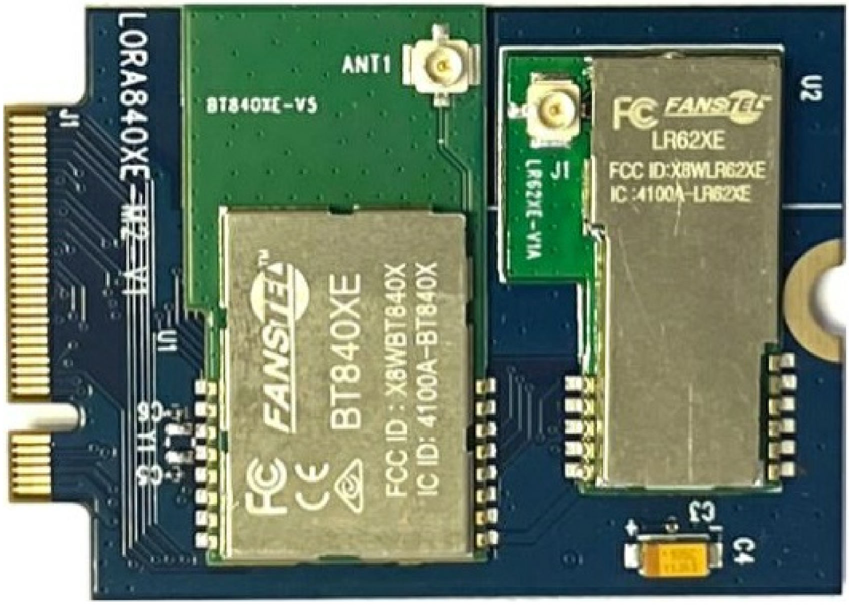
FANSTEL LR62C Lora Transceiver Module User Guide

Contents

FANSTEL LR62C Lora Transceiver Module



LoRa Sensor, Beacon Applications
LR62E1 and LR62C LoRa transceiver module uses a Semtech SX1262 sub-GHz radio transceiver. A chip antenna or an u.FL connector is on-board for the external antenna. In this document, LR62E1 or LR62C is referred to as LR62C.
It is paired with Fanstel BT840F, a Nordic nRF52840 BLE 5.3 module. The Cortex M4F MCU in BT840F manages LR62C through the SPI interface. BT840F GPIOs can be used for sensor data input or control output. Android OS app is available for field set-up through Bluetooth interface.
BT840F + LR62C pair can be used in the LoRaWANTM application. LoRaWan stacks are not available from Fanstel.

Cloud Connection, LoRa Gateway
The 2nd application example is in a gateway for connecting to a cloud server(AWS, Microsoft, Google, Fanstel development server, etc.) through Ethernet, WiFi, or LTE network.
BLE 5.3 module manages LR62C through the SPI interface.

LR62E1 Specifications:

- Semtech SX1262 transceiver.
- Size:10.2x15mm
- Uses a TCXO instead of the crystal in LR62E for better frequency stability.

LR62C Specifications:

- Semtech SX1262 transceiver with a chip antenna.
- Uses a TCXO resonator.
- Size: 10 x ?? mm.

M262E840F/M262C840F Combo:

- Combo modules for M.2 connector, B key.
- M262E840F: LR62E1, BT840F combo.
- M262C840F: LR62C, BT840F combo.

BT840F Specifications:

- Nordic nRF52 with ARM Cortex M4F at 64 MHz.
- Over-the-air (OTA) firmware update
- Flash/RAM: 1024KB/256KB
- 34 GPIOs
- 12 bit/200KSPS ADC, 8 configurable channels with programmable gain.
- 3X SPI Master/Slave (8Mbps)
- 3X 4-channel pulse width modulator (PWM)
- 2X 2-wire Master/Slave (I2C compatible)
- UART (with CTS/RTS and DMA)
- 128-bit AES HW encryption
- 5 x 32 bits, 3 x 24 bits Real Time Counters (RTC)
- Available NFC-A tag interface for OOB pairing
- Size: 30×42 mm for M.2 connector, B-key
- Operation temperature: -40°C to +85°C

Evaluation Board

- EV-LN60G for LR62E1 or LR62C combo with BT840F(M.2 module not included).

Model Summaries

module	LR62E1	LR62C	M262E840F	M262C840F
BLE module/Flash/RAM			BT840F/1MB/512KB	BT840F/1MB/512KB
Size	10.2×15.0mm		30x42mm, M.2, B key	30x42mm, M.2, B key
GPIO			34	34
Antenna LoRa/BLE	u.FL	Chip	u.FL/PCB	Chip/PCB
LoRa max. TX power, conducted/radiated				
BLE max. TX power, conducted/radiated			+8.5 dBm/+8.8 dBm	+8.5 dBm/+8.8 dBm
Certifications				
Availability				

Introduction

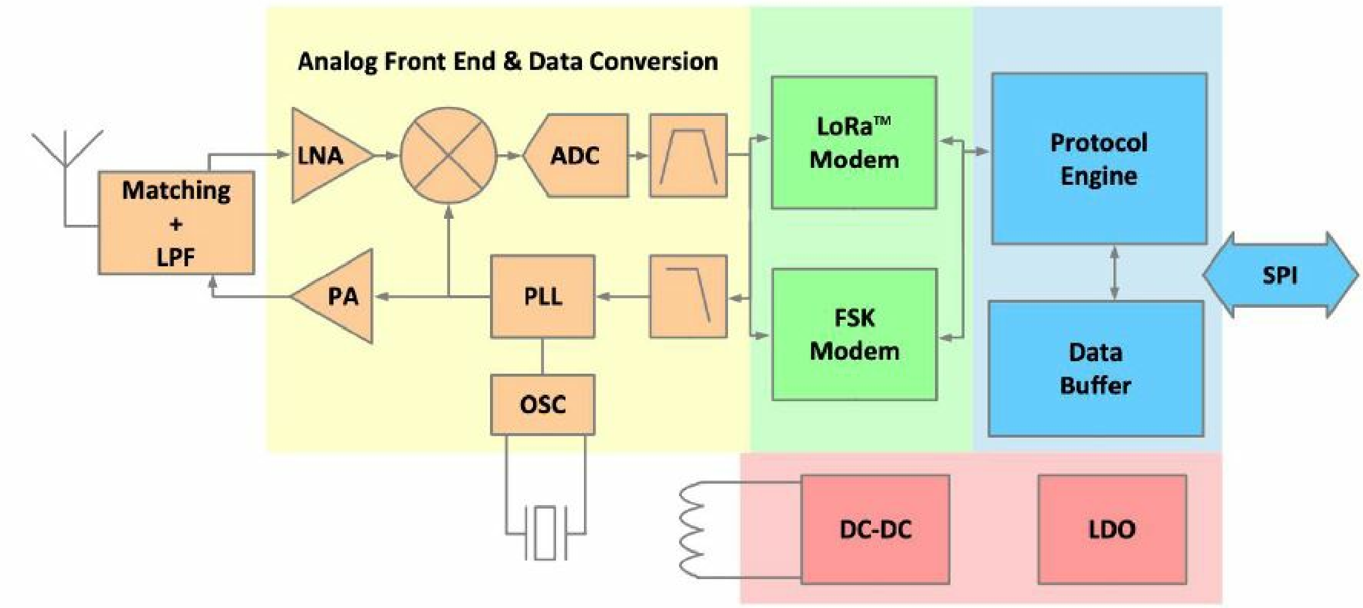
- LR62C LoRa module with Semtech SX1262 transceiver is ideal for long-range wireless applications. It can be paired with a BT840F BLE module in a LoRa sensor or beacon design. A smartphone can set up a sensor or beacon easily through Bluetooth interface.
- BT840F is a powerful, highly flexible, ultra-low power Bluetooth Low Energy (BLE) module using Nordic nRF52840 SoCs. With an ARM CortexTM M4F MCU, 1024KB flash, 256KB RAM, embedded 2.4GHz multi-protocol transceiver, and an integrated antenna, it allows faster time to market with reduced development cost.

- The second application example is in a gateway for connecting to a cloud server. A LoRa sensor or beacon can be connected to a cloud server through Ethernet, WiFi, or LTE network.
- It is possible to port LoRaWANTM stacks to Nordic nRF52 BLE SoCs. LoRaWANTM stacks are not available from Fanstel.

Product Overview

Semtech SX1262

Semtech SX1262 data sheets can be downloaded from this webpage.
https://www.fanstel.com/wirelessdocument.



A block diagram is below.

LR62E1

- A LoRa module with Semtech SX1262, 915 MHz.
- Uses a TCXO instead of a crystal for improved frequency stability.
- An u.FL connector for external antenna.
- 10 castellated pins.
- Size: 10.2x15mm.

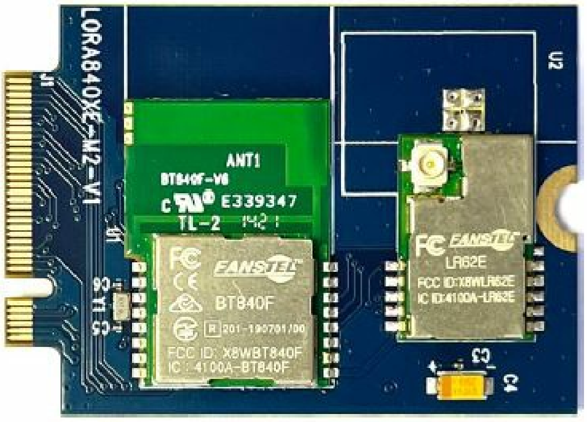
LR62C

- A LoRa module with Semtech SX1262, 915 MHz.
- Uses a TCXO instead of a crystal for improved frequency stability.
- A chip antenna is integrated.

- 10 castellated pins.
- Size: 10.2x ??mm.

M262C840F

- BT840F with + 8.5dBm TX power, an integrated PCB antenna.
- LR62C with a chip antenna.
- Size: 30x42mm
- For M.2 connector, 67 pins, B key.

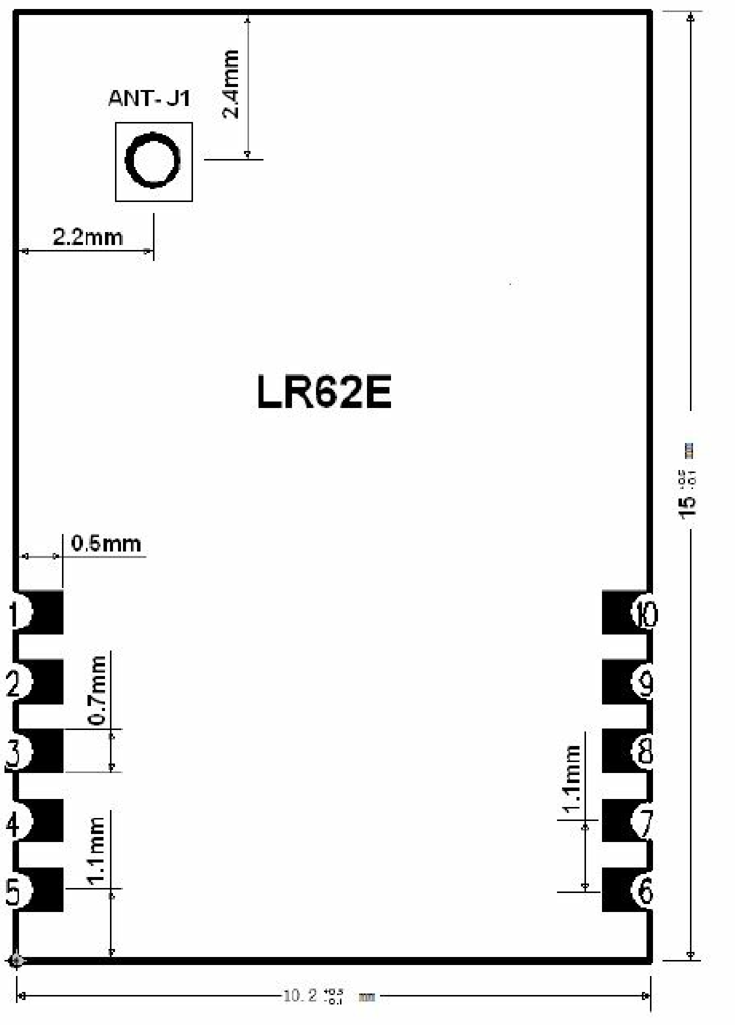


M262E840F

- BT840F with + 8.5dBm TX power, an integrated PCB antenna.
- LR62E1 with dBm TX power, an u.FL connector for external antenna.
- Size: 30x42mm
- For M.2 connector, 67 pins, B key.

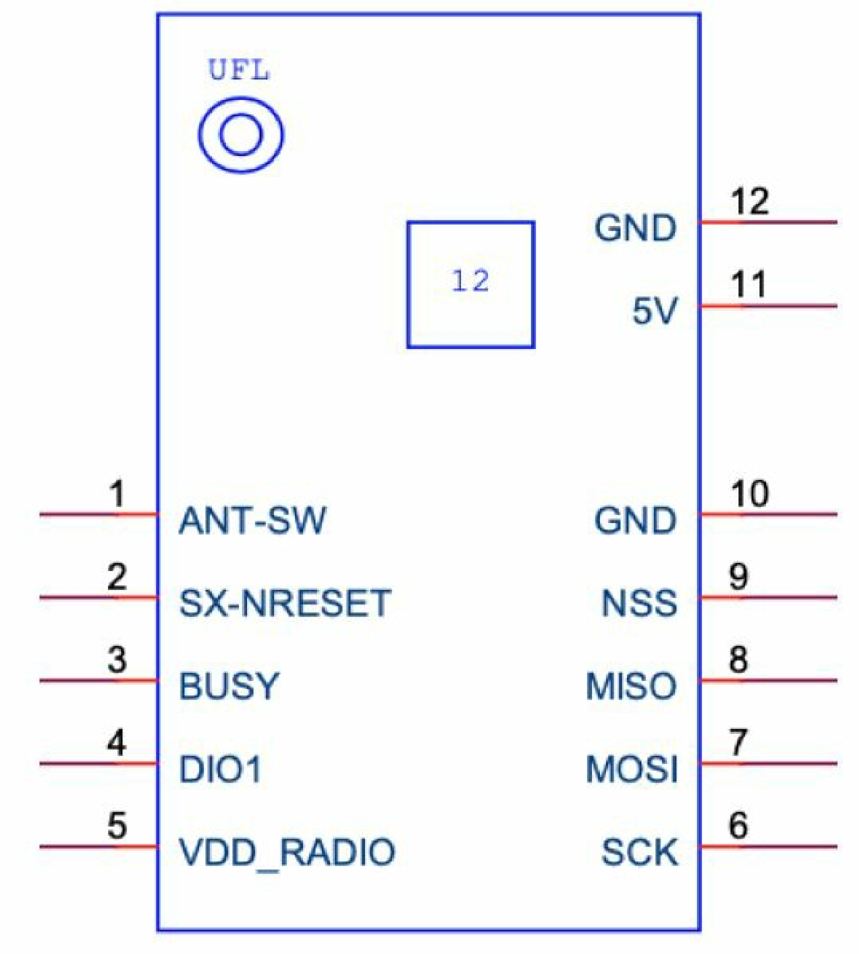
Mechanical Drawings

- The following are mechanical drawings of LR62E1 and LR62C, top view.
- Library components for PADS and EAGLE can be downloaded from http://www.fanstel.com/download-document/.
- For other PCB layout tools, please download the evaluation board Gerber files and extract the library component.



LR62E1 and LR62C Pin Functions

The following are LR62C pin assignments. Pin functions are in the table below. Please refer to Semtech SX1262 Product Specifications for detailed descriptions and features supported. It can be downloaded from: https://www.fanstel.com/wirelessdocument.



LR62C		SX1262	
pin#	pin name	pin#	Descriptions
1	ANT-SW		Antenna switch
2	SX-NRESET	15	Reset signal, active low
3	BUSY	14	Busy indicator
4	DIO1	13	Multiple-purpose Digital IO
5	VDD	1	DC input voltage, 1.8V to 3.7V
6	SCK	18	SPI clock
7	MOST	17	SPI Slave input
8	MISO	16	SPI Slave Output
9	NSS	19	SPI Slave Select
10	GND	20	Ground
11	5V		Power amplifier 5V regulated DC power input
12	GND		Power amplifier ground

M262840F/M262X840XE Pin Functions

M.2	nRF52840	BT840F	M262X840F	
pin#	pin#	pin#	Name	Descriptions
1				DC input for 3.3V regulator; 3.2V to 15V. 4.35V minimum if connected to USB-VBUS externally.
2	Y2	F4	BLE-VDDH	High voltage input for nRF52840/nRF5340, 2.5V to 5.5V
3				DC input for 3.3V regulator; 3.2V to 15V. 4.35V minimum if connected to USB-VBUS externally.
4	B1	9	VDD-3V3	Regulated 3.3V DC input, 800 mA minimum
5	AD2	F6	USB-VBUS	USB power supply, 4.35V to 5.5V.
6	B1	9	VDD-3V3	Regulated 3.3V DC input, 800 mA minimum
7	AD6	E4	USB DP	USB data pin
8		15	BLE-SWDCLK	Serial Wire Debug clock input for BLE
9	AD4	E5	USB DN	USB data pin
10	AC24	16	BLE-SWDIO	Serial Wire Debug data for BLE
11	B6	10	GND	Ground
12				
13				
14				
15				
16				
17				
18				
19				
20			GND	Ground
21	T2	11	P011	BLE GPIO
22			GND	Ground
23	AD22	12	P100	BLE GPIO
24	AD8	13	P013	BLE GPIO
25	U1	E6	P012	BLE GPIO
26	Y23	D5	P101	BLE_UART RXD
27	R1	E3	P109	BLE GPIO
28	AC13	14	P018/RESET	Reset for BT40F, Reset or P018 for BT840F
29	AC17	E2	P021	BLE GPIO

30	AC9	D4	P014	BLE GPIO
31	AC19	D1	P023	BLE GPIO
32	AC11	D3	P016	BLE-OTA
33	AD20	C1	P024	BLE GPIO
34	AC15	D2	P019	BLE GPIO
35	W24	C5	P102	BLE_UART-TXD

LR62E1, LR62C LoRa Modules

36	AD10	C4	P015	BLE GPIO
37	AD18	C2	P022	BLE GPIO
38	AD12	C3	P017	BLE GPIO
39	N1	B5	P008	BLE GPIO
40	AD16	E1	P020	BLE GPIO
41	L1	B4	P006	BLE GPIO
42	A8	B3	P031	BLE GPIO, analog input
43	P2	A6	P108	BLE GPIO
44	B9	B2	P030	BLE GPIO, analog input
45	M2	A5	P007	BLE GPIO
46	AC21	B1	P025	BLE GPIO
47	K2	A4	P005	BLE GPIO, analog input
48				No Connect
49	J1	A3	P004	BLE GPIO, analog input
50				No Connect
51	A10	A2	P029	BLE GPIO, analog input
52				No Connect
53	B11	A1	P028	BLE GPIO, analog input
54				No Connect
55	G1	1	P026	BLE_I2C, SDA
56				No Connect
57	H2	2	P027	BLE_I2C, SCL
58				No Connect
59	J24	8	P010	BLE_GPIO, NFC2
60				No Connect

61	L24	7	P009	BLE_GPIO, NFC1
62				No Connect
63	B13	6	P003	BLE_GPIO, AIN1
64				No Connect
65	A12	5	P002	BLE_GPIO, AIN 0
66				No Connect
67				No Connect
68				No Connect
69				No Connect
70				No Connect
71				No Connect
72				No Connect
73				No Connect
74				No Connect
75				No Connect

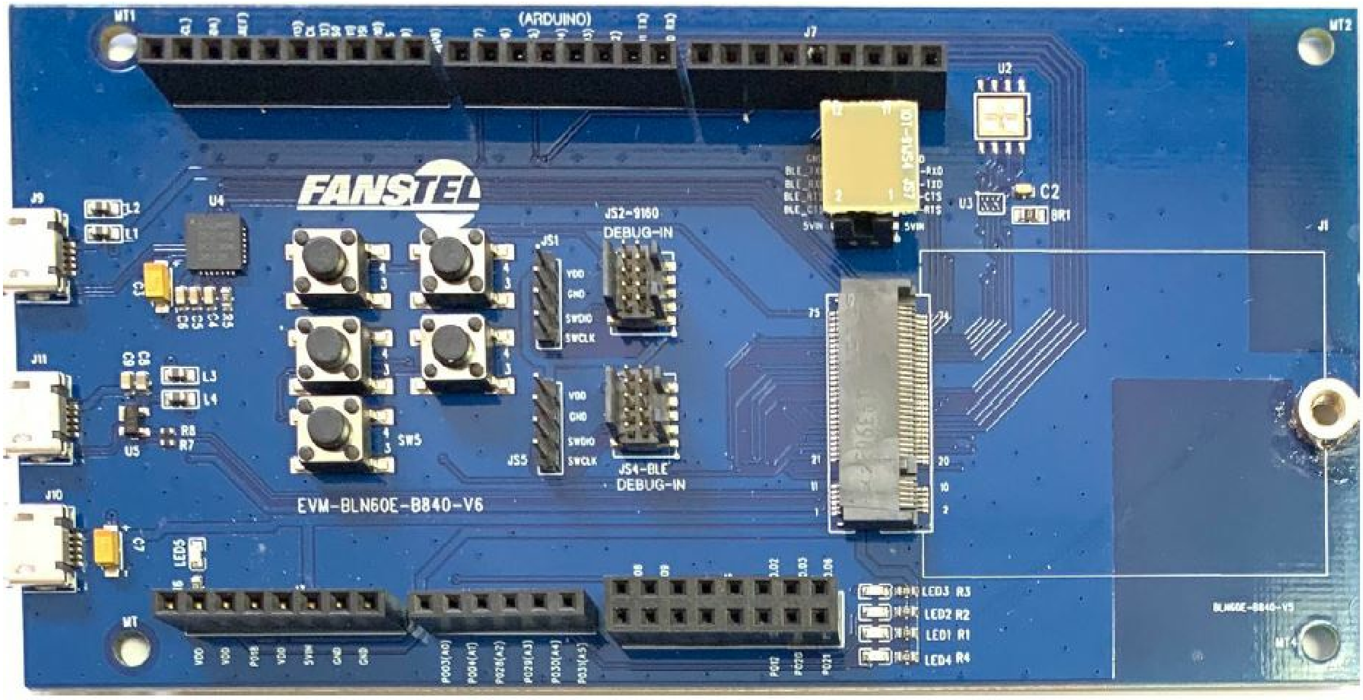
Transmission Power Settings

The conditions for LR62E to transmit at +20.3 dBm:

- Regulated 5V, 1.5 Amp DC power to the 5V pin.
- Regulated 3.3V DC power to the VDD pin.
- Set SX1262 TX power to +22 dBm.

Evaluation Boards

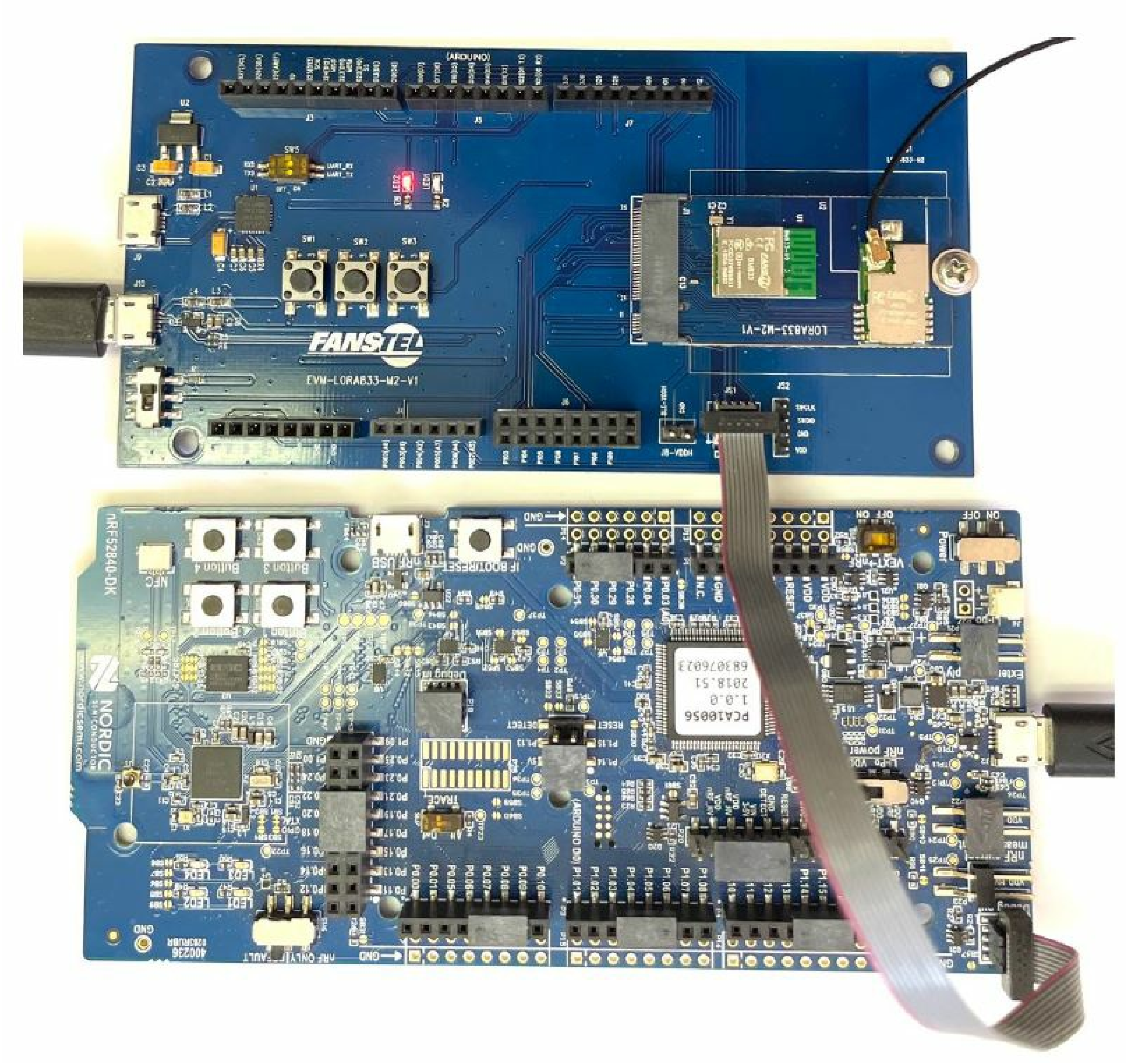
Evaluation Board EV-LN60G
EV-LN60G can be used to evaluate LR62E1 or LR62C with a Nordic nRF52840 module, BT840F. An EV-LN60G includes the following:



- An EV board without an M.2 module.
- A 10-pin flat cable.
- A USB cable
- Additional hardware is required but not included in EV-LN60G.
- M262E840F (LR62E1 + BT840F) module and a LoRa antenna ANT025 or ANT025P (IP67). Or,
- M262C840F (LR62C + BT840F) module and a LoRa antenna ANT025 or ANT025P (IP67).

Loading Firmware into the Evaluation Board Through a Nordic DK

- To program BT840F BLE module.
- Connect Nordic nRF52840DK debug out to Fanstel evaluation board debug using the 10-pin flat cable as shown below.



- Connect Nordic nRF52DK to PC.
- Connect a DC power source to the micro or mini USB port of the evaluation board.

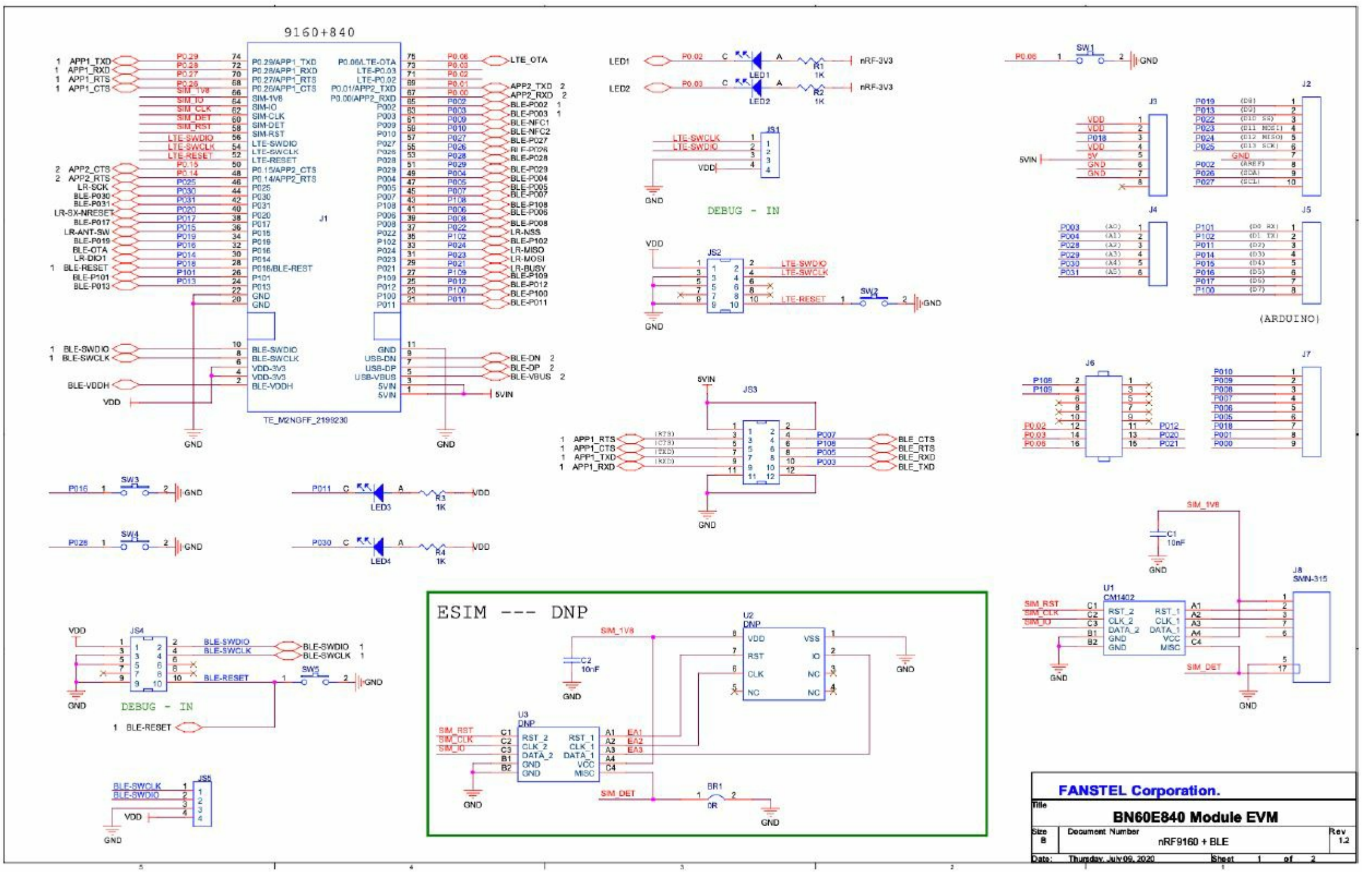
Nordic Development Environment

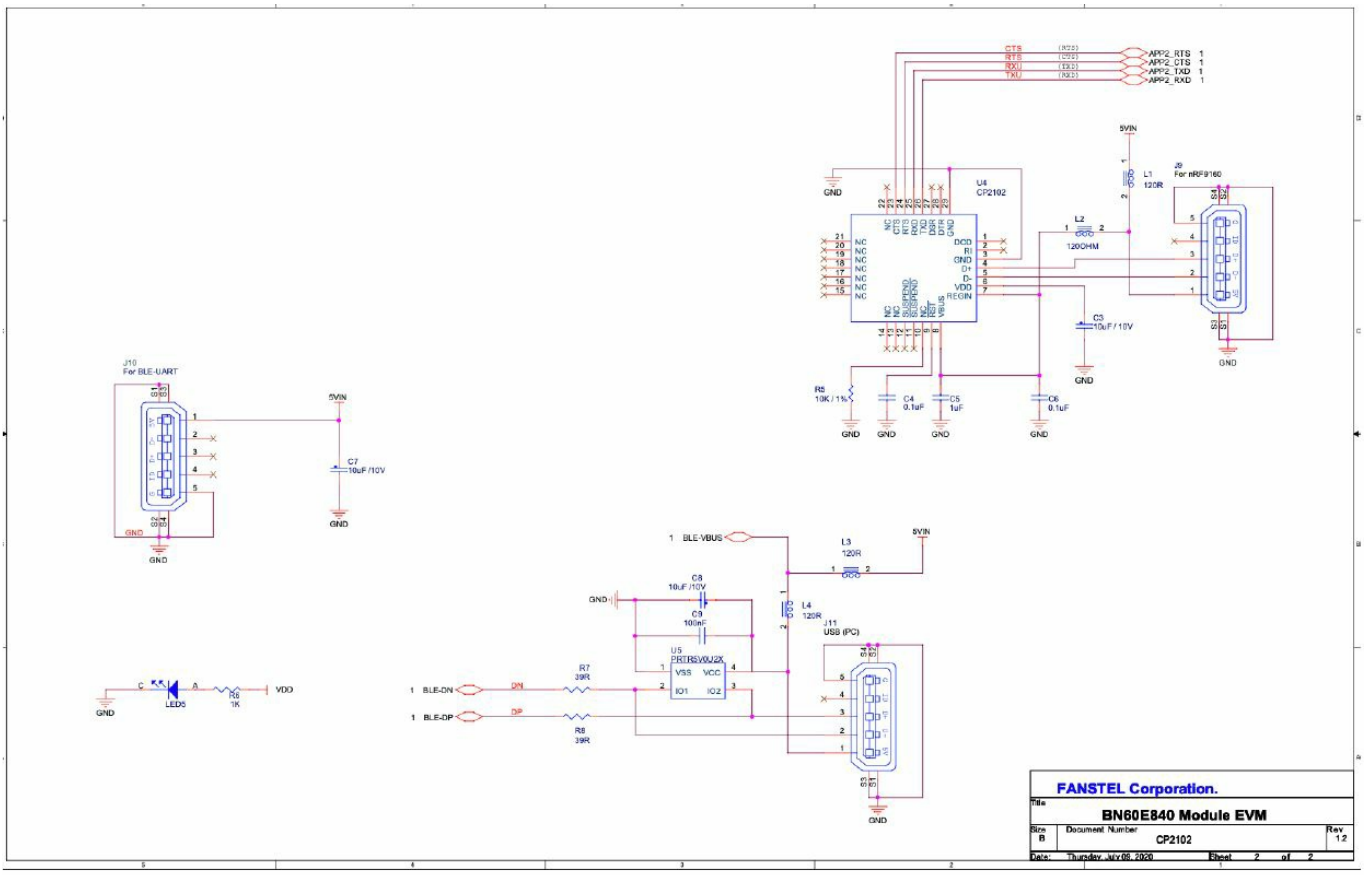
- Nordic Semiconductor provides a complete range of hardware and software development tools for the nRF52 Series devices. nRF52DK or nRF52840DK board is recommended for firmware development. Document and Software development tools can be downloaded by the following links.
- Get started with Nordic chip and all online documents.
- http://infocenter.nordicsemi.com/index.jsp?topic=/com.nordic.infocenter.nrf52/dita/nrf52/development/nrf52_dev_kit.html&cp=1_1.
- Nordic SDK with many example projects.
- https://developer.nordicsemi.com/nRF5_SDK/.
- Nordic development zone.
- https://devzone.nordicsemi.com/tutorials/b/getting-started/posts/development-with-gcc-and-eclipse.

Download and set up Basic Software tools for EV-LN60G

- nRF command line tool 10.2.1 or newer.
  https://www.nordicsemi.com/Software-and-Tools/Development-Tools/nRF-Command-Line-Tools/Download
- nRF Connect desktop 3.2.0 or newer.
  https://www.nordicsemi.com/Software-and-Tools/Development-Tools/nRF-Connect-for-desktop

Evaluation LN60G Board EV-Schematics





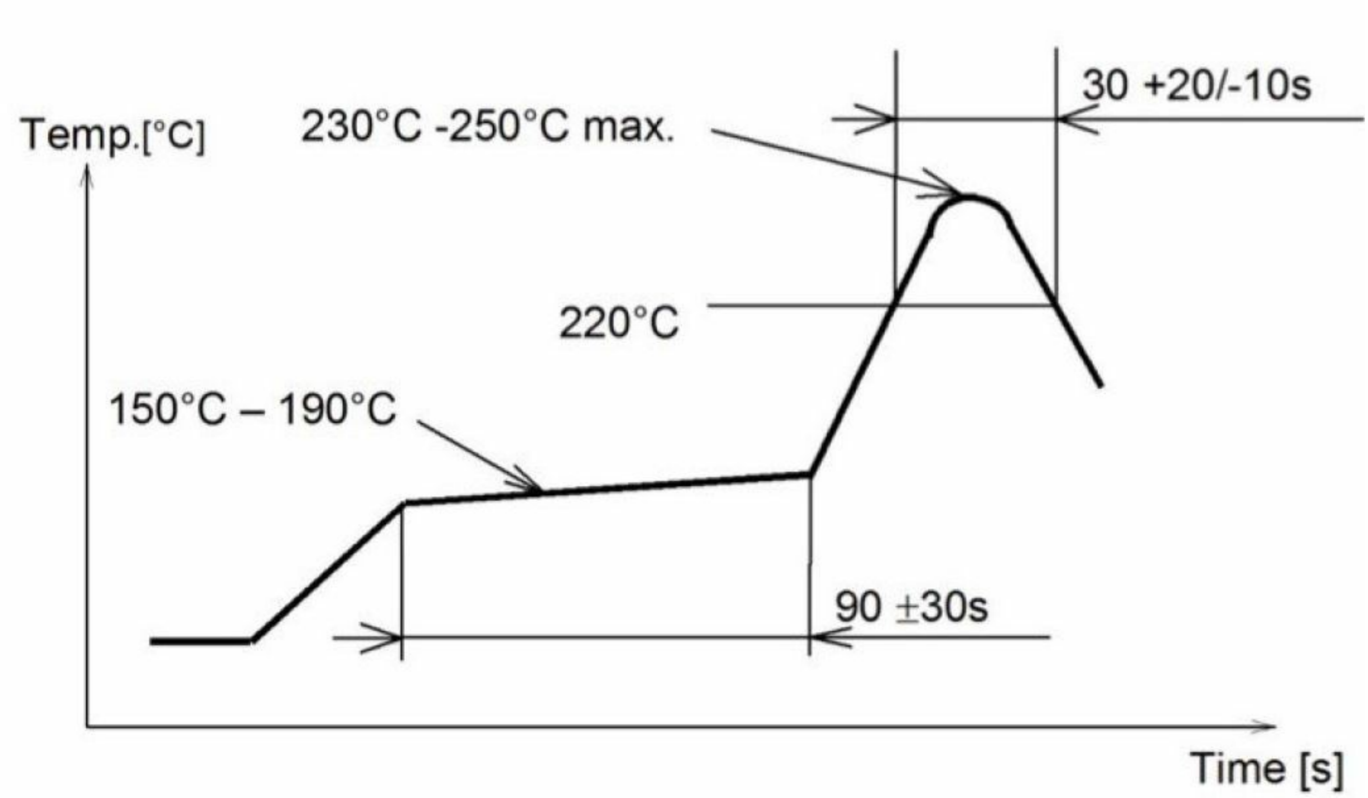
Battery Power Application

- Two inductors required for the DCDC converter are inside the BT840F module. You can enable DCDC to lower power consumption.
- The 32.768 kHz sleep crystal and load capacitors are on the M.2 module.

Miscellaneous

Soldering Temperature-Time Profile for Re-Flow Soldering

Maximum number of cycles for re-flow is 2. No opposite side reflow is allowed due to module weight.



Cautions, Design Notes, and Installation Notes
Failure to follow the guidelines outlined in this document may result in the degrading of the product's functions and damage to the product.

Design Notes

1. Follow the conditions written in this specification, especially the control signals of this module.
2. The supply voltage has to be free of AC ripple voltage (for example from a battery or a low noise regulator output). For noisy supply voltages, provide a decoupling circuit (for example a ferrite in series connection and a bypass capacitor to ground of at least 47uF directly at the module).
3. This product should not be mechanically stressed when installed.
4. Keep this product away from heat. Heat is the major cause of decreasing the life of these products.
5. Avoid assembly and use of the target equipment in conditions where the products' temperature may exceed the maximum tolerance.
6. The supply voltage should not be exceedingly high or reversed. It should not carry noise and/or spikes.
7. this product away from other high-frequency circuits.

Notes on Antenna and PCB Layout

1. Don't use a module with an internal antenna inside a metal case.
2. For PCB layout:

- Avoid running any signal line below the module whenever possible,
- No ground plane below the antenna,
- If possible, cut off the portion of the main board PCB below the antenna.

Installation Notes

1. Reflow soldering is possible twice based on the time-temperature profile in this datasheet. Set up the temperature at the soldering portion of this product according to this reflow profile.
2. Carefully position the products so that their heat will not burn into printed circuit boards or affect the other components that are susceptible to heat.
3. Carefully locate these products so that their temperatures will not increase due to the effects of heat generated by neighbouring components.
4. If a vinyl-covered wire comes into contact with the products, then the cover will melt and generate toxic gas, damaging the insulation. Never allow contact between the cover and these products to occur.
5. This product should not be mechanically stressed or vibrated when reflowed.
6. If you want to repair your board by hand soldering, please keep the conditions of this chapter.
7. Do not wash this product.
8. Refer to the recommended pattern when designing a board.
9. Pressing on parts of the metal cover or fastening objects to the metal will cause damage to the unit.
10. For more details on LGA (Land Grid Array) soldering processes refer to the application note.

Usage Condition Notes

1. Take measures to protect the unit against static electricity. If pulses or other transient loads (a large load applied quickly) are applied to the products, check and evaluate their operation before assembly on the final products.
2. Do not use dropped products.
3. Do not touch, damage or soil the pins.
4. Follow the recommended condition ratings about the power supply applied to this product.
5. Electrode peeling strength: Do not add pressure of more than 4.9N when soldered on PCB
6. Pressing on parts of the metal cover or fastening objects to the metal cover will cause damage.
7. These products are intended for general purpose and standard use in general electronic equipment, such as home appliances, office equipment, information and communication equipment.

Storage Notes

1. The module should not be stressed mechanically during storage.
2. Do not store these products in the following conditions or the performance characteristics of the product, such as RF performance will be adversely affected:
    - Storage in salty air or an environment with a high concentration of corrosive gas.
    - Storage in direct sunlight
    - Storage in an environment where the temperature may be outside the range specified.
    - Storage of the products for more than one year after the date of delivery storage period.
3. Keep this product away from water, poisonous gas and corrosive gas.
4. This product should not be stressed or shocked when transported.
5. Follow the specification when stacking packed crates (max. 10).

Safety Conditions

These specifications are intended to preserve the quality assurance of products and individual components. Before use, check and evaluate the operation when mounted on your products. Abide by these specifications, without deviation when using the products. These products may short-circuit. If electrical shocks, smoke, fire, and/or accidents involving human life are anticipated when a short circuit occurs, then provide the following failsafe functions, as a minimum.

1. Ensure the safety of the whole system by installing a protection circuit and a protection device.
2. Ensure the safety of the whole system by installing a redundant circuit or another system to prevent a dual fault causing an unsafe status.

Other Cautions

1. This specification sheet is copyrighted. Reproduction of this data sheet is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices.
2. Do not use the products for other purposes than those listed.
3. Be sure to provide an appropriate failsafe function on your product to prevent additional damage that may be caused by the abnormal function or the failure of the product.
4. This product has been manufactured without any ozone chemical controlled under the Montreal Protocol.
5. These products are not intended for other uses, other than under the special conditions shown below. Before using these products under such special conditions, check their performance and reliability under the said special conditions carefully to determine whether or not they can be used in such a manner.
    - In liquid, such as water, salt water, oil, alkali, or organic solvent, or in places where liquid may splash.
    - In direct sunlight, outdoors, or in a dusty environment
    - In an environment where condensation occurs.
    - In an environment with a high concentration of harmful gas.
6. If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these products with new products because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.
7. When you have any questions or uncertainty, contact Fanstel.

Packaging
Production modules are delivered in reels, with 1000 modules in each reel.

FCC LABEL
The Original Equipment Manufacturer (OEM) must ensure that the OEM modular transmitter must be labelled with its own FCC ID number. This includes a visible label on the outside of the final product enclosure that displays the contents shown below. If the FCC ID is not visible when the equipment is installed inside another device, then the outside of the device into which the equipment is installed must also display a label referring to the enclosed equipment.

The end product with this module may be subject to performing FCC part 15 unintentional emission test requirements and be properly authorized.
This device is intended for OEM integrators only.

Revision History

- Dec. 2023, Ver. 0.90: The first draft release.

FCC STATEMENT

Federal Communications Commission (FCC) Statement

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user’s authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, according 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 under 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 the receiver.
- Connect the equipment to 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.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

FCC RF Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body.
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Note: The end product shall have the words “Contains Transmitter Module FCC ID: X8WLR62E1”

Canada, Industry Canada (IC)
This Class B digital apparatus complies with Canadian ICES-003

ICES-003 RF Radiation Exposure Statement
This equipment complies with ICES-003 radiation exposure limits set forth for an uncontrolled environment.
This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body.
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Note: The end product shall have the words “Contains Transmitter Module IC: 4100A-LR62E1”

(Modular approval) End Product Labeling:
The end product must be labelled in a visible area with the following: “Contains IC: 4100A-LR62E1”.

OEM statement
The Original Equipment Manufacturer (OEM) must ensure that the OEM modular transmitter must be labelled with its own FCC ID number. This includes a visible label on the outside of the final product enclosure that displays the contents shown below. If the FCC ID is not visible when the equipment is installed inside another device, then the outside of the device into which the equipment is installed must also display a label referring to the enclosed equipment.

- The end product with this module may be subject to performing FCC part 15 unintentional emission test requirements and be properly authorized.

- This device is intended for OEM integrators only
- This radio transmitter (192170139/AA/00) has been approved by Innovation, Science and Economic
- Development Canada to operate with the antenna types listed Below, with the maximum permissible gain indicated. Antenna types not included in this list that Have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
- LR62E1: Dipole Antenna, 2.3dBi

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Documents / Resources

FANSTEL LR62C Lora Transceiver Module [pdf] User Guide
LR62C Lora Transceiver Module, LR62C, Lora Transceiver Module, Transceiver Module, Modul
e

References

- **Nordic Semiconductor Infocenter**
- **Fanstel**
- **Download BlueNor Document — Fanstel**
- **download.recurser.com**
- **Sign in - Nordic DevZone**
- **Download Wireless Document — Fanstel**
- **nRF Command Line Tools - Downloads - nordicsemi.com**
- **nRF Connect for Desktop - nordicsemi.com**
- **User Manual**