

Use of ISP1507-AL Evaluation Boards

Application Note AN181103



Introduction

Scope

This document gives details on hardware and software for using and testing Insight SiP Bluetooth Low Energy module ISP1507-AL, version with 192K flash and 24K RAM memories.

Contents

1.	Recommended Documentation	2
2.	ISP1507-AL Dev Kit Hardware Content	3
3.	Software Installation	4
4. 4.1. 4.2. 4.3. 4.4. 4.5.	Hardware Description Information about ISP1507-AL Module ISP1507-AL-TB Test Board ISP130603 Interface Board ISP1880 Sensors Board nRF5 series Development Dongle	6
5. 5.1. 5.2. 5.3. 5.4.	Basic Application using ISP1507-AL-TB Test Board Basic BLE Proximity Application Direct Test Mode (UART) UART Mode Example BLE UART Mode Example	
6. 6.1. 6.2.	Basic Sensor Application with ISP1880 On Master Control Panel and/or with nRF connect app On Android Device	

PPLICATION NOTE ISP1507-AL-TE

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

- InRF52810 Development kit User Guide, hardware section should be partially ignored Insight SiP development kit hardware replaces Nordic Semiconductor hardware.
- Index nRF52 Series Reference Manual.
- 4 nRF52810 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 hRFgo 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 S112 and S132.
- **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:

- AN181103 App Note this document.
- DS1507 module data sheet.
- ISP1507-AL-TB Test Board schematic.
- ISP130603 Interface Board schematic.
- ISP1880 Sensors Board schematic.

Insight SiP – Green Side – 400 avenue Roumanille – BP 309 – 06906 Sophia-Antipolis Cedex – France – www.insightsip.com The information contained in this document is the property of Insight SiP and should not be disclosed to any third party without written permission. Specification subject to change without notice.



2. ISP1507-AL Dev Kit Hardware Content



December 1, 2018

Page 3/32

Document Ref: isp_ble_AN181103_R0.docx

Insight SiP – Green Side – 400 avenue Roumanille – BP 309 – 06906 Sophia-Antipolis Cedex – France – www.insightsip.com The information contained in this document is the property of Insight SiP and should not be disclosed to any third party without written permission. Specification subject to change without notice.



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.

HIE Packs window Help				
Device: Nordic Semiconductor - nRF52832_xxAA				
4 Devices Boards	b	4 Packs Examples		4
Search: • ×		k	Action	Description
Device /	Summary	Device Specific	18 Packs	nRF52832_xxAA selected
E 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 Semicond
+ 🔶 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.
±	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	🔅 İnstall	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 Smart) Sc
🛨 🌳 Maxim	4 Devices	NordicSemiconductor::nRF_SoftDevice_Common	🔶 Up to date	Common components for Nordic Semiconductor nRF family SoftDevices.
+ 🖌 Mediatek	2 Devices	NordicSemiconductor::nRF_SoftDevice_S110	🔶 Up to date	Components for Bluetooth Low Energy (Bluetooth Smart) S110 SoftDevice for Nordic Semicor
😐 🏈 Microsemi	6 Devices	NordicSemiconductor::nRF_SoftDevice_S120	📀 Install	Components for Bluetooth Low Energy (Bluetooth Smart) S120 SoftDevice for Nordic Semicor
MindMotion	2 Devices	NordicSemiconductor::nRF_SoftDevice_S130	🤣 Update	Components for Bluetooth Low Energy (Bluetooth Smart) \$130 SoftDevice for Nordic Semicor
Nordic Semiconductor	8 Devices	NordicSemiconductor::nRF_SoftDevice_S132	🔶 Up to date	Components for Bluetooth Low Energy (Bluetooth Smart) S132 SoftDevice for Nordic Semicor
nRF51 Series	7 Devices		🗱 Remove	Components for Bluetooth Low Energy (Bluetooth Smart) S132 SoftDevice for Nordic Semicor
E 🏤 nRE52 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) S132 SoftDevice for Nordic Semicor
+ 🖉 Nuvoton	433 Devices	NordicSemiconductor::nRF_SoftDevice_S210	😒 Install	Components for ANT/ANT+ S210 SoftDevice for Nordic Semiconductor nRF family.
	275 Devices	NordicSemiconductor::nRF_SoftDevice_S310	😵 Install	Components for Bluetooth Low Energy (Bluetooth Smart) and ANT/ANT+ S310 SoftDevice for
😐 🔗 Renesas	2 Devices	Generic	18 Packs	
😐 🤗 Silicon Labs	397 Devices	ARM::CMSIS	Up to date	CMSIS (Cortex Microcontroller Software Interface Standard)
😥 🔗 SONIX	49 Devices	ARM::CMSIS-Driver_Validation	📀 Install	CMSIS-Driver Validation
STMicroelectronics	768 Devices	ARM::CMSIS-RTOS_Validation	Install	CMSIS-RTOS Validation
Image: 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	S Install	mbed OS Scheduler for Cortex-M devices
		E Keil::ARM_Compiler	😔 Update	Keil ARM Compiler extensions
			Install	Jansson is a C library for encoding, decoding and manipulating JSON data
		E-Keil::MDK-Middleware	😵 Update	Keil MDK-ARM Professional Middleware for ARM Cortex-M based devices
		Keil::XMC1000_DFP	Se Offline	Infineon XMC1000 Series Device Support, deprecated: Use "Infineon::XMC1000_DFP" instead
			📀 Offline	Infineon XMC4000 Series Device Support, deprecated: Use "Infineon::XMC4000_DFP" instead
			Up to date	WIP is a light-weight implementation of the TCP/IP protocol suite
		Micrium:RTOS	😒 İnstall	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 http://www.segger.com/jlink-software.html.



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 nRF52810 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/nRF52810</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-AL Module

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



This module is based on Nordic Semiconductor nRF52810 2.4 GHz wireless SoC. nRF52810 integrates nRF52 series 2.4 GHz transceiver, a 32-bit ARM Cortex[™]-M4 CPU, flash memory, and analogue and digital peripherals. nRF52810 can support Bluetooth low energy and a range of proprietary 2.4 GHz protocols. The ISP1507-AL 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-AL-TB Test Board

Board dimensions are 43.7 x 29 mm². It encloses:

- ISP1507-AL 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 ISP1507-AL-TB electrical schematic is presented in document Schematic ISP1507-AL-TB.



December 1, 2018

Page 6/32

Document Ref: isp_ble_AN181103_R0.docx Insight SiP - Green Side - 400 avenue Roumanille - BP 309 - 06906 Sophia-Antipolis Cedex - France - www.insightsip.com The information contained in this document is the property of Insight SiP and should not be disclosed to any third party without written permission. Specification subject to change without notice.



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.





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-AL-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-AL-TB Test Board to the Master Emulator. In order to use Bluetooth Low Energy radio, the software is loaded in 2 parts:

- 4 S112 SoftDevice using nRFgo Studio (hex file, no source).
- Proximity Application using Keil uVision.

Then Master Emulator is connected and Proximity Application is launched.

S112 SoftDevice loading

- 1. Connect the provided USB cable from the Interface Board ISP130603 to your computer.
- 2. Connect the ISP1507-AL-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.

Document Ref: isp_ble_AN181103_R0.docx

Insight SiP – Green Side – 400 avenue Roumanille – BP 309 – 06906 Sophia-Antipolis Cedex – France – www.insightsip.com The information contained in this document is the property of Insight SiP and should not be disclosed to any third party without written permission. Specification subject to change without notice.



catures ^			
2.4 GHz	SEGGER to use: 518004334 V Refresh		
 Front-End Te 			
TX carrie			
RX const	nRF51822		
TX/RX c	QFAAHX0 (0x007d)		
RX sensit	Region 1 (Application)	Program SoftDevice Program Application Program Bootloan	der
Bluetooth nRF8001 Co		Programming of SoftDevice on nRF5x device	ce
Trace Transl		File to program: rf51822_8.0.0_softdevice.hex Browse	e
Direct Test		Eliste de la factoria	
nRF8002		LOCK SOTTUEVICE from readback	
		SoftDevice size (kB): 0	
		Enable SoftDevice protection (UICR.CL	ENR0)
	Size: 129.10		
	5/28: 128 KB		
		Program Verify Re	ad
levice Manager X	tither as		
Motherboards	Address: UXU		
nRF5x Program	Erase al		
nRF5x Bootloader			
nRF24LU1+ Boo			
20			
ig	ar AGA 2000-2015		

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\s112\hex\s112_nrf52_6.0.0_softdevice.hex



🛤 nRFgo Studio		- 🗆 X
File View nRF8001 Setup Help		
Features ×		
 ✓ 2.4 GHz ✓ Front-End Tests TX carrier wave output RX constant carrier/LO leakage TX/RX channel sweep 	SEGGER to use: 483016869 Refresh	
RX sensitivity	Region 1 (Application)	Program SottDevice Program Application Program Bootloader
 Bluetooth nRF8001 Configuration 		Programming of SoftDevice on nRF5x device
Dispatcher Trace Translator	Size: 92 kB	File to program:nrf52_6.1.0_softdevice.hex Browse
Direct Test Mode nRF8002		SoftDevice size (kB): 100
	Address: 0x19000	Enable SoftDevice protection (UICR.CLENR0)
	Region 0 (SoftDevice)	
	Size: 100 kB	
	Firmware:	Program Verity Read
	Dikilown (10: 0X0000)	
Device Manager ×		
Motherboards nRF5x Programming	Erase all	
nRF5x Bootloader		
INF24L01+ Buolloaders		
Log		×
(c) Nordic Semiconductor ASA 2008-2015 Erase completed		
Softdevice C:/Data/BLE/ISP1807/Hex file/s140_	nrf52_6.1.0_softdevice.hex programmed successfully	
Erase completed	- AL/Certif/c112 prf52 6.1.0 softdevice bey programmed successfully	

Document Ref: isp_ble_AN181103_R0.docx

Insight SiP – Green Side – 400 avenue Roumanille – BP 309 – 06906 Sophia-Antipolis Cedex – France – www.insightsip.com The information contained in this document is the property of Insight SiP and should not be disclosed to any third party without written permission. Specification subject to change without notice.



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_pca10040e_s112.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\pca10040e\s112\arm5_no_packs \ ble_app_proximity_pca10040e_s112.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		- 🗆 X
File View nRF8001 Setup Help		
Features × ✓ 2.4 GHz ✓ Front-End Tests TX carrier wave output RX constant carrier/LO leakage	SEGGER to use: 483016869 Refresh	
TX/RX channel sweep RX sensitivity	Region 1 (Application)	Program SoftDevice Program Application Program Bootloader
 Bluetooth nRF8001 Configuration Dispatcher Trace Translator Direct Test Mode nRF8002 	Size: 92 kB	Programming of Application on nRF5x device File to program: nnected/prox_nrf52810_xxaa.hex Browse Lock entire chip from readback
	Address: 0x19000 Region 0 (SoftDevice) Size: 100 kB Firmware: Unknown (Id: 0x00b0)	Program Verify Read
Device Manager X Motherboards nRF5x Programming	Erase all	
nRF5x Bootloader nRF24LU1+ Bootloaders		
Log		
(c) Nordic Semiconductor ASA 2008-2015		

Application C:/Data/BLE/ISP1507/Hex file/ISP1507-AL/PROX with 32KHz connected/prox_nrf52810_xxaa.hex programmed successfully

The file project is located for example:

...\nRF5_SDK_15.0.0\examples\ble_peripheral\ble_app_proximity\pca10040e\s112\arm5_no_packs_build\nrf52810_xxaa_s112.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	<u>8 1 1 8</u>
COM113 - 680791841 • 680791841 connected	Reset
Scan for devices	
Stop discovery	
Discovered devices	
Select device	
Delete bond info	
Log	
[16:57:49.1] Ready	-
[16:57:49.1] SERVER: Server has started	
[16:57:43:6] Device discovery started	_
[10:50:13.2] Device discovery stopped	
[16.56:15.5] Device discovery started	

 December 1, 2018
 Page 14/32
 Document Ref: isp_ble_AN181103_R0.docx

 Insight SiP – Green Side – 400 avenue Roumanille – BP 309 – 06906
 Sophia-Antipolis
 Cedex – France – www.insightsip.com

 The information contained in this document is the property of Insight SiP and should not be disclosed to any third party without written permission.
 Specification subject to change without notice.



- 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) OracteristicDeclaration, Value: 04-0E-00-06-2A, Properties: WriteWithoutResponse, Cha AertLevel, (No values read) PrimaryService, Value: 03-18, Link Loss (0x1803) OracteristicDeclaration, Value: 0A-11-00-06-2A, Properties: Read, Write, Characteristic L AertLevel, (No values read) PrimaryService, Value: 0F-18, BatteryService (0x180F) OracteristicDeclaration, Value: 12-14-00-19-2A, Properties: Read, Notify, Characteristic L Battery Level, Value: 64
Value: hex text Write long Write
Back
-Log
[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-AL-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-AL-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-AL-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_11 // P0_06 by default (could be defined/changed on the main source code. For the ISP1507-AL, P0_06 does not exist and we have replaced by P0_11)

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/pca10040e/blank/arm5/direct_test_mode_blank_pca10040e.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).



File Edit View Project Flash Debug	Peripherals Tools SVCS Window Help	
📄 😂 🛃 🥔 🔬 🔤 👯 Download	F8 🐘 15 🛊 淳 //注 //注 🖄 💌 🖃 🔝 📌	
🔗 🕮 📾 🥔 📇 🔤 Erase	🛔 🗟 🗇 🍘	
Project Configure FI	lash Tools nrf6310.h 🐒 main.c	
Project direct test mode blank pca Project direct test mode blank pca Imain.c Project direct direct test mode blank pca Imain.c Project disset direct d	<pre>ash Took inf6310h imanc inf6310h imanc if Copyright (c) 2014 Nordic Semiconductor. All Righ if the information contained herein is property of N if the information contained herein is property of N if terms and conditions of usage are described in de if SEMICONDUCTOR STANDARD SOFTWARE LICENSE AGREEMENT if the file. if the file. if the file. if the file. if the file is the file is the file is the file. if the file is the file is the file is the file is the file is the file is the file is the file is the file is the file. if the file is</pre>	Its Reserved. Nordic Semiconductor ASA. ttail in NORDIC of the information. NO ist NOT be removed from rget inf51422_xxxc Output Usting User CC+ Aem Unker Debug Utilities Symbols
	46 #endif 47 -	



C:\Keil_v5\ARM\Pack\NordicSemiconducto	sr\nRF_Examples\11.0.0-2.alpha\dtm\direct_test_mode\pca10040\blank\arm5\direct_test_mode_blank_pca10040.uvprojx[Read Only]
File Edit View Project Flash Debug	Peripherals Tools SVCS Window Help
🗋 😂 🖬 🌒 🐰 🖿 🛍 🖉 🗠	🖕 🔿 🥐 隐 隐 殷 譯 譯 //// //// ///////////////////
🔗 🏥 📇 🥔 🔜 🙀 nrf52832 xxaa	
	<u>pca10040.n</u> * main.c
Project: direct_test_mode_blank_pca	34 #define BSP_LED_2_MASK (1< <bsp_led_2)< th=""></bsp_led_2)<>
🖻 羄 nrf52832_xxaa	35 #define BSP_LED_3_MASK (1< <bsp_led_3)< th=""></bsp_led_3)<>
🖨 🦾 Application	36
🖃 🛍 main.c	3/ FORTINE LEDS MASK (BSP_LED_U MASK BSP_LED_I MASK BSP_LED_Z MASK BSP_LED_3 MASK)
ble dtm.h	30 / " all helps all fir when off of is for "/
P boards b	
S ben h	41 #define BUTTONS NUMBER 4
Spin	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 FORTINE BUTTON 4 10
🔤 core cmSimd.h	49 Idefine BUTION PULL NEF GETO EIN PULLUP
nrf h	
r nrf51 to nrf52 h	51 #define BUTTONS LIST { BUTTON 1, BUTTON 2, BUTTON 3, BUTTON 4 }
······································	52 52
nrtoz.n	53 #define BSP_BUTTON_0 BUTTON_1
nrf52_bitfields.h	54 #define BSP_BUTTON_1 BUTTON_2
mrf_gpio.h	55 #define BSP_BUTTON_2 BUTTON_3
— 🎬 pca10040.h	56 #define BSP_BUTTON_3 BUTTON_4
stdbool.h	58
	59 idefine BSP BUTTON 1 MASK (1< <bsp 1)<="" button="" th=""></bsp>
System_nrf52.h	60 #define BSP BUTTON 2 MASK (1< <bsp 2)<="" button="" th=""></bsp>
Documentation	61 #define BSP_BUTTON_3_MASK (1< <bsp_button_3)< th=""></bsp_button_3)<>
Board Support	62
CMSIS	63 #define BUTTONS_MASK 0x001E0000
	65 faction DY DIN NUMPER 2
	66 define TX PIN NUMBER 6
I NKF_BLE	67 #define CTS PIN NUMBER 7
••• nRF_Drivers	68 #define RTS PIN NUMBER 5
	69 #define HWFC true
	70
	71 #define SPIS_MISO_PIN 28 // SPI MISO signal.
	72 fdefine SPIS CSN PIN 12 // SPI CSN signal.
	74 tadfine SPIS RUSI FIN 25 // SPI MUSI SIGNAL
	75
	76 #define SPIMO SCK PIN 29 // SPI clock GPIO pin number.
	77 #define SPIMO_MOST_PIN 25 // SPI Master Out Slave In GPIO pin number.
	78 #define SPIMO_MISO_PIN 28 // SPI Master In Slave Out GPIO pin number.
	79 #define SPIMO_SS_PIN 12 // SPI Slave Select GPIO pin number.
1	80 station SDIM1 SCY DIN 2 // SDI clock (DIO pin pumber
	or starting Serving Scale 2 // SPI Clock GPIO pin number.
💷 Project 🥎 Books 😯 Func 🛛 🛓 Temp	

- 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 Perin	herals Tools	SVCS Window Help	_
		9 (8) (# 1# 1/2) (28) hand	
	× € क क ⊷⊡ ≪ ∎		
Project			- 1
	1 -		-
A Source Code	2	*	Ē
H- H main.c	3	* The information contained herein is property of Nordic Semiconductor ASA.	
🖻 🔄 Libraries	4	RDIC	
👜 🛃 ble_advdata.c	5	JLink - Cortex Error: C:\Keil_v5\ARM\PACK\NordicSemiconductor\nRF_DeviceFa	
💼 🔝 app_timer.c	7	ormation. NO	
i app_button.c	8	removed from	
softdevice_handler.c	9	Cannot Load Hash Programming Algorithm !	
ble_debug_assert_handler.c	10		
er_codecs	11		
ser_codecs_mw	13 E	OK	
er_etis	14		
E car bal carial	15	* @defgroup ble_sdk_app_dtm_main main.c	
	16	* 61	
	17	μVision	
. V benee	10	A THE.	
	20	* 1 Mactivation example.	
	21	*/ Error: Flash Download failed - "Cortex-M0"	
	22		
	23	#inc	
	29		
	26	ind in the second sec	
	27	\$incase approximation	
	28	<pre>#include "ble_advdata.h"</pre>	
	29	finclude "ble dtm app.h"	
	30	finclude "postas.n"	
	32	#include "softdevice handler.h"	
	33	-	
	34	<pre>#define DTM_INIT_BUTTON_FIN_NO BUTTON_0 /**< Button to initializing DTM mode or</pre>	n co
	35	tisfing PEADY IED DIN NO. IED 0 /tt/ IED indicating that the example in	
	37	#define DTM READY LED PIN NO LED 1 /**< LED indicating that the connectiv:	itv
	38	#define ASSERT LED PIN NO LED 7 /**< Is on when application has asserted	ed.
	39		
🖬 Project 🎯 Books {} Functions 🗛 Templates	•		•
Build Output			¢
Watchpoints: 2 JTAG speed: 2000 kHz			
Insufficient RAM for Flash Algorith	ms !		
crase failed:			
Error: Flash Download failed - "C	ortex-M0"		
•			•
		* JLink Info: FPUnit: 4 code (BP) slots and 0 literal s J-LINK / J-TRACE Cortex L:1 C:1	

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 C Use Simulator Settings	Unker Debug Utilities	Debug Trace Rash Download Oownload Function Name C Erase Full Chip IV Program RAM for Algorithm RAM for Algorithm
Load Application at Startup Run to main() Initialization File:	I Load Application at Startup I Run to main() Initialization File:	C Erase Sectors Verfy C Do not Erase Preset and Run Programming Algorithm
E dit	Edit	Description Device Size Device Type Address Bange
Restore Debug Session Settings	Restore Debug Session Settings If Breakpoints If Toolbox If Watch Windows If Memory Display	nRF5 box 2M On chip Rash 00000000H - 001FFFFFH
CPU DLL: Parameter:	Driver DLL: Parameter:	Stat: Size:
Jalog DLL: Parameter: DARMCM1.DLL (pCM0 OK Ca	Dialog DLL: Parameter: TARMCM1.DLL [pCM0	Add Hemove

6. Click OK and load again the project.

C:\Keil v5\ARM\



Direct Test Mode Testing

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

<u>File View n</u> RF8	ile <u>V</u> iew <u>n</u> RF8001 Setup <u>H</u> elp		
eatures	X Direct Test Mode I	IART interface	
▲ 2.4 GHz	Seturnen		
 Front-End le TX carrie 	Secupion		
RX const	Com port COM28	 Refresh list of com ports 	
TX/RX c.	. Mode		
RX sensit	🧿 Transmit	Receive	
nRF8001 Co.	Channel		
Dispatcher			
Trace Transl.	. Single	C Sweep	
Direct lest	Channel	19	
	Payload model	Constant carrier	
	Pavload length	1 bytes	
	Packets received	N/A	
		Start test	
evice Manager	×		
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-AL-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-AL-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_11 // P0_06 by default (could be defined/changed on the main source code. For the ISP1507-AL, P0_06 does not exist and we have replaced by P0_11)
 - CTS to P0_14 // P0_07 by default (could be defined/changed on the main source code. For the ISP1507-AL, P0_07 does not exist and we have replaced by P0_14)
 - RTS to P0_15 // P0_05 by default (could be defined/changed on the main source code. For the ISP1507-AL, P0_05 does not exist and we have replaced by P0_15)

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 Project then Open Project in order to open UART_example application: ...\nRF5_SDK_15.0.0\examples\peripheral\uart\pca10040e\arm5_no_packs\uart_pca10040e.uvprojx
- 3. Click Build Target and Load.

Note

Nordic have already generated the hex file "uart_pca10040e.hex" available on the SDK folder, for example:

...\nRF5_SDK_15.0.0 \examples\peripheral\uart\hex\uart_pca10040e.hex

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



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	
	*
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: **S112** (or **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-AL-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_11 // P0_06 by default (could be defined/changed on the main source code. For the ISP1507-AL, P0_06 does not exist and we have replaced by P0_11)
 - CTS to P0_14 // P0_07 by default (could be defined/changed on the main source code. For the ISP1507-AL, P0_07 does not exist and we have replaced by P0_14)
 - RTS to P0_15 // P0_05 by default (could be defined/changed on the main source code. For the ISP1507-AL, P0_05 does not exist and we have replaced by P0_15)

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.

S112 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\s112\hex\s112_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\s112\arm5_no_packs\ble_ app_uart_pca10040e_s112.uvprojx
- 3. Click Build Target and Load.

Note

Nordic have already generated the hex file "ble_app_uart_pca10040e_s112.hex" available on the SDK folder, for example:

...\nRF5_SDK_15.0.0\examples\ble_peripheral\ble_app_uart\hex\ble_app_uart_pca10040e_s112.hex

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



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.

* ¥ © ™.# 24% ± 11:11.	■ *¥@ ™⊿24% ± 11:11	■ * ¥ Ø ⊞ ⊿ 24% ■ 11:11 ■ nRF UART v2.0	nRF UAF	RT v2.0	*¥⊘ ₩	C (3 9 24% 11:11 st UART 7 8 9 0 U i 0 p	
Connect	nRF UART v2.0 ^{00nnect}	Disconnect		Discon	nect		
	Select a device III Nordic_UART Rssi = -83 C19AA22003870 Rssi = -81 P775-648993200 Rssi = -81	[11:11:17] Connected to: Nordic_UART	[11:11:17] Conne [11:11:28] TX: all	cted to: No o	rdic_UART		
	Cancel						Send
			Device: Nordic_I	UART - ready	/		_
			LEAT	je		pour	>
			123	4 5	6 7	8 9	9 0
			a z e	r t	y u	i	p p
			q s d	f g	h j	k	m
Send	Send	Send	★ w	xc	v b	n	
Device: <select a="" device=""></select>	Device: <select a="" device=""></select>	Device: Nordic_UART - ready	Sym ,*	 Français 	s(FR) ▶	$\left \cdot \right $	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	12C 12C-2 12CMisc Misc	In Clear Freeze ?
Display As ← Ascii ← Ansi ← Hextspace] ← Hextspace] ← Hextspace] ← Hextspace] ← Hextspace] ← Hextspace] ← Hit ← Hoat4 ← HextSV	Half Duplex newLine mode Invert ZBits Big Endian Data Frames Bytes 2 € Single Gulp Terminal Eont 16 € 80 €	C 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 Raw 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 Misc Misc	ear Freeze ?
yes Send Numbers Send ASCI ✓ Send Numbers Send ASCI ✓ Send Numbers Send ASCI ✓ +CR ✓ +CR ✓ +CR ✓ +CR ←	Status Disconnect RXD (2) TXD (3) CTS (8)
U C LF Repeats 1 C Literal Strip Spaces +crc SMBUS 0	DCD (1)
c:\temp\capture.txt	DSR (6)
	BREAK
You can use ActiveX automation to control me! Char Count:10 CPS:0 Port	: 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	р
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.

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.

PPLICATION NOT

SP1507-AL-T

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.
- Start Master Control Panel or launch "nRF Connect" app. 3.
- Scan and search the ISP1880 sensor. 4.

lt's <mark>all</mark> 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

Document Ref: isp_ble_AN181103_R0.docx



D 🖬 🕙 ·	*	* @	Ver 👫 🗐 30% 🗎	14:04
		D	ISCONNECT	:
BONDED	ADVERTISER	ISP F7:	2 1880 51:36:EA:4A:A3	×
CONNECTED NOT BONDED	CLIE	INT	SERVER	•
Generic Access UUID: 0x1800 PRIMARY SERVICE	E			
Generic Attribu UUID: 0x1801 PRIMARY SERVICE	ıte			
Device Informa UUID: 0x180A PRIMARY SERVICE	tion			
Unknown Servi UUID: b8c71100-d PRIMARY SERVICE	ce d70-4c5a-b872- ⁻ ≘	184ea	ac50d00b	
Unknown Servi UUID: b8c71200-d PRIMARY SERVICE	ce d70-4c5a-b872- ⁻ ≘	184ea	ac50d00b	
Unknown Servi UUID: b8c71300-d PRIMARY SERVICE	ce d70-4c5a-b872-′ ≘	184ea	ac50d00b	
	Wireless by Nor	dic		

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)

	≉ ≼ @ ₩	🏥 .il 22% 🗎 14:53	區 老咪雞溜 幣加 21% ◘ 14:55
≡	ISP1880 Sensor De	CONNECT	E ISP1880 Sensor De CONNECT
· . .	Environment sensors	() i	Environment sensors
		C.	
ENVI	RONMENT 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
ıĿ	Pressure		Pressure
1 080,00	D		1 080,00
1 040,00	0		1 040,00

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



※≼資證 # .il 21% □ 14:55 届				
≡ ISP1880 Senso	or DISCONNECT	≡ ISP1880 Sensor	DISCONNE	
Environment sensor	Temperature 🗹	Current motion	i	
	Pressure 🗹	Gravitation		
20 57 % 000 7		0.02 g -0.03 g	1.02 g	
29.37 6 999.7	Humidity 🗹	Angular Velocity		
ENVIRONMENT SETTING		2.73 dps 2.24 dps	3.01 dps	
		U Magnetic Field		
Temperature		113.16 uT -78.61 uT	-111.48 uT	
0,00		G Gravitation		
20,00		Gravitation		
10,00		2,00		
0,00				
	Time	1,00		
10,00 14:55:09:902 14:55:12:847	14:55:15:868 14:55:23:074	0.00		
 Temperature (°C) 				
I. Pressure		-1,00		
i ressure			Groutettee	
080,00		-2,00 55:39:41 55:39:59 55:39:80 55:39:99	55:40:18 55:40:39	
040,00		- Gravity X - Gravity Y - Gravity Z		

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.



