

Use of ISP1507-AX Evaluation Boards

Application Note AN160601



Introduction

Scope

This document gives details on hardware and software for using and testing Insight SiP Bluetooth Low Energy module ISP1507-AX, version with 512K flash and 64K RAM memories.

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APPLICATION NOTE ISP1507-AX-EE

1. Recommended Documentation

The following Nordic Semiconductor documents and Software Dev Kits are required to understand the complete setup and programming methods.

Nordic Semiconductor Documents

t's all in the package

- InRF52832 Development kit User Guide, hardware section should be partially ignored Insight SiP development kit hardware replaces Nordic Semiconductor hardware.
- Index not series Reference Manual.
- **4** nRF52832 Product Specification V.x.x make sure you have the last document version updated.
- **4** S100 series SoftDevice Specification.
- In the second second

To access documentation, information, go to:

- Official Nordic Semi website <u>http://www.nordicsemi.com</u>
- The Nordic Semiconductor Infocenter is a "comprehensive library" containing technical documentation for current and legacy solutions and technologies <u>http://infocenter.nordicsemi.com/index.jsp</u>
- 4 Ask any Nordic related question and get help <u>https://devzone.nordicsemi.com/questions</u>
- For any question, you can also open a case on the <u>http://www.nordicsemi.com</u>

Software Dev kits

- \rm nRFgo Studio.
- InRF5 Software Development Kit (SDK) which includes precompiled HEX files, source code as well as SES and Keil ARM project files.
- S100 series SoftDevice, namely S132 and S112.
- **4** Master Control Panel and/or nRF Connect application for Smartphone.

To access these files, go to <u>www.nordicsemi.com</u> and download the files. Instructions can be found in Section 3.

Other Insight SiP documents

To complete the above, following documents are available on Insight SIP website or/and on request:

- AN160601 App Note this document.
- DS1507 module data sheet.
- ISP1507-AX-TB Test Board schematic.
- ISP130603 Interface Board schematic.
- ISP1880 Sensors Board schematic.

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2. ISP1507-AX Evaluation Board Hardware Content





3. Software Installation

This paragraph describes the steps to follow for software installation.

- 1. Download and install Keil MDK-ARM from <u>https://www.keil.com/demo/eval/arm.htm</u> to your hard drive. After installation, you have two ways to launch a uVision project:
 - a. Open Keil uVision and click on the "Packs" section and "Check for updates". After you can show in the Device section "Nordic Semiconductor" on the left side of the screen and different Packs available on the right side of the screen.

Devices Boards		A Packs Examples	
Search: • ×		k	Action Description
evice	/ Summary	Device Specific	18 Packs nRF52832_xxAA selected
All Devices	3515 Devices	NordicSemiconductor::nRF_ANT	Install ANT services and data modelling support modules.
ABOV Semiconductor	5 Devices	NordicSemiconductor::nRF_BLE	💠 Up to date 🛛 Bluetooth Low Energy (Bluetooth Smart) services and software modules for Nordic Se
🗉 🤗 Ambia Micro	8 Devices	NordicSemiconductor::nRF_DeviceFamilyPack	Update Nordic Semiconductor nRF ARM devices Device Family Pack.
Analog Devices	16 Devices	NordicSemiconductor::nRF_Drivers	Up to date Drivers for Nordic Semiconductor nRF family.
+ 🖌 ARM	26 Devices	NordicSemiconductor::nRF_Drivers_External	Up to date Drivers for external hardware used by Nordic Semiconductor nRF family examples.
🗉 🔗 Atmel	260 Devices	NordicSemiconductor::nRF_Examples	Up to date Examples and BSP for Nordic Semiconductor nRF family.
Cypress	381 Devices	NordicSemiconductor::nRF_Libraries	Up to date Software modules for Nordic Semiconductor nRF family.
🗉 🤗 Freescale	241 Devices	NordicSemiconductor::nRF_NFC	Install NFC services and data modelling support modules.
🗉 🄗 GigaDevice	40 Devices	NordicSemiconductor::nRF_Properitary_RF	Install Proprietary RF protocols for Nordic Semiconductor nRF family.
🗉 🎐 Holtek	19 Devices	NordicSemiconductor::nRF_RTX	Install Port of the ARM CMSIS-RTOS based RTX for Nordic Semiconductor nRF family.
🛨 🎐 Infineon	144 Devices	NordicSemiconductor::nRF_Serialization	👲 Up to date Serialization for Nordic Semiconductor nRF family Bluetooth Low Energy (Bluetooth S
🐑 🎐 Maxim	4 Devices	NordicSemiconductor::nRF_SoftDevice_Common	Up to date Common components for Nordic Semiconductor nRF family SoftDevices.
+ 🔮 Mediatek	2 Devices		🔹 Up to date Components for Bluetooth Low Energy (Bluetooth Smart) S110 SoftDevice for Nordic
🗉 🤗 Microsemi	6 Devices	NordicSemiconductor::nRF_SoftDevice_S120	🐵 Install 📕 Components for Bluetooth Low Energy (Bluetooth Smart) S120 SoftDevice for Nordic
MindMotion	2 Devices	NordicSemiconductor::nRF_SoftDevice_S130	🚸 Update Components for Bluetooth Low Energy (Bluetooth Smart) S130 SoftDevice for Nordic
Nordic Semiconductor	8 Devices	NordicSemiconductor::nRF_SoftDevice_S132	Up to date Components for Bluetooth Low Energy (Bluetooth Smart) \$132 SoftDevice for Nordic
nRF51 Series	7 Devices		🗱 Remove 🛛 Components for Bluetooth Low Energy (Bluetooth Smart) \$132 SoftDevice for Nordic
nRF52 Series	1 Device	Previous	NordicSemiconductor::nRF_SoftDevice_S132 - Previous Pack Versions
nRF52832 xxAA	ARM Cortex-M4. 64 MHz. 64 kB RAM. 512 kB ROM		Install Components for Bluetooth Low Energy (Bluetooth Smart) \$132 SoftDevice for Nordic
A Neveton	433 Devices	NordicSemiconductor::nRF_SoftDevice_S210	Install Components for ANT/ANT+ S210 SoftDevice for Nordic Semiconductor nRF family.
T 🔮 NXP	275 Devices		Install Components for Bluetooth Low Energy (Bluetooth Smart) and ANT/ANT+ S310 SoftD
+ · · P Renesas	2 Devices	Generic	18 Packs
- 🔗 Silicon Labs	397 Devices	ARM::CMSIS	Up to date CMSIS (Cortex Microcontroller Software Interface Standard)
T SONIX	49 Devices	ARM::CMSIS-Driver_Validation	Install CMSIS-Driver Validation
STMicroelectronics	768 Devices	ARM::CMSIS-RTOS_Validation	Install CMSIS-RTOS Validation
+ 🔮 Texas Instruments	341 Devices	⊕-ARM::mbedClient	Install ARM mbed Client for Cortex-M devices
🛨 🤗 Toshiba	88 Devices	⊕ ARM::mbedTLS	Install ARM mbed Cryptographic and SSL/TLS library for Cortex-M devices
		⊞-ARM::minar	Install mbed OS Scheduler for Cortex-M devices
			😔 Update 🛛 Keil ARM Compiler extensions
			Install Jansson is a Clibrary for encoding, decoding and manipulating JSON data
		Keil::MDK-Middleware	🚸 Update 🔤 Keil MDK-ARM Professional Middleware for ARM Cortex-M based devices
		Keil::XMC1000_DFP	Offline Infineon XMC1000 Series Device Support, deprecated: Use "Infineon::XMC1000_DFP" i
		Keil::XMC4000_DFP	Offline Infineon XMC4000 Series Device Support, deprecated: Use "Infineon::XMC4000_DFP" i
		⊕-twiP::twiP	Up to date IwIP is a light-weight implementation of the TCP/IP protocol suite
		B. Micrium BTOS	A Install Micrium software components

On the "Packs" section, you can download and update Nordic example, nRF SoftDevice, nRF DeviceFamilyPack, nRF examples..., etc ...

All the Packs are installed on the following directory: C:\Keil_v5\ARM\Pack\NordicSemiconductor.

- b. Or download the nRF5-SDK.zip (latest version) on the Nordic website and install it on your hard disk drive (see section 4). Once you open a uVision project, an alert message invites you to install DeviceFamilyPack. Download the latest version of the pack on the Nordic Semi website, install it and then you can open your uVision project with success.
- 2. Download the latest version and run the J-Link Software and documentation pack for Windows from <u>http://www.segger.com/jlink-software.html</u>.



3. Go to www.nordicsemi.com and log in to your Nordic My Page account.

Go to Products and click on Bluetooth Smart/Bluetooth Energy. You will have access to the different product:

- a. nRF52 Series: Click on nRF52832 and on the download section you have access to the documentation, SoftDevice, Master control panel, nRFgo studio, SDK ... etc ...
- b. nRF52 Development Tools: You can download the last nRF5 SDK.
- 4. You can also download the SDK in the following link: <u>https://developer.nordicsemi.com/</u>.
- 5. Download and install nRFgo Studio, make sure to download the last version updated. During the installation, windows will appear and propose you to install a version of Jlink driver (not the last one) and also a version of nRF5x-Command-Line-Tools (not the last one). We recommend downloading and install the last version of Jlink (see section 2 above) and to download and install the last version of "nRF5x-Command-Line-Tools" available on the Nordic web site on the download section, for example: <u>https://www.nordicsemi.com/eng/Products/nRF52832</u>
- 6. Download and install Master Control Panel (x86 is for 32 bits windows and x64 is for 64 bits windows).

You can also download the Smartphone application "nRF Connect" available on the Play Store (Android version) and on the App Store (IOS version).



4. Hardware Description

4.1. Information about ISP1507-AX Module

ISP1507-AX is a Bluetooth Low Energy module with integrated antenna.



This module is based on Nordic Semiconductor nRF52832 2.4 GHz wireless SoC. nRF52832 integrates nRF52 series 2.4 GHz transceiver, a 32bit ARM Cortex[™]- M4 CPU, flash memory, and analogue and digital peripherals. nRF52832 can support Bluetooth low energy and a range of proprietary 2.4 GHz protocols. The ISP1507-AX module measures 8 x 8 x 0.95 mm3. The module integrates all the decoupling capacitors, the 32 MHz and 32 kHz crystals, their load capacitors, the DC-DC converter component, the RF matching circuit and the antenna in addition to the wireless SoC. For more details, see Insight SiP module data sheet (document DS1507).

4.2. ISP1507-AX-TB Test Board

Former Generation Test Board Rev B

Board dimensions are 30 x 50 mm². It includes:

- ISP1507-AX BLE module
- 4 1 x 3 pin header
- 4 2 x jumpers to connect IO on the 3 pin header as described on the picture nearby.
- **4** 3 x FPC connectors in order to access the nRF52832 GPIOs:
- 1 x 10 pin FPC connector on top side of the board.
- 1 x 14 pin FPC connector on top side of the board.
- 1 x 22 pin FPC connector on top side of the board.



When using an ISP130603 Interface Board Rev E, place the jumper on the ISP1507-AX TB Test Board as indicated on the picture above. The ISP1507-AX-TB electrical schematic is presented in document Schematic_ISP1507-AX-TB.



New Generation Test Board Rev C

Board dimensions are 44.8 x 31 mm². It includes:

ISP1507-AX BLE module

- **4** 3 x FPC connectors in order to access the nRF52810 GPIOs:
- 1 x 10 pin FPC connector on top side of the board.
- 1 x 14 pin FPC connector on top side of the board.
- 1 x 22 pin FPC connector on top side of the board.
- 4 2 x 5 pin header for the Debug using Nordic Evaluation Board
- JTAG footprint for the programming



The ISP1507AX-TB electrical schematic is presented in document Schematic_ISP1507-AX-TB.

4.3. ISP130603 Interface Board

ISP130603 is the application type interface board that has dimensions of 100 x 80 mm². The ISP130603 electrical schematic is presented in document SC130604.



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4.4. ISP1880 Sensors Board

ISP1880 Sensor Board is not included in the Evaluation Board and can be purchased separately. It has dimensions of 32 x 26.5 mm² and encloses:

- ISP1507-AX BLE module.
- **4** ST Micro LPS22HB barometer sensor.
- ST Micro LSM9DS1 accelerometer / magnetometer / gyroscope sensor.
- Sensirion Humidity / Temperature sensor
- 4 Jtag footprint for the programming
- USB female connector
- CR2032 battery holder
- Software to read/drive the sensors.



4.5. nRF5 series Development Dongle

nRF5 Development Dongle is not included in the Evaluation Board and can be purchased separately. The reader should refer to the corresponding paragraph in nRF52832 Development Kit User Guide document.

Dongle/Master can also refer to your Smartphone by downloading the Smartphone application "nRF Connect" available on the Play Store (Android version) and on the App Store (IOS version).



5. Basic Application using ISP1507-AX-TB Test Board

5.1. Basic BLE Proximity Application

This paragraph shows you how to set up and program a BLE proximity application on top of a SoftDevice that will send data on a Bluetooth link from the ISP1507-AX-TB Test Board to the Master Emulator. In order to use Bluetooth Low Energy radio, the software is loaded in 2 parts:

- 4 S132 SoftDevice using nRFgo Studio (hex file, no source).
- Proximity Application using Keil uVision.

Then Master Emulator is connected and Proximity Application is launched.

S132 SoftDevice loading

- 1. Connect the provided USB cable from the Interface Board ISP130603 to your computer.
- 2. Connect the ISP1507-AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit).



- 3. Start nRFgo Studio.
- 4. Select nRF5x Programming.
- 5. Click Erase all.



atures ×		
 2.4 GHz Front-End Te 	SEGGER to use: 518004334 Refresh	
TX carrie		
RX const	nRF51822	
RY sensit	Design 1 (Appleation)	
# Bluetooth	Region I (Application)	Program SomDevice Program Application Program Bootloader
nRF8001 Co		Programming of SoftDevice on nRF5x device
Dispatcher		File to program: rf51872 8.0.0 roftdevice hav Browne
Direct Tert		The top og unit in a second so the method is a second so the second so t
nRF8002		Lock SoftDevice from readback
		SoftDevice size (kB): 0
		Enable SoftDevice protection (UICR.CLENR0)
	Size: 128 kB	
		Program Varify Read
		Godram Zennà Zean
levice Manager X	Address: 0x0	
Motherboards		
nRF5x Bootloader	Liase a	
nRF24LU1+ Boo		
9		

6. Browse to SoftDevice hex file and click Program. The SoftDevice is available on the Nordic Website or on the SDK folder by installing the nRF5-SDK and go to for example: \nRF5_SDK_15.0.0 \components\softdevice\s132\hex\s132_nrf52_6.0.0_softdevice.hex



NRFgo Studio	
File View nRF8001	L Setup Help
Features X	
 2.4 GHz Front-End Te TX carrie BX const. 	SEGGER to use: 518004330 Refresh
 Front-End Te TX carrie RX const TX/RX c RX sensit Bluetooth nRF8001 Co Dispatcher Trace Transl Direct Test nRF8002 Device Manager × Motherboards nRF5x Program nRF5x Bootloader nRF24LU1+ Boo 	Region 1 (Application) Size: 40448 Address: 0x.0000 Region 0 (SoftDevice) Size: 1848 Timmare S132_rRF52_2.0.0-7.alpha (td: 0x0079) Erace all
Log Unable to find or open Recover completed Erase completed	the JLinkARM dll
Softdevice C:/Kell_VS/A	ANY/Pack/Nordicsemiconductor/nkr_softDevice_stsz/2.0.0-7.aipna/nex/stsz_nnsz_2.0.0-7.aipna_softdevice.nex programmed successfully

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Proximity Application loading

You can directly load the program application (hex file) through nRFgo Studio. Nordic have already compiled file and it is available on the followed path, for example:

...\nRF5_SDK_15.0.0\examples\ble_peripheral\ble_app_proximity\hex\ble_app_proximity_pca10040_s132.hex

If you want to modify the application software example, you can use Keil uVision and follow recommendation below:

- 1. Start Keil uVision.
- 2. Select Project then Open Project in order to open Proximity app. Make sure it is the right file project. The project is locked, it is read only, if you want to modify it, you have to change the right in the file App directory properties, for example:

...\nRF5_SDK_15.0.0\examples\ble_peripheral\ble_app_proximity\pca10040\s132\arm5_no_packs\ ble_app_proximity_pca10040_s132.uvprojx.

3. Click Build Target and Load. If you have this message after click Load, it means that the power is not enough and you have to increase the voltage by adding jumpers on the interface board.



You can also load the hex file (generated after building target with keil uVision) by nRFgo studio in the program application.



🔀 nRFgo Studio		
File View nRF8001	Setup <u>H</u> elp	
Features X 2.4 GHz Front-End Te TX carrie DX count	SEGGER to use: 518004330 V Refresh	
TX carrie RX const TX/RX c RX sensit Dispatcher Trace Transl Direct Test nRF8002 Device Manager X Motherboards inRF5x Program nRF5x Bottoader nRF54LU1+ Boo	Region 1 (Application) Size: 404 kB Address: 0x1b000 Region 0 (SoftDevice) Size: 108 kB Firmware: S132_nRF52_2.0.0-7.alpha (Id: 0x0079)	Program SoftDevice Program Application Program Bootloader Frogramming of Application on RFSS device Browse Browse Lock entire drip from readback Browse Read
Log	L	×
Erase completed Softdevice C:/Keil_v5// Application C:/Keil_v5/	RM/Pack/NordicSemiconductor/nRF_SoftDevice_S132/2.0.0-7.alpha/hev/s ARM/Pack/NordicSemiconductor/nRF_Examples/11.0.0-2.alpha/ble_peripl III	132_nrf52_2.0.0-7.alpha_softdevice.hex programmed successfully heral/ble_app_proximity/pca10040/s132/arm5/_build/nrf52832_xxaa_s132.hex p +

The file project is located for example:

...\nRF5_SDK_15.0.0\examples\ble_peripheral\ble_app_proximity\pca10040\s132\arm5_no_packs_buil d\nrf52832_xxaa_s132.hex



Master Emulator and Proximity Application

- 1. Connect nRF5 Dongle (Master Emulator) into a USB port on your computer.
- 2. Start Master Control Panel. If you have no master emulator found, you have to flash the dongle in Flash programming section.



3. Click Start Discovery.

Master Control Panel	
File Help	
Master emulator	
COM113 - 680791841 - 680791841 connected	Reset
Scan for devices	
Stop discovery	
Discovered devices	
Select device	
Delete bond info	
16:57:49.1] Heady	
16:57:49.1] SERVER: Server has started	-
16:57/43.6J Device discovery started	
15:38:13.2] Device discovery stopped	
15:58:13.9] Device discovery started	

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- 4. After starting discovery, if no device appearing, disconnect and connect again the interface board power supply.
- 5. If you have an error message as indicated in the photo, it means that the nRF5 Dongle is not programmed.



For your information, please refer to the nRF51822 Development Kit User Guide document as indicated in our application note ISP130301-DK1 part 4.5 on page 14-7. You can find this user guide on the Nordicsemi website. The procedure to program the nRF51 Dongle is described on page 13. I enclose a copy of the user guide for your convenience.

- a. Open the Master Control Panel from the Start menu (Start > All Programs > Nordic Semiconductor > Master Control Panel).
- b. Make sure the Development Dongle is detected. The Master Emulator item list should show COMnn-xxxxxxxx (nn gives the COM port number; xxxxxxxx is the SEGGER serial number printed on the dongle). Restart the application if it doesn't appear in the item list. Before continuing, make sure you have selected the correct device by verifying the serial number in the item list with the serial number printed on the Development Dongle.
- c. When you use the Development Dongle for the first time, you must first program it with the Master Emulator Firmware.
 - i. In the Master Control Panel menu click File and select Flash Programming.
 - ii. Click Browse. This opens a browser that automatically points to the location of the mefw_nrf51822_<version>_firmware.hex (<version> will be replaced by a number giving the version of the actual firmware).
 - Control iii. The Master Panel Firmware is file located in: C:\Program Files (x86) Nordic Semiconductor \ Master Control Panel \ \<version>\firmware\pca10000\MEFW_nRF51822_<version>_firmware.hex.
 - iv. Select the Master Emulator Firmware file and click Open.
 - v. Click Program to start programming the selected device.
 - vi. When the programming is finished click Exit to go back to the main window.
- 6. Click Select Device.
- 7. On the following display, click successively on Bond, Discover Services and Enable Services.



Master Control Panel
File Help
Master emulator
COM113 - 680791841 680791841 connected Reset
Device info Device address: C9E7671F2E15 Bonded: True
Actions
Disconnect Bond Update Discover services Disable services DFU
Service Discovery
PrimaryService, Value: 02-18, Immediate Alert (0x1802) CharacteristicDeclaration, Value: 04-0E-00-06-2A, Properties: WriteWithoutResponse, Cha AertLevel, (No values read) PrimaryService, Value: 03-18, Link Loss (0x1803) CharacteristicDeclaration, Value: 0A-11-00-06-2A, Properties: Read, Write, Characteristic U AertLevel, (No values read) PrimaryService, Value: 0F-18, BatteryService (0x180F) CharacteristicDeclaration, Value: 12-14-00-19-2A, Properties: Read, Notify, Characteristic U Battery Level, Value: 64
Attribute value UUUD (by)- Handle (by)- Display as UTE8 Read long Read
Value: hex to text Write long Write
Back
[17:00:21.7] ConnectionParameterUpdateResponse sent
[17:00:22.0] Connection Parameters Updated. ConnInterval:500ms, SlaveLatency:0, Supervisio
[17:00:22.9] EnableServices({0x0015:1,})
[17:00:23.5] Updated handle 0015 with value [1, 0]
[17:00:23.5] Successfully updated the store value of CCCD

- 8. You can note Battery voltage is sent by the ISP1507-AX-TB Test Board to the Master Emulator via the Bluetooth link. The application is written to send a value that changes cyclically.
- 9. You can also use the "nRF Connect" application which is available for iOS from App Store and for Android from Play Store. Download, install and run the application, click to SCAN and select the device: Nordic_PROX.

Notice

Please pay attention to the compatibility between the IC revision, the SoftDevice, the nRF5 SDK, etc, ... Please read the compatibility matrix available on the "infocenter" website from Nordic: <u>http://infocenter.nordicsemi.com/index.jsp</u>



5.2. Direct Test Mode (UART)

This paragraph shows you how to set up and program the Direct Test Mode through the UART on ISP1507-AX-TB Test Board.

Direct Test Mode Set-up

- 1. Connect the USB cable from the Interface Board ISP130603 to your computer.
- 2. Connect the ISP1507-AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit)
- 3. On the ISP130603 Interface Board, connect the 2-lead patch cable in order to connect:
 - RXD to P0_08 (by default on the source code)
 - TXD to P0_06 (by default on the source code)

Make sure the RXD/TXD labels match for each wire. This matches the default setting if you are using the Nordic Board PCA10040 in the SDK project (be careful: depending on the Nordic Board version you are using, the ports used could be different, see next part: Direct Test Mode loading).

Direct Test Mode Loading

- 1. Start Keil uVision.
- 2. Select Project then Open Project in order to open Direct Test Mode application:/nRF5_SDK_15.0.0/examples/dtm/direct_test_mode/pca10040/blank/arm5/direct_test_mode_blank_pca10040.uvprojx

Warning

Regarding the Nordic Board you are using, the RX and TX pin number could be different. In the following pictures, the Nordic board PCA10040 is used (you can modify the Nordic Board model in: Flash \rightarrow Configure Flash Tools \rightarrow C/C++, by writing the correct Board name in the "Define" area with the name indicated in the boards.h).



Project direct Let, mode, block, pro- pert Project direct Let, mode, block, pro- pert<	File Edit View Project Flash Debug	Peripherals Tools SVCS Window Help	
Compute Number Compute Number Compute Number Project Compute Number Compute Number Compute Number	🗋 🚰 🛃 🐉 🐒 🙀 Download	「8 熱 熱 津 津 川川」 ()通	🗟 🥐 🍭 💿 🔿 🔗 💼 🔍
Next Configure Fash Tools mediation ** Project direct tet, model, blank, project direct, tet, model, blank, project, project	📀 🎬 🕮 🥔 📇 🙀 Erase	🛔 🗟 🧇 🐡	
*** Project direct tet_mode_black_prop 1 []/* Copyright (c) 2014 Nordic Semiconductor. All Rights Reserved. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. *** The information contained herein is property of Nordic Semiconductor ASA. ************************************	roject Configure Fla	ash Tools nrf6310.h 💒 main.c	
<pre>bpp/ coms_wrnch c</pre>	% Project: direct, test_mode_blank_pca # nrf51422_yaac # Application # main.c ble_dtm.h ble_dtm.h ble_dtm.h	1 ⊟/* Copyright (c) 2014 Nordic Semicon 2 * 3 The information contained herein 4 Terms and conditions of usage are 5 SEMICONDUCTOR STANDARD SOFTWARE I 6 * 7 Licensees are granted free, non-t 8 WARRANTY of ANY KIND is provided.	ductor. All Rights Reserved. is property of Nordic Semiconductor ASA. e described in detail in NORDIC LICENSE AGREEMENT. transferable use of the information. NO . This heading must NOT be removed from
CMSIS Felif defined (BOARD_PCA10030) felif defined (BOARD_PCA10030) felif defined (BOARD_PCA10036).h" felif defined (BOARD_PCA10036).h" felif defined (BOARD_PCA10040) felif defined (BOARD_MTS1822) felif defined (BOARD_MTS1822) finclude "nc starterkit.h" felif defined (BOARD_VSDRI) finclude "nc starterkit.h" finclud	by.h cmsi_armcc.h compiler_abstraction core_cmfunc.h core_cmfunc.h core_cmfunc.h core_cmfunc.h core_cmfunc.h fi.h mf3L.h mf5L_bitfields.h mf5L_bitfields.h mf5L_bitfields.h mf5L_bitfields.h mff_Lopercated.h mff_Lopercated.h stdbool.h stdbool.h stdbool.h stdmt.h System_ntf5L.h	<pre>* the fale. 9 * the fale. 10 * 11 - */ 12 =#ifndef BOARDS_H 13 #define BOARDS_H 14 15 #include "nrf_gpio.h" 16 17 =#if defined(BOARD_RCA10000) 18 #include "nrf6310.h" 19 #elif defined(BOARD_RCA10001) 21 #include "pca10000.h" 22 #include "pca10000.h" 23 #elif defined(BOARD_RCA10001) 24 #include "pca10000.h" 25 #elif defined(BOARD_RCA10002) 24 #include "pca10000.h" 25 #elif defined(BOARD_RCA10003) 26 #include "pca10000.h" 27 #elif defined(BOARD_RCA20006) 38 #include "pca20006.h"</pre>	
44 #error "Board is not defined" 45 46 #endif	CMSIS	<pre>29 felif defined (BOARD_PCA10028) 30 finclude "pca10028.h" 31 felif defined (BOARD_PCA10031) 32 finclude "pca10031.h" 33 felif defined (BOARD_PCA10036) 34 finclude "pca10036.h" 35 felif defined (BOARD_PCA10040) 36 finclude "pca10040.h" 37 felif defined (BOARD_NTS1822) 38 finclude "vc51822.h" 39 felif defined (BOARD_NTS1822) 41 finclude "nc51822.h" 39 felif defined (BOARD_CUSTOM) 41 felif defined (BOARD_CUSTOM) 42 finclude "custom_board.h" 43 felie 44 ferror "Board is not defined" 46 fendif</pre>	Include Image: Controls Image:

In the following picture, the Nordic board PCA10040 is used by default and the RX and TX pin number are 08 and 06.



C:\Keil_v5\ARM\Pack\NordicSemiconducto	<pre>r\nRF_Examples\11.0.0-2.alpha\dtm\direct_test_mode\pca10040\blank\arm5\direct_test_mode_blank_pca10040.uvprojx[Read Only]</pre>
File Edit View Project Flash Debug	Peripherals Tools SVCS Window Help
🗋 💕 🛃 🗿 👗 ዄ 🛍 🖉 🗠	🖛 → 陀 穆 穆 穆 津 津 //E //E 🖄 ADIO_TXPOWER_TXPOW 🗨 🗟 🥐 🕘 🍥 🔿 🔗 🍓 💼 🔍
🔗 🔛 🕮 🥔 🔜 🙀 nrf52832_xxaa	🗔 🔊 🛔 🖶 🗢 🏟
Project II 🕅	
	pcaluodun * main.c
Project: direct_test_mode_blank_pca	34 #define BSP_LED_2_MASK (1< <bsp_led_2)< th=""></bsp_led_2)<>
🖃 🧊 nrf52832_xxaa	35 #define BSP_LED_3_MASK (1< <bsp_led_3)< th=""></bsp_led_3)<>
😑 🦾 Application	36 37 HERE VACY (POD TED A VACY POD TED A VACY POD TED A VACY POD TED A VACY POD TED A VACY
🖃 🛍 main.c	3/ #define Lebs mask (DSF_LEb_0 mask DSF_LEb_1 mask DSF_LEb_2 mask DSF_LEb_3 mask)
ble_dtm.h	39 define LEDS INV MASK LEDS MASK
m hoards h	40
S ben b	41 #define BUTTONS NUMBER 4
la bapin	42
cmsis_armcc.n	43 #define BUTTON_START 13
compiler_abstraction	44 #define BUTTON_1 13
Core_cm4.h	45 #define BUTTON_2 14
🔤 🚰 core_cmFunc.h	46 #define BUTTON 3 15
🗳 core_cmInstr.h	47 #define BUITON 4 16
ore cmSimd.h	40 Heatine Button But NDF GDIO DIN BUILIUD
nrf h	50
S	51 #define BUTTONS LIST { BUTTON 1, BUTTON 2, BUTTON 3, BUTTON 4 }
	52
nrt52.h	53 #define BSP BUTTON 0 BUTTON 1
nrf52_bitfields.h	54 #define BSP_BUTTON_1 BUTTON_2
🔤 🗂 nrf_gpio.h	55 #define BSP_BUTTON_2 BUTTON_3
👚 🔭 pca10040.h	56 #define BSP_BUTTON_3 BUTTON_4
stdbool.h	
stdint.h	50 FORTING BSD BUITON 1 WASK (1< <bsp 1)<="" buiton="" th=""></bsp>
evetem prf52 h	60 idefine BSP BUITON 2 MASK (1<85P BUITON 2)
System_mbz.m	61 #define BSP BUTTON 3 MASK (1< <bsp 3)<="" button="" th=""></bsp>
	62
Board Support	63 #define BUTTONS MASK 0x001E0000
CMSIS	64
🕀 🍫 Device	65 #define RX_PIN_NUMBER 8
🗉 🐟 nRF_BLE	66 #define TX_PIN_NUMBER 6
nRF_Drivers	67 #define CTS PIN NUMBER 7
-	60 Heefine KIS FIN NUMBER 5
	71 #define SPIS MISO PIN 28 // SPI MISO signal.
	72 #define SPIS CSN FIN 12 // SPI CSN signal.
	73 #define SPIS MOSI PIN 25 // SPI MOSI signal.
	74 #define SPIS_SCK_PIN 29 // SPI SCK signal.
	75
	76 #define SPIMO_SCK_PIN 29 // SPI clock GPIO pin number.
	77 #define SPIMO MOSI PIN 25 // SPI Master Out Slave In GPIO pin number.
	70 tdefine SPIMO RISO FIN 28 // SPI Master in Slave Out GPIO pin number.
	RO
٠	81 #define SPIM1 SCK PIN 2 // SPI clock GPIO pin number.
🖻 Project 🎯 Books {} Func 0,, Temp	٠

- 3. Click Build Target and Load.
- 4. If you have the next error message, it means that you have not enough RAM to flash algorithm.



File Edit View Project Flash Debug Peri	pherals Tools	SVCS Window Help	
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🧇 🖾 🖽 🧼 🧮 🙀 nrf51822_xxab_s110_	spi 🖃 🌋 🛔		
Project 🛛 🗖 🔝	📩 main.c	LC	•
	1 📮	3/* Copyright (c) 2014 Nordic Semiconductor. All Rights Reserved.	
😑 🚎 Source Code	2	•	
i main.c	3	* The information contained herein is property of Nordic Semiconductor ASA.	
🖻 🔄 Libraries	5	Unk - Cortex Error CiKeil vS\ARM\RACK\NordicSemiconductor\nRE DeviceEa	
ble_advdata.c	6		
H app_timer.c	7	ormation. NO	
H app_outton.c	8	Cannot Load Flash Programming Algorithm ! removed from	
Sondevice_nancier.c	9		
	10		
ser codecs mw	12		
🗐 🧰 ser utils	13 E	OK	
🖬 🧰 ser hal	14		
ser_hal_serial	15	* @defgroup ble_sdk_app_dtm_main main.c	
CMSIS	10		
🖬 🚸 Device	18	v Vision file.	
	19		
	20	* 1 A activation example.	
	21	*/ Error: Flash Download failed - "Cortex-M0"	
	22 -		
	24	7 - 113 	
	25	#ing OK	
	26	#inq hereita	
	27	#ind	
	28	finclude "ble advdata.h"	
	30	finclude "borga,b"	
	31	#include "nordic common.h"	
	32	<pre>#include "softdevice_handler.h"</pre>	
	33		
	34	<pre>#define DTM_INIT_BUTTON_PIN_NO BUTTON_0 /**< Button to initializing DTM mode</pre>	on co
	36	#define READY LED PIN NO LED 0 /**< LED indicating that the example	is re
	37	#define DTM READY LED PIN NO LED 1 /**< LED indicating that the connect:	ivity
	38	<pre>#define ASSERT_LED_PIN_NO LED_7 /**< Is on when application has asset</pre>	rted.
	39		
Project Books {} Functions 0, Templates		III	
uild Output			ņ
Atchpoints: 2			
ING Speed: 2000 kHz			
nsufficient RAM for Flash Algorith	ams !		
Tase falled:			
rror: Flash Download failed - "C	Cortex-M0"		
	_	III	•

5. You can modify the size of the RAM Algorithm in: Flash→ Configure Flash Tools... and on the windows click on Debug → Settings Click on Flash Download and modify the size (put 0x02000).

Oevice Target Output Listing User C/C++ Asm	Unker Debug Utilities	Debug Trace Hash Download
Limit Speed to Real-Time		LOAD C Erase Full Chip V Program
Load Application at Startup Run to main() Initialization File:	✓ Load Application at Startup ✓ Run to main() Initialization File:	C Donot Erase V Reset and Run
Edit		Description Device Size Device Type Address Range
Restore Debug Session Settings Fraekpoints Toolbox Watch Windows & Performance Analyzer Memory Display System Viewer	Restore Debug Session Settings ✓ Breakpoints ✓ Toolbox ✓ Watch Windows ✓ Memory Display ✓ System Viewer	nRF51xxx 2M On-chip Rash 00000000H - 001FFFFFH
CPU DLL: Parameter:	Driver DLL: Parameter:	Stat: Size:
		Add Remove
Dialog DLL: Parameter: DARMCM1.DLL pCM0	Dialog DLL: Parameter: TARMCM1.DLL PCM0	
ОК Са	ancel Defaults Help	

6. Click OK and load again the project.



Direct Test Mode Testing

- 1. Start nRFgo Studio.
- 2. Select Direct Test Mode.

I nKrgo Studio - Direct Test Mode UART Interface		
estures X	i setup <u>m</u> eip	
a 2.4 GHz	Direct Test Mode	UART interface
Front-End Te	Set up on	Program
TX carrie	Com port COM28	 Refresh list of com ports
RX const TX/RX c.	Mode	
RX sensit	Transmit	C Dereive
Bluetooth	. Inditation	() Receive
nRF8001 Co Dispatcher	Channel	
Trace Transl	Single	🔘 Sweep
Direct Test	Channel	10
nRF8002	Channel	19
	Pavload model	Constant carrier
	n dylodd model	consume conter
	Payload length	1 bytes
	Packets received	N/A
		Start test
vice Manager X		
Motherboards		
nRF5x Program		
nRF24LU1+ Boo		

3. For details on how to use the Direct Test Mode, press F1 to open the nRFgo Studio help.

Notice

Erase all before loading Direct Test Mode program. The SoftDevice must not be loaded, only the Program Application with uVision or with nRFgo studio in "Program Application" (load the .hex generated by uVision).



5.3. UART Mode Example

This paragraph shows you how to set up and program a communication by sending some characters through the UART interface on ISP1507-AX-TB Test Board. This example just echoes input characters from the PC terminal.

UART Mode Set-up

- 1. Connect the USB cable from the Interface Board ISP130603 to your computer.
- 2. Connect the ISP1507-AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit)
- 3. On the ISP130603 Interface Board, connect the 2-lead patch cable in order to connect:
 - RXD to P0 08
 - TXD to P0 06
 - CTS to P0_07 •
 - RTS to P0 05

Make sure the RXD/TXD and CTS/RTS labels match for each wire. This matches the default setting if you are using the Nordic Board pca10040 in the SDK project (be careful: depending on the Nordic Board version you are using, the ports used could be different, see next part: UART Mode loading). CTS and RTS are needed because in the UART process when the TX is ready to send (RTS), the RX needs to allow the TX send datas (CTS) and vice versa.

UART Mode Loading

- 1. Start Keil uVision.
- 2. Select UART example Project then Open Project in order to open application: ...\nRF5_SDK_15.0.0\examples\peripheral\uart\pca10040\arm5_no_packs\uart_pca10040.uvprojx
- 3. Click Build Target and Load.

Note

Nordic have already generated the hex file "uart_pca10040.hex" available on the SDK folder, for example:

...\nRF5_SDK_15.0.0 \examples\peripheral\uart\hex\uart_pca10040.hex

Insight SiP can provide also the Hex files on demand at contact@insightsip.com

Specification subject to change without notice.



UART Mode Testing

1. Download and install the program "Putty.exe" (or equivalent like TTERM for example) in order to configure the baudrate, the port COM, .. etc ...

Real PuTTY Configuration	States and the second	×
Category:		
□ Session	Options controlling	local serial lines
	Select a serial line	
- Terminal	Serial line to connect to	COM28
Bell Features	Configure the serial line	
⊡ · Window	Speed (baud)	38400
Appearance Behaviour	Data <u>b</u> its	8
Translation	Stop bits	1
Colours	<u>P</u> arity	None 👻
Connection	Flow control	RTS/CTS ▼
Proxy Telnet Rilogin SSH Sertal		
About	C)pen <u>C</u> ancel

- 2. Click to Open.
- 3. You can write and/or delete some characters. Sometimes you have to reset the ISP130603 Interface Board in case if it is not working.

PCOM28 - PuTTY	
Shows a	*
Start: Welcome to UART_example program !!!!q	
Exit!	
	*

4. Press 'q' to exit



5.4. BLE UART Mode Example

This paragraph shows you how to set up and program an example that emulates a serial port over BLE. In the example, Nordic Semiconductor's development board serves as a peer to the phone application "nRF UART", which is available for iOS from Apple Store and for Android from Play Store. In addition, the example demonstrates how to use a proprietary (vendor-specific) service and characteristics with the SoftDevice. In order to use Bluetooth Low Energy and UART interface, the software is loaded in 2 parts:

- The SoftDevice: **S132**.
- ble_app_uart using Keil uVision.

UART Mode Set-up

- 1. Connect the USB cable from the Interface Board ISP130603 to your computer.
- 2. Connect the ISP1507-AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit)
- 3. On the ISP130603 Interface Board, connect the 2-lead patch cable in order to connect:
 - RXD to P0_08
 - TXD to P0_06
 - CTS to P0_07
 - RTS to P0_05

Make sure the RXD/TXD and CTS/RTS labels match for each wire (be careful: depending on the Nordic Board version you are using, the ports used could be different, see next part: UART Mode loading).

CTS and RTS are needed because in the UART process when the TX is ready to send (RTS), the RX needs to allow the TX send datas (CTS) and vice versa.

S132 SoftDevice loading

- 1. Start nRFgo Studio
- 2. Select nRF5x Programming
- 3. Click Erase all
- 4. Browse to SoftDevice hex file and click Program. The SoftDevice is available on the Nordic Website or on the SDK folder by installing the nRF5-SDK and go to, for example: \nRF5_SDK_15.0.0 \components\softdevice\s132\hex\s132_nrf52_6.0.0_softdevice.hex



UART Mode Loading

- 1. Start Keil uVision.
- Select Project then Open Project in order to open ble_app_uart application: ...\nRF5_SDK_15.0.0\examples\ble_peripheral\ble_app_uart\pca10040e\s132\arm5_no_packs\ble_ app_uart_pca10040_s132.uvprojx
- 3. Click Build Target and Load.

Note

Nordic have already generated the hex file "ble_app_uart_pca10040_s132.hex" available on the SDK folder, for example:

...\nRF5_SDK_15.0.0\examples\ble_peripheral\ble_app_uart\hex\ble_app_uart_pca10040_s132.hex

Insight SiP can provide also the Hex files on demand at *contact@insightsip.com*



BLE Mode Testing

- 1. Download and install "nRF UART 2.0" on your iOS or Android device, which is available for iOS from App Store and for Android from Play Store.
- 2. Run the App, click to Connect and select the device: Nordic_UART.

* ¥ ⊠ ∰i 24% և 11:11	■ * ¥ @ ™ ⊿ 24% ≜ 11:11	■ * ¥ © ⊞ ⊿ 24% ≞ 11:11	nRF UART v	* ¥ © ^u	% 🗎 11:11
Connect	nRF UART v2.0 ^{10nnect}	Disconnect	C	Disconnect	
	Select a device ① Nordic_UART Rssi = -83 C13AJ20088FD H2S 7H	[11:11:17] Connected to: Nordic_UART	[11:11:17] Connected [11:11:28] TX: allo	to: Nordic_UART	
	F7764A 993030 Cancel				Send
			Device: Nordic_UART	- ready	-
			LEAT	je pou	· >
			1 2 3 4	5 6 7 8	9 0
			a z e r	t y u i	o p
			q s d f	g h j k	l m
Send	Send	Send	↑ w x	c v b n	
Device: <select a="" device=""></select>	Device: <select a="" device=""></select>	Device: Nordic_UART - ready	Sym ,*	Français(FR) 🕨	4

3. You are now able to send and receive data through the BLE. Next step is to establish the communication with the UART interface.

UART Mode Testing

1. Download and install the program "RealTerm" (or equivalent like Putty, TTERM for example) in order to configure the baudrate, the port COM, .. etc ...

Display Port	Capture Pins Send Echo	Port I2C I2C-2 I2CMisc Misc	<u> </u>	n <u>Clear</u> Freeze ?
Display As ← Ascii ← Ansi ← Hextspacel ← Hextspacel ← Hextspacel ← Hextspacel ← Hextspacel ← Hextspacel ← Hextspacel ← Hoat4 ← HextSV	✓ Half Duplex newLine mode Invert ZBits ✓ Big Endian Data Frames Bytes 2 \$ Single Gulp Terminal Font 16 \$	s Scrollback		Status Disconnect RXD (2) TXD (3) CTS (8) DCD (1) DSR (6) Ring (9) BREAK Error
		Char Count:10	CPS:0	Port: 28 38400 8N1 RTS/ //



Display Port Capture Pins Send Echo Port 12	C 12C-2 12CMisc Misc	<u>\n</u> Clear Freeze ?
Baud 38400 Port 28 Parity Data Bits Stop Bits © None © 8 bits © 1 bit 2 bits Odd C 7 bits Hardware Flow Control C None C Mark C 6 bits C None © RTS/CTS C Space C 5 bits C DTR/DSRC RS485-rts	Open Spy ✓ Change Software Flow Control Receive Xon Char: 17 Transmit Xoff Char: 19 Winsock is: C Raw C Telnet	Status
You can use ActiveX automation to control me!	Char Count:10	CPS:0 Port: 28 38400 8N1 RTS/

Display Port Capture Pins Send Echo Port 12C 12C-2 12CMisc Misc 1	Clear Freeze ?
yes Send <u>N</u> umbers Send <u>A</u> SCI V +CR Before ↓ +C	Status Disconnect RXD (2)
	TXD (3) CTS (8) DCD (1)
Dump File to Port c:\temp\capture.txt Send File X Stop Delays 0	DSR (6)
You can use ActiveX automation to control me! Char Count:10 CPS:0 P	ort: 28 38400 8N1 RTS/ //

2. Click to Send, write some characters and click to "Send ASCII".

📲 RealTerm: Serial Capture Program 2.0.0.70						*1	\$ @"	™adi 2	4% 🏥 '	11:11
allo4 A		nRF	UA	RT v	2.0					
				۵	isco	nne	ct			
E	[11:11 [11:11 [11:11	:17] C :28] T :50] R	Conne TX: al RX: ye	ected lo es	to: N	ordic	_UAR	Т		
	1								s	end
Display Port Capture Pins Send Echo Port 12C 12C-2 12CMisc Misc 16 Clear Freeze ?	Device	: No	ordic_	UART	- read	Ξy				
	L	.EAT		l	je		I.	ροι	ır	>
Send Aster RXD (2)	1	2	3	4	5	6	7	8	9	0
C LF Repeats C LF Repeats	а	z	e	r	t	у	u	i	0	p
Dump File to Port C \temp\capture tot V Send File Stop Delays 0	q	s	d	f	g	h	j	k	1	m
BREAK	+		w	x	С	۷	b	n		×
You can use ActiveX automation to control me! Char Count:10 CPS:0 Port: 28 38400 8N1 RTS/	Sym	n ,		1	França	ais(FR) >			μ

3. The communication is established, you are now able to emulate a serial port over BLE.



5.5. NFC Launch App Example

The Launch App Example shows how to use the NFC tag to launch an app on a device that supports NFC and runs Android (4.0 or later) or Windows Phone (8.0 or later).

NFC Mode Set-up

- 1. Connect the USB cable from the Interface Board ISP130603 to your computer.
- 2. Connect the ISP1507-AX-TB Test Board to the ISP130603 Interface Board with the 10 pin, 14 pin and 22 pin FPC jumper cables (0.5 mm pitch, provided in the Development Kit)
- 3. On the ISP130603 Interface Board, connect the 2-lead patch cable in order to connect:
 - NFC_1 to P0_09 •
 - NFC_2 to P0_10 •



Page 28/34



NFC Mode Loading

- 1. Start Keil uVision.
- 2. Select Project then Open Project in order to open nfc_launchapp_record: ...\nRF5_SDK_15.0.0\examples\nfc\record_launch_app\pca10040\blank\arm5_no_packs\nfc_launch app_record_pca10040.
- 3. Click Build Target and Load.

Note

Nordic have already generated the hex file "nfc_launchapp_record_pca10040.hex" available on the SDK folder, for example:

...\nRF5_SDK_15.0.0\examples\nfc\record_launch_app\hex\nfc_launchapp_record_pca10040.hex

NFC Mode Testing

Test the Launch App Example with a Smartphone or a tablet with NFC support by performing the following steps:

- 1. After programming the application, touch the NFC antenna with the Smartphone or tablet
- 2. Observe that the Smartphone/tablet tries to:
 - Launch the nRF Toolbox app if it is installed.
 - Download the nRF Toolbox app from the store if it is not installed.

This paragraph shows you how to set up a Sensor application with ISP1880 Sensors Board that will send data via the Bluetooth link to the Master Emulator or to an Apple Device.

APPLICATION NOT

SP1507-AX-E

Two types of demonstration are presented. The first one is directly executable with hardware and software provided in the Development Kit using Master Control Panel application. The second demonstration requires the use of an android or an iOS device.

6.1. On Master Control Panel and/or with nRF connect app

6. Basic Sensor Application with ISP1880

- 1. Place the CR2032 lithium battery into the battery holder.
- 2. Connect nRF51 Dongle (Master Emulator) into a USB port on your computer, or use your Smartphone and launch "nRF connect" application.
- 3. Start Master Control Panel or launch "nRF Connect" app.
- 4. Scan and search the ISP1880 sensor.

It's **all** in the **package**

5. Connect to the device



- 6. Once you are connected to the sensor, you can read the information related to the sensors by selecting the UUID corresponding, for example:
 - a. UUID starting by *b8c71100* ... is related to the BLE configuration (connection interval, name of the device ...)
 - b. UUID starting by *b8c71200* ... is related to the environmental sensors: humidity, pressure and temperature
 - c. UUID starting by b8c71300 ... is related to the motion sensor: accelerometer



D 🖾 🕑 ·		**	Ver 49 .1 30% 🗖	14:04
		ļ	DISCONNECT	:
BONDED	ADVERTISE		P1880 /:51:36:EA:4A:A3	×
CONNECTED NOT BONDED	C	CLIENT	SERVER	0 0 0
Generic Access UUID: 0x1800 PRIMARY SERVICE	E			
Generic Attribu UUID: 0x1801 PRIMARY SERVICE	ite			
Device Informa UUID: 0x180A PRIMARY SERVICE	tion			
Unknown Servie UUID: b8c71100-de PRIMARY SERVICE	ce d70-4c5a-b8	72-1846	eac50d00b	
Unknown Servie UUID: b8c71200-de PRIMARY SERVICE	ce d70-4c5a-b8	72-1846	eac50d00b	
Unknown Servie UUID: b8c71300-de PRIMARY SERVICE	ce d70-4c5a-b8	72-1846	eac50d00b	
	Wireless bv	Nordic		

7. To switch off ISP1880 Sensor Board, remove battery.



6.2. On Android Device

An App is also available for Android Devices. The app is still on development ... and will be uploaded to the Play Store soon. The android App is a demonstration App that is provided "as is" in order to demonstrate the Smart Bluetooth sensor node.

Make sure your Android device is compatible with Bluetooth 4.0 (Android v4.3 at least).

After the "sip sensor" application is downloaded and installed (you need to validate the permission during the installation) you should see the application on your Android device. Then you will be able to set up the application demonstration as follows:

- 1. Place the CR2032 lithium battery into the battery holder.
- 2. Start "Sensor" application on your Android, click Connect and select your Sensor Board (ISP1880)

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≡	ISP1880 Sensor De	CONNECT	≡ ISP1880 Sensor De CONNECT
۲	Environment sensors	· ·	Environment sensors
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ENV	IRONMENT SETTINGS		ENVIRONMENT SETTINGS
11.	Temperature		Select device:
40,00			AVAILABLE DEVICES:
30,00			SP15/18 EE:9A:E6:93:A4:67
20,00			CANCEL
10,00			10,00
0,00			0,00
-10,00		Time	-10,00 Time
	Pressure		Pressure
1 080,00	0		1 080,00
1 040,00	0		1040,00

3. For the environmental sensors, you have the information on the main screen of the app.



	10° ➡ ₩ LTE 17,11 2176 ₩ 14.33	······································	🕻 👾 🖞 . 📲 21% 🖬 14
E ISP1880 Sensor	DISCONNECT	≡ ISP1880 Sensor	DISCONNE
Environment sensors	Temperature 🔽	Current motion	(j)
	Pressure 🗹	S Gravitation	
20.57 % 000.7		0.02 g -0.03 g	1.02 g
29.37 6 999.7	Humidity 🗹	Angular Velocity	
ENVIRONMENT SETTINGS		2.73 dps 2.24 dps	3.01 dps
		U Magnetic Field	
I. Temperature		113.16 uT -78.61 uT	-111.48 uT
0.00			
10,00			
20,00		C Gravitation	
20,00		Gravitation	
20,00		Gravitation	
20,00		© Gravitation	
20.00	Time	C Gravitation	
0,000 0,000 0,000 14:55:09:902 14:55:12:847 - Temperature (°C)	Time 14:55:15:868 14:55:23:074	C Gravitation	
0.00 0.00 0.00 14.55.09.902 14.55.12.847 - Temperature (°C) 11. Pressure	Time 14:55:15:868 14:55:23:074	C Gravitation	
20.00 20.00 10,00 10,00 14.55.09.902 14.55.12.847 - Temperature (°C) Pressure	Time 14:55:15:868 14:55:23:074	Cravitation 2,00 1,00 -1,00 -2	Gravitation

4. For the motion sensor, click on the top left part of the screen to move to the motion sensor. A calibration phase is needed to ensure a good motion. We invite you to rotate the ISP1880 Sensor Board. Then you can move the sensor on all the direction you want to see the plane moving in real time.





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