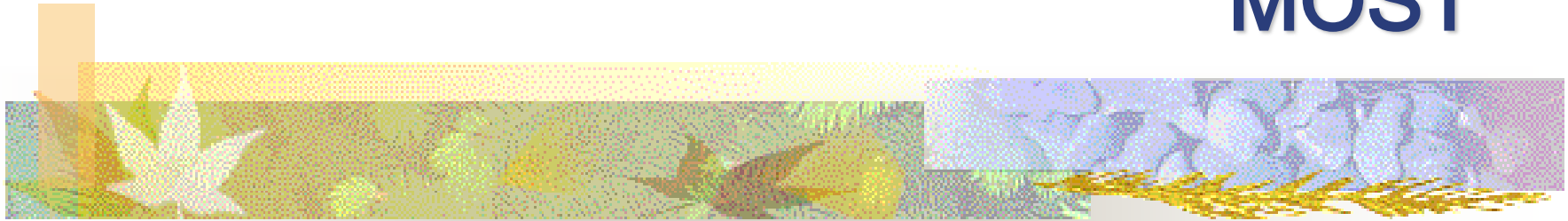


Module : LSN8001

FCC Qualification Application to MOST



by Li Seng Technology Ltd.
Rev 1.1 Jan-2013

Aims & Content

Content :

User Manual / User Guide

FCC Statement

Label of End Product

User Manual of End Product

Overview

Functional Block Diagram

Technical Description

Circuit Schematics

PCB Layout & Component Layouts

Part List

User Manual / User Guide (1/4)

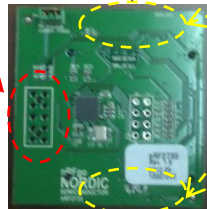
Parts Description & Before Installation :

⚠: Antenna
Protection Cap :
Remove before
Test



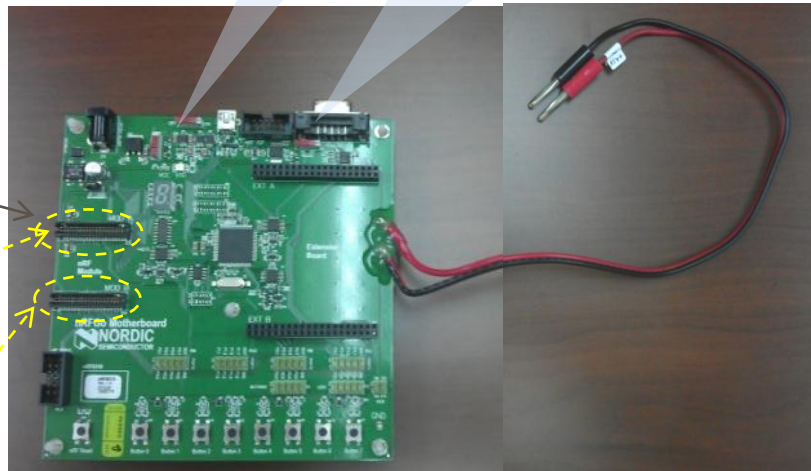
**Li Seng Bluetooth
BLE Module
LSN8001 x2**

⚠: Connection Socket
Position



**Adaptor
Board
nRF2735 x1**

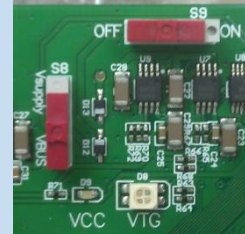
⚠: Side Switch Setting
> RS232 → ON
> S8 → VBUS
> S9 → OFF
> Power Source (Banana
Plug) : 4.5V DC



**Mother Board
nRF6310 x1**

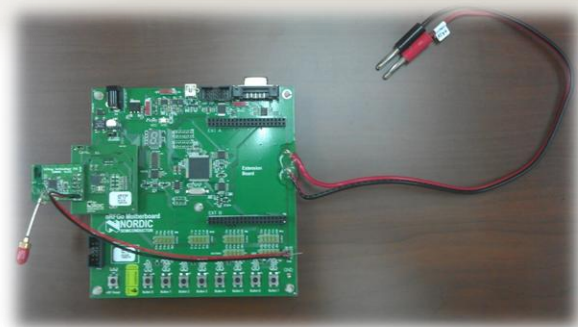


**Tx / Rx
Cable x1**



User Manual / User Guide (2/4)

Installation :



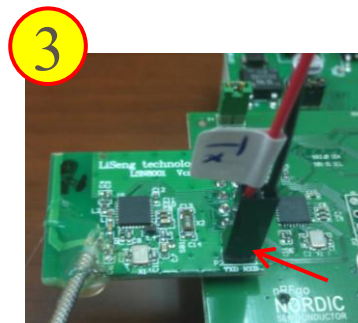
Finished Assembly



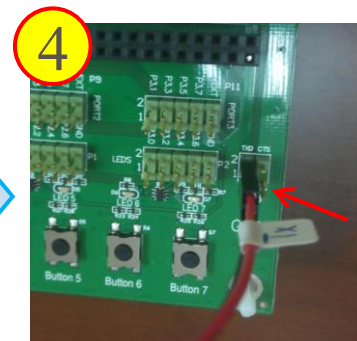
1) Place the “Adaptor Board nRF2735” on “Mother Board nRF 6310”



2) Place the “Li Seng Bluetooth BLE Module LSN8001” on “Adaptor Board nRF2735”



3) Connect “Tx/Rx cable” on “Li Seng Bluetooth BLE Module LSN8001”

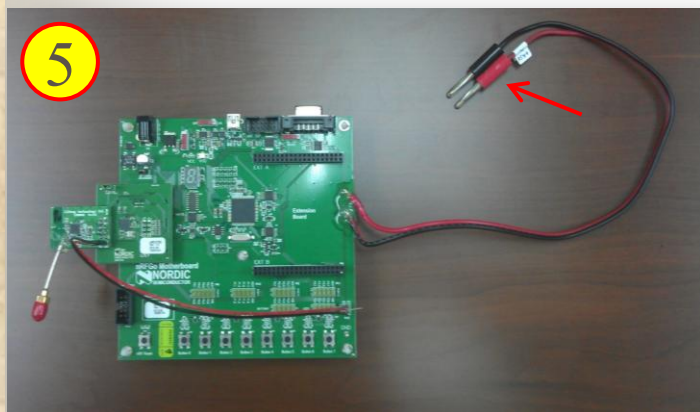


4) Connect “Tx/Rx cable” on “Mother Board nRF6310”

Remove “Antenna Protection Cap” and Connect to **Testing Equipment**

User Manual / User Guide (3/4)

Installation :



5) Connect Power Source by
“Banana Plug” 4.5V DC
(Beware of + & -)



6) Power On the Unit by
Power ON Slide Switch S9



7) The Unit is Ready
for Testing



8) Power OFF the unit by Switch OFF
the Slide Switch S9 **after** Testing

User Manual / User Guide (4/4)

Direct Test Mode :

The DTM RS232 interface :
Baud Rate : 192000
Number of data bits : 8
No Parity
1 Stop bit
No flow control (meaning no RTS/CTS)

5.1 Setting up the hardware for testing with Direct Test Mode

1. Mount the nRF8001 SCC module (either nRF2740 or nRF2741) and the carrier board (nRF2735) onto the nRFgo Motherboard.
2. Connect the patch cable between **P15** on the nRFgo Motherboard and **P2** on the nRF8001 SCC module (nRF2740 or nRF2741). Make sure the RXD/TXD labels match for each wire.
3. Connect the nRFgo Motherboard to your computer using a USB cable. Make sure switch **S11** is **ON**.
4. Connect a serial cable from **RS232** to the serial port on your computer.
5. You are now ready to begin testing with Direct Test Mode in nRFgo Studio.

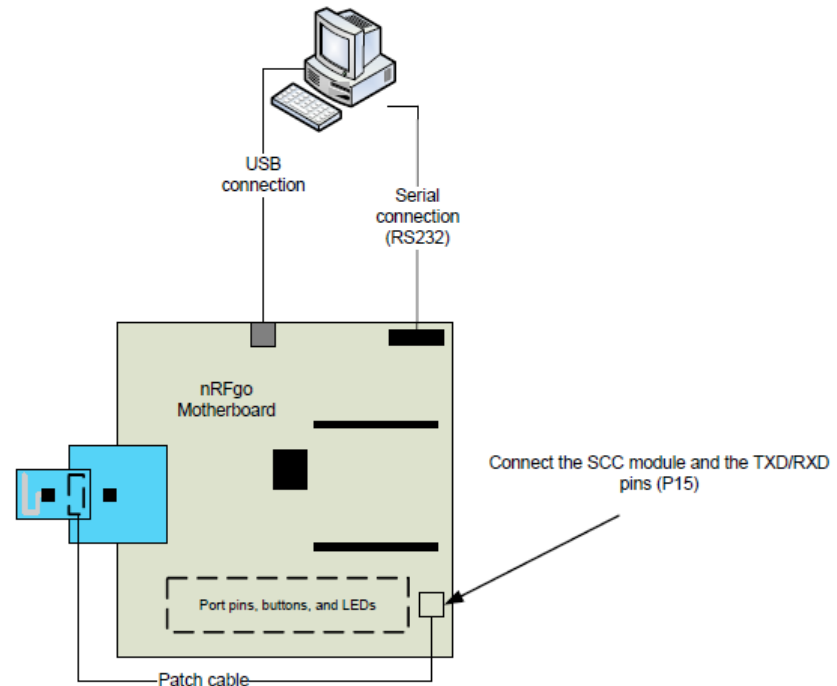


Figure 4. Hardware setup for testing with Direct Test Mode



FCC statement :

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

Label Of The End Product :

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: RR3-LSN8001 ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Overview

LSN8001 Module Apply to Bluetooth Low Energy (4.0) as Bluetooth Smart.

Key Features

- *Bluetooth* low energy peripheral device
- Stack features:
 - Low energy PHY layer
 - Low energy link layer slave
 - Low energy host for devices in the peripheral role
 - Proprietary Application Controller Interface (ACI)
- Hardware features:
 - 16 MHz crystal oscillator
 - Low power 32 kHz ± 250 ppm RC oscillator
 - 32.768 kHz crystal oscillator
 - DC/DC converter
 - Temperature sensor
 - Battery monitor
 - Direct Test Mode interface
- Ultra low power consumption
- Single 1.9-3.6V power supply
- Temperature range -40 – 85°C
- Compact 5×5 mm QFN32 package
- RoHS compliant

Applications

- Sport and fitness sensors
- Health care sensors
- Proximity
- Watches
- Personal User Interface Devices (PUIID)
- Remote controls

Electrical Data Reference of LSN8001 Module

LSN8001 Key performance data

Parameter	Min	Typ	Max
Supply range (V)	1.9		3.6
Temperature range (°C)	-40		85
Output power (dBm)	-18		0
Sensitivity (dBm)		-87	
Sleep current (uA)		0,5	
Base current, active (uA)		2	
I _{TX} (mA) (0 dBm)	Linear	13	
	DCDC	11	
I _{RX} (mA)	Linear	14	
	DCDC	12	

Module Supply Power : 1.9V to 3.6 V DC

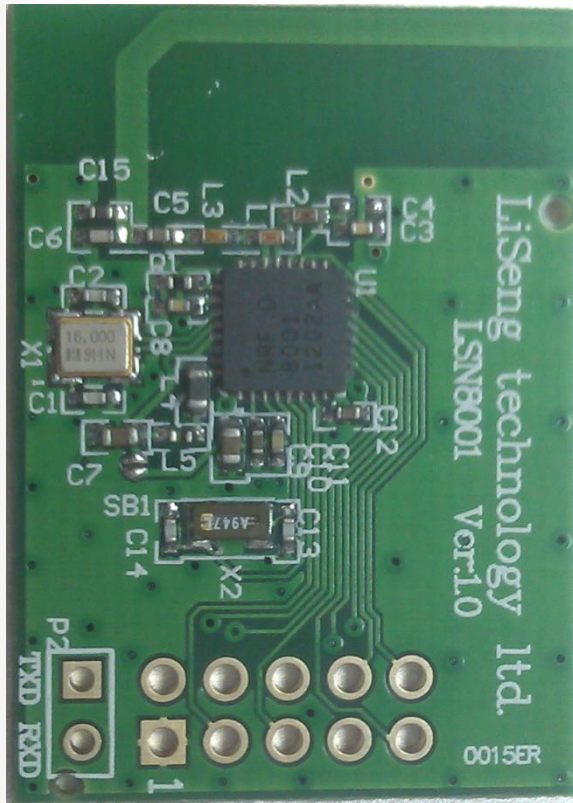
1 Power supply needed

87 dB link budget

It is all about power consumption:

- **LSN8001 offer the lowest peak current on the market**
 - Allows low peak current capacity of power supply (battery)
- **Average current consumption decided by on air activity and amount of user data transferred**
 - *Bluetooth* low energy profile decides on air activity
 - Application decides amount of user data

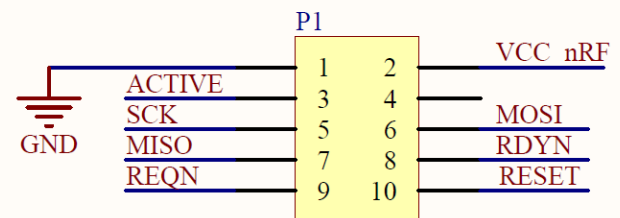
Technical Description



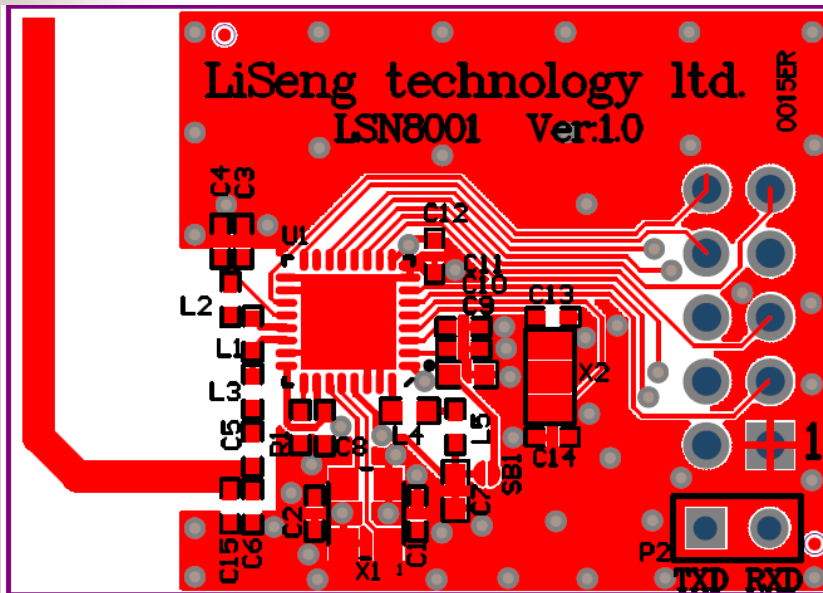
Module Dimension : 33 x 23 x 3 (15.0)mm

Pin number	Connector P1
1	GND
2	VCC_nRF
3	ACTIVE
4	Not in use
5	SCK
6	MOSI
7	MISO
8	RDYN
9	REQN
10	RESET

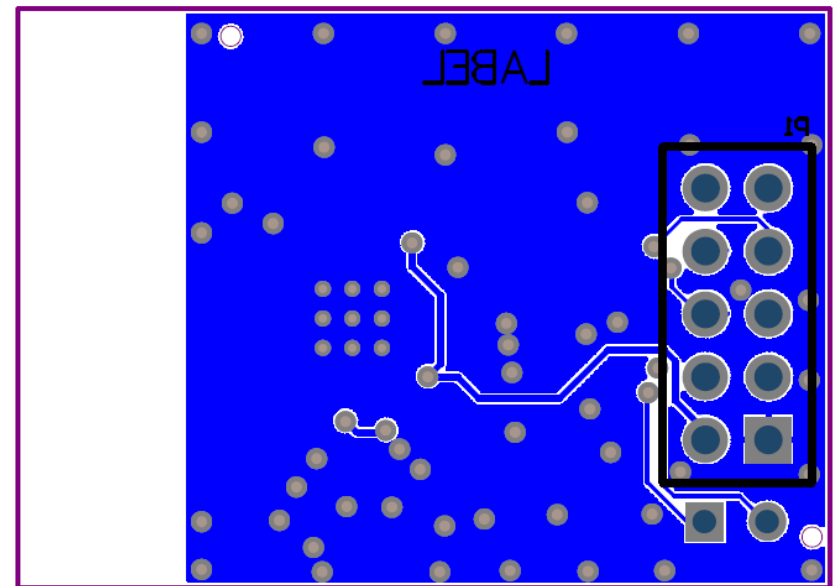
Interface to Application processor



PCB & Components Layout



Front



Rear

Part List

Bill of material

PCB: LSN8001

Version: 1.0

Designator	Value	Footprint	Description	Comment	Quantity	Digi-Key part number	Farnell part number
C1, C2, C13, C14	15pF	0402s	Capacitor	NP0 +/- 2%	4		
C3	2.2nF	0402s	Capacitor	X7R +/- 10%	1		
C4	NA	0402s	Capacitor	Not mounted	0		
C5	1.8pF	0402s	Capacitor	NP0 +/-0.1pF	1		1650788
C6	1.2pF	0402s	Capacitor	NP0 +/-0.1pF	1		
C7, C9	1.0µF	0603s	Capacitor	X7R +/- 10%,TAIYO YUDEN - LMK107B7105KA-T	2	587-1242-1-ND	1683674
C8	1.0nF	0402s	Capacitor	X7R +/- 10%	1		
C10, C12	100nF	0402s	Capacitor	X7R +/- 10%	2		
C11	33nF	0402s	Capacitor	X7R +/- 10%	1		
C15	1.5pF	0402s	Capacitor	NP0 +/-0.1pF	1		
L1	8.2nH	0402s	Inductor	+/-5%, Murata LQP15MN8N2B02D	1		
L2	5.6nH	0402s	Inductor	+/-5%, Murata LQP15MN5N6B02D	1		
L3	3.9nH	0402s	Inductor	+/-5%, Murata LQP15MN3N9B02D	1		
L4	10µH	0603s	Inductor	I _{DC,min} = 50mA, +/-20%, TAIYO YUDEN - LBMF1608T100K	1	587-1714-1-ND	178-6105
L5	15nH	0402s	Inductor	+/-10%, TAIYO YUDEN - HK100515NJ-T	1	587-1521-1-ND	6581328
P1		HDR2x5 - small	Header, 5-Pin, Dual row, B=5.8mm, A=5.3mm	Fisher Elektronik, SL2/53/72G 2x36-pin 2.54mm	1		
P2		HDR1X2	Header, 2-Pin	UART	1		
R1	22k	0402s	Resistor	1%	1		
U1	nRF8001	Nordic_QFN50P500X500X90-33N	2.4GHz Single chip Bluetooth low energy	QFN32 5x5	1		
X1	16MHz	3.2 x 2.5 mm	Crystal	Epson-Toyocom TSX-3225, 16MHz, Cl=9pF, Total tolerance (at 25°C + temp. drift + aging) = ±50ppm max, ESR=100Ω max, C0=7pF max, Operating temperature range = -20°C to +70°C min.	1		
X2	32.768kHz	3.2 x 1.5 mm	Crystal	FC-135, 32.768kHz, Cl=9pF, Frequency tolerance = ±20ppm, Operating temperature range = -20°C to +70°C min.	1		1278037



Thank You ~!

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