

Nox Bluetooth LE Module (NOXBLEMOD)

Installation Guide

REV02

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1 Introduction

1.1 Purpose

This document describes how to integrate the *Nox Bluetooth LE Module (NOXBLEMOD)* into a product as a Bluetooth module.

Incorrect integration or use may infringe compliance rules, i.e. recertification may be required.

1.2 Module Description

The *Nox Bluetooth LE Module (NOXBLEMOD)* is a Bluetooth 5.0 and Bluetooth LE module based on a HW solution using the nRF52840 SoC chipset, a QFN package SoC by Nordic Semiconductor. The SoC is capable of concurrent (simultaneous) central role + peripheral role operation for use cases where connected to multiple sensors as master (central) and connected to mobile device as slave (peripheral). The module contains a Bluetooth PCB F-type antenna, designed for 2.45 GHz.

2 Module Integration

2.1 Module placement on a Carrier Board

Below pictures show examples of recommended placements for the *Nox Bluetooth LE Module (NOXBLEMOD)* on a carrier board (mother board). As can be seen, the module should be placed in a corner for best antenna performance.

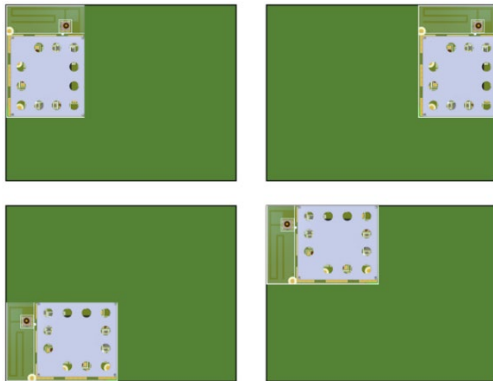


Figure 1: Examples of good placement of module on carrier board

The size of the carrier board should be significantly larger than the module itself as illustrated above, while smaller size may be feasible if the application does not require optimal antenna performance.

For completeness also a few examples of bad module placements are illustrated below. As can be understood from below examples is that the antenna of the module should not be oriented as illustrated in below bad examples.

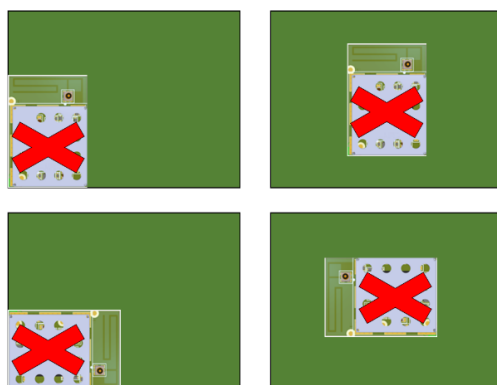


Figure 2: Examples of poor placement of module on carrier board

2.2 GND plane removal under Antenna

When placing the *Nox Bluetooth LE Module (NOXBLEMOD)* onto a carrier board there need to be a GND “cut out area” on the carrier board under the

antenna as illustrated below. The GND cut out area shall be on all PCB layers, and no other signals should be routed in this area.

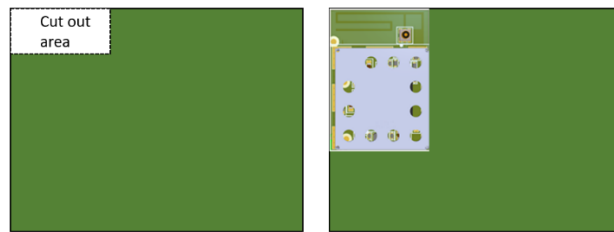


Figure 3: Example of GND cut out area under module antenna area

2.3 Considerations for nearby Materials

The placement of the *Nox Bluetooth LE Module (NOXBLEMOD)* onto a carrier board may depend on the product mechanical design, e.g. plastic housing, placement of any connectors, cables etc. The general recommendation is to try to avoid any material close to the antenna of the module. Especially metal or components containing metal (e.g. batteries) may negatively affect antenna performance, while also plastic material can affect the antenna if placed near the antenna. When possible, keep distance of > 5 mm between antenna and any nearby material.

For wearable applications, where the module antenna may be located close to the human body there is a significant risk of poor antenna performance due to body losses. Here, special consideration of the antenna placement and design is typically required. Therefore, the general recommendation is to try placing the module as far as possible from the body in wearable applications.

2.4 Other PCB related considerations

The *Nox Bluetooth LE Module (NOXBLEMOD)* is designed for robust wireless performance in environments where other interfering radio systems may be present. The *Nox Bluetooth LE Module (NOXBLEMOD)* exposes all (IO) pins for use in an end product application. The pinout uses 2 rows of pads, implying a multi-layer PCB design if the application makes use of many IO pins.

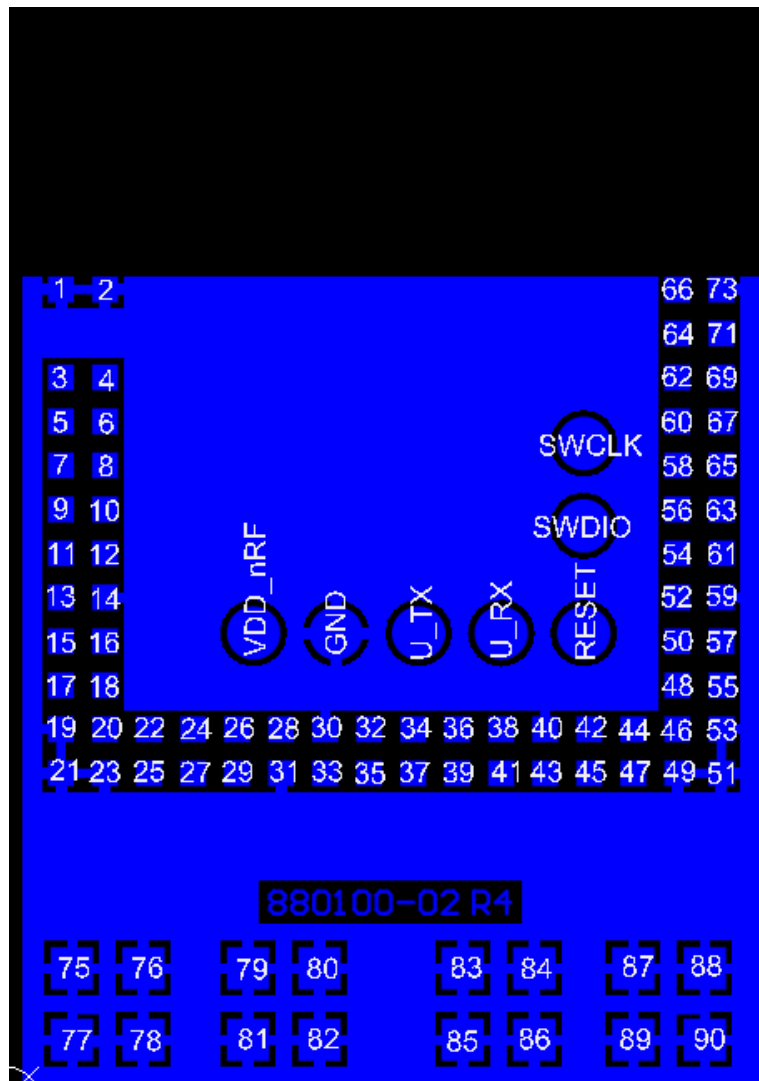


Figure 4 Nox Bluetooth LE Module pin numbering (top view)

The assumption is that typically a multi-layer PCB with micro vias is needed, i.e. micro vias used between the outer top layer where the module is placed and the signal layer directly under the top layer. One PCB layer of the carrier board should be a solid GND plane. All GND pads of the module should be connect with a dedicated via to this GND plane.

Since the module design include all required decoupling capacitors there are normally not any need for external components, however this may depend on power supply architecture of the application carrier board design. If external capacitors are used these should be placed close to the module for best EMI performance.

Even if the nRF52840 based *Nox Bluetooth LE Module (NOXBLEMOD)* is flexible in how to use GPIO pins, the designer should be aware of the limitations related to general purpose GPIO pins and low speed GPIO pins.

When it comes to PCB design and routing ,the signal integrity should be considered. Especially the higher speed interfaces, such as SPI or USB, while

low speed control signals and communication interfaces (e.g. I2C) are normally not critical.

3 Regulatory Information

3.1 FCC

This device complies with Part 15 of FCC Rules, Operation is Subject to following two conditions:

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

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

This device and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter except in accordance with FCC's multi-transmitter procedures.

IMPORTANT NOTE:

FCC Radiation Exposure Statement; Co-location of this module with other transmitter that operate simultaneously are required to be evaluated using the FCC multi-transmitter procedures.

This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. The device contains an integral antenna hence, the device must be installed to so that a separation distance of at least 20cm from all persons.

This module and complies with the safety requirements for portable RF exposure in accordance with FCC rule part §2.1093 and KDB 447498 D01.

3.2 ISED Canada

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

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

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

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This device and its antenna must not be co-located with any other transmitters except in accordance with IC multi-transmitter product procedures.

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionner en association avec une autre antenne ou transmetteur.

IMPORTANT NOTE:

IC Radiation Exposure Statement:

RF Exposure:

This module can be used in mobile applications with a separation distance of at least 20 cm from all persons in accordance with RSS-102, Issue 5.

This device complies with the safety requirements for RF exposure in accordance with RSS-102 Issue 5 for portable use conditions with a head/body separation distance of 10 mm and a limb-worn (extremity) separation distance of 5 mm.

Exposition RF:

Ce module peut être utilisé dans des applications mobiles avec une distance de séparation d'au moins 20 cm par rapport à toutes les personnes, conformément à la norme RSS-102, édition 5.

Cet appareil est conforme aux exigences de sécurité relatives à l'exposition aux radiofréquences conformément à la norme RSS-102, édition 5, pour les conditions d'utilisation portables avec une distance de séparation tête / corps de 10 mm et une distance de séparation des extrémités de 5 mm (membres).

INTEGRATION INFORMATION FOR THE OEM: It is the responsibility of the OEM / Host product manufacturer to ensure continued compliance to FCC and ISED Canada certification requirements once the module is integrated into the Host product. Please refer to FCC KDB 996369 D04 for additional information.

The module is subject to the following FCC rule parts: 15.207, 15.209 and 15.247

3.3 Host Product

3.3.1 Host Product User Guide Information

FCC Compliance

This device complies with Part 15 of FCC Rules, Operation is Subject to following two conditions:

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

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

This device and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter except in accordance with FCC's multi-transmitter procedures.

IMPORTANT NOTE:

FCC Radiation Exposure Statement; Co-location of this module with other transmitter that operate simultaneously are required to be evaluated using the FCC multi-transmitter procedures.

If the host manufacturer uses the module in a Mobile configuration then the following text is placed in the host product, user guide:

This device complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. The device contains an integral antenna hence, the device must be installed to so that a separation distance of at least 20cm from all persons.

OR

If the host manufacturer uses the module in a Portable configuration then the following text is placed in the host product, user guide:

This device complies with the safety requirements for RF exposure for portable use conditions in accordance with FCC rule part 2.1093 and KDB 447498 D01.

ISED Canada Compliance

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with IC multi-transmitter product procedures.

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnement en association avec une autre antenne ou transmetteur.

IMPORTANT NOTE:

IC Radiation Exposure Statement:

If the host manufacturer uses the module in a Mobile configuration then the following text is placed in the host product, user guide:

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum separation distance of 20 cm between the device and all persons.

Cet équipement est conforme aux limites d'exposition au rayonnement IC RSS-102 définies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance de séparation minimale de 20 cm entre l'appareil et toutes les personnes.

OR

If the host manufacturer uses the module in a Portable configuration then the following text is placed in the host product, user guide:

This device complies with the safety requirements for RF exposure in accordance with RSS-102 Issue 5 for portable use conditions.

Le présent appareil est conforme aux limites d'exposition aux RF conformément au norme CNR-102 émission 5 pour conditions d'utilisation portable.

3.3.2 Host Product Label

The host product must be labelled with the following information:

"Contains FCC ID: V5A-NOXBLEMOD"

"Contains IC: 25077-NOXBLEMOD"

"This device complies with Part 15 of FCC Rules, Operation is Subject to following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received including interference that cause undesired operation."

Important Notice to OEMs: The FCC Part 15 text must go on the Host product unless the product is too small to support a label with the text on it. It is not acceptable just to place the text in the user guide.

3.4 E-Labeling

It is possible for the Host product to use e-labelling providing the Host product supports the requirements of FCC KDB 784748 D02 e labelling and ISED Canada RSS-Gen, section 4.4.

E-labelling would be applicable for the FCC ID, ISED Canada certification number and the FCC Part 15 text.

3.5 Changes in Usage Conditions of this Module

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with FCC and ISED Canada multi-transmitter product procedures.

If the device is co-located with multiple antennas, the module could be subject to FCC Class 2 Permissive Change and ISED Canada Class 4 Permissive Change policy in accordance with FCC KDB 996396 D01 and ISED Canada RSP-100.

In accordance with FCC KDB 996369 D03, section 2.9, test mode configuration information is available from the Module manufacturer for the Host (OEM) product manufacturer.

NOTE: For ISED Canada Head/Body to antenna separation only:

In accordance with RSS-102, section 2.5.1, this module is exempt from Head/Body SAR testing when installed in a host product with a Head/Body to antenna separation distance of ≥ 10 mm.

If the module is to be used with a smaller separation distance than the above, SAR testing must be performed.