User Manual of SRM100A(Rev1.0)

1. Introduction

The SRM100A is a dual mode module supporting Sigfox, BLE.
This Module able to transmit and receive messages using the SIGFOX network.
The typical applications can be used as a low power tracking device.

2. Hardware Architecture:

2.1 Main Chipset Information

Item	Vendor	Part Number
SigFox BLE	STMicroelectronics STMicroelectronics	S2-LP BlueNRG-2

2.2 Circuit Block Diagram

The major internal and external block diagram of SRM100A is illustrated in Figure 1-1.

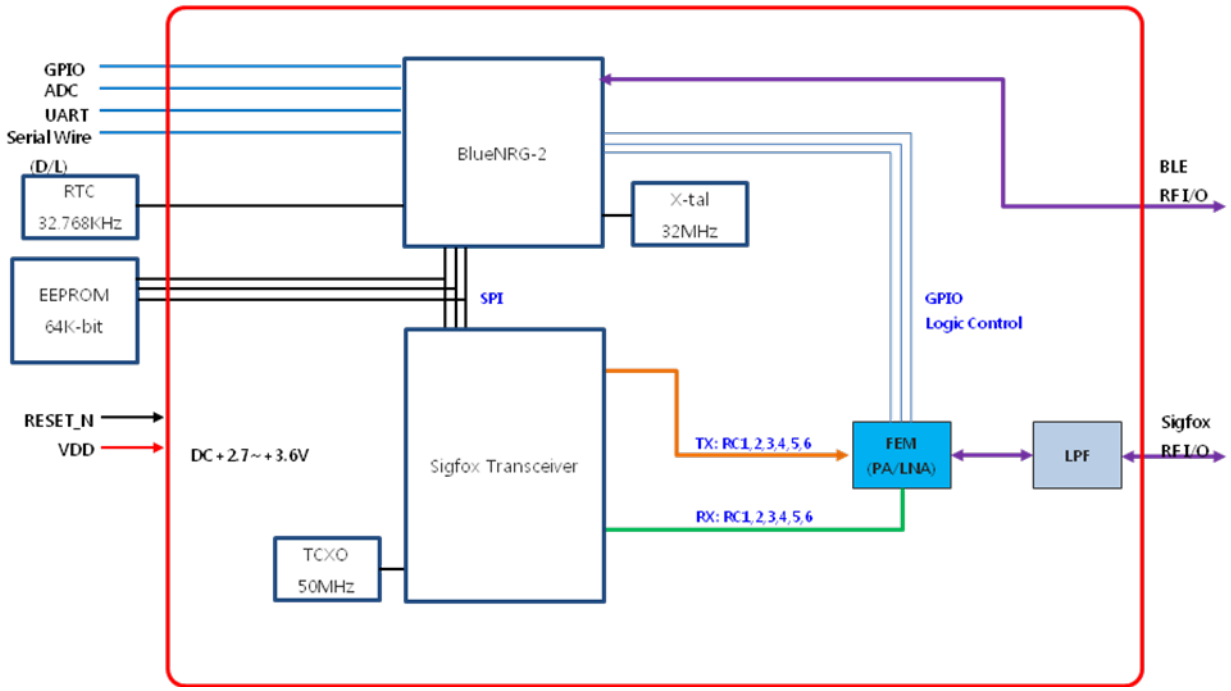


Figure 1-1 SRM100A block diagram and System Interface

3. Operational Description

-SIGFOX

SIGFOX able to transmit and receive messages using the SIGFOX network.
This module address the RC1(Europe), RC2(North America), RC3(Japan), RC4(Australia, New Zealand), and RC5(Korea).

-BLE

Bluetooth 5.0 optimized for low-power applications.
The RADIO contains a 2.4 GHz radio receiver and a 2.4 GHz radio transmitter that is compatible with BlueNRG-2 proprietary 1 Mbps radio modes in addition to 1 Mbps *Bluetooth*® low energy mode.

3.1 Features

- SIGFOX
> Sigfox up-link and down-link functionality controlled by CLI commands
> Ultra-low power consumption
> High performance narrow-band Sigfox

- BLE
> BLE single mode system-on-chip compliant with Bluetooth 5.0 specifications
(master/slave and multiple simultaneous roles, LE data packet length extension)
> Cortex-M0 32-bit based architecture core
> Programable 256 kB Flash
> 24 kB RAM with retention (two 12 kB banks)
> External interface: 26 GPIO, 1xSPI, 2xI^2C, 1xUART, 2xCrystal (32.768 KHz, 32 MHz) and 10-bit ADC

3.2 Time base of the RF frequency

-SIGFOX
For Sigfox RF frequency, a TCXO(50MHz) is a clock reference.

-BLE
Using external 32.768 kHz crystal for RTC.
Using external 32 MHz crystal for BLE.

3.3 Transmission

-SIGFOX
The Tx path produces a DBPSK-modulated signal. Modulate RF signal generated by the synthesizer. The modulated RF signal is fed to the integrated RX/TX switch and antenna interface and then out of the S2-LP.

-BLE

In 2.4GHz transmission, TX IQ signal is inputted through DAC in IC and transmitted through amplification stage through TX carrier frequency.

3.4 Receiver

-SIGFOX

The Rx path is able to receive sub-1GHz signal and the noise amplifier is built in the inside of the chip, it amplifies the received signal by the low noise amplifier according to the receiving intensity, and the amplified signal is converted into the digital signal through the ADC, Packets will be interpreted.

-BLE

The transceiver IC is isolated to prevent unwanted noise emission by the internal low noise amplifier stage, and the RF signal is converted and demodulated into RX IQ signal through the intermediate frequency, low pass filter, and input to the baseband processing section.

3.5 Product Details

-SIGFOX

> Data Modulation

TX : DBPSK

RX : 2GFSK

> Frequency :

Sigfox zone	Uplink/TX (MHz)
RC2	902.1375 ~ 904.6625
RC4	920.7375 ~ 923.2625

-BLE

> Data Modulation : GFSK

> Frequency : 2402-2480MHz

3.6 Conducted output Power tolerance

-SIGFOX Output power : 23.5dBm (tolerance: +/- 2dBm)

-BLE Output power : 1.0dBm (tolerance: +/- 2dBm)

3.7 SRM100A Category of signal

1) Categorization as Correlated or Completely Uncorrelated

For the purposes of this guidance, transmitter output signals are considered *correlated* if any of the following are true:

- The same digital data are transmitted from two or more antennas in a given symbol period, even with different coding or phase shifts; or,
- Correlation between two transmitted signals exists at any frequency and time delay; or,
- Multiple transmitter outputs serve to focus energy in a given direction or to a given receiver; or,
- The operating mode combines correlated techniques with uncorrelated techniques.

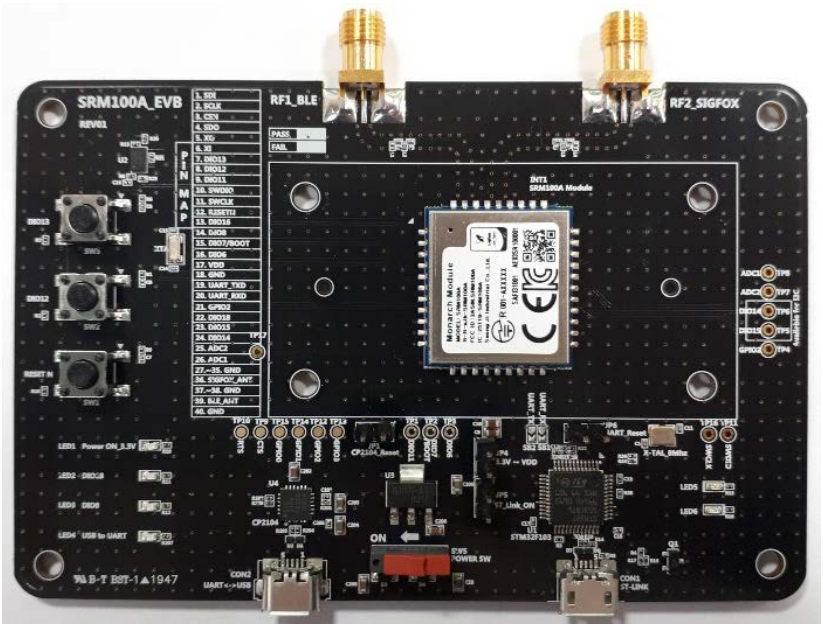
Otherwise, the output signals are considered *completely uncorrelated*.

4. Installation Guide

- Contents

This module is used by mounting on the main board that included antenna.

- InstallationFigure



5. FCC_IC statement

- FCC ID : 2AS8LSRM100A

- IC ID : 25119-SRM100A

6. Contact Address

54-33, DongtanHana1(i)-gil, Hwaseong-si, Gyeonggi-do, 18423, Korea.

7. Manufacturer

SEONG JI INDUSTRIAL CO., LTD.

<FCC/IC Warning>

FCC Part 15.19 Statements:	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. 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.
FCC Part 15.21 statement	Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
<Regulatory notice to host manufacturer according to KDB 996369 D03 OEM Manual v01>	
List of applicable FCC rules	This module has been granted modular approval as below listed FCC rule parts. -FCC Rule parts 15C(15.247)
Summarize the specific operational use conditions	-The OEM integrator should use equivalent antennas which is the same type and equal or less gain then an antenna listed in this instruction manual.
RF exposure considerations	The module has been certified for integration into products only by OEM integrators under the following condition: -The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times. -The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures. -Mobile use As long as the three conditions above are met, further transmitter testing will not be required. OEM integrators should provide the minimum separation distance to end users in their end-product manuals. l'exposition aux RF L'antenne (ou les antennes) doit être installée de façon à maintenir à tout instant une distance minimum de au moins 20 cm entre la source de radiation (l'antenne) et toute personne physique. Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment. Attention: Les changements ou modifications de cet appareil non expressément approuvé par le fabricant peuvent annuler votre droit à utiliser cet équipement.
Antennas list	This radio transmitter [25119-SRM100A] 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. *FCC/IC requirements for antenna list This module is certified with the following antenna. -Type: External Antenna(Dipole antenna) -Max. peak Antenna gain

<table>
<tr><td></td><td>
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<tr><th>Frequency band</th><th>Sigfox(INNO-ADI-0269)</th><th>BT(INNO-EWFSWS-151)</th></tr>
<tr><td>BLE(2.4GHz)</td><td></td><td>5.33dBi</td></tr>
<tr><td>Sigfox(900MHz)</td><td>1.98dBi</td><td></td></tr>
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Any new antenna type, higher gain than listed antenna should be met the requirements of FCC rule 15.203 and 2.1043 as permissive change procedure. The use of a different trace layout other than approved requires a Class II Permissive Change or a New Grant as appropriate.
</td></tr>
<tr><td>End Product Labeling</td><td>The module is labeled with its own FCC ID. If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case, the final end product must be labeled in a visible area with the following:
-Contains FCC ID: 2AS8LSRM100A
-Contains IC: 25119-SRM100A

Le module SRM100A est étiqueté avec sa propre identification FCC et son propre numéro de certification IC. Si l’identification FCC et le numéro de certification IC ne sont pas visibles lorsque le module est installé à l’intérieur d’un autre dispositif, la partie externe du dispositif dans lequel le module est installé devra également présenter une étiquette faisant référence au module inclus. Dans ce cas, le produit final devra être étiqueté sur une zone visible avec les informations suivantes :
« Contient module émetteur identification FCC ID : 2AS8LSRM100A
« Contient module émetteur IC : 25119-SRM100A</td></tr>
<tr><td>Information on test modes and additional testing requirements</td><td>OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, additional transmitter in the host, etc.).</td></tr>
<tr><td>Additional testing, Part 15 Subpart B disclaimer</td><td>The final host product also requires Part 15 subpart B compliance testing with the modular transmitter installed to be properly authorized for operation as a Part 15 digital device.</td></tr>
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