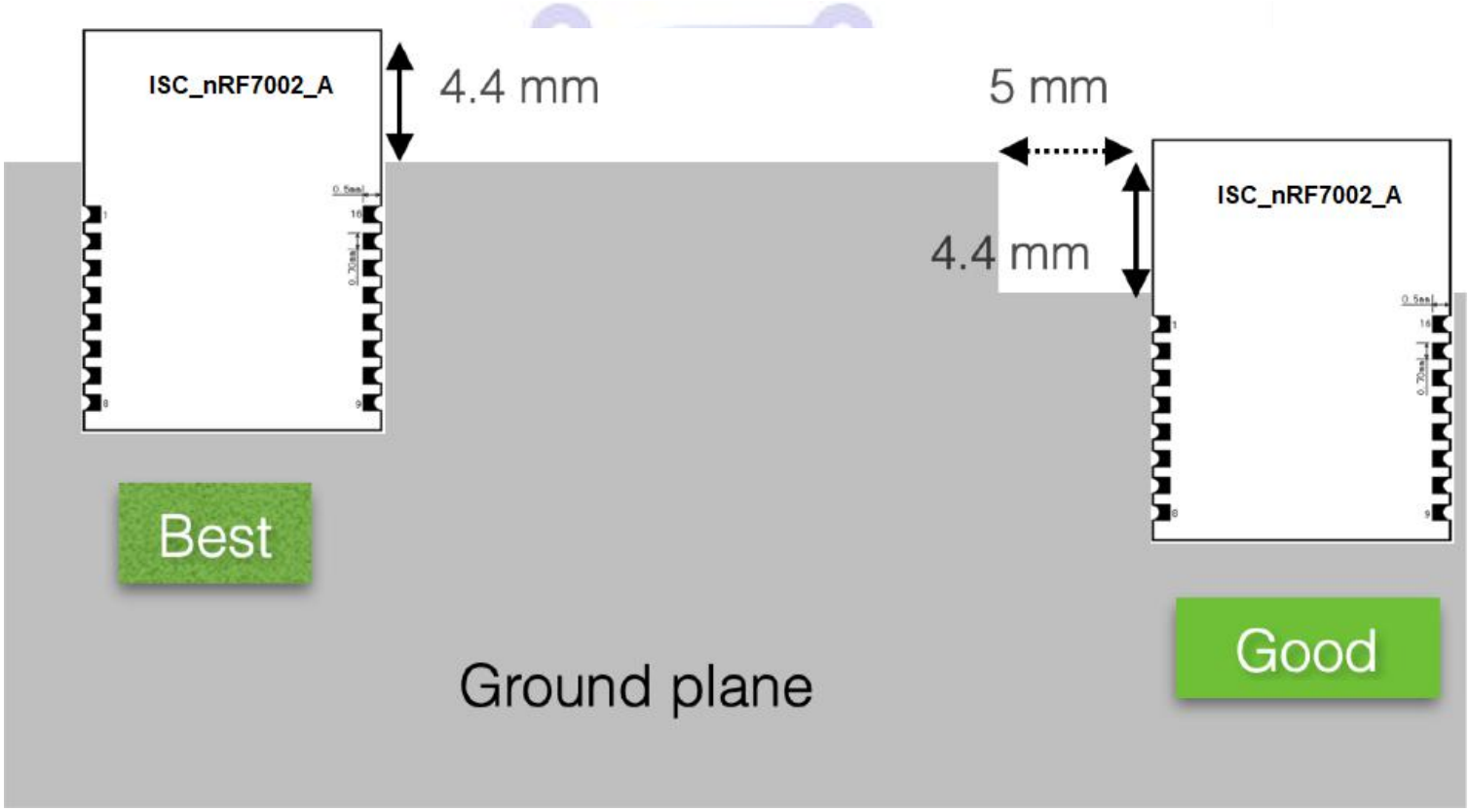
Suggestions for prototyping during module development in early 2023:

- *The physical size of module with an u.FL or PCB antenna is likely to stay as specified.*
- *The antenna area of modules with a chip antenna can change as we are developing multiple versions with chip antennas from multiple suppliers. The modules with the best RF performance will be certified and in production. The module soldering pads are the same. The antenna area can be different. Please have clearance on your hostboard for expanded antenna area. Or, the entire antenna area of module be outside of the host board.*

The following figure shows recommended mounting of ISC_NRF7002_A module on the host PCB.

For the best WiFi range performance, the antenna area of ISC_NRF7002_A module shall extend 4.4 mm outside the edge ofhost PCB board, or 4.4 mm outside the edge of a ground plane.

- The next choice is to place ISC_NRF7002_A on a corner of host PCB, the antenna area shall extend 4.4 mm from the edge of ground plane. Ground plane shall be at least 5 mm from the edge of the antenna area of module.
- We don't recommend mounting ISC_NRF7002_A module in the middle of a host PCB.



For the best WiFi range performance, keep all external metal at least 20 to 30mm from the antenna area.