HARDWARE REFERENCE

IMM-NRF52840
Module

Bluetooth 5 / Bluetooth Mesh

CE
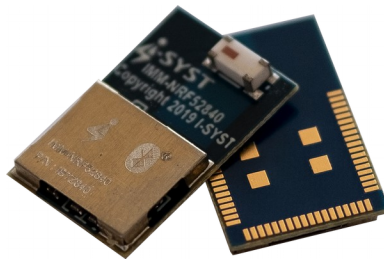
FCC ID : 2ATLY-IBTZ840
IC : 25671-IBTZ840

i-SYST INC

Limited Warranty

The IMM-NRF52840 module is warranted against defects in materials and workmanship for a period of 30 days from the date of purchase from I-SYST or from an authorized dealer.
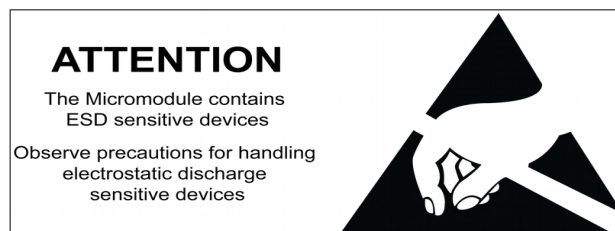
Disclaimer

I-SYST reserves the right to change this product without prior notice. Information furnished by I-SYST is believed to be accurate and reliable. However, no responsibility is assumed by I-SYST for its use; nor for any infringement of patents nor other rights of third parties which may result from its use. No license is granted by implication or otherwise under the patent rights of I-SYST.

In no event shall I-SYST be liable for any direct, indirect, incidental, special, exemplary, or consequential damages (including, but not limited to, procurement of substitute goods or services; loss of use, data, or profits; or business interruption) however caused and on any theory of liability, whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way out of the use of I-SYST hardware and software, even if advised of the possibility of such damage.

I-SYST products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury.
I-SYST customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify I-SYST for any damages resulting from such improper use or sale.

Trademark

Bluetooth® is a registered trade mark of Bluetooth SIG

ATTENTION

The Micromodule contains
ESD sensitive devices

Observe precautions for handling
electrostatic discharge
sensitive devices

FCC Caution

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

FCC RF Radiation Exposure Statement

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.
3. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Host product manufacturers that they need to provide a physical or e-label stating, "Contains FCC ID: 2ALTY-IBTZ840" with their finished product.**Only those antennas with same type and lesser gain filed under this FCC ID can be used with this device.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. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.The final host integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter module except such device has implemented two-ways authentication between module and the host system.The final host manual shall include the following regulatory statement:This equipment has been tested and found to comply with the limits for a 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 complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil nedoit pas produire de brouillage.
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

IC SAR Warning

The device has been tested and compliance with SAR limits, users can obtain Canadian information on RF exposure and compliance.
Le présent appareil est conforme Après examen de ce matériel aux conformité aux limites DAS et/ou aux limites d'intensité de champ RF, les utilisateurs peuvent sur l'exposition aux radiofréquences et la conformité and compliance d'acquérir les informations correspondantes

The ISED certification label of a module shall be clearly visible at all times when installed in the host product; otherwise, the host product must be labelled to display the ISED certification number for the module, preceded by the word "contains" or similar wording expressing the same meaning, as follows:
Contains IC: 25671-IBTZ840

Table of Contents

Introduction

The nRF52840 is an ultra low power System on Chip (SoC) from Nordic Semiconductor. It integrates the nRF52 series 2.4GHz transceiver with programmable output power -20dBm to +8 dBm, a 32 bits ARM® Cortex™-M4F MCU, USB 2.0, Flash memory, analog and digital I/O. The nRF52840 supports Bluetooth 5 Low Energy, Zigbee, Threads and proprietary wireless protocols.

The IMM-NRF52840 is a 14 x 9 x 1.5 mm module with embedded ceramic antenna. It allows developers to take full advantage of the nRF52840 by making all its I/O available via 54 SMD 0.4mm pitch pads.

Features:

- 32 bits ARM® Cortex™-M4F @ 64MHz.
- 2.4GHz transceiver, Bluetooth 5, Bluetooth Mesh, ANT+
- IEEE 802.15.4 radio support Zigbee, Thread
- USB 2.0 Device full speed 12Mbps
- 1MB FLASH, 256KB SRAM.
- 32 MHz Crystal 20PPM
- 32.768 KHz Crystal 20PPM
- DC/DC power mode configurations builtin
- 46 configurable I/O pins
- NFC-A Tag with wakeup on field
- ARM CryptoCell CC310
- 8 configurable 12 bits, 200 ksps ADC
- Digital microphone interface
- 3 x 4 channels PWM
- AES hardware encryption
- Temperature sensor
- Up to 4 PWM
- Digital interfaces SPI Master/Slave, Quad SPI, 2-wire Master/Slave (I2C compatible), UART (CTS/RTS)
- Quadrature decoder
- Low power comparator
- Operating voltage : 1.7V to 5.5V
- Dimension : 14 x 9 x 1.5 mm
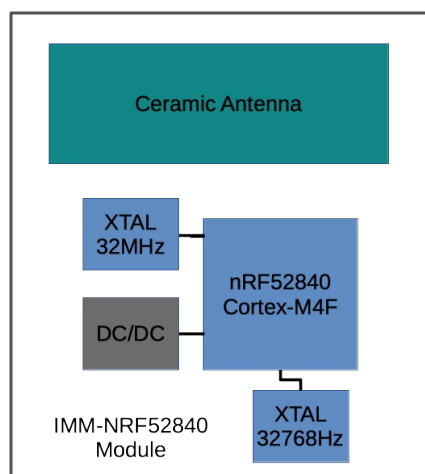
Module Layout

Dimensions and I/O pins layout

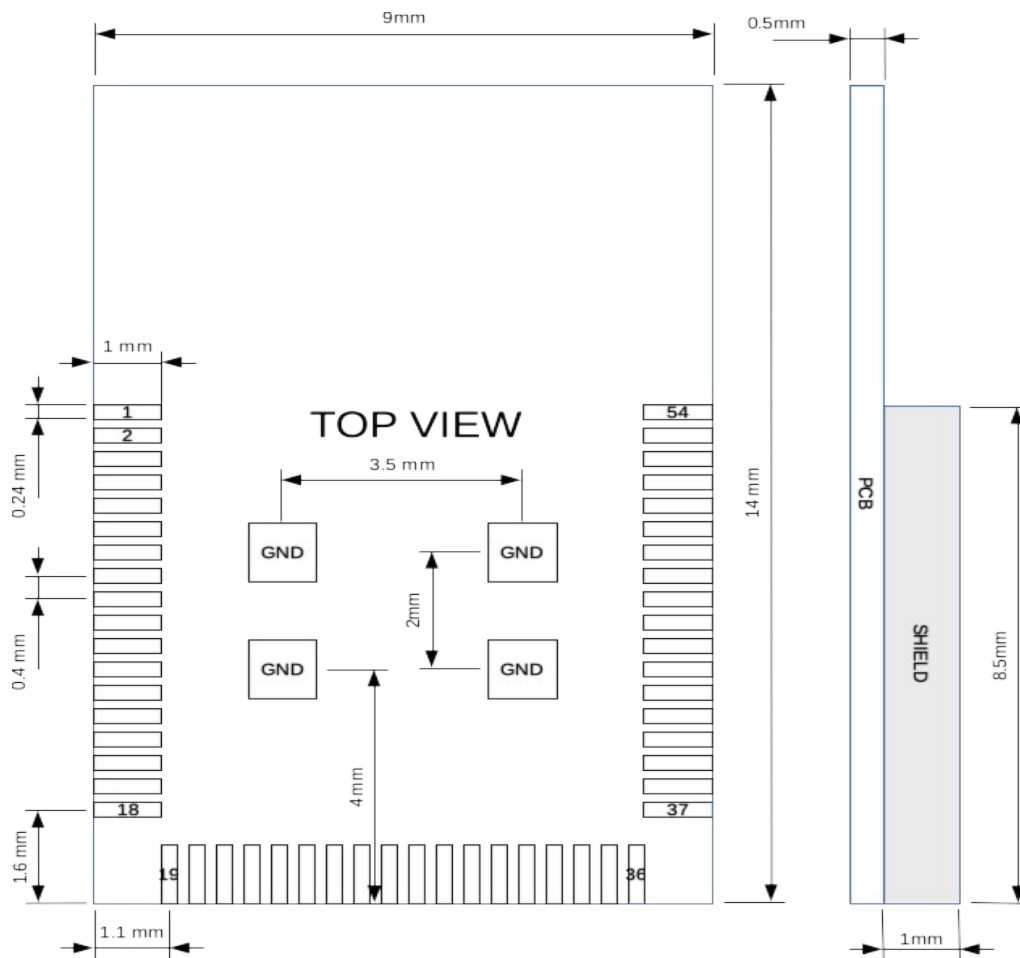Bellow is the direct relationship of the module pads and the nRF52840 I/O pins.
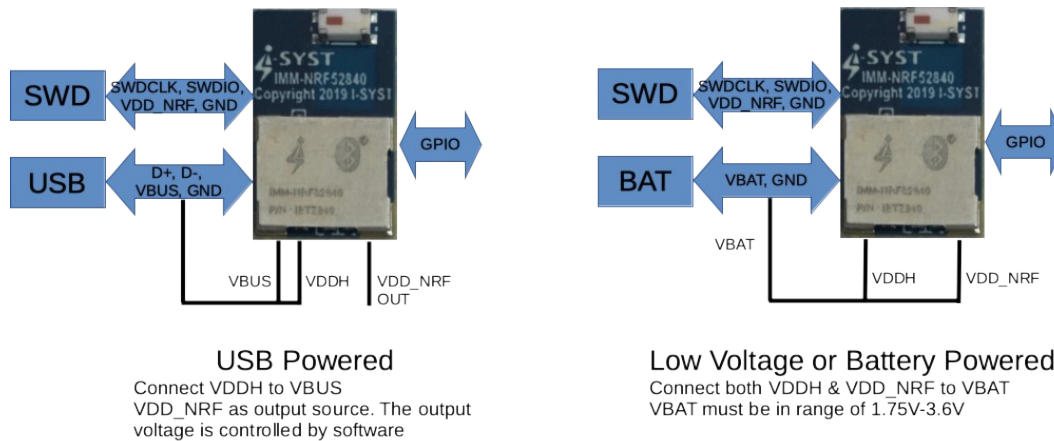

Fig. 1: Dimensions top view

Pins map

Pin Number	Pin Name	Description
1	P1.07	GPIO 1,07
2	P1.03	GPIO 1,03
3	P1.02	GPIO 1,02
4	P1.05	GPIO 1,05
5	SWDCLK	JTAG Clock
6	P1.04	GPIO 1,04
7	P1.01	GPIO 1,01
8	SWDIO	JTAG Data
9	P0.25	GPIO 0,25
10	P0.22	GPIO 0,22
11	P0.19	GPIO 0,19
12	P1.00	GPIO 1,00
13	P0.18/nRESET	GPIO 0,18 or nRESET
14	P0.21	GPIO 0,21
15	P0.24	GPIO 0,24
16	P0.23	GPIO 0,23
17	D-	USB D-
18	D+	USB D+
19	P0.20	GPIO 0,20
20	P0.17	GPIO 0,17
21	GND	Ground
22	VDD_nRF	Core voltage 1.75V-3.6V configurable as in or out
23	VDDH	Main input voltage 1.75V-5V
24	VUSB	USB input voltage 5V
25	P0.16	GPIO 0,16
26	P0.15	GPIO 0,15
27	P0.14	GPIO 0,14
28	P0.13	GPIO 0,13
29	P0.12	GPIO 0,12
30	P0.11	GPIO 0,11
31	P1.09	GPIO 1,09
32	P1.08	GPIO 1,08
33	P0.08	GPIO 0,08
34	P0.07	GPIO 0,07
35	P0.06	GPIO 0,06
36	P0.05/AIN3	GPIO 0,05 or Analog Input 3

37	P0.04/AIN2	GPIO 0,04 or Analog Input 2
38	P0.27	GPIO 0,27
39	P0.26	GPIO 0,26
40	P0.31/AIN7	GPIO 0,31 or Analog Input 7
41	P0.30/AIN6	GPIO 0,30 or Analog Input 6
42	P0.29/AIN5	GPIO 0,29 or Analog Input 5
43	P0.28/AIN4	GPIO 0,28 or Analog Input 4
44	P0.03/AIN1	GPIO 0,03 or Analog Input 1
45	P0.02/AIN0	GPIO 0,02 or Analog Input 0
46	P1.15	GPIO 1,15
47	P1.14	GPIO 1,14
48	P1.13	GPIO 1,13
49	P1.12	GPIO 1,12
50	P1.11	GPIO 1,11
51	P1.10	GPIO 1,10
52	P1.06	GPIO 1.06
53	P0.10/NFC2	GPIO 0,10 or NFC2
54	P0.9/NFC1	GPIO 0,09 or NFC1

Power configuration

The modules supports 2 power modes as shown bellow.

USB Powered
Connect VDDH to VBUS
VDD_NRF as output source. The output
voltage is controlled by software

Low Voltage or Battery Powered
Connect both VDDH & VDD_NRF to VBAT
VBAT must be in range of 1.75V-3.6V

32.768KHz and all DC coils are builtin, no extra components require to work.
Just wire the power configuration of 3 power pins VUSB, VDDH and VDD_NRF
and the SWD debug Jtag.

Fig. 2: Power Configuration

SMD Footprint

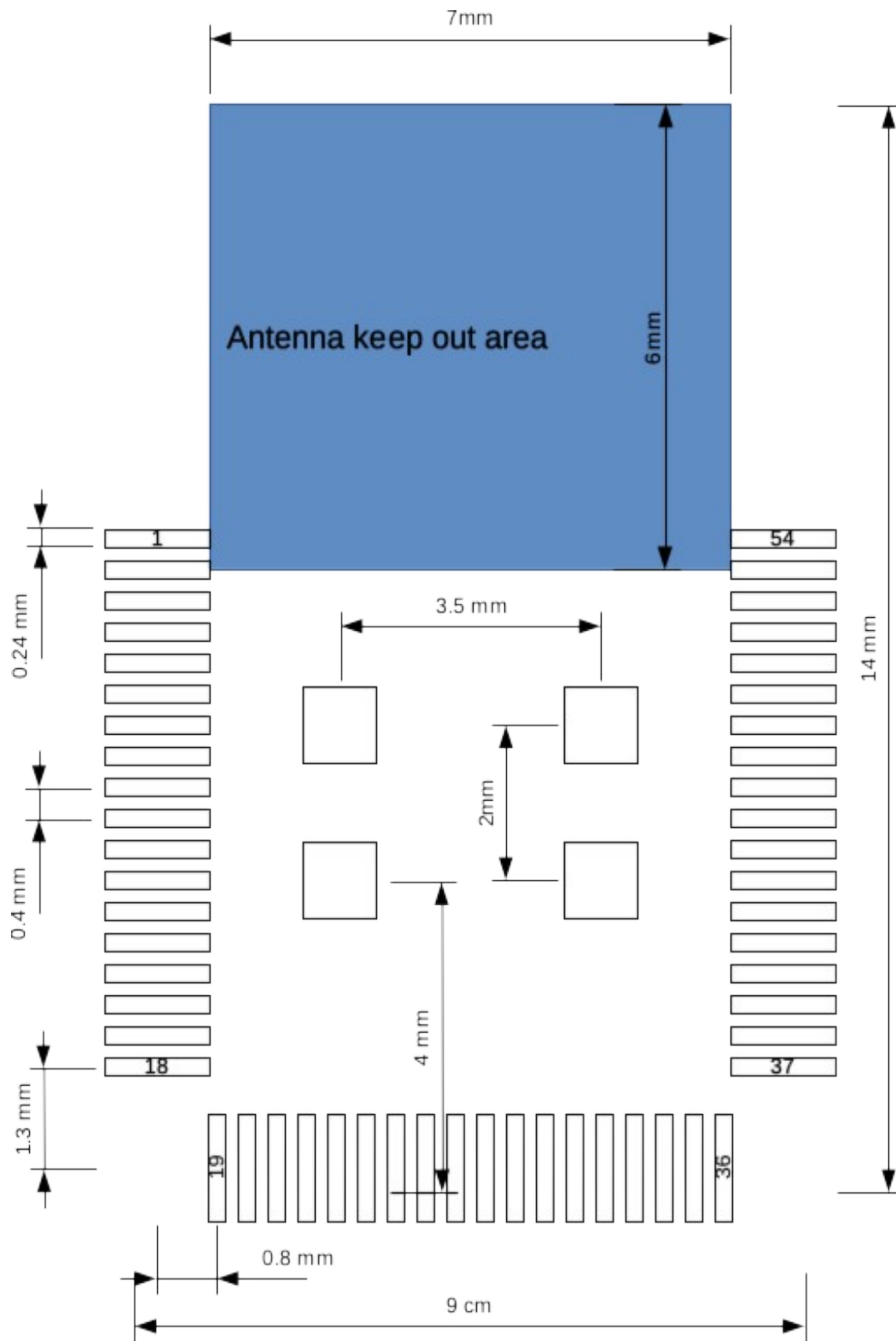Note : Do not route any traces or planes under the indicated antenna area.

Fig. 3: SMD footprint

Quick Start

Requirements

The follows are required for software development

- Debug J-Tag : IDAP-Link, Segger J-Link, or any ARM compatible J-Tag.
- Nordic SDK for ANT, BLE, Zigbee, Thread stack (https://developer.nordicsemi.com/)
- C/C++ embedded software development environment : Eclipse, Keil, CrossWorks, ...

Flashing firmware

The Nordic Softdevice is required to use ANT, BLE, Zigbee, Thread application. There are many methods to flash it in the module. The official method from Nordic is to use nrfjprog with J-Link. This   program   is   available   on   Nordic   website https://www.nordicsemi.com/Software-and-Tools/Development-Tools/Test-and-Evaluation-Software.   The other method is to use IDAP-Link with IDAPnRFProg for OSX, Linux & Windows. More details available on blog page http://embeddedsoftdev.blogspot.ca/p/ehal-nrf51.html.   The IDAPnRFProg can program Softdevice, DFU and Firmware app without requiring mergehex. It can parallel program multiple nRF5x series boards at once when multiple IDAP-Link are connected to same PC..

Breakout board

For quick development and prototyping, a breakout board, IBK-NRF52840, is available with all I/O pins routed out to standard DIP48, 2.54mm pitch header pin, onboard LED indicator, buttons and USB. Ready to be mounted on a breadboard. The SWD connector pins are also routed out for debug probe.   Connect it to the IDAP-Link for OpenOCD debugging.
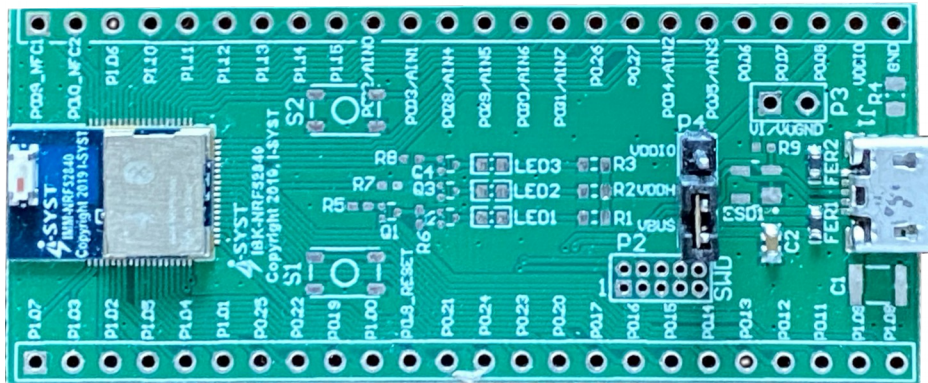

Fig. 4: IBK-NRF52840 Breakout Board

J-Tag wiring

The IMM-NRF52840 module has exposed the SWD (Serial Wire Debug) pins SWDIO & SWCLK, see I/O layout section. The module can be directly connected to a J-Tag tool for development by wiring the 2 SWD and the optional Reset pins to the appropriate pins on the J-Tag connector.   The VIN must be wire to the VCC pin on the J-Tag. GND pad is also require to be connected to GND on J-Tag.
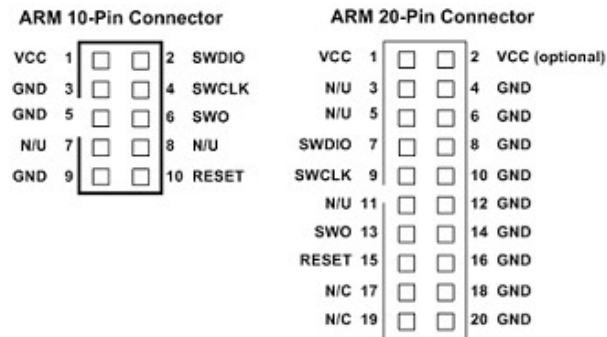

Fig. 5: ARM JTAGE Connector

Nordic Software

The Nordic SDK and software tools can be download from http://developer.nordicsemi.com and http://www.nordicsemi.com. Community support forum at https://devzone.nordicsemi.com.

Firmware development with Eclipse IDE

Eclipse with GCC is the most cost effective software development environment. It is 100% free. The drawback is that it requires a bit of gymnastics to setup. Fortunately many Blog posts are available on the Internet showing step by step. Follow this blog to setup the Eclipse IDE & GCC compiler: http://embeddedsoftdev.blogspot.ca/p/eclipse.html.

There are samples code in the Nordic SDK itself. Other Eclipse based example code are available from this Blog page http://embeddedsoftdev.blogspot.ca/p/ehal-nrf51.html

CE certificate of conformity

CCIC (SHENZHEN) ENVIRONMENTAL SERVICE CO.,LTD.

Test Verification of Conformity

Certificate No.:CTC19110210

Issued Date: Nov 29, 2019

The sample, as described herewith, was tested pursuant to the testing standard :

IEC 62321-3-1-2013, IEC 62321-6-2015, IEC 62321-8-2017

and all the test results comply with the requirements of :

RoHS Directive 2011/65/EU, (EU) 2015/863

**Restriction of the use of certain Hazardous Substance
in electrical and electronic equipment**

Applicant: **I-SYST Inc.**

6245 rue Berthier, Brossard, QC., Canada J4Z 2K4

Manufacturer: **I-SYST Inc.**

6245 rue Berthier, Brossard, QC., Canada J4Z 2K4

Sample Name: **Bluetooth Module**

Sample Model(s):IMM-NRF52840

Laboratory: **CCIC (Shenzhen) Environmental Service Co., Ltd.**
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RoHS

Note:
The certification is only valid for the submitted sample(s), in conjunction with the test data detailed in our test report

No. :   QHJ19110210/EN

CE

**For and on behalf of
CCIC (Shenzhen) Environmental Service Co., Ltd.**

Authorized by: *Renjou. Yang*