

SL40F6 OpenSource Battery Powered Gateway/Sensor Draft Ver 0.90 Sep. 2022

IP67 Gateway, Market Ready Enclosure

SL40F6 Series battery powered gateway/sensor provides wire and wireless connection for external sensors in commercial, industrial, and agriculture applications. It relays sensor data to and control data from the cloud servers. A 4 MB flash memory provides local storage in case of network disconnection.

A battery cartridge with 4 AA Lithium provides up to 30 amp-hours of power. The battery life time is estimated at 5 years for transmitting 100 bytes of data per minute at +10 dBm TX power for 5 years.

The gateway/sensor base consists of:

- an M.2 connector for an [LN Series LTE-BLE module](#); or an [M2 Series BLE-LoRa module](#).
- A battery cartridge for 4AA.
- A 4 MB flash memory, upgradeable to 16MB.
- A 3-axis motion sensor, ST Micro LIS3DH.

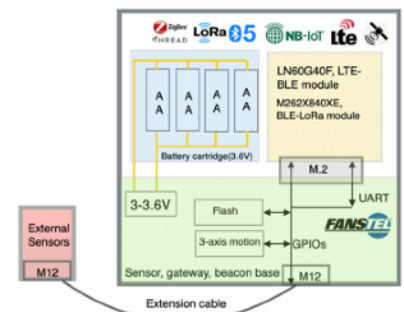
Sensor, Gateway, or Beacon

- **SL840F5R**: An IP51 LTE-BLE gateway with an RJ45 connector for external wired sensors.
- **SL40E6M**: An IP67 LTE-BLE gateway with a 8-pin M12 for external wired sensors. BT40E certified with ANT060, a 6 dBi antenna, to provide the best BLE receiver sensitivity.
- **SL40F6N**: An LTE-BLE gateway, external BLE sensors only.
- **SLG6N**: An LTE beacon with a high performance GPS receiver.
- **SR840F6N**: An IP51 BLE-LTE gateway-sensor with a RJ45 connector for external wired sensor.

Demonstration quality source codes for connecting sensors to AWS, Google, or MicroSoft cloud servers are available. They can reduce your development time and cost, allowing shorter time to market.

Hardware for Firmware Development

- Nordic nRF9160-DK
- For BT40F/BT40E module: Nordic nRF5340 DK
- PK-LEW840X for monitoring LTE traffic data.



Battery powered	LTE-BLE gateway/	LTE-BLE gateway/	LTE-BLE gateway	LoRa-BLE Bridge	LTE-GPS beacon
	SL840F5R	SL40E6M	SL40F6N	SR840F6N	SLG6N
Ingress Protect/Color	IP51/black	IP67/yellow	IP67/yellow	IP67/yellow	IP67/yellow
Gateway base	SLR5	SLM6	SLN6	SLN6	SLN6
Radios	BLE5.3, LTE	BLE5.3,LTE	BLE 5.3, LTE	BLE 5.3, LoRa	LTE, GPS
LN, M2 module	LN60E840F	LN60E40E	LN60E40F	M262840F	LN60G1
Sensors	LIS3DH; ENS210,temp/	LIS3DH, 3-axis motion	LIS3DH, 3-axis motion	LIS3DH, 3-axis motion	LIS3DH, 3-axis motion
External Antenna		0	1	0	1
Ext.sensor conn.	RJ45	M12	None	None	None
Power, not included	4AA, 3.6V Lithium	4AA, 3.6V Lithium	4AA, 3.6V Lithium	4AA, 3.6V Lithium	4AA, 3.6V Lithium
Max operating temp	-40°C to +80°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
Mounting	Wall or pole mount	Wall or pole mount	Wall or pole mount	Wall or pole mount	Wall or pole mount
Certifications					
QDID	108621	119517	119517	108621	
1K price, each					
Availability	Sample	Sample	Sample		

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1. Introduction

SL40F6 is a series of battery powered gateways, sensors, bridge, and beacons.

Series can be used with a Fanstel LN Series LTE-BLE module or an M2 Series BLE-LoRa module to create:

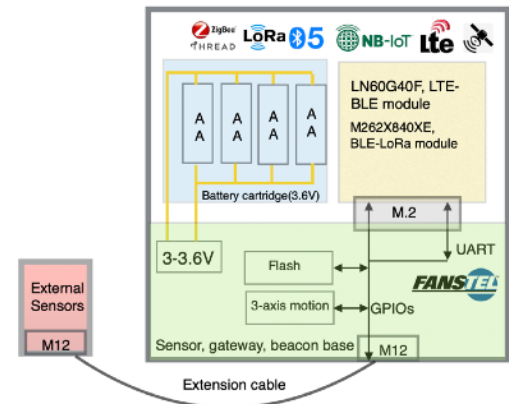
- An LTE sensor or beacon.
- A BLE-LoRa sensor or bridge.
- A BLE sensor or beacon.
- An LTE to BLE gateway.
- A BLE-LoRa bridge.

2. Specifications

SLM6 Sensor Gateway Base, M12 Connector

With an M.2 module, The SLM6 gateway base can support external Bluetooth, Thread, Zigbee, or LoRa sensors/beacons. It consists of the following.

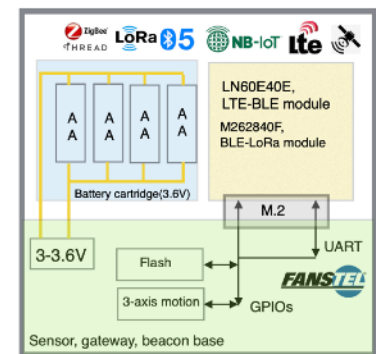
- An IP67, yellow enclosure with an 8-pin M12 connector for external wired sensors.
- An M.2 connector, 67 pins, B-key for a Fanstel LN series LTE-BLE combo module or a M2 series BLE-LoRa module.
- A flash memory chip, 4 MB, factory upgradeable to 16 MB.
- A 3-axis motion sensor, ST Micro LIS3DH.
- A battery cartridge for 4 AA, 3.6V Lithium batteries.



SLN6 Sensor Gateway Base, No Connector

With an M.2 module, the SLN6 gateway base can support external Bluetooth, Thread, Zigbee, or LoRa sensors/beacons. It consists of the following.

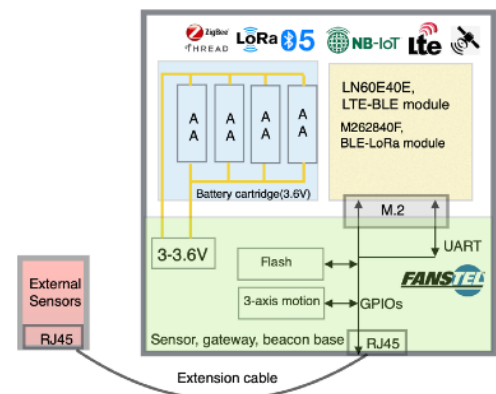
- AN IP67, yellow enclosure with no connector for external wired sensor.
- An M.2 connector, 67 pins, B-key for a Fanstel LN series or M2 series combo module.
- A flash memory chip, 4 MB, factory upgradeable to 16 MB.
- A 3-axis motion sensor, ST Micro LIS3DH.
- A battery cartridge for 4 AA, 3.6V Lithium batteries.



SLR5 Sensor Gateway Base, RJ45 Connector

With an M.2 module, the SLR5 gateway base can support external Bluetooth, Thread, Zigbee, or LoRa sensors/beacons. It consists of the following.

- An IP51, black enclosure with an 8-pin RJ45 connector for external wired sensors.
- An M.2 connector, 67 pins, B-key for a Fanstel LN series or an M2 series combo module.
- A flash memory chip, 4 MB, factory upgradeable to 16 MB.
- A 3-axis motion sensor, ST Micro LIS3DH.
- A battery cartridge for 4 AA, 3.6V Lithium batteries.



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SL40F6 Series Part Numbers

Possible part numbers of SL40F6 Series are listed below.

- Enclosure supports 1 external antenna.
- Enclosure can be IP67 or IP51 rated.

S L 40F 6 M

S: Sensor, gateway or beacon.

L: LTE-M/NB-IoT; **R:** LoRa; **RX** with PA; **B:** Bluetooth; **W:** WiFi.

40F: BLE module, **BT40F**; **BT40E**, **BT40X**, **BT840F**; **BT840E**, **BT840X**;
BT840XE; Missing: none.

6: IP67 Ingress Protection, yellow enclosure; **5:** IP51 black enclosure

M: M12 connector for external sensors; **R:** RJ45 connector; **N:** No connector.

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SL40F6 Configurations

The following table has a list of sensor bases can be manufactured.

- We keep sample stock for gateway bases in **bold**. Others are made to order with MOQ.

Gateway Base			
Ingress protect/color	IP51/black	IP67/yellow	IP67/yellow
Gateway Base	SLR5	SLM6	SLN6
Power supply, not included	1 to 4 AA, 3.6V Lithium	1 to 4 AA, 3.6V Lithium	1 to 4 AA, 3.6V Lithium
Ext. antenna, supported	0 or 1	0 or 1	0 or 1
Connector for external sensors	RJ45	M12	None
Flash memory, MB	4	4	4
Operating temp.	-40°C to +80°C	-40°C to +85°C	-40°C to +85°C

Battery Powered Gateways/Ser			
Gateway	Base	LN or M2 Module	Notes
SL840F5R	SLR5	LN60E840F	BT840F BLE to LTE gateway-sensor
SL840XE5R	SLR5	LN60E840XE	BT840XE BLE with PA to LTE gateway-sensor. The longest BLE range to another BT840XE.
SL40F5R	SLR5	LN60E40F	BT40F, nRF5340 BLE to LTE gateway-sensor
SL840E5R	SLR5	LN60E840E	BT840E to LTE gateway-sensor; 6 dBi ext. antenna, the best BLE receiver sensitivity.
SL40E5R	SLR5	LN60E40E	BT40E to LTE gateway-sensor. 6 dBi external antenna, the best BLE receiver sensitivity in the global market.
SL40XE5R	SLR5	LN60E40XE	BT40XE BLE with PA to LTE gateway-sensor.
SL40NE5R	SLR5	LN60E40NE	BT840F BLE with PA to LTE gateway-sensor.
S840F5R	SLR5	M2840F	BT840F BLE sensor
S840E5R	SLR5	M2840E	BT840E BLE sensor
S840XE5R	SLR5	M2840XE	BT840XE with PA, BLE sensor
S40F5R	SLR5	M240F	BT40F BLE sensor
S40E5R	SLR5	M240E	BT40E BLE sensor
S40XE5R	SLR5	M240XE	BT40XE with PA, BLE sensor
S40NE5R	SLR5	M240NE	BT40NE with PA, BLE sensor
SR840F5R	SLR5	M262840F	BT840F+LR62E, BLE+LoRa bridge+sensor
SR840X5R	SLR5	M262840XE	BT840X+LR62E, BLE with PA +LoRa bridge+sensor
SL840F6M	SLM6	LN60E840F	BT840F BLE to LTE gateway-sensor
SL840XE6M	SLM6	LN60E840XE	BT840XE BLE with PA to LTE gateway-sensor. The longest BLE range to another BT840XE.
SL40F6M	SLM6	LN60E40F	BT40F, nRF5340 BLE to LTE gateway-sensor
SL840E6M	SLM6	LN60E840E	BT840E to LTE gateway-sensor; 6 dBi ext. antenna, the best BLE receiver sensitivity.
SL40E6M	SLM6	LN60E40E	BT40E to LTE gateway-sensor. 6 dBi external antenna, the best BLE receiver sensitivity in the global market.
SL40XE6M	SLM6	LN60E40XE	BT40XE BLE with PA to LTE gateway-sensor.
SL40NE6M	SLM6	LN60E40NE	BT840F BLE with PA to LTE gateway-sensor.
S840F6M	SLM6	M2840F	BT840F BLE sensor
S840E6M	SLM6	M2840E	BT840E BLE sensor
S840XE6M	SLM6	M2840XE	BT840XE with PA, BLE sensor
S40F6M	SLM6	M240F	BT40F BLE sensor
S40E6M	SLM6	M240E	BT40E BLE sensor
S40XE6M	SLM6	M240XE	BT40XE with PA, BLE sensor
S40NE6M	SLM6	M240NE	BT40NE with PA, BLE sensor
SR840F6M	SLM6	M262840F	BT840F+LR62E, BLE+LoRa bridge+sensor
SR840X6M	SLM6	M262840XE	BT840X+LR62E, BLE with PA +LoRa bridge+sensor
SL840F6M	SLM6	LN60E840F	BT840F BLE to LTE gateway-sensor
SL840XE6M	SLM6	LN60E840XE	BT840XE BLE with PA to LTE gateway-sensor. The longest BLE range to another BT840XE.

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SL40F6M	SLM6	LN60E40F	BT40F, nRF5340 BLE to LTE gateway-sensor
SL840E6M	SLM6	LN60E840E	BT840E to LTE gateway-sensor; 6 dBi ext. antenna, the best BLE receiver sensitivity.
SL840F6N	SLN6	LN60E840F	BT840F BLE to LTE gateway-sensor
SL840XE6N	SLN6	LN60E840XE	BT840XE BLE with PA to LTE gateway-sensor. The longest BLE range to another BT840XE.
SL40F6N	SLN6	LN60E40F	BT40F, nRF5340 BLE to LTE gateway-sensor
SL840E6N	SLN6	LN60E840E	BT840E to LTE gateway-sensor; 6 dBi ext. antenna, the best BLE receiver sensitivity.
SL40E6N	SLN6	LN60E40E	BT40E to LTE gateway-sensor. 6 dBi external antenna, the best BLE receiver sensitivity in the global market.
SL40XE6N	SLN6	LN60E40XE	BT40XE BLE with PA to LTE gateway-sensor.
SL40NE6N	SLN6	LN60E40NE	BT840F BLE with PA to LTE gateway-sensor.
S840F6N	SLN6	M2840F	BT840F BLE sensor
S840E6N	SLN6	M2840E	BT840E BLE sensor
S840XE6N	SLN6	M2840XE	BT840XE with PA, BLE sensor
S40F6N	SLN6	M240F	BT40F BLE sensor
S40E6N	SLN6	M240E	BT40E BLE sensor
S40XE6N	SLN6	M240XE	BT40XE with PA, BLE sensor
S40NE6N	SLN6	M240NE	BT40NE with PA, BLE sensor
SR840F6N	SLN6	M262840F	BT840F+LR62E, BLE+LoRa bridge+sensor
SR840X6N	SLN6	M262840XE	BT840X+LR62E, BLE with PA +LoRa bridge+sensor
SL840F6N	SLN6	LN60E840F	BT840F BLE to LTE gateway-sensor
SL840XE6N	SLN6	LN60E840XE	BT840XE BLE with PA to LTE gateway-sensor. The longest BLE range to another BT840XE.
SL40F6N	SLN6	LN60E40F	BT40F, nRF5340 BLE to LTE gateway-sensor
SL840E6N	SLN6	LN60E840E	BT840E to LTE gateway-sensor; 6 dBi ext. antenna, the best BLE receiver sensitivity.
SL40E6N	SLN6	LN60E40E	BT40E to LTE gateway-sensor. 6 dBi external antenna, the best BLE receiver sensitivity in the global market.
SL40XE6N	SLN6	LN60E40XE	BT40XE BLE with PA to LTE gateway-sensor.
SLG6N	SLN6	LN60G1	nRF9160 LTE beacon/sensor with a high performance GPS receiver amplifier and antenna.

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LN and M2 Combo Modules

An LN Series LTE-BLE combo or an M2 series BLE-LoRa combo can be used with the SL40F6 series, batteries-powered gateway-sensor.

LN Module: The **Lte-Nbiot** module has 3 variations. Size is 30 x 42mm.

- LTE-M/NB-IoT only module with an integrated high performance **GPS** receiver amplifier and antenna (LN60**G1**). There is an u.FL connector for an external LTE antenna.
- BLE only module can be with an nRF52840 module (BT840F, BT840E, BT840X, BT840XE), an nRF5340 module (BT40F, BT40E).
- LTE-BLE combo module. Both BLE and LTE modules are on an LN module.

M2 Module: There are a few M2 module designs. Size is 30x42mm.

- M262X840XE is a high TX power BLE-LoRa combo module. Both BLE and LoRa modules can be with Power Amplifier (PA).
- M262840F is a low cost nRF52840 BLE 5.3 and LoRa combo module.

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LN Module with LTE-M/NB-IoT and Bluetooth Interfaces

The following table has a list of available LN Series modules.

- Size of LN Series module is 30x42mm, for M.2 connector, B key.
- nRF9160 SICA is a Nordic LTE-M/NB-IoT module with GPS receiver.
- All modules have an u.FL connector for an external LTE antenna.
- LN60G Series module has a GPS receiver amplifier and a GPS antenna integrated on board.
- LN60E Series module has an u.FL connector for an external GPS antenna with amplifier.
- nRF52840 module can be BT840F, BT840E, BT840X, or BT840XE.
- nRF5340 module can be BT40F or BT40E.

LN Module	LTE module	GPS antenna	BLE module	Description
LN60G1	nRF9160 SICA	Integrated	None	nRF9160 LTE module with an integrated GPS antenna.
LN60E	nRF9160 SICA	u.FL	None	nRF9160 LTE module with an u.fl for an external GPS antenna.
LN60G840F	nRF9160 SICA	Integrated	BT840F	nRF9160-BT840F, LTE-BLE module, integrated BLE antenna. GPS
LN60G840E	nRF9160 SICA	Integrated	BT840E	nRF9160-BT840E, LTE-BLE module, u.FL for external BLE antenna. GPS
LN60G840X	nRF9160 SICA	Integrated	BT840X	nRF9160-BT840X, LTE-BLE+PA module, integrated BLE antenna. GPS
LN60G840XE	nRF9160 SICA	Integrated	BT840XE	nRF9160-BT840XE, LTE-BLE+PA module, u.FL for external BLE antenna. GPS
LN60E840F	nRF9160 SICA	u.FL	BT840F	nRF9160-BT840F, LTE-BLE module, integrated BLE antenna.
LN60E840E	nRF9160 SICA	u.FL	BT840E	nRF9160-BT840E, LTE-BLE module, u.FL for external BLE antenna.
LN60E840X	nRF9160 SICA	u.FL	BT840X	nRF9160-BT840X, LTE-BLE+PA module, integrated BLE antenna.
LN60E840XE	nRF9160 SICA	u.FL	BT840XE	nRF9160-BT840XE, LTE-BLE+PA module, u.FL for external BLE antenna.
LN60G40F	nRF9160 SICA	Integrated	BT40F	nRF9160-BT40F, LTE-BLE module, integrated BLE antenna. GPS
LN60G40E	nRF9160 SICA	Integrated	BT40E	nRF9160-BT40E, LTE-BLE module, u.FL for external BLE antenna. GPS
LN60E40F	nRF9160 SICA	u.FL	BT40F	nRF9160-BT40F, LTE-BLE module, integrated BLE antenna.
LN60E40E	nRF9160 SICA	u.FL	BT40E	nRF9160-BT40E, LTE-BLE module, u.FL for external BLE antenna.

Nordic nRF9160 SICA Modules

Brief specifications of nRF9160 SICA are below. Full product specifications are available at: <https://www.nordicsemi.com/Products/Low-power-cellular-IoT/nRF9160>

Microcontroller:

- ARM® Cortex® -M33
- 1 MB flash, 256 kB low leakage RAM
- ARM® Trustzone®
- ARM® Cryptocell 310
- Up to 4x SPI master/slave
- Up to 4x I2C compatible two-wire master/slave.
- Up to 4x UART (CTS/RTS)
- I2S
- Digital microphone interface (PDM)
- 4x pulse width modulator (PWM) unit
- 12-bit, 200 ksps ADC - 8 configurable channels with programmable gain
- 3x 32-bit timer with counter mode
- 2x real-time counter (RTC)
- Programmable peripheral interconnect (PPI)
- 32 general purpose I/O pins

LTE modem:

- Transceiver and baseband

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- 3GPP LTE release 13 Cat-M1 and Cat-NB1 compliant
 - 3GPP release 13 coverage enhancement
- 3GPP LTE release 14 Cat-NB2 compliant
- GPS receiver
 - GPS L1 C/A supported
 - GPS antenna and amplifier integrated
- RF transceiver for global coverage
 - Up to 23 dBm output power
 - -108 dBm sensitivity (LTE-M) for low band, -107 dBm for mid band
 - An u.FL connector for external LTE antenna
- LTE band support in hardware:
 - Cat-M1: B1, B2, B3, B4, B5, B8, B12, B13, B14, B17, B18, B19, B20, B25, B26, B28, B66
 - Cat-NB1/NB2: B1, B2, B3, B4, B5, B8, B12, B13, B17, B18, B20, B25, B26, B28, B66
- Nano SIM card connector on-board.
- Power saving features: DRX, eDRX, PSM
- IP v4/v6 stack
- Secure socket (TLS/DTLS) API

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nRF52840 Bluetooth 5.3 Modules

nRF52840 Bluetooth module supports Bluetooth 5.3, Thread, and Zigbee radio interfaces. One of four Bluetooth 5.3 modules can be installed.

- BT840F, an nRF52840 module. It is FCC certified with max. TX power of +8.46 dBm.
- BT840E, an nRF52840 module with an u.FL connector, panel mounted SMA connector for an external antenna. It passes FCC certification testing with ANT060, a 6 dBi antenna.
- BT840X, an nRF52840 module with SKY66112 power amplifier. It passes FCC testings at +21 dBm TX.
- BT840XE, an nRF52840 + SKY66112 module with an u.FL connector, panel mounted SMA connector for an external antenna. It passes FCC testings with ANT000, a 0 dBi antenna.

Maximum TX power of BT840X is about 13.8 dB higher than that of BT840F. The receiver gain of SKY66112 is measured at 1.5 dB. Comparing to BT840F, BT840X has 15 dB more link budget. In free space (antenna high above ground and without obstruction), 15 dB link budget can more than quadruple range. Or, it is enough to penetrate 2 dry walls in typical house in the U.S.A.

If you are developing a mesh network or sensor using BT840X/XE, a gateway with BT840X/XE will provide the longest possible Bluetooth, Thread or Zigbee range. If this gateway is to receive data from various (Fanstel and non Fanstel) sensors, beacons, BT840E with ANT060 antenna will provide the best receiver sensitivity if antennas are deployed in parallel (horizontal polarization).



Full product specifications of nRF52840 can be downloaded at:

<https://www.nordicsemi.com/Products/Low-power-short-range-wireless/nRF52840>

Full product specifications of BT840F Series modules.

<https://www.fanstel.com/download-document>

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Brief specifications of BT840F Series modules.

- nRF52840 QIAA, ARM Cortex M4F, 64 MHz
- ARM® TrustZone® Cryptocell-310 co-processor
- BLE 5 data rate: 2Mbps, 1Mbps, 500kbps, 125kbps.
- IEEE 802.15.4 Thread and Zigbee data rate: 250 Kbps
- 2.4 GHz proprietary data rate: 2 Mbps, 1 Mbps
- Serial Wire Debug (SWD)
- Nordic SoftDevice Ready
- Over-the-Air (OTA) firmware update
- Flash/RAM: 1MB/256KB.
- 48 General purpose I/O pins
- Type 2 NFC-A tag with wake-on field, Touch-to-pair support
- Integrated PCB trace antenna or u.FL connector

module	BT840F	BT840E	BT840X	BT840XE
SoC	nRF52840-QIAA	nRF52840-QIAA	nRF52840-QIAA	nRF52840-QIAA
Size	15x20.8x1.9mm	14x16x1.9mm	15x28.0x1.9mm	15x28.0x1.9mm
BT Antenna	PCB trace	ANT060	PCB trace + PA	PA+ANT000/ANT060
Max TX includes antenna gain	+8.8dBm	+14.4 dBm	+22.6 dBm	+21.0 dBm
32.768 sleep crystal	External	External	Integrated	Integrated
BT range, 1 Mbps, LMPI	1000 meters		1170 meters	1170 meters
BT range, 1Mbps, 1.52m	390 meters		900 meters	1170 meters
BT range, 125 Kbps, LMPI.	2300 meters	3400 meters, est.	>4500 meters	>4500 meters
BT range, 125 kbps, 1.52m	640 meters		1240 meters	1920 meters
FCC ID	X8WBT840F	X8WBT840F	X8WBT840X	X8WBT840X
IC ID	4100A-BT840F	4100A-BT840F	4100A-BT840X	4100A-BT840X
CE	Certified	Certified	Certified	Certified
RCM	Certified	Certified	Certified	Certified
TELEC	201-190710/00	201-190710/00		
Availability	Production	Production	Production	Production

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nRF5340 Bluetooth 5.3 Modules

Bluetooth module supports Bluetooth 5.3, Thread, and Zigbee radio interfaces. One of Bluetooth modules can be installed.

- BT40F, an nRF5340 module.
- BT40E, an nRF5340 module with an u.FL connector, panel mounted SMA connector for an external antenna.
- BT40NE, an nRF5340 module with nRF21540 power amplifier, with both an integrated antenna and an u.FL connector.
- BT840XE, an nRF5340 module with SKY66112 power amplifier.

Nordic nRF5340 SoC has a dual core ARM Cortex™ M33 MCU. BT40F Series modules are footprint compatible with BT840F series. Firmware configuration of GPIO pins is required.

The application core ARM Cortex™ M33 can operate at 128 MHz. It has a Floating Point Unit (FPU) and hardware DSP instruction sets. It can handle Bluetooth profiles needing processing power, e.g., BLE 5.1 directional finding, audio.

Full product specifications of Nordic nRF5340 SoC can be downloaded from:

<https://www.nordicsemi.com/Products/Low-power-short-range-wireless/nRF5340>

Full product specifications of BT40F Series modules can be downloaded from:

<https://www.fanstel.com/download-document>

Brief Specifications BT40F Series modules.

- nRF5340 QKAA, dual core ARM® Cortex M33
- Application Core
 - 128/64 MHz Cortex M33 with FPU and DSP instructions
 - 1MB flash, 512KB RAM
 - 8KB 2-way set associate cache
 - ARM® TrustZone® Cryptocell-312 co-processor
- Network core:
 - 64 MHz Cortex M33 with 2KB instruction cache
 - 256KB flash, 64KB RAM
 - 2.6 mA in RX and 3.2 mA in 0dBm TX
 - Receiver Sensitivity: -97.5 dBm at 1Mbps
 - TX power: programmable +3dBm to -20dBm
 - BLE 5.1 data rate: 2Mbps, 1Mbps, 500kbps, 125kbps.
 - IEEE 802.15.4 data rate: 250 Kbps
 - 2.4 GHz proprietary data rate: 2 Mbps, 1 Mbps
- Serial Wire Debug (SWD)
- Nordic SoftDevice Ready
- Over-the-Air (OTA) firmware update
- Type 2 NFC-A tag with wake-on field, Touch-to-pair support

module	BT40F	BT40E	BT40X
SoC	nRF5340	nRF5340	nRF5340
Size	15x20.8x1.9mm	14x16x1.9mm	15x28.0x1.9mm
BT Antenna	PCB trace	u.FL	PCB trace + PA + u.FL
Max TX			
Operating temp.	-40°C to +105°C	-40°C to +105°C	-40°C to +105°C
Availability	02/21 production	02/21 production	Sample 2Q21

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M262X840XE Series High Power Bluetooth and LoRa Modules

The following table has a list of modules available in the M262X840XE high power Bluetooth and LoRa modules.

- Size of M262X840XE Series module is 30x42mm, for M.2 connector, B key.
- LoRa module LR62E is a Semtech SX1262 module.
- LR62XE is a Semtech SX1262 module with a Power Amplifier (PA).
- Bluetooth module manages LoRa module and must be on board.
- When an M262X840XE module is installed in the gateway, LN module must be without Bluetooth feature, LN60G or LN60E only,
- nRF52840 module can be BT840F, BT840E, BT840X, or BT840XE.

M2 Module	LoRa module	BLE module	M262X840XE High Power Series
M262840F	LR62E	BT840F	LoRa - BLE module
M262840E	LR62E	BT840E	LoRa-BLE module, u.FL
M262840X	LR62E	BT840X	LoRa-BLE+PA module
M262840XE	LR62E	BT840XE	LoRa-BLE+PA module, u.FL
M262X840F	LR62XE	BT840F	LoRa+PA-BLE module
M262X840E	LR62XE	BT840E	LoRa+PA-BLE module, u.FL
M262X840X	LR62XE	BT840X	LoRa+PA-BLE+PA module
M262X840XE	LR62XE	BT840XE	LoRa+PA-BLE+PA module, u.FL
M26240F	LR62E	BT40F	LoRa - BLE module
M26240E	LR62E	BT40E	LoRa-BLE module, u.FL

LR62E specifications:

- LR62E module with Semtech SX1262 transceiver and an u.FL connector.
- Up to +20.3 dBm transceiver (USA version) at 902 to 928 MHz.
- LoRa stacks for cloud connection are managed by a BT840F Series or a BT40F series module.

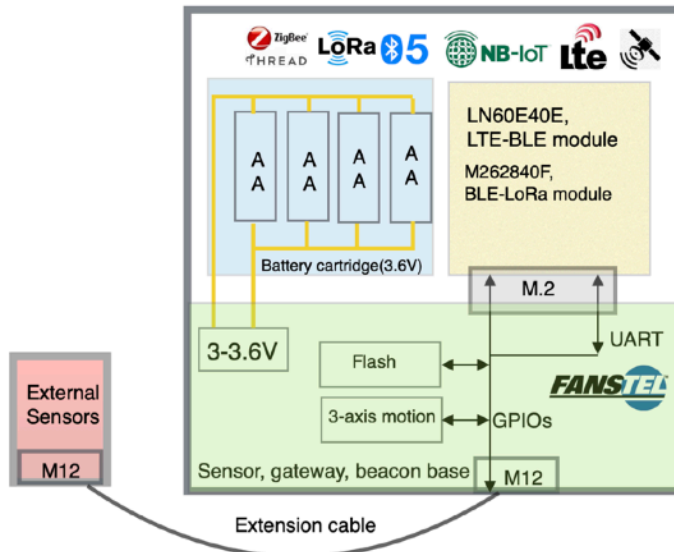
LR62XE specifications:

- LR62XE module with Semtech SX1262 transceiver, a power amplifier, and and.FL connector.
- Up to **+29.2** dBm transceiver (USA version) at 902 to 928 MHz.
- LoRa stacks for cloud connection are managed by a BT840F Series module.

3. Hardware Description

SL40F6M, IP67 Battery Powered BLE to LTE Gateway-Sensor

SL40F5M is an SLM6 gateway base with an LN60E40E LTE-BLE combo module installed.

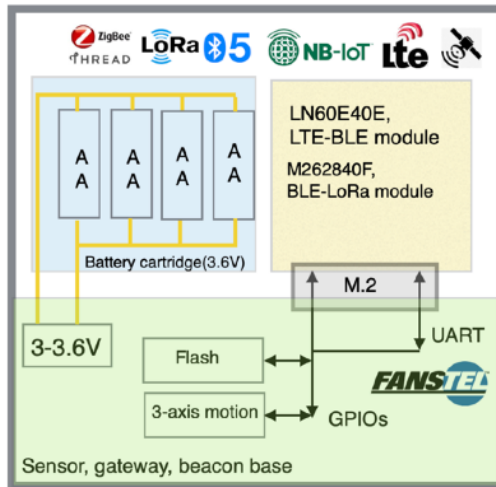


Features:

- SLM6 IP67 gateway base with an 8-pin M12 connector for external wired sensors.
- An LN60E40E combo module with nRF9160 SICA and BT40E nRF5340 module.
- Powered by 1 to 4 AA Lithium batteries, up to 30 amp-hours of power. Batteries are not included.
- Supports BLE 5.3, Thread, and Zigbee radio interfaces.
- Supports LTE-M and NB-IoT interfaces.
- Enclosure color: orange
- Enclosure size: 107x141x40mm
- Gateway can be desk, wall, ceiling, or pole mounted.
- Includes a piece of 2-sided type for mounting.
- Operating temperature: -40°C to +85°C when using 4 AA batteries meeting this specification.

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SL40F6N, IP67 Battery Powered BLE 5.3 to LTE Gateway

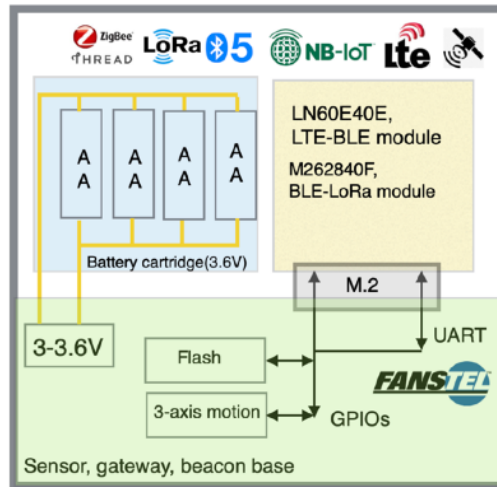


Features:

- SLN6 IP67 gateway base with no connector for external wired sensors
- An LN60E40E combo module with nRF9160 SICA and BT40E nRF5340 module.
- Powered by 1 to 4 AA Lithium batteries, up to 30 amp-hours of power. Batteries are not included.
- Supports BLE 5.3, Thread, and Zigbee radio interfaces.
- Supports LTE-M and NB-IoT interfaces.
- Enclosure color: orange
- Enclosure size: 107x141x40mm
- Gateway can be desk, wall, ceiling, or pole mounted.
- Includes a piece of 2-sided type for mounting.
- Operating temperature: -40°C to +85°C when using 4 AA batteries meeting this specification.

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SLG6N, IP67 Battery Powered LTE Beacon with GPS

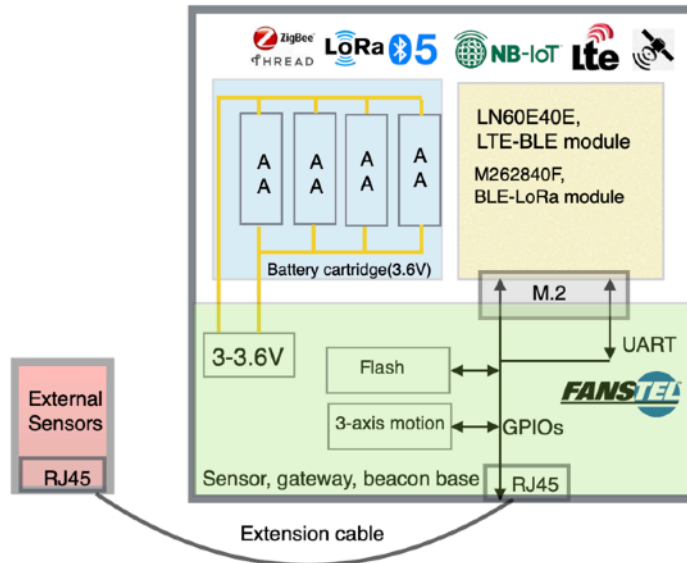


Features:

- SLN6 IP67 gateway base with no connector for external wired sensors.
- An LN60G1 module with nRF9160 SICA, integrated GPS receiver amplifier and antenna.
- Powered by 1 to 4 AA Lithium batteries, up to 30 amp-hours of power. Batteries are not included.
- Supports LTE-M and NB-IoT interfaces.
- Enclosure color: orange
- Enclosure size: 107x141x40mm
- Gateway can be desk, wall, ceiling, or pole mounted.
- Includes a piece of 2-sided type for mounting.
- Operating temperature: -40°C to +85°C when using 4 AA batteries meeting this specification.

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SR840F5R, IP 51 Battery Powered BLE to LTE Gateway-Sensor



Features:

- SLR5 IP51 gateway base with a RJ45 connector for external wired sensors.
- An LN60E840E module with nRF9160 SICA and BT840F, nRF52840 module.
- Powered by 1 to 4 AA Lithium batteries, up to 30 amp-hours of power. Batteries are not included.
- Supports LTE-M and NB-IoT interfaces.
- Enclosure color: black
- Enclosure size: 107x141x40mm
- Gateway can be desk, wall, ceiling, or pole mounted.
- Includes a piece of 2-sided type for mounting.
- Operating temperature: -40°C to +80°C when using 4 AA batteries meeting this specification.

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Private Label and Custom Hardware

Logo and button names are printed on a membrane. They can be customized with 1000 pcs MOQ.

Custom enclosure design and electronic hardware are available. Please contact [Fanstel](#).

PK-LEW840X Programming Kit

To load firmware into LEW840X Series gateway, a Programming Kit PK-LEW840X is required. In addition, you need the following hardware:

- nRF52840-DK, Development Kit for nRF52840 modules.
- nRF5340-DK, Development Kit for nRF5340 modules.
- nRF9160-DK if you have LTE interface

4. Firmware Development and Programming

SL40F6 series gateway/sensor is pre-loaded with LTE NB_IOT demonstration codes.

LTE Modem 1.3.2

SDK V2.0.0

When connected to internet, the gateway sends temperature and humidity sensor data to Fanstel MQTT server. You can use Fanstel MQTT PC tool or mobile APP to monitor data.

MQTT tool or MQTT APP<->MQTT broker <->SLXXXX<->Sensor

It is easier to test gateway and load firmware by removing gateway PCBA from enclosure.

SL40F6 series gateway/sensor is referred as SLXXXX.

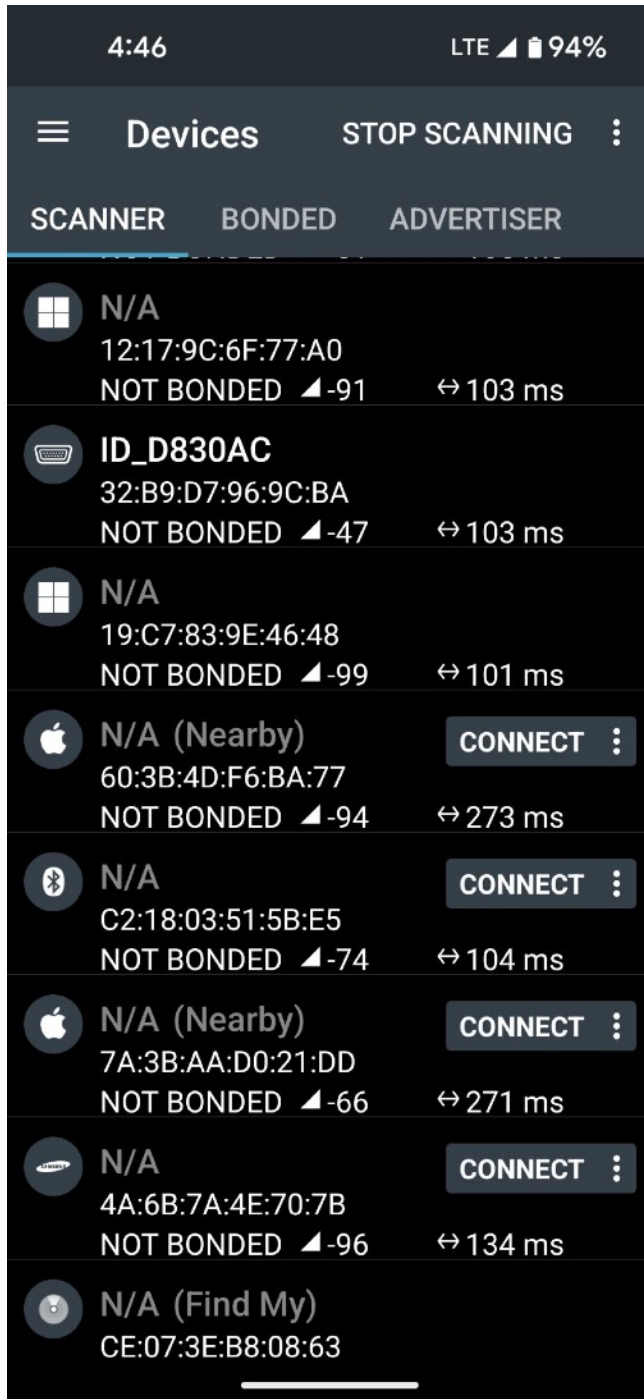
Check the BLE

- Install 4AA 3.6V Lithium batteries.
- The preloaded BLE codes are advertising the MQTT ID.



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- Use nRF Connect for mobile APP to scan the BLE signals.



- The ID is "D830AC" in this screenshot.

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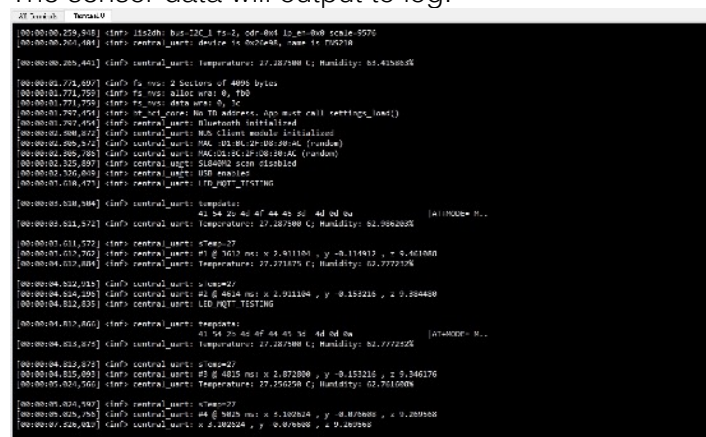
Check LTE MQTT

- Connect the SIM card and antenna.
- Open the MQTT monitor tool.
- Enter the ID code.
- The data is displayed on MQTT monitor tool.



Check Sensors

The preloaded codes include supports for ENS-210 temperature/humidity sensors and LIS3DH motion sensor. Hardware sensors are installed in selected products. Connected the DK debug out to SLXXXX BLE debug in. Open the RTT Viewer log. The sensor data will output to log.



Check LoRa

The preloaded codes include the LoRa Ping Pong codes. Connect the nRF52840 DK debug out to SLXXXX BLE debug in. Open the RTT Viewer log. The LoRa module starts Ping Pong. Need two SLXXXX with BLE-LoRa combo modules to run Ping Pong codes.

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```
J-Link RTT Viewer V7.70e
File Terminals Input Logging Help
All Terminals Terminal C
<info> app_tlinor: RTC: initialized.
<info> app: Fanstel Lora Ping Pong test
<info> app: RF_FREQUENCY=915000000
<info> app: TX_OUTPUT_POWER=22
<info> app: Setting adv params PHY to 2M ..
<info> app: Advertising type set to CONNECTABLE_SCANNABLE_UNDIRECTED
<info> app: BLE and Lora started.
<info> app: Starting advertising.
<info> app: WHO_AM_I=33
<info> app: CTRL_RESET=5F
<info> app: L33D01 x =0.0 y =0.202 z =0.64
<info> app: Temp: 25.00 c
<info> app: Hum: 73.97
<info> app: Temp: 25.35 c
<info> app: Hum: 79.56
```

Programming the nRF52840 or nRF5340 Module.

For SLXXXX with an nRF52840 module, connect nRF52840DK or nRF9160DK debug out to SLXXXX JS1 BLE debug in.

For SLXXXX with an nRF5340 module, connect the nRF5340DK debug out to SLXXXX JS1 BLE debug in.

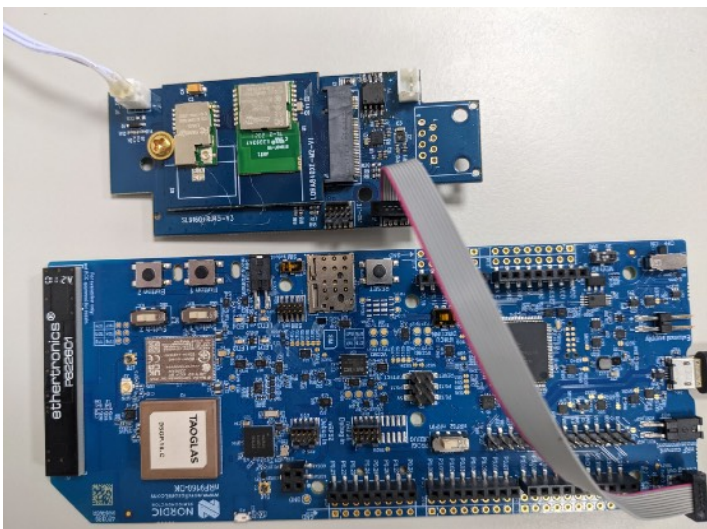
Both DK and SLXXXX need to supply power resource.

Download and install Nrf5x-Command-Line Tools

<https://www.nordicsemi.com/Software-and-Tools/Development-Tools/nRF5-Command-Line-Tools>

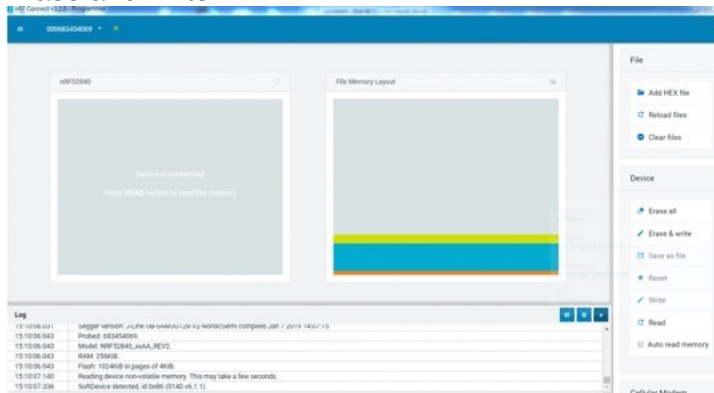
Download the nRF Connect desk top version

<https://www.nordicsemi.com/Software-and-Tools/Development-Tools/nRF-Connect-for-desktop>



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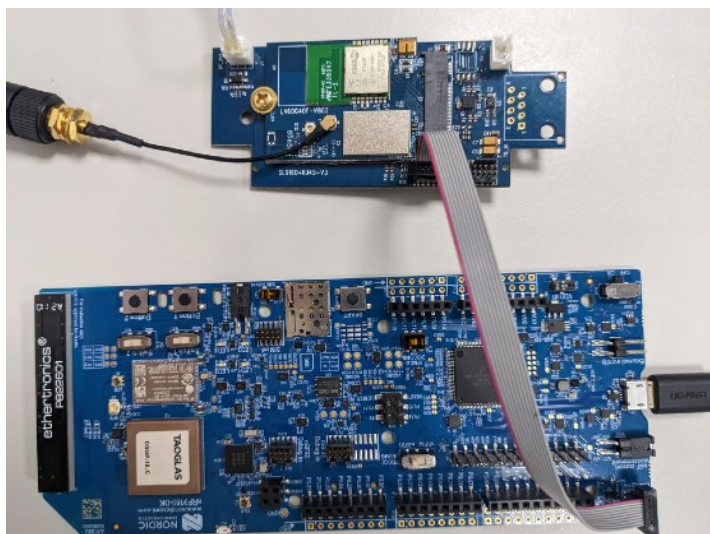
Open nRF connect /programmer and load the SoftDevice and application codes.
Erase and write.



Programming the nRF9160 Module

Connect nRF9160 DK debug out to SLXXXX JS2 Debug in

Open nRF connect /programmer and load the SoftDevice and application codes.
Erase and write.



Nordic Development Environment

Nordic Semiconductor provides a complete range of hardware and software development tools for the nRF52 Series devices. nRF52840 DK board is recommended for firmware development. Document and Software development tools can be downloaded by the following links.

Get start 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. You can search or ask a question there.

<https://devzone.nordicsemi.com/tutorials/b/getting-started/posts/development-with-gcc-and-eclipse>

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Programming the Nordic chip

Download and install Nrf5x-Command-Line Tools

<https://www.nordicsemi.com/eng/nordic/Products/nRF52840/nRF5x-Command-Line-Tools-Win32/58850>

Download and install nRF Connect

https://www.nordicsemi.com/?sc_itemid={B935528E-8BFA-42D9-8BB5-83E2A5E1FF5C}

Revision History

- Sep.2022, Ver. 0.90: Initial draft release.

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