

SEONG JI / SRM100A

Monarch Module

P/N: WSSRM100A00

DATASHEET Rev0.2

SEONG JI

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1. Approval Revision Record

NO	REASON	RECORD OF REVISION	Date	Remark
1	REV 0.0	WSSRM100A00 Initial Releases	2019-12-23	-
2	REV 0.1	Certification No. added.	2020-04-09	-
		Notice added.	2020-04-09	-
3	REV 0.2	Modify PIN MAP.	2020-07-23	-
		EEPROM feature removed.		-

2. Scope

The SRM100A is a sub-1GHz with PA and Bluetooth low energy ultra low power wireless MCU Module. This module is built-in STM S2-LP and BlueNRG-2 chip.

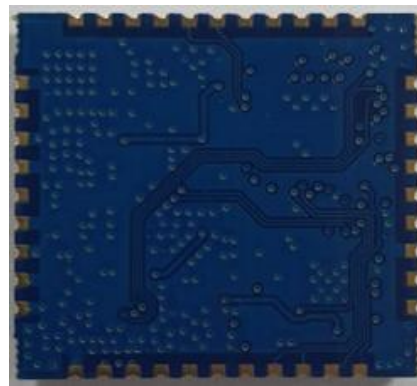
This module is available worldwide.

- Description
 - Sigfox Configuration RC1, 2, 3, 4, 5, 6, 7
 - BLE : Support version BT5.0 (option)
 - UART interface
 - 4GPIOs and I2C
- PIN Type : Half thru-hole SMD Type
- Dimension : 19.5mm(W) x 21.5mm(L) x 2.5mm(H)

This module has complete SIGFOX P1(RC1~ RC7) verification and ETSI, FCC, IC Telec and KC RF regulatory certification.

3. Numbering of product

3-1. Product



3-2. Part No.

W	S	S	R	M	1	0	0	A	0	0
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

No.	EXPLANATION
(1),(2)	Product Type(WS:Wireless Solution)
(3)	Application(S:Sigfox)
(4)	Application(R:Roaming)
(5)	Type(M:Module)
(6),(7),(8)	Group model

Sigfox Roaming Module

Revision: 0.2

(9)	Derived model : Sub Part(A:Default)
(10),(11)	Managed Code : Default(00)

3-3. Lot. No.

S	A	F	D	C	1	0	0	1
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

(1)	Sigfox Module												
(2)	Manufacture Area												
	Packing Lot			A		B		C					
	Area			Korea		China		Vietnam					
(3)	Year												
	Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
	Mark	E	F	G	H	I	J	K	L	M	N		
(4)	Month												
	Month	1	2	3	4	5	6	7	8	9	10	11	12
	Mark	A	B	C	D	E	F	G	H	I	J	K	L
(5)	Day												
	Day	1	2	3	4	5	6	7	8	9	10		
	Mark	1	2	3	4	5	6	7	8	9	A		
	Day	11	12	13	14	15	16	17	18	19	20		
	Mark	B	C	D	E	F	G	H	I	J	K		
	Day	21	22	23	24	25	26	27	28	29	30	31	
	Mark	L	M	N	O	P	Q	R	S	T	U	V	
(6), (7)	Model Serial Number (10,11,12,13...)												
(8), (9)	A Serial Number (1serial: 640ea)												

4. Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
VCC	Module input voltage	3.6	V
OT	Operating Temperature	-30 to +85	°C
ST	Storage Temperature	-40 to +125	°C
Ves	Electrostatic handling(HBM)	+/-2000	V

5. DC Characteristics

Symbol	Parameter	Min	Typ.	Max	Unit
VCC	Module input voltage	2.7	3.3	3.6	V

6. I/O Specifications

Symbol	Parameter	Min	Typ.	Max	Unit
VCC	Supply voltage		3.3	3.6	V
VIH	High level input voltage	0.65*VCC			V
VIL	Low level input voltage			0.9	V

7. RF Specifications

7-1. Sigfox

7-1-1. Electrical Specification

Conditions: VCC=3.3V, Temp=25℃, reduce_output_power=0

Parameter		Min	Typ.	Max	Unit
Current	Tx Current(@+13.5dBm, CW) RC1,RC3,RC5,RC6,RC7		28		mA
	Tx Current(@+23.5dBm, CW) RC2,RC4		230		mA
	RX Current		18.7		mA
	Sleep Current		30		uA

7-1-2. Receiver, Transmitter Specification

Conditions: VCC=3.3V, Temp=25℃

Parameter			Min	Typ.	Max	Unit
RF Frequency Range	RC1	Tx	868.034	868.130	868.226	MHz
		Rx	869.429	869.525	869.621	MHz
	RC2	Tx	902.104	902.2	902.296	MHz
		Rx	905.104	905.2	905.296	MHz
	RC3	Tx	923.104	923.2	923.296	MHz
		Rx	922.104	922.2	922.296	MHz
	RC4	Tx	920.704	920.8	920.896	MHz
		Rx	922.204	922.3	922.396	MHz
	RC5	Tx	923.204	923.3	923.396	MHz
		Rx	922.204	922.3	922.396	MHz
	RC6	Tx	865.104	865.2	865.296	MHz
		Rx	866.204	866.3	866.396	MHz
	RC7	Tx	867.704	868.8	868.896	MHz
		Rx	869.004	869.1	869.196	MHz
Tx output power	RC1, RC3, RC5, RC6, RC7			+13.5		dBm
	RC2, RC4			+23.5		dBm
Frequency Error Tolerance(+25℃)			-3.0	-	+3.0	ppm

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2 nd Harmonics(conducted)	-	-	-35	dBm
3 nd Harmonics(conducted)	-	-	-35	dBm
Rx Sensitivity(@600bps, GFSK)	-	-127	-	dBm
Rx Spurious Emission(30MHz~12.75GHz)	-	-	-54	dBm

7-2. BLE

7-2-1. Electrical Specification

Parameter		Min	Typ.	Max	Unit
BLE	Tx mode(@+8dBm, Cont.Tx)		14		mA
	Rx mode		13		mA

7-2-2. Receiver, Transmitter Specification

Conditions: VCC=3.3V, Temp=25℃

Parameter	Min	Typ.	Max	Unit
RF Frequency Range	2.402	-	2.480	GHz
Output Power	-	8	10	dBm
6dB bandwidth for modulated carrier(1Mbps)	500			KHz
1 st adjacent channel transmit power 2Mhz		-35		dBm
2 nd Aduacent channel transmit power >3		-40		dBm
Sensitivity(BER<0.1%)		-88		dBm
Saturation(BER<0.1%)		11		dBm

8. TCXO Specifications

1. Device Name TCXO
2. Model Name DSB211SDN
3. Nominal Frequency 50.000 MHz
4. Mass 0.015g max.
5. Absolute Maximum Ratings

	Item	Symbol	Rating	unit
1	Supply Voltage	V _{CC}	-0.3~+4.6	V
2	Storage Temperature Range	T _{STG}	-40~+85	°C

6. Recommended Operating Conditions

	Item	Symbol	min.	typ.	max.	unit
1	Supply Voltage	V _{CC}	+1.71	+1.8	+3.7	V
2	Load Impedance (resistance part)	L _{OAD} R	9	10	11	kΩ
	(parallel capacitance)	L _{OAD} C	9	10	11	pF
3	Operating Temperature Range	T _{OPR}	-30	-	+85	°C

7. Electrical Characteristics

(T_A=-30~+85°C, L_{OAD} R/C=10kΩ/10pF, V_{CC}=+1.8V, unless otherwise noted)

	Item	Conditions	Limits			unit	Notes
			min.	typ.	max.		
1	Current Consumption		-	-	+2.0	mA	
2	Output Level		0.8	-	-	V _{P-P}	1
3	Symmetry	GND level (DC cut)	40/60	-	60/40	%	
4	Harmonics		-	-	-5	dBc	
5	Frequency Stability						
	1.Tolerance	After 2 times reflow Ref. to nominal frequency	-	-	±2.0	ppm	2,3
	2.vs Temperature	T _A =-30~+85°C Ref. to frequency (T _A =+25°C)	-	-	±2.5	ppm	
	3.vs Supply Voltage	V _{CC} =+1.8V±5%	-	-	±0.2	ppm	
	4.vs Load Variation	L _{OAD} R/C = (10kΩ/10pF) ±10%	-	-	±0.2	ppm	
	5.vs Aging	T _A =Room ambient	-	-	±1.0	ppm/year	
6	Start Up Time	@90% of final V _{OUT} level	-	-	2.0	ms	
7	SSB Phase Noise	Relative to F0 level offset 100Hz	-	-	-105	dBc/Hz	2
		Relative to F0 level offset 1kHz	-	-	-125		
		Relative to F0 level offset 10kHz	-	-	-145		
		Relative to F0 level offset 100kHz	-	-	-150		

Notes

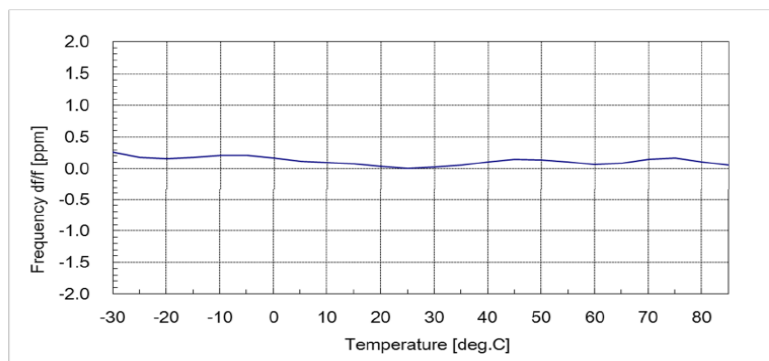
1. Clipped sine wave (DC-coupled)
2. T_A=+25°C
3. Please leave after reflow in 2h or more at room ambient.

Frequency stability vs. Temperature



DSB211SDN 50MHz ZK16476

Condition: V_{CC}=+1.8V, Load=10kΩ/10pF, -30 ~ +85°C(Ref.+25°C)



*Typical Value

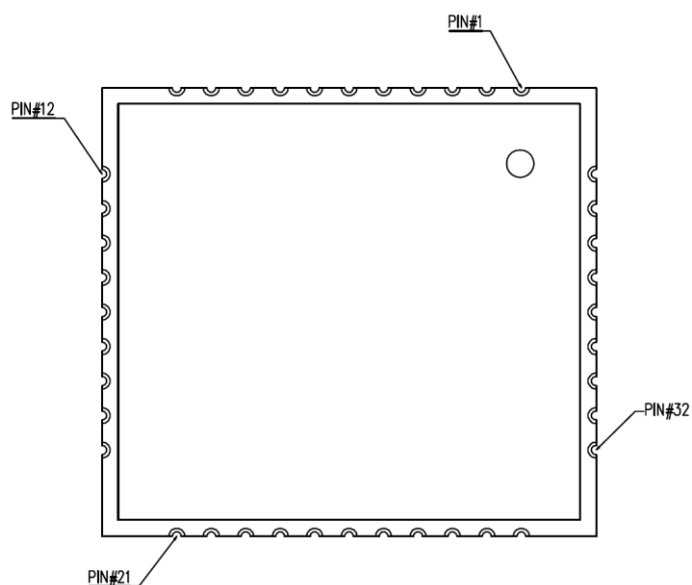
2019/10/25

Daishinku Corp.

Engineering Section

9. Pin Description

9-1. Interface PIN(Half Thru-hole Type : 40 Pin) Top view



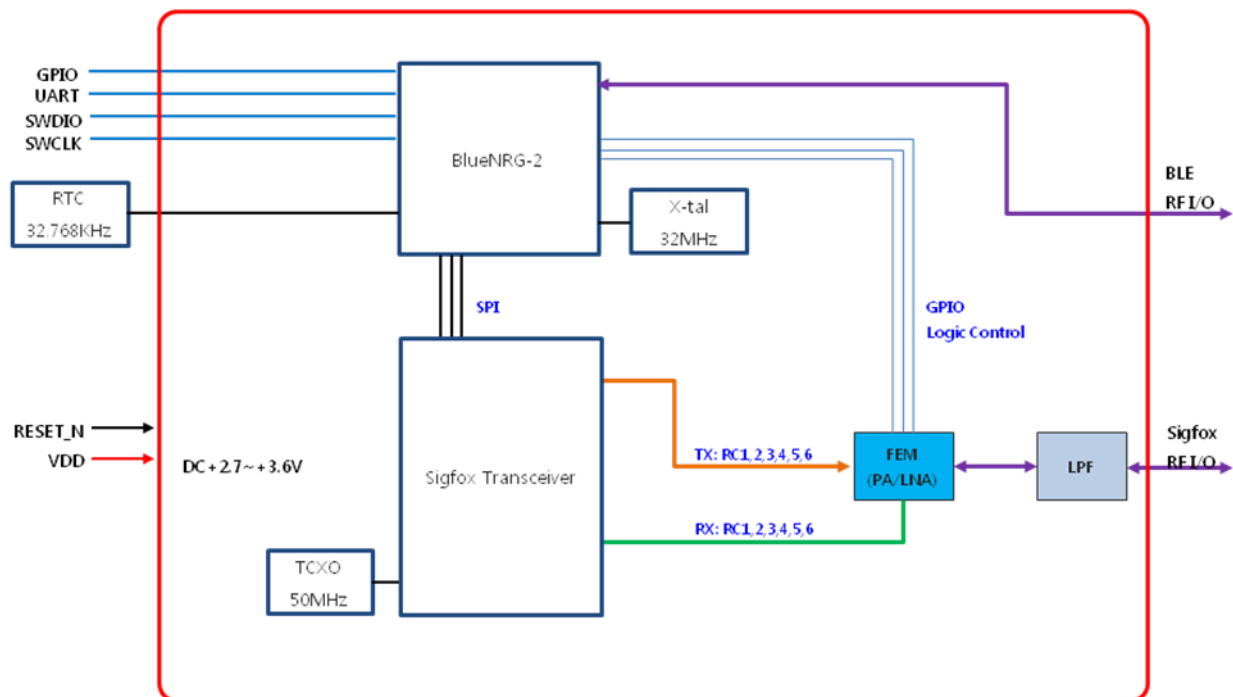
NO	PIN NAME	NO	PIN NAME	NO	PIN NAME
1	N.C.	16	DIO6	31	GND
2	N.C.	17	VCC	32	GND
3	N.C.	18	GND	33	GND
4	N.C.	19	UART_TXD	34	GND
5	XO	20	UART_RXD	35	GND
6	XI	21	TX_IND	36	SIGFOX_ANT
7	WAKEUP	22	DIO18	37	GND
8	DIO12	23	I2C_DAT	38	GND
9	DIO11	24	I2C_CLK	39	BLE_ANT
10	SWDIO	25	N.C.	40	GND
11	SWCLK	26	N.C.		
12	RESETN	27	GND		
13	N.C	28	GND		
14	EXCEPTION	29	GND		
15	N.C.	30	GND		

9-2. Interface PIN description

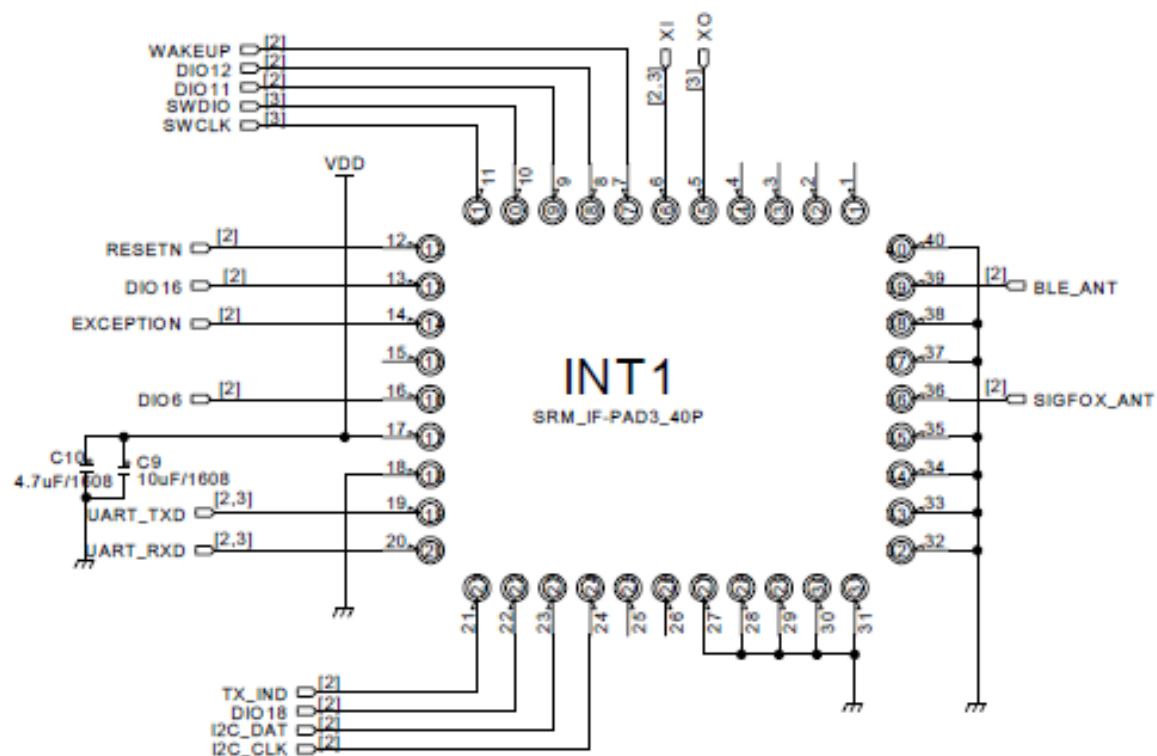
Pin No.	Pin name	Type	Description
1	N.C.	N.C	Not Connected.
2	N.C.	N.C	Not Connected.
3	N.C.	N.C	Not Connected.
4	N.C.	N.C	Not Connected.
5	XO	O	32.768kHz Sleep Crystal Output
6	XI	I	32.768kHz Sleep Crystal Input
7	WAKEUP	I	Wake up SRM100A from sleep. Edge Triggered : H -> L
8	DIO12	I	General purpose digital I
9	DIO11	I/O	General purpose digital I/O
10	SWDIO	I/O	Serial wire debug data in/output It must be connected to an external connector or TP for Use in RF regulatory certifications.
11	SWCLK	I	Serial wire debug clock in It must be connected to an external connector or TP for Use in RF regulatory certifications.
12	RESETN	I	System reset
13	N.C	N.C	Not Connected.
14	EXCEPTION	O	Exception Notification. Need to reset SRM100A. Exception : HIGH (Normal : LOW)
15	N.C.	N.C	Not Connected.
16	DIO6	I/O	General purpose digital I/O
17	VCC	VCC	Supply voltage input, +3.3Vdc typ.
18	GND	GND	Common ground
19	UART_TXD	O	UART Tx data
20	UART_RXD	I	UART Rx data
21	TX_IND	O	Indicate Sigfox Tx State. (Tx : HIGH, IDLE : LOW)
22	DIO18	I/O	General purpose digital I/O
23	I2C_DAT	I/O	I2C DATA (option)
24	I2C_CLK	I/O	I2C_CLK (option)
25	N.C.	N.C	Not Connected.
26	N.C.	N.C	Not Connected.
27~35	GND	GND	Common ground
36	SIGFOX_ANT	RF I/O	Sigfox RF in/out put
37,38	GND	GND	Common ground

39	BLE_ANT	RF I/O	BLE RF in/out put
40	GND	GND	Common ground

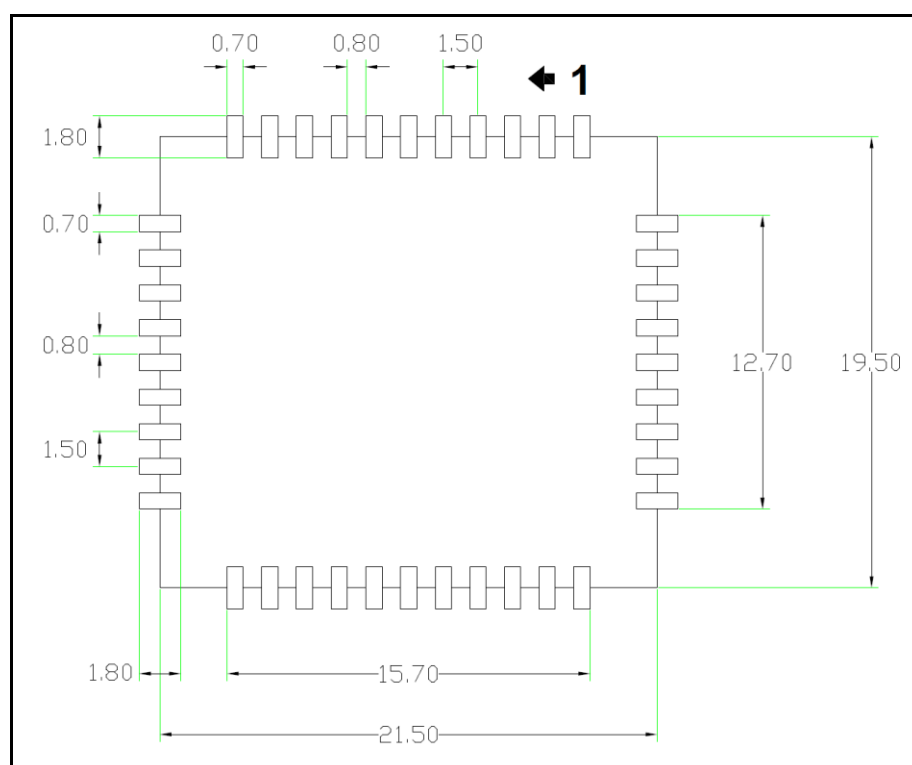
10. Block Diagram



11. Reference Schematic

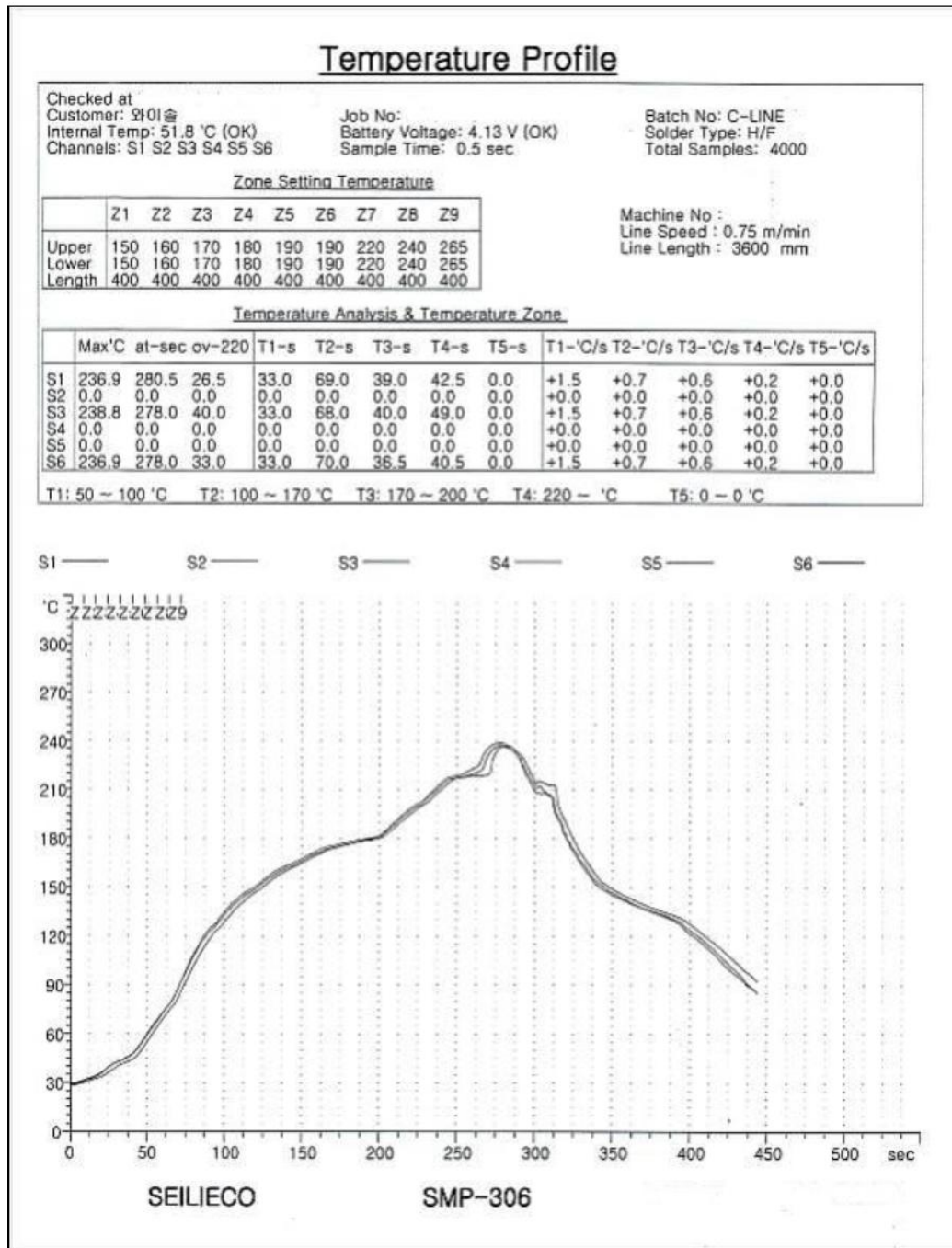


Unit: mm



13. Reflow profile

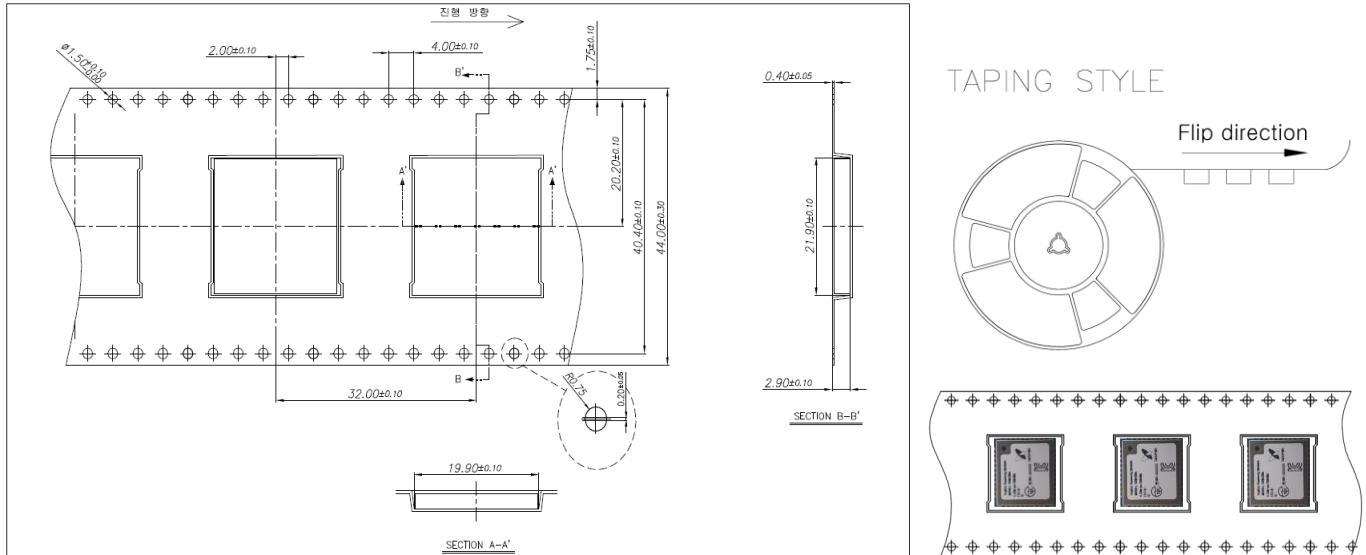
<Reflow profile of Module>



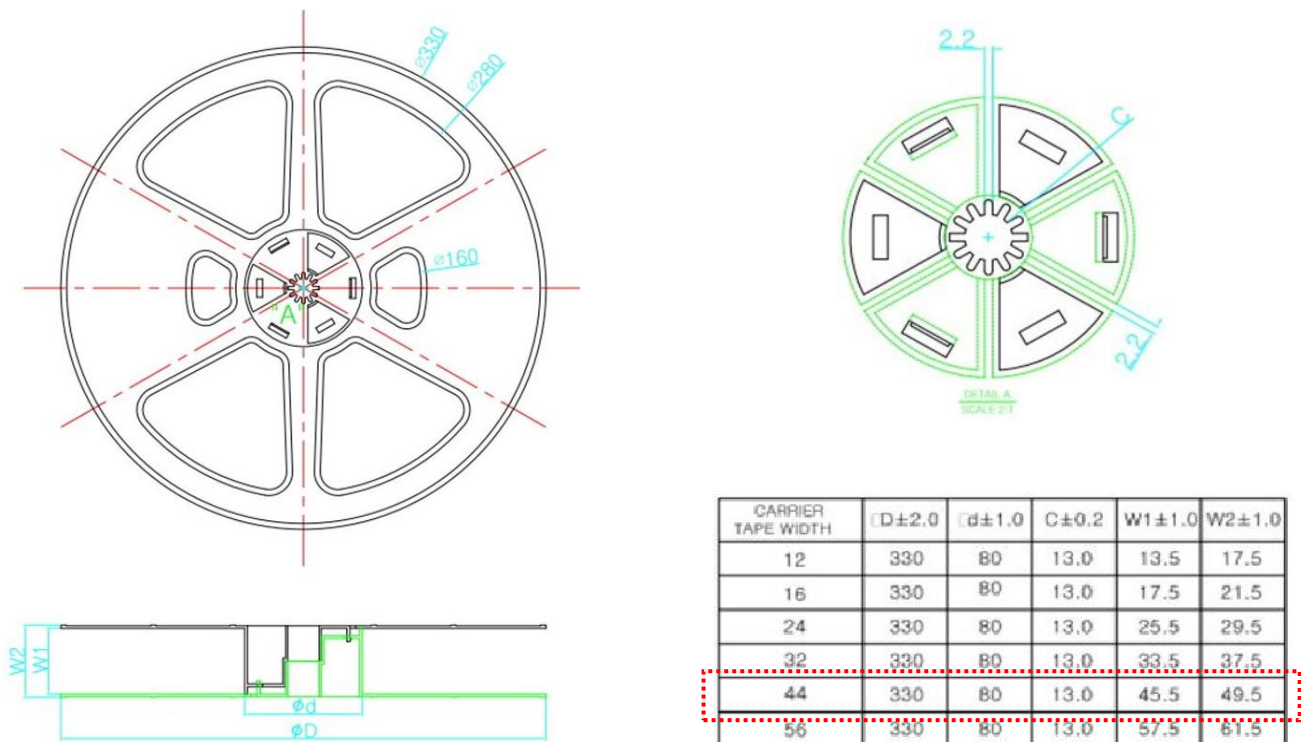
SPEC	Preheat	Soak	Ramp	PEAK
	50~100°C	100~170°C	220°C ↑	240°C
	1~2°C/sec	60~100sec	30~50sec	±5°C
result of measurement	1.5	69	44	237.5
	OK	OK	OK	OK

14. Package

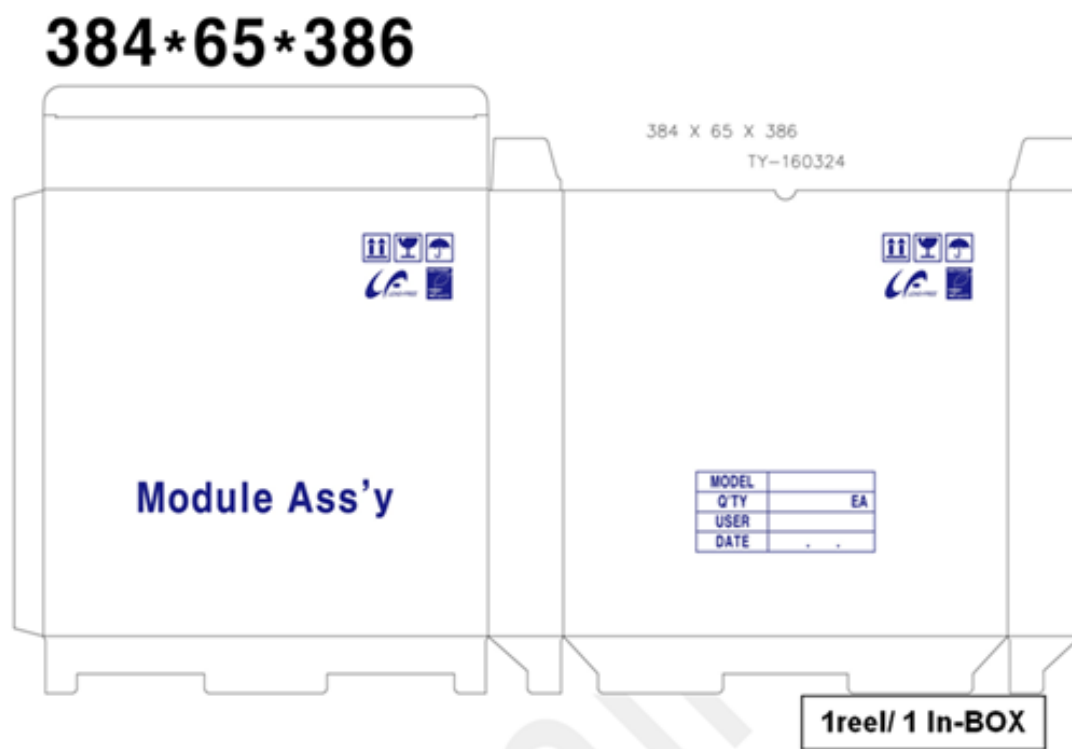
14-1. Dimension of Tape



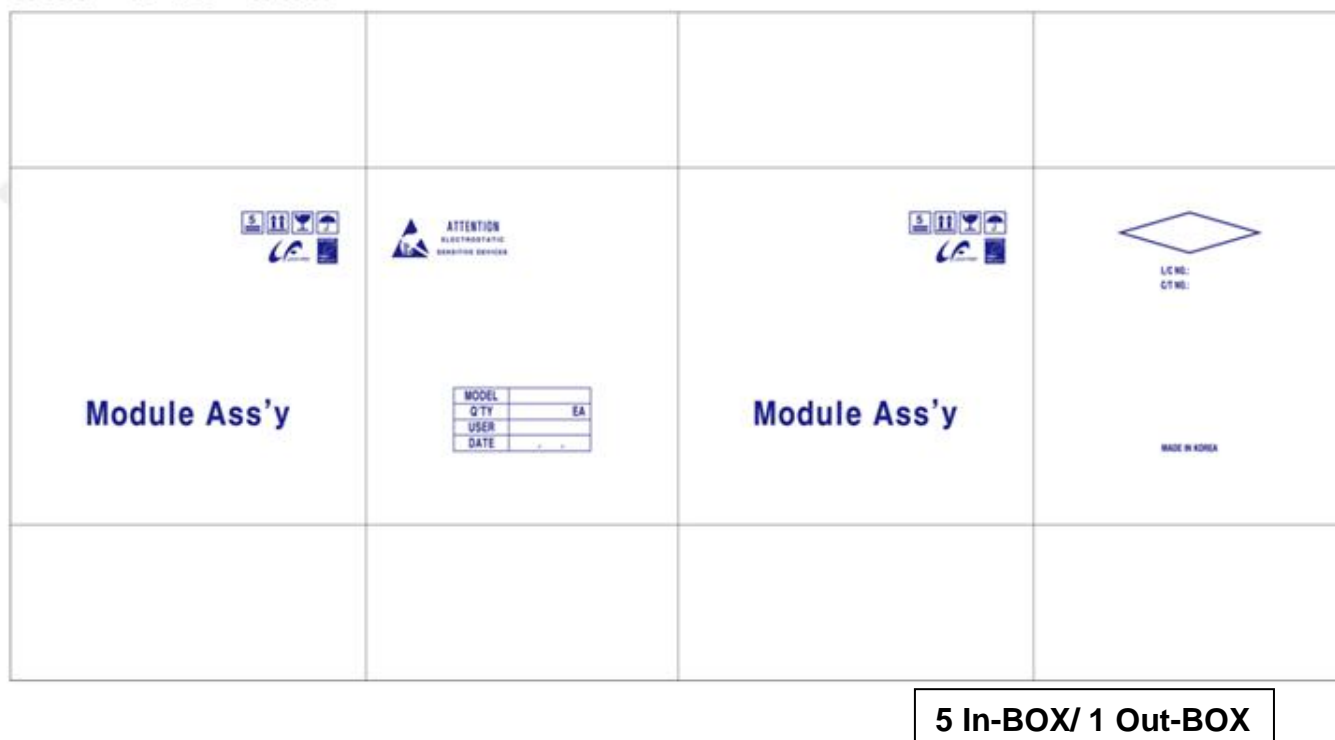
14-2. Dimension of Reel



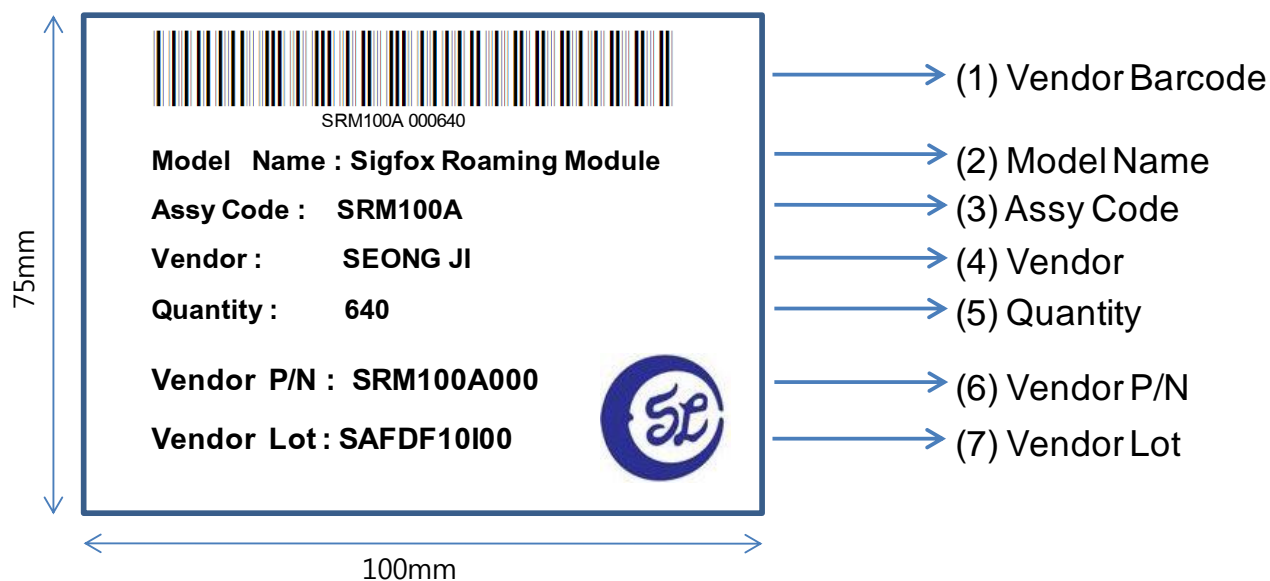
14-3. IN BOX



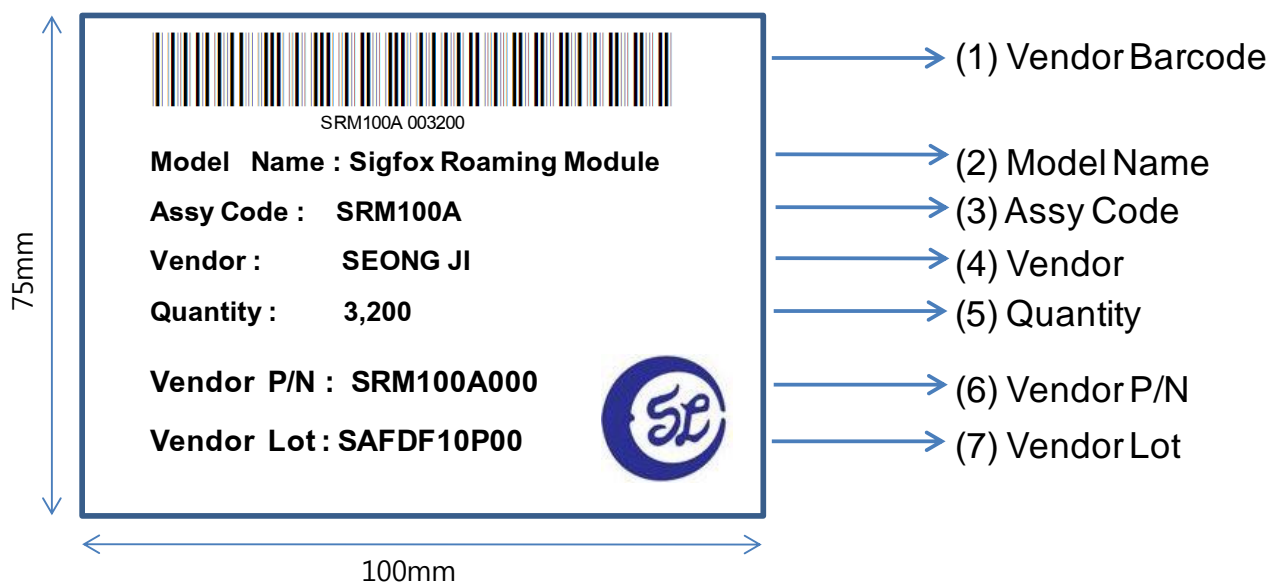
14-4. OUT BOX

387*340*390

14-5. IN BOX Label



14-6. OUT BOX Label



15. CLI Command

Name	Arg	Arguments description	Description
node_close		None	Closes the Sigfox library, resetting its state
node_open	u	rc : pointer to sfx_rc_t type representing the RC number(RC1=1, RC2=2, RC3C=3, RC4=4, RC5=5, RC6=6 or RC7=7).	
Node_open_with_zone	u		
node_get_info		None	
node_get_version	u	None	
node_send_bit	uuu	bit_value : bit value to send (0 or 1) tx_repeat : tx repeat value (default : 2) initiate_downlink_flag : wait for a response after transmitting. (0 or 1)	This function is used to send a single bit. It is mainly used when the node seeks downlink data (and not to transmit).
node_send_frame	buu	cust_data : pointer to the data to transmit ex) ASCII : "12345678" Hexa : {0102030405060708} tx_repeat : tx repeat value (default : 2) initiate_downlink_flag : wait for a response after transmitting. (0 or 1)	DM00365435.pdf Please refer to page 9 of the "DM00365435.pdf" file
Node_execute_monarch_scan	uuu	rc_capability : rc 7 6 5 4 3 2 1 bit 6 5 4 3 2 1 0 time : scan time time_unit : 0: ms, 1:sec, 2:min, 3:hour	Execute Monarch scan. rc_capability, time, unit
Node_stop_monarch_scan		None	This function stops any ongoing RC scan
node_set_std_config	wwwv	config_word1 : ch1 ~ 32 for RC2,4 config_word2 : ch33~64 for RC2,4 config_word3 : ch65~86 for RC2,4 timer_enable : (0,1) for RC2,4	DM00365435.pdf Please refer to page 10 of the "DM00365435.pdf" file
Node_get_std_config		none	Get std_config value.
start_continuous_transmission	wu	frequency : Frequency at which the signal has to be generated type : Type of modulation to use in continuous mode (SFX_NO_MODULATION=0 SFX_DBPSK_100BPS=1 SFX_DBPSK_600BPS=2)	Executes a continuous wave or modulation depending on the parameter type
stop_continuous_transmission		None	Stop the current continuous transmission
node_test_mode	uu	rc : pointer to sfx_rc_t type representing the RC number (0, 1, 2, 3, 4, 5, 6 or 7). test_mode : (SFX_TEST_MODE_TX_BPSK =0 SFX_TEST_MODE_TX_PROTOCOL =1 SFX_TEST_MODE_RX_PROTOCOL =2 SFX_TEST_MODE_RX_GFSK =3 SFX_TEST_MODE_RX_SENSe =4 SFX_TEST_MODE_TX_SYNTH =5 SFX_TEST_MODE_TX_FREQ_DISTRIBUTION =6 SFX_TEST_MODE_TX_BIT=11 SFX_TEST_MODE_PUBLIC_KEY=12 SFX_TEST_MODE_NVM=13)	Sigfox test mode rc : 0 : RC1 1 : RC2 2 : RC3A 3 : RC3C 4 : RC4 5 : RC5 6 : RC6 7 : RC7
node_monarch_test_mode	uuu	rc : pointer to sfx_rc_t type representing the RC number (0, 1, 2, 3, 4, 5,6 or 7). test_mode : (SFX_TEST_MODE_RX_MONARCH_PATTERN_LISTENING_SWEEP=7 SFX_TEST_MODE_RX_MONARCH_PATTERN_LISTENING_WINDOW=8 SFX_TEST_MODE_RX_MONARCH_BEACON=9 SFX_TEST_MODE_RX_MONARCH_SENSe=10) rc_capability : rc 6 5 4 3 2 1 bit 5 4 3 2 1 0	Sigfox monarch test mode rc : 0 : RC1 1 : RC2 2 : RC3A 3 : RC3C 4 : RC4 5 : RC5 6 : RC6 7 : RC7
switch_public_key	u	key : private=0, public=1	Switch device on public or private key.
Switch_test_credentials	u	credentials : 1 : test ID,PAC 0 : module ID, PAC	Set test credentials 1=On, 0=Off
set_payload_encryption	u	enc : encryption enable : 1	Payload encryption

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		disable : 0	
switch_pa	u	pa : set external power amplifier (1 if a PA, 0 if not.).	Instructs the library to configure the S2-LP for a external PA (Power Amplifier).
set_smpps_voltage	u	smpps : smpps voltage of the device (1.2V=1.... 1.8V=7) The default is to use the S2-LP at 1.8V	Instructs the library to configure the S2-LP with a user defined smpps frequency
get_smpps_voltage		None	Get SMPS voltage
set_rssi_offset	u	rssi_value : Rssi offset value in dB	Set an RSSI offset for the RSSI. Very useful if the RF frontend has an LNA or to calibrate the RSSI measurement.
get_rssi_offset		None	Get the RSSI offset for the RSSI
set_xtal_frequency	w	xtal : xtal value in Hz	Sets the XTAL frequency of the S2-LP in Hertz (default is 50MHz).
get_xtal_frequency		None	Get xtal frequency
set_xtal_frequency_offset	w	freq_offset : RF offset value in Hz	Sets the RF frequency offset in Hertz (default is 0 Hz).
get_xtal_frequency_offset		None	Get xtal frequency offset
reduce_output_power	v	o_pwr : power reduction in half dB	Reduces the output power of the transmitted signal by a facor (reduction*0.5dB against the actual value)
get_reduce_output_power		None	Get reduce output power
set_lbt_thr_offset	u	lbt : LBT threshold offset	Set LBT threshold offset
get_lbt_thr_offset		None	Get LBT threshold offset
get_id		None	ID stored in the current node
get_pac		None	PAC stored in the current node
get_rcz		None	RCZ stored in the current node
get_lib_version	u	lib_ver : 0 : Sigfox, 1 : MCU_API 2 : RF_API, 5 : MONARCH_API 6 : DEVICE_CONFIG_API	Get version of specified module
set_rcz	u	rc : pointer to sfx_rc_t type representing the RC number(RC1=1, RC2=2, RC3C=3, RC4=4, RC5=5, RC6=6 or RC7=7).	Set rc
ble_get_mac		None	Return MAC address
ble_set_beacon_data	b	advertising_data : Max 21byte	Set the advertising data. hex: ble_set_beacon_data {000102030405060708090a0b0c0d0e0f1011121314} string: ble_set_beacon_data "123456789012345678901"
ble_send_noti_Character	b	notification_data : Max 14byte	Set the notification data. hex: ble_send_noti_Character {000102030405060708090a0b0c0d} string: ble_send_noti_Character "12345678901234"
ble_set_read_Character	b	read_data : Max 14byte	Set the read data. (Same as notification data) hex: ble_set_read_Character {000102030405060708090a0b0c0d} string: ble_set_read_Character "12345678901234"
ble_start	uvv	adv_type: 0: Connectable undirected advertising 1: Connectable directed advertising 2: Scannable undirected advertising 3: Non connectable undirected advertising Advertising_Interval_Max: 32(20.000 ms)~ 16384(10240.000 ms) Advertising_Interval_Min: 32(20.000 ms)~ 16384(10240.000 ms)	Start ble for the option. In the connected mode, the write value is output to Serial.. modified_event : 0x00 0x00...(8byte)
ble_set_tx_power_lvl	uu	high_power : 0-disable 1-enable level : 0: -14 dBm (High Power) 1: -11 dBm (High Power) 2: -8 dBm (High Power) 3: -5 dBm (High Power) 4: -2 dBm (High Power) 5: 2 dBm (High Power)	Set the power of tx

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		6: 4 dBm (High Power) 7: 8 dBm (High Power)	
ble_test_tx	uuu	Frequency: 0(2042MHz)~39(2480MHz) Length:0-255 Payload: 0: Pseudo-Random bit sequence 9 1: Pattern of alternating bits '11110000' 2: Pattern of alternating bits '10101010' 3: Pseudo-Random bit sequence 15 4: Pattern of All '1' bits 5: Pattern of All '0' bits 6: Pattern of alternating bits '00001111' 7: Pattern of alternating bits '0101'	Start ble tx test.
ble_test_rx	u	Frequency: 0(2042MHz)~39(2480MHz)	Start ble rx test.
ble_test_stop		None	Stop ble test. Returns the number of received packets.
ble_tone_start	u	Frequency: 0(2042MHz)~39(2480MHz)	Start the ble tone test.
ble_tone_stop		None	Stop the ble tone test.
ble_reset		None	Reset the ble.

16. Notice

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications.

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ESD Warning



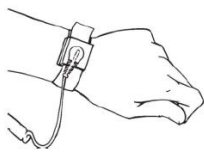
This modules are ESD sensitive devices, appropriate precautions should be taken during the module assembly in the final product. Mechanical impact and harsh tools must be avoided during the module assembly in the final product.

Product ESD specification:

- HBM TBD

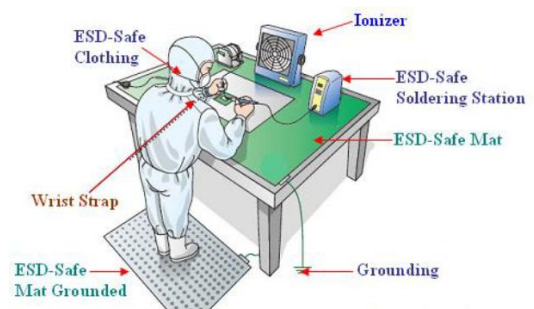
The following precautions must be taken:

- Do not open the protective conductive packaging until you have use the following, and are at an approved anti-static work station.



- Use a conductive wrist strap attached to a good earth ground.

- If working on a prototyping board, use a soldering iron or station that is marked as ESD-safe.
- If possible, use SMT equipment(reflow) when making prototype boards.
- Use an approved anti-static mat to cover your work surface.



- Always discharge yourself by touching a grounded bare metal surface or approved anti-static mat before picking up an ESD - sensitive electronic component.