# LR62E, LR62XE LoRa and LoRa-BLE Combo Modules

## LoRa Sensor, Beacon Applications

LR62E and LR62XE LoRa transceiver module uses a Semtech SX1262 sub-GHz radio transceiver. A Skyworks SKY65313 power amplifier is added to LR62XE. An u.FL connector is on-board for external antenna. It is paired with Fanstel BT840F, a Nordic nRF52840 BLE 5.2 module. The Cortex M4F MCU in BT840F manages LR62XE through 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.
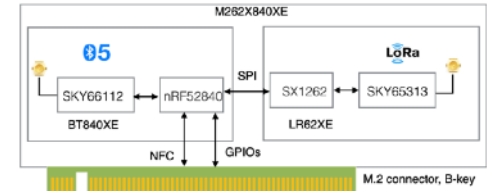
BT840F + LR62XE pair can be used in LoRaWAN™ application. LoRaWan stacks are not available from Fanstel.

## 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 5.2 module manages LR62XE through SPI interface.

## LR62E Specifications:
- Semtech SX1262 transceiver.
- Size:10.2x15mm
- +20.3 dBm TX power (USA).

## LR62XE Specifications:
- Semtech SX1262 transceiver with Skyworks SKY65313 power amplifier
- Size: 10 (14) x 22.3mm, L- shape.
- +29.2 dBm TX power (USA).

## M262840F/M262X840F/M262X840XE Combo:
- Combo modules for M.2 connector, B key.
- M262840F: LR62E, BT840F combo.
- M262X840F: LR62XE, BT840F combo.

- M262X840XE:
  LR62XE, BT840XE combo.
- 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: 30x42 mm for M.2 connector, B-key
- Operation temperature: -40°C to +85°C

## Evaluation Board
- EV-LR62E for LR62E with BM833(nRF52833).
- EV-LN60G for LR62E or LR62XE with BT840F or BT840XE( M.2 module not included).

## Model Summaries

| module | LR62E | LR62XE | M262840F | M262X840F | M262X840XE |
|---|---|---|---|---|---|
| BLE module/Flash/RAM | | | BT840F/1MB/512KB | BT840F/1MB/512KB | BT840XE/1MB/256KB |
| Size | 10.2x15.0mm | 10(14) x22.3mm | 30x42mm, M.2, B key | 30x42mm, M.2, B key | 30x42mm, M.2, B key |
| GPIO | | | 34 | 34 | 34 |
| Antenna LoRa/BLE | u.FL | u.FL | u.FL/PCB | u.FL/PCB | u.FL/u.FL |
| LoRa max. TX power, conducted/radiated | +20.3 dBm/ +22.3 dBm | +29.2dBm/ +31.2 dBm | +20.3 dBm/+22.3 dBm | +29.2 dBm/+31.2 dBm | +29.2 dBm/+31.2dBm |
| BLE max. TX power, conducted/radiated | | | +8.5 dBm/+8.8 dBm | +8.5 dBm/+8.8 dBm | +21.0 dBm/+27.0 dBm |
| Certifications | FCC,IC,RCM | FCC,IC,RCM | FCC,IC,RCM | FCC,IC,RCM | FCC,IC,RCM |
| Availability | Production | Production | Production | Production | Production |

# Table Of Contents

# 1. Introduction

LR62XE LoRa module with Semtech SX1262 transceiver are ideal for long range wireless applications. It can be paired with BT840F BLE module in LoRa sensor or beacon design. A smart phone can set up sensor or beacon easily through Bluetooth interface.

BT840F is powerful, highly flexible, ultra low power Bluetooth Low Energy (BLE) modules using Nordic nRF52840 SoCs. With an ARM Cortex™ 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 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 LoRaWAN™ stacks to Nordic nRF52 BLE SoCs. LoRaWAN™ stacks are not available from Fanstel.

## 2. Product Overview

### Semtech SX1262
Semtech SX1262 data sheets can be downloaded from this webpage.

https://www.fanstel.com/wirelessdocument

A block diagram is below.
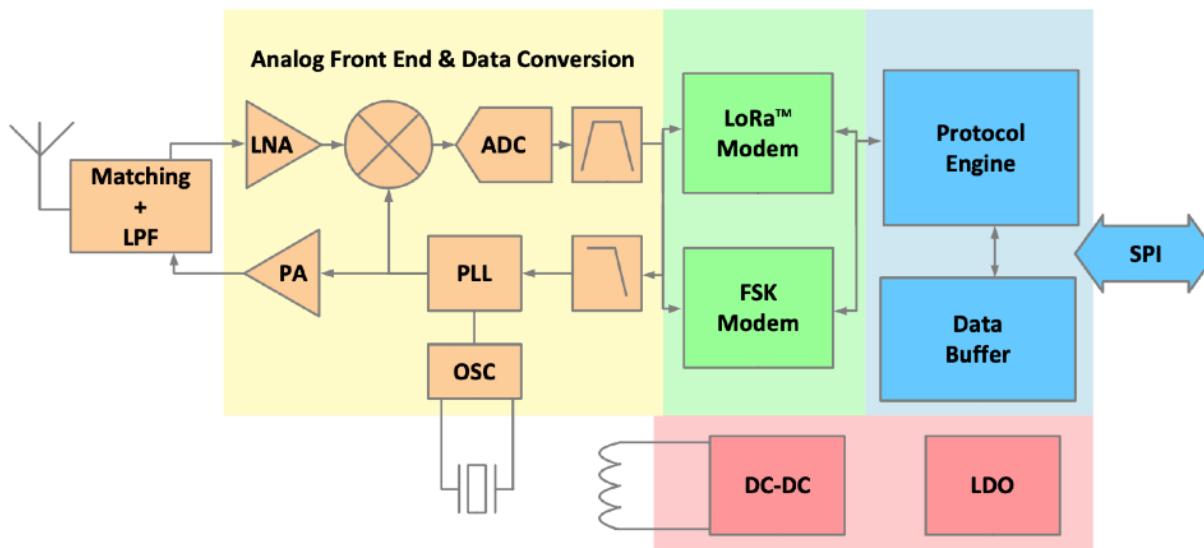
## LR62E

- A LoRa module with Semtech SX1262, 915 MHz.
- An u.FL connector for external antenna.
- 10 castellated pins.
- Size: 10.2x15mm.

## LR62XE

- A LoRa module with Semtech SX1262 and a Skyworks SKY65313 power amplifier, 915 MHz.
- An u.FL connector for external antenna.
- 10 castellated pins.
- Size: 10.2 (14) x22.3mm.

## M262X840XE, SuperPower BLE and LoRa Combo

The following is a block diagram of M262X840XE.
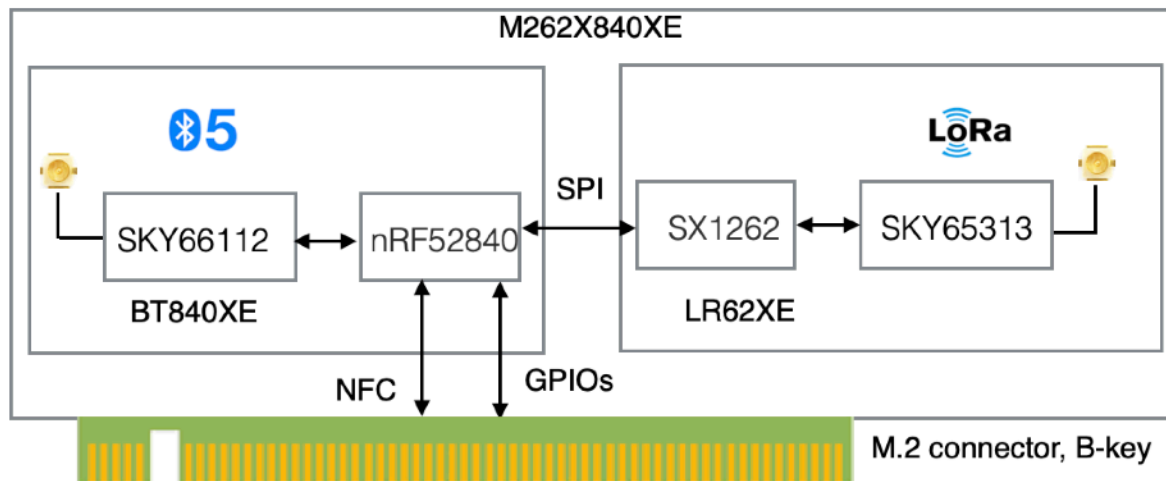


- BT840XE with + 21dBm TX power, an u.FL connector for external antenna.
- LR62XE with +29.2 dBm TX power, an u.FL connector for external antenna.
- Size: 30x42mm
- For M.2 connector, 67 pins, B key.

## M262X840F

- BT840F with + 8.5dBm TX power, an integrated PCB antenna.
- LR62XE with +29.2 dBm TX power, an u.FL connector for external antenna.
- Size: 30x42mm
- For M.2 connector, 67 pins, B key.
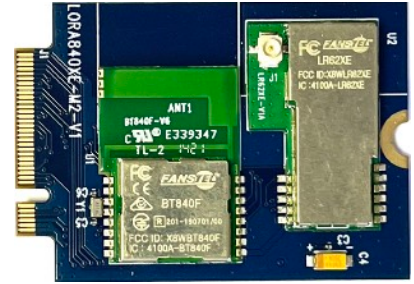
## M262840F

- BT840F with + 8.5dBm TX power, an integrated PCB antenna.
- LR62E with +20.3 dBm TX power, an u.FL connector for external antenna.
- Size: 30x42mm
- For M.2 connector, 67 pins, B key.
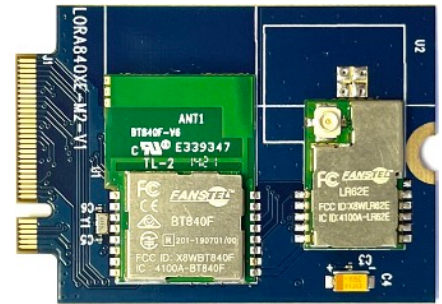
## Mechanical Drawings

The followings are mechanical drawings of LR62E and LR62XE, top view.
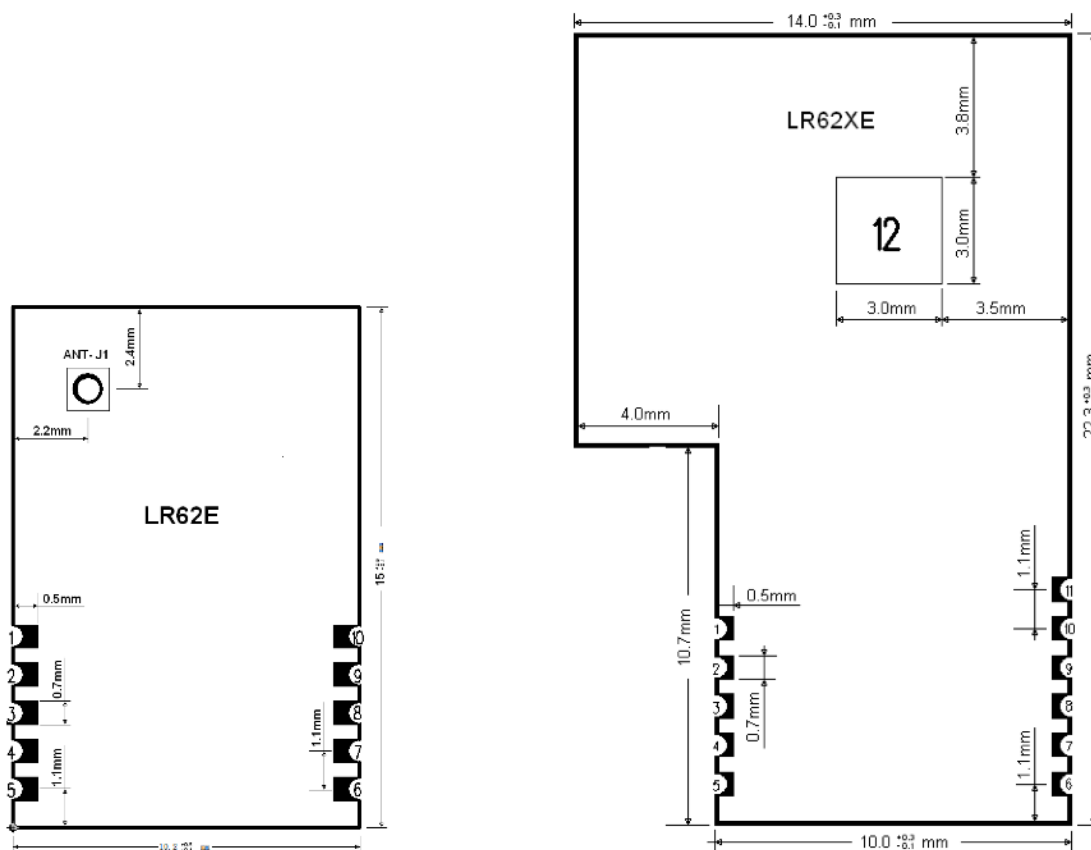


Library components for PADS and EAGLE can be downloaded from

http://www.fanstel.com/download-document/

For other PCB layout tools, please download evaluation board Gerber files and extract library component.

## LR62E, LR62XE Pin Functions

The followings are LR62E and LR62XE pin assignment. Pin functions are in a 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
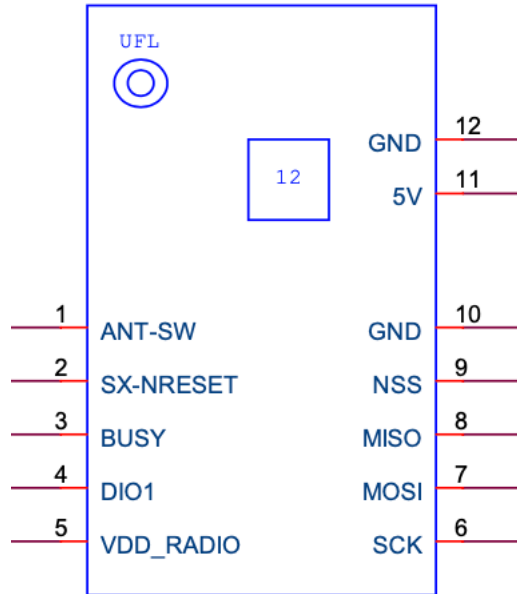
| LR62XE | | SX1262 | |
|---|---|---|---|
| pin# | pin name | pin# | Descriptions |
| 1 | ANT-SW | | Antenna switch |
| 2 | SX-NRESET | 15 | Reset signal, active low |
| 3 | BUSY | 14 | Busy indicator |
| 4 | DIO1 | 13 | Multiple purpose Digital IO |
| 5 | VDD | 1 | DC input voltage, 1.8V to 3.7V |
| 6 | SCK | 18 | SPI clock |
| 7 | MOSI | 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 pin# | nRF52840 pin# | BT840F pin# | M262X840F 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 |
| 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 |

# 3. Transmission Power Settings

The conditions for LR62XE to transmit at +29.2 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 +9 dBm.

• An external LoRa antenna ANT025 or an equivalent shall be connected to the u.FL connector during development testing and deployment

The conditions for LR62XE to transmit at +28.5 dBm. These settings can reduce power consumption and increase the transmission duty cycle.

• Regulated 4.5V, 1.5 Amp DC power to the 5V pin.

• Regulated 3.3V DC power to the VDD pin.

• Set SX1262 TX power to +9 dBm.

• An external LoRa antenna ANT025 or an equivalent shall be connected to the u.FL connector during development testing and deployment

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.
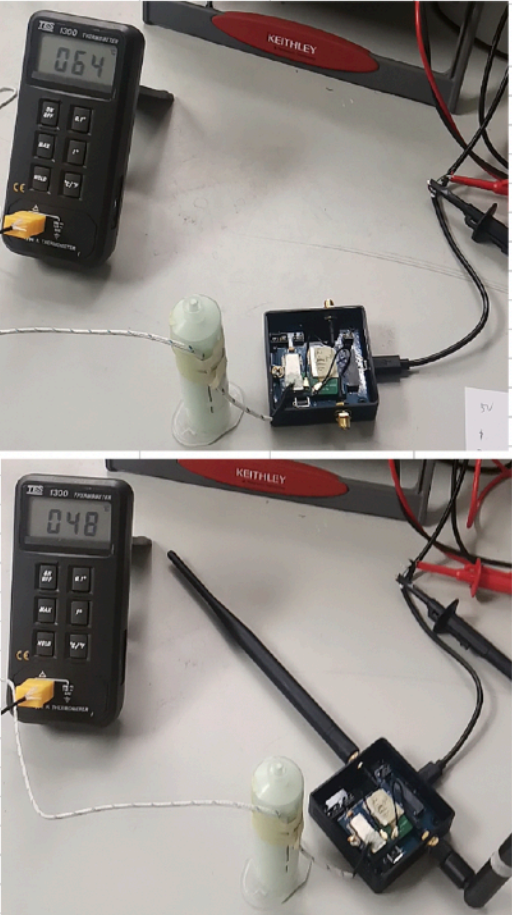
• Set SX1262 TX power to +22 dBm.

## 4. Settings for High Duty Cycle LR62XE Transmission

In a typical LoRaWAN application, the transmission duty cycle is low. Power consumption and heat dissipation is not an issue. If you use an LR62XE for a long range data transfer, precaution is required.

At the maximum transmission power, +29.2 dBm, LR62XE consumes about 3 watts of power.
• We measure the temperature of the LR62XE module RFI shield.
• We remove the RFI shield and measure temperature on the surface of SKY65313 power amplifier.
• Temperature on the RFI shield is about 3°C lower than that on the SKY65313.

| DC Voltage | Test codes | | Time, minutes | Temperature | Photo |
|---|---|---|---|---|---|
| 5V | lora_only_norx_8_16 | 60mm adapter cable | 1 | 53 | |
| | 8 mS on, 16mS off | | 2 | 54 | |
| | 33% transmission duty cycle | | 3 | 58 | |
| | | | 4 | 61 | |
| | | | 5 | 62 | |
| | | | 6 | 63 | |
| | | | 7 | 64 | |
| | | | 8 | 64 | |
| | | | 9 | 64 | |
| | | | 10 | 64 | |
| | | | 11 | 64 | |
| | | | 12 | 64 | |
| | | | 13 | 64 | |
| | | | 14 | 64 | |
| | | | 15 | 64 | |
| | | Install antenna | 16 | 60 | |
| | | | 17 | 58 | |
| | | | 18 | 57 | |
| | | | 19 | 56 | |
| | | | 20 | 55 | |
| | | | 21 | 53 | |
| | | | 22 | 51 | |
| | | | 23 | 49 | |
| | | | 24 | 48 | |
| | | | 25 | 48 | |
| | | | 26 | 48 | |
| | | | 27 | 48 | |
| | | | 28 | 48 | |
| | | | 29 | 48 | |
| | | | 30 | 48 | |

To minimize LR62XE heat dissipation, always connect an external LoRa antenna ANT025 or an equivalent to the u.FL connector. Temperature of the LR62XE RFI shield is measured.
• LR62XE transmits with 33% duty cycle, 8ms ON/16 ms OFF and repeat continuously.
• The LR62XE module is on M262X840XE M.2 module inside an enclosure of BRX840XE LoRa-BLE bridge.
• A 60 mm long u.FL to SMA adapter cable is connected to LR62XE u.FL connector.
• The LoRa antenna is installed at the 16th minute.
• The RFI shield temperature is 16°C lower with an LoRa antenna connected.
• If the u.FL to SMA adapter is not connected, the RFI temperature increases much quicker and higher.
• We repeat the measurement for 500ms ON/1000ms OFF, the results are similar.
• We suggest to limit the transmission duty cycle to 20% for 5V DC power supply. A LoRa antenna shall be connected.

**Temperature Tests, 4.5V DC, 500ms ON/1000ms OFF**
We repeat the tests with the following changes.
• The DC power supply voltage is reduced to 4.5V.
• The duty cycle is the same, 33%. However, LR62XE transmits for 500 ms, stops for 1000 ms and repeats
  continuously.
• The steady state temperature with an antenna connected is reduced from 48°C to 41°C.

| DC Voltage | Test codes | | Time, minutes | Temperature |
|---|---|---|---|---|
| 4.5V | lora_only_norx_500_1000 | 60mm adapter cable | 1 | 45 |
| | 500ms ON, 1000ms OFF | | 2 | 53 |
| | | | 3 | 54 |
| | | | 4 | 55 |
| | | | 5 | 55 |
| | | | 6 | 55 |
| | | | 7 | 55 |
| | | | 8 | 55 |
| | | | 9 | 55 |
| | | | 10 | 55 |
| | | | 11 | 55 |
| | | | 12 | 55 |
| | | | 13 | 55 |
| | | | 14 | 55 |
| | | | 15 | 55 |
| | | Install antenna | 16 | 52 |
| | | | 17 | 50 |
| | | | 18 | 49 |
| | | | 19 | 48 |
| | | | 20 | 48 |
| | | | 21 | 47 |
| | | | 22 | 46 |
| | | | 23 | 44 |
| | | | 24 | 41 |
| | | | 25 | 41 |
| | | | 26 | 41 |
| | | | 27 | 41 |
| | | | 28 | 41 |
| | | | 29 | 41 |
| | | | 30 | 41 |

# 5. Evaluation Boards

## Evaluation Board EV-LR62E
An evaluation board can be used to evaluate performance of module and to develop and test your firmware before an application-specific host board is developed. An EV-LR62E include the followings:
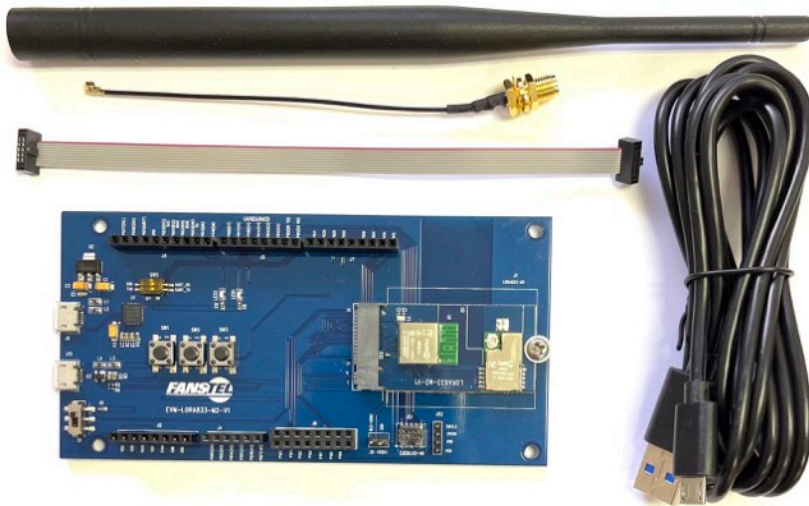


• An EV board with M262833, LR62E + BM833 (nRF52833) module INSTALLED.

• A 10-pins flat cable.

• An USB cable

• A 915 MHz LoRa antenna.
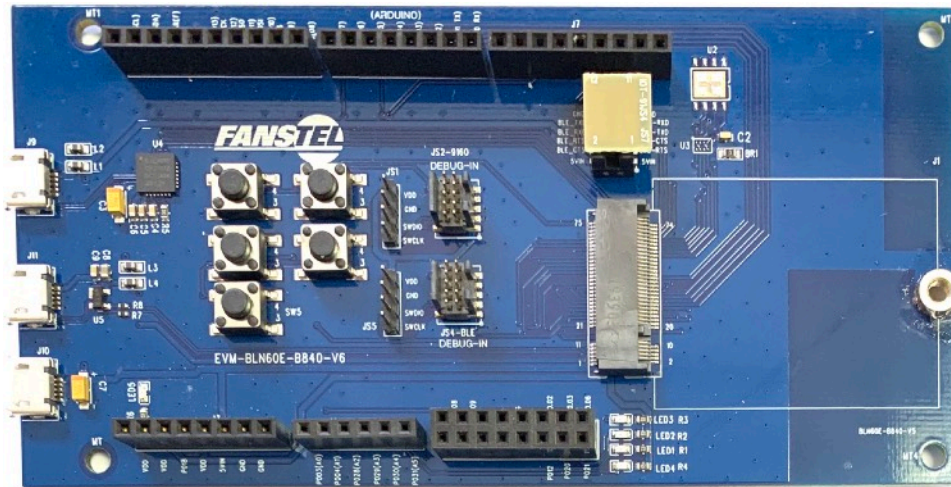
• An u.FL to SMA adapter cable.

This evaluation board is for LR62E only.

## Evaluation Board EV-LN60G

EV-LN60G can be used to evaluate LR62E or LR62XE with a Nordic nRF52840 module, BT840F or BT840XE. An EV-LN60G includes the following:

• An EV board without an M.2 module.



• A 10-pins flat cable.

• An USB cable

Additional hardware required but not included in EV-LN60G.

• M262840F (LR62E + BT840F) module and a LoRa antenna ANT025 or ANT025P (IP67). Or,

• M262X840F (LR62XE + BT840F) module and a LoRa antenna ANT025 or ANT025P (IP67). Or,

• M262X840XE (LR62XE + BT840XE) module, a LoRa antenna ANT025 or ANT025P (IP67), and a 0 dBi BLE antenna ANT000.

## Loading Firmware into Evaluation Board Through a Nordic DK

To program BT840F BLE module.

• Connect Nordic nRF52840DK **debug out** to Fanstel evaluation board **debug in** using the 10-pin flat cable as shown below.
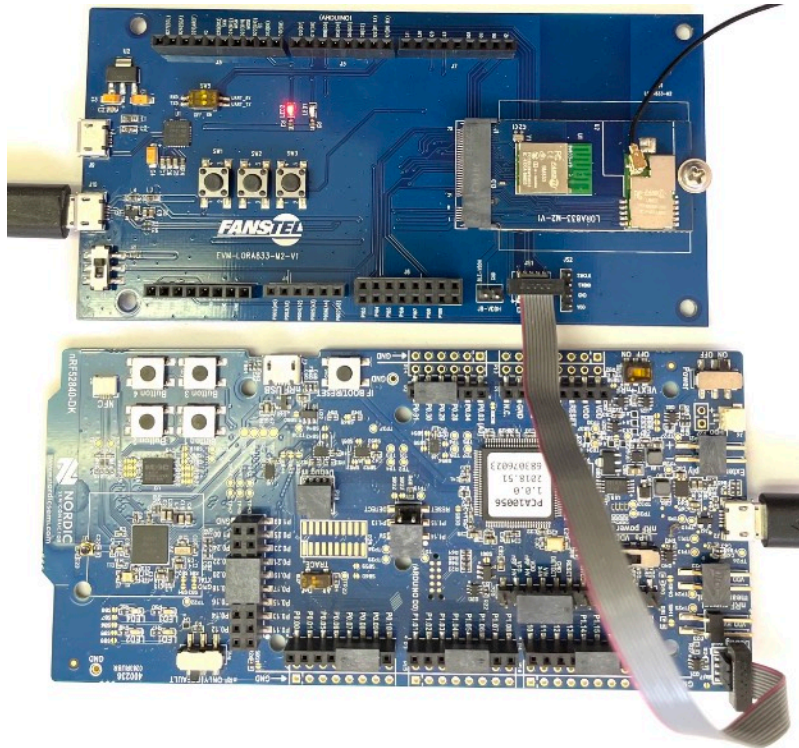


• Connect Nordic nRF52DK to PC.
• Connect a DC power source to micro or mini USB port of evaluation board.

## 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**
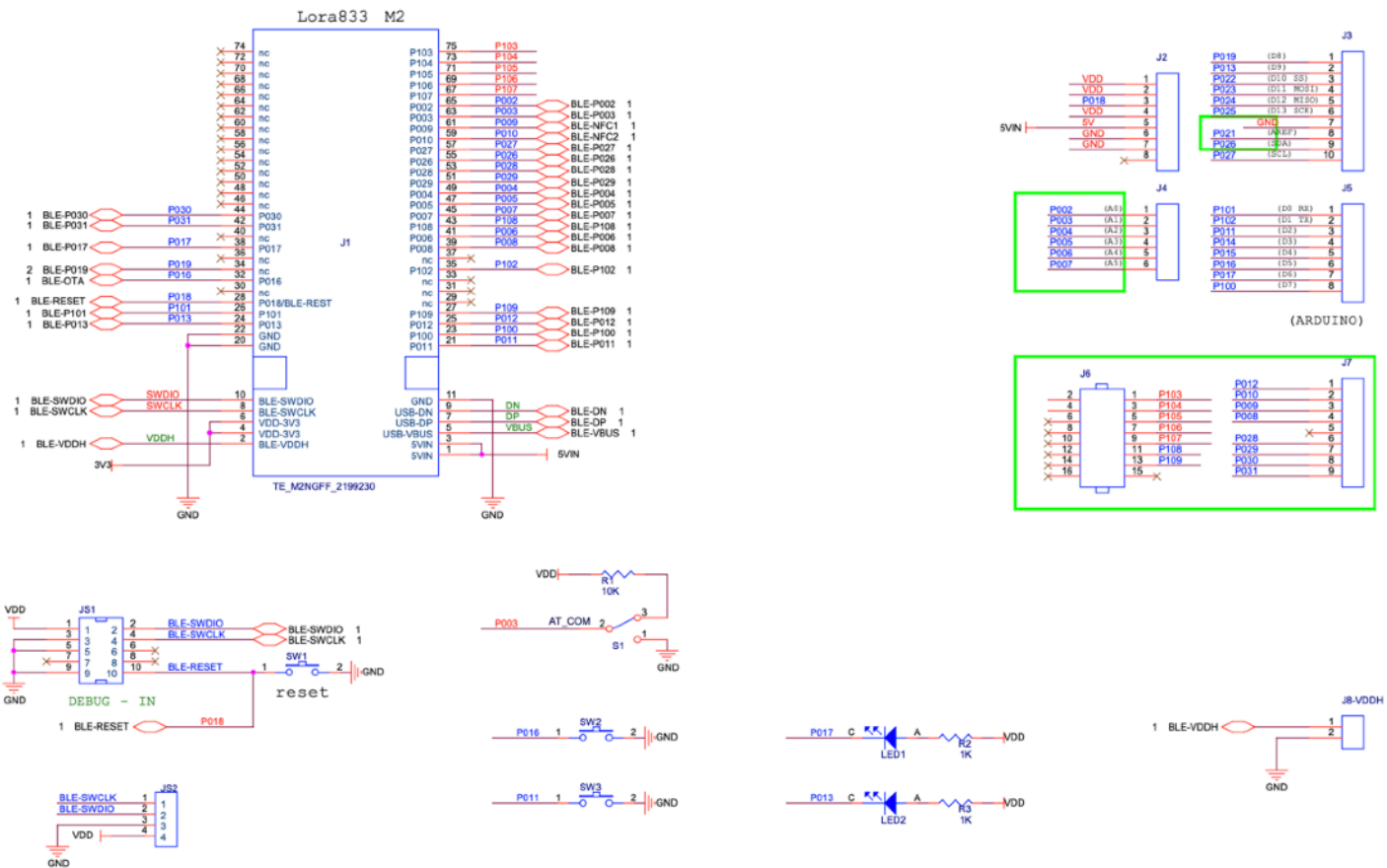
nRF command line tool 10.2.1 or newer.
https://www.nordicsemi.com/Software-and-Tools/Development-Tools/nRF-Command-Line-Tools/Download

nRF Connect desktop 3.2.0 or newer.
https://www.nordicsemi.com/Software-and-Tools/Development-Tools/nRF-Connect-for-desktop

## M262833 M.2 M.2 Module Schematics

The following is the schematics of M.2 module, M262833. It can be used as a reference design if you use an LR62E and a BM833 on you host PCB. The 32.768 kHz crystal, Y1 and load capacitors are required to provide precise sleep clock during powered down.

## Evaluation Board EV-LR62E Schematics

The following is schematics of EV-LR62E.

## Evaluation Board EV-LN60G Schematics
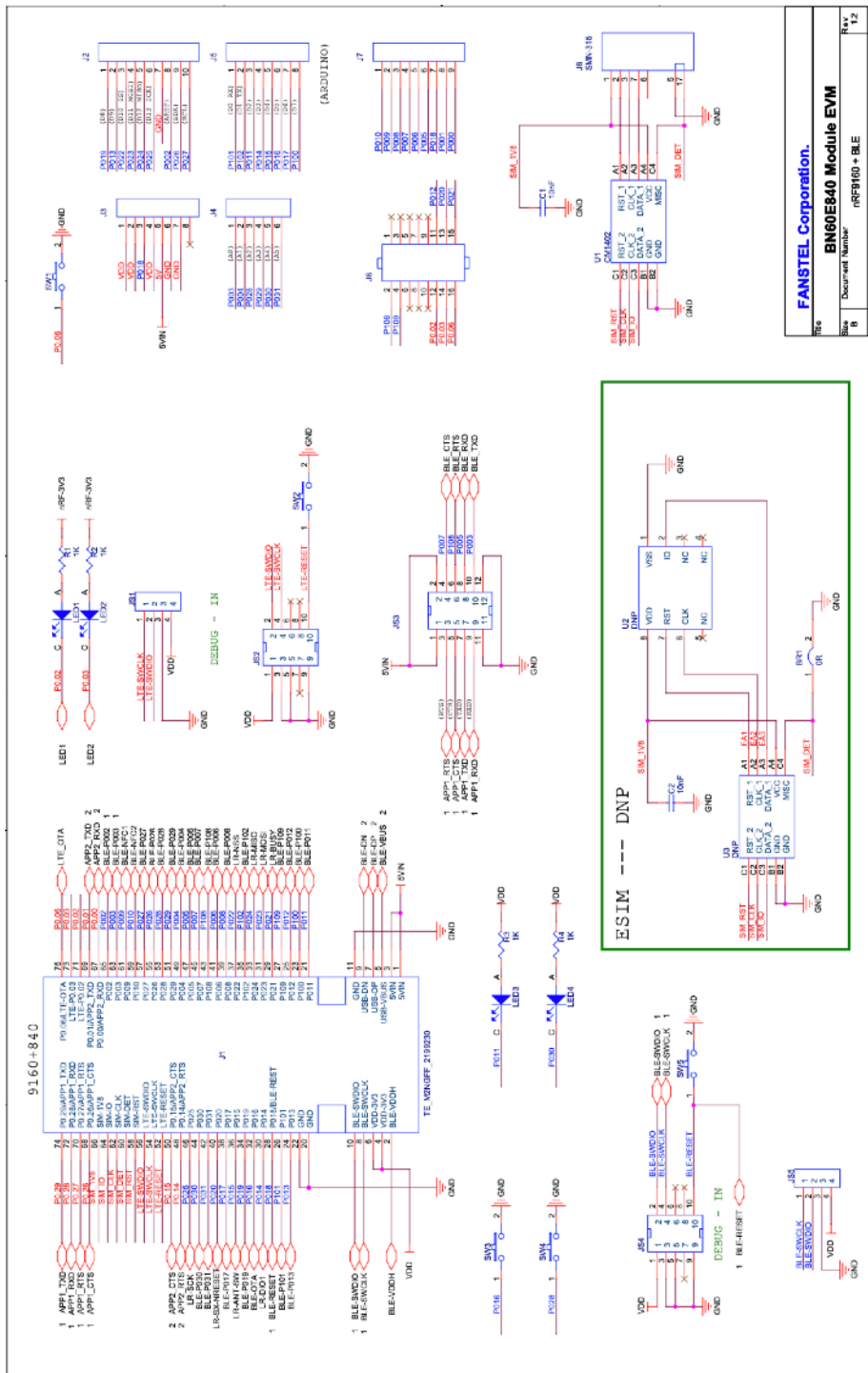
## Battery Power Application

Two inductors required for DCDC converter are inside BT840F module. You can enable DCDC to lower power consumption.

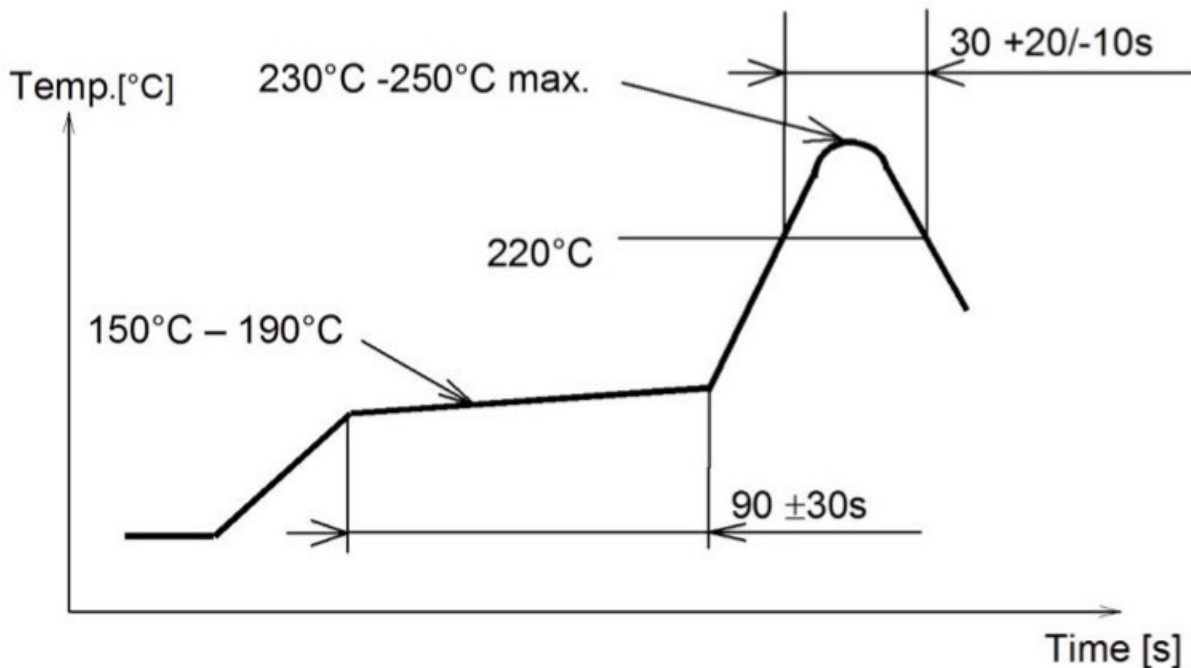The 32.768 kHz sleep crystal and load capacitors are on the M.2 module.

# 6. Miscellaneous

## Soldering Temperature-Time Profile for Re-Flow Soldering
Maximum number of cycles for re-flow is 2. No opposite side re-flow is allowed due to module weight.



## Cautions, Design Notes, and Installation Notes
Failure to follow the guidelines set forth in this document may result in 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 internal antenna inside a metal case.

(2) For PCB layout:

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

### Installation Notes

(1) Reflow soldering is possible twice based on the time-temperature profile in this data sheets. 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 neighboring 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 in a short time) 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 in 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 sheets 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 an 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 question or uncertainty, contact Fanstel.

## Packaging

Production modules are delivered in reel, 1000 modules in each reel.

## FCC LABEL

The Original Equipment Manufacturer (OEM) must ensure that the OEM modular transmitter must be labeled with its own FCC ID number. This includes a clearly 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 subject to perform FCC part 15 unintentional emission test requirement and be properly authorized.

This device is intended for OEM integrator only.

## 7. Revision History

• Feb, 2021, Ver. 0.90: The first draft release.

• July 2022, Ver. 1.00: Initial release.

• Jan. 2023, Ver, 1.01: Update mechanical drawings and EV board schematics.

## 8. Contact Us

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