WISOL / LOM102A00

DATA SHEET

NOTE:

- 본 기자재에 사용되는 안테나의 공중선절대이득은 최대 2.5dBi 이하로 제한하여 사용함

출력	917.3MHz ~ 921.9MHz : 10mW
	922.1MHz ~ 923.3MHz : 25mW

- 당 모듈과 같이 인증 받은 안테나를 사용하지 않을 경우 사용된 안테나와 그 이득에 대해서는 별도로 신고의 의무가 있습니다

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Revision History

Version	Note
0.1	Created. Temporary Version.
0.2	Updated Picture, Power Spec, Schematic, Serial Number Rule, Packing and Label.
0.3	Add the NOTE for KC Certificate.
0.4	Updated Serial No., Label and Pictures.
0.5	Changed the NOTE for KC Certificate.
0.6	Changed the model name.
0.7	Change the sleep current consumption.

Aim of this Document

The aim of this document is to give a detailed product description including interfaces, features and performance of the radio module LOM102A00.

Table of Contents

1 Introduction

The LOM102A00 is a compact, low power, bidirectional radio module for the 917 MHz frequency band using Semtech's LoRa™ modulation technology. The module provides ultra-long range spread spectrum communication and high interference immunity whilst minimising current consumption.

This LOM102A00 is a highly-integrated, low power, bi-directional radio transceiver module optimized for use in the 917 MHz ISM and the 868 MHz ETSI frequency bands.

< TOP > < BOTTOM >

Figure 1-1: Picture of LOM102A00

"이 기기는 사용 중 전파혼신 가능성이 있으며, 타 기기로부터 유해한 혼신을 받을 수 있음"

1.1 Key Features

- Compact module 17.0 x 26.0 x 2.65mm.
- LoRa™ modulation technology.
- Sensitivity down to -136dBm.
- UART and SPI interface.
- Low-Power Long Range Transceiver operating in the 917 MHz ISM and the 868MHz ETSI frequency band.
- Supply voltage range from 3.0 to 3.6V.
- RF interface optimized to 50 Ω.
- Output Power Level up to +14dBm
- STM32L051R8H6.

1.2 Applications

- Automated Meter Reading.
- Home-, Building- and Industrial Automation.
- Industrial Monitoring and Control
- Wireless Sensors.
- Wireless Alarm and Security Systems.

2 Module Overview

The LOM102A00 is an ultra-long range, high-performance, pre-certified module for wireless communication. It includes all necessary passive components for wireless communication as depicted in the following figure.

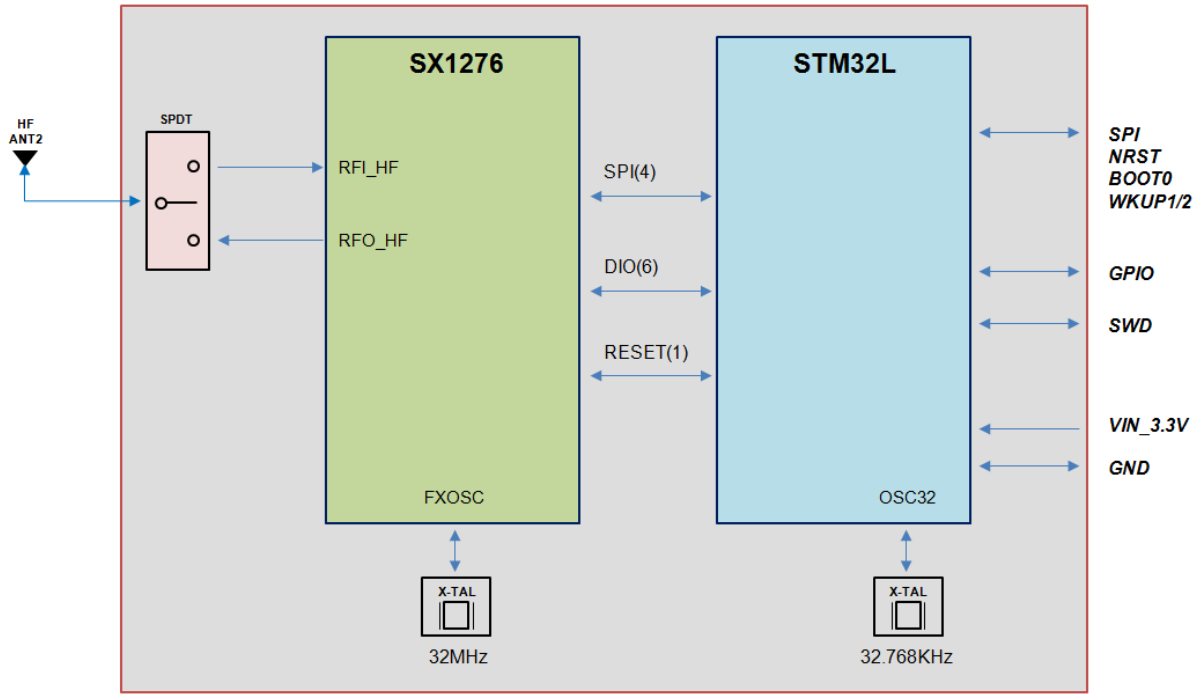

Figure 2-1: Block Diagram of Radio Module LOM102A00

The LOM102A00 uses Semtech's patented LoRa modulation technique which combines spread spectrum modulation and forward error correction techniques to increase the range and robustness of radio communication links compared with traditional FSK or OOK based modulation. Typically examples of LOM102A00 receive performances are given in the following table.

SF	125kHz	250kHz	500kHz	Unit
SF6	*-118*	*-115*	*-111*	*dBm*
SF7	*-123*	*-120*	*-116*	*dBm*
SF8	*-126*	*-123*	*-119*	*dBm*
SF9	*-129*	*-125*	*-122*	*dBm*
SF10	*-132*	*-128*	*-125*	*dBm*
SF11	*-133*	*-130*	*-128*	*dBm*
SF12	*-136*	*-133*	*-130*	*dBm*

Table 2-1: Typically Radio Performance of LOM102A00

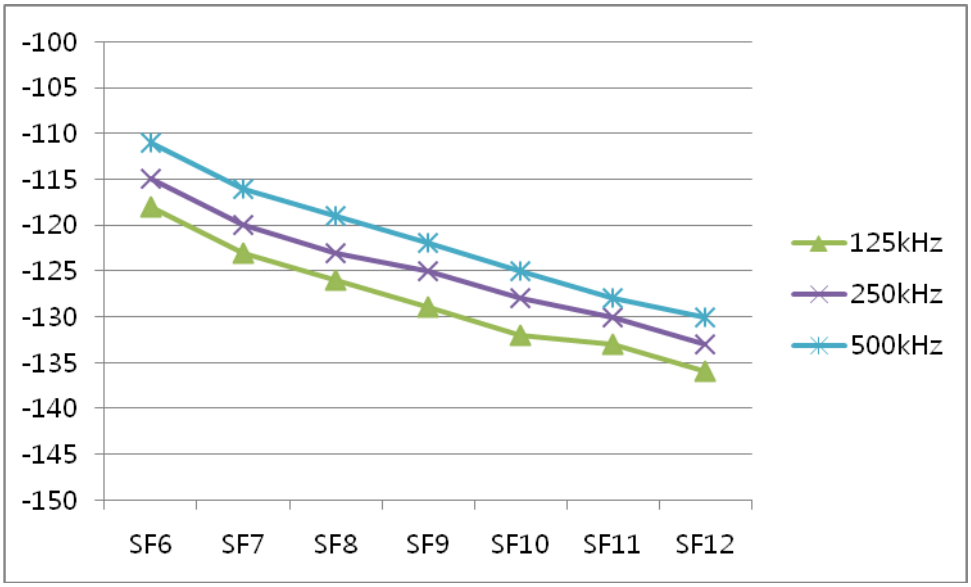

Figure 2-1: Typically Radio Performance Graph of LOM102A00

The wide range of capabilities provided by the LOM102A00 can be tested by using the our EVB.

3 LoRa Modulation

The LOM102A00 uses Semtech's LoRa proprietary spread spectrum modulation technique. This modulation, in contrast to conventional modulation techniques, permits an increase in link budget and increased immunity to in-band interference. It achieves sensitivities 8 dB better than FSK modulation.

LoRa also provides significant advantages in both blocking and selectivity, solving the traditional design compromise between range, interference immunity and energy consumption.

In LoRa mode the LOM102A00 offers three bandwidth options of 125 kHz, 250 kHz, and 500 kHz with spreading factors ranging from 7 to 12.

The spread spectrum LoRa modulation is performed by representing each bit of payload information by multiple chips of information. The rate at which the spread information is sent is referred to as the symbol rate (Rs), the ratio between the nominal symbol rate and chip rate is the spreading factor and represents the number of symbols sent per bit of information. The range of parameters which can be configured are given in the following tables.

Spreading Factor	Chips/Symbol	SNR/[dB]
7	128	-7.5
8	256	-10
9	512	-12.5
10	1024	-15
11	2048	-17.5
12	4096	-20

Table 3-1: Spreading Factors of Sx1276

Note that the spreading factor must be known in advance on both transmit and receive sides of the radio link as different spreading factors are orthogonal to each other. Note also the resulting signal to noise ratio (SNR) required at the receiver input. It is the capability to receive signals with negative SNR that increases the sensitivity, so link budget and range, of the LoRa receiver.

To further improve the robustness of the radio link LOM102A00 provides cyclic error coding with different coding rates. With using this coding scheme forward error detection and correction can be applied.

Coding Rate	Cyclic Coding Rate	Overhead Ratio
1	4/5	1.25
2	4/6	1.5
3	4/7	1.75
4	4/8	2

Table 3-2: Coding Rate of LOM102A00

4 Electrical Characteristics

In the following different electrical characteristics of the LOM102A00 are listed. Furthermore details and other parameter ranges are available on request.

- Note**:** Stress exceeding of one or more of the limiting values listed under “Absolute Maximum Ratings” may cause permanent damage to the radio module

4.1 Absolute Maximum Ratings

Parameter	Condition	Min	Typ.	Max	Unit
Supply Voltage (VDD)		3.0	3.3	3.6	V
Storage Temperature		-40	-	+85	°C
Operating Temperature		-30	-	+70	°C
RF Input Power				+10	dBm
Notes: 1) Unless otherwise noted, all voltages are with respect to GND					

Table 4-1: Absolute Maximum Ratings

4.2 Global Electrical Characteristics

T = 25°C, VDD = 3.3 V (typ.) if nothing else stated

Parameter	Condition	Min	Typ.	Max	Unit
Supply Voltage (VDD)	**Note 1*	3.0	3.3	3.6	V
Current Consumption ***Note 2*	Sleep		1.4	10	uA
	Receive		11		mA
	Transmit (RF power level =10dBm)		36		mA
Operation Clock Frequency	Tranceiver		32		MHz
	MCU RTC		32.768		kHz
Notes: 1) Unless otherwise noted, all voltages are with respect to GND 2) Unless otherwise noted, all results are tested under the latest LORAWAN firmware version					

Table 4-2: General Characteristics

4.3 Module Interface Characteristics

T = 25°C, VDD = 3 V (typ.) if nothing else stated

Parameter	Condition	Min	Typ.	Max	Unit
Digital output voltage (high level)	All I/Os	0.7VDD			V
Digital output voltage (low level)	TC, FT, FTf, RST I/Os			0.3VDD	V
	BOOT0			0.14VDD	
Digital input voltage (high level)	I_{IO} = -4 mA	VDD-0.45			V
					V
Digital input voltage (low level)	I_{IO} = +4 mA			0.45	V
UART baud rate			115.2		kbps

Table 4-3: Module Interface Characteristics

4.4 RF Characteristics

4.4.1 Output Power vs. Power table

Power table	
Power Setting	Output Power (Typ.) / dBm
0	-1.3
1	-0.3
2	0.8
3	1.9
4	3.0
5	4.1
6	5.2
7	6.3
8	7.5
9	8.8
10	9.9
11	11.1
12	12.0
13	12.9
14	13.5
Note: TX : S/F7, 125KHz BW, Frequency 922.7MHz	

Table 4-4: Output Power vs. Power table

4.4.2 Transmitter RF Characteristics

The LOM102A00 has an excellent transmitter performance as given by Table 4-5

* T = 25°C, VDD = 3.3 V (typ.), 917 MHz if nothing else stated

Parameter	Condition	Min	Typ.	Max	Unit
Frequency Range		902.3	-	927.5	MHz
RF Output Power	917 MHz Band			14	dBm
Modulation Techniques	LoRa™				
TX Frequency Tolerance	25°C	-20	-	20	kHz

Table 4-5: Transmitter RF Characteristics

5 Module Package

In the following the LOM102A00 module package is described. This description includes the LOM102A00 pinout as well as the modules dimensions. Furthermore a recommendation for a suitable footprint is given, which should be used for further mounting on appropriate carrier boards.

5.1 Pinout Description

Figure 5-1 depicts a description of the LOM102A00's pads on the bottom side. The figure shows the module with its pinout in top view (right figure). A detailed description of the individual pins can be found in Table 5-1: LOM102A00 Pinout Table.

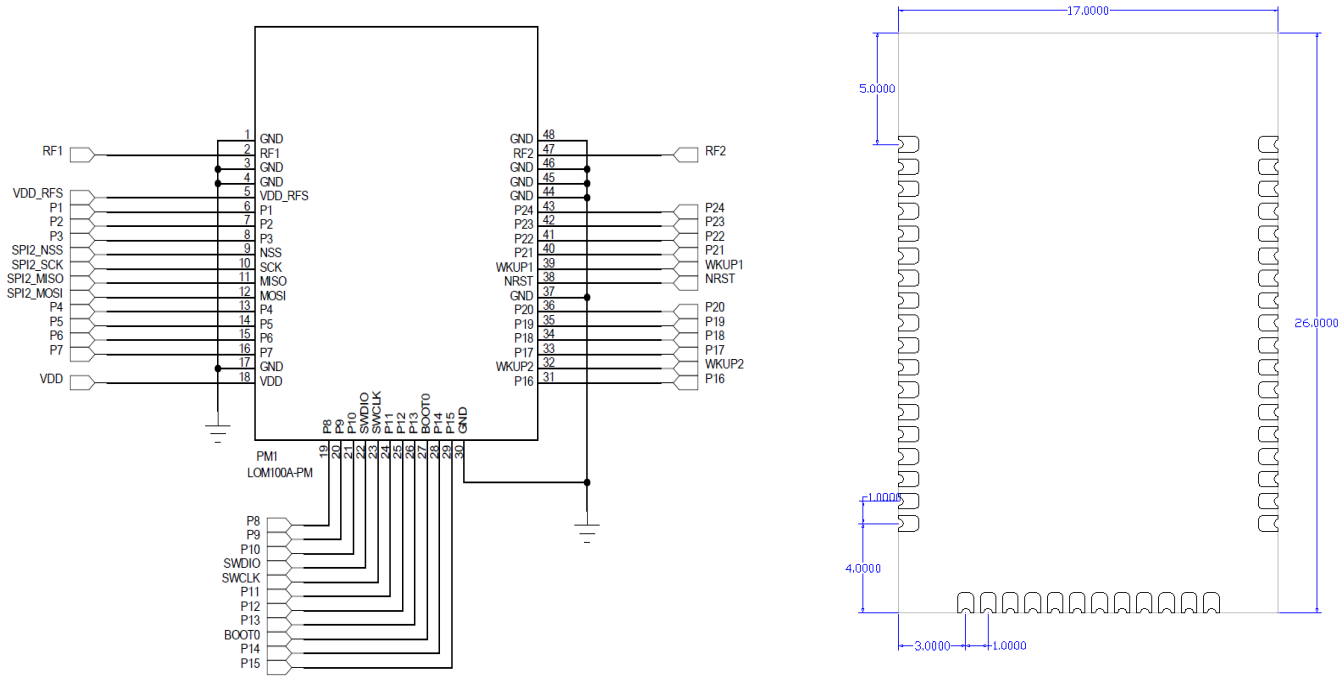

Figure 5-1: Description of LOM102A00 module pins and top view

PIN	PIN Name	PIN Type	MCU Pin (number)	Description
1	GND	Supply		Ground connection
2	RF1	A IN/OUT		NC (LOM102A00 do not support RF1)
3	GND	Supply		Ground connection
4	GND	Supply		Ground connection
5	VDD_RFS			Supply voltage
6	P1	D IN/OUT	PB2(G6)	
7	P2	D IN/OUT	PB0(F5)	ADC_IN
8	P3	D IN/OUT	PC6(F6)	
9	NSS	D IN/OUT	PB12(H8)	
10	SCK	D IN/OUT	PB13(G8)	
11	MISO	D IN/OUT	PB14(F8)	
12	MOSI	D IN/OUT	PB15(F7)	
13	P4	D IN/OUT	PC8(E8)	
14	P5	D IN/OUT	PA8(D7)	
15	P6	D IN/OUT	PC9(D8)	
16	P7	D IN/OUT	PA9(C7)	UART1_TX
17	GND	Supply		Ground connection
18	VDD	Supply		Supply voltage
19	P8	D IN/OUT	PA11(C8)	
20	P9	D IN/OUT	PA12(B8)	
21	P10	D IN/OUT	PC10(B7)	
22	SWDIO	D IN/OUT	PA13(A8)	JTMS-SWDIO
23	SWCLK	D IN/OUT	PA14(A7)	JTCK-SWCLK
24	P11	D IN/OUT	PA15(A6)	
25	P12	D IN/OUT	PC11(B6)	
26	P13	D IN/OUT	PB3(A5)	
27	BOOT0	D IN	BOOT0(B4)	Bootloader Pin 0, internally pulled-down by 47 kΩ
28	P14	D IN/OUT	PD2(B5)	
29	P15	D IN/OUT	PB4(A4)	
30	GND	Supply		Ground connection
31	P16	D IN/OUT	PB9(A3)	
32	WKUP2	D IN/OUT	PC13(A2)	
33	P17	D IN/OUT	PB8(B3)	
34	P18	D IN/OUT	PB7(C3)	
35	P19	D IN/OUT	PA10(C6)	UART1_RX
36	P20	D IN/OUT	PC12(C5)	
37	GND	Supply		Ground connection

PIN	PIN Name	PIN Type	MCU Pin (number)	Description
38	NRST	D IN	NRST(E1)	NReset
39	WKUP1	D IN/OUT	PA0(G2)	Digital IO / Wake Up1
40	P21	D IN/OUT	PB6(D3)	
41	P22	D IN/OUT	PB5(C4)	
42	P23	UART_TXD	PA2(F3)	
43	P24	UART_RXD	PA3(G3)	
44	GND	Supply		Ground connection
45	GND	Supply		Ground connection
46	GND	Supply		Ground connection
47	RF2	A IN/OUT		External 50Ω port for monostatic antenna connection.
48	GND	Supply		Ground connection

Table 5-1: LOM102A00 Pinout Table

5.2 Module Dimensions

The outer dimensions of the LOM102A00 are given by Figure 5-2.

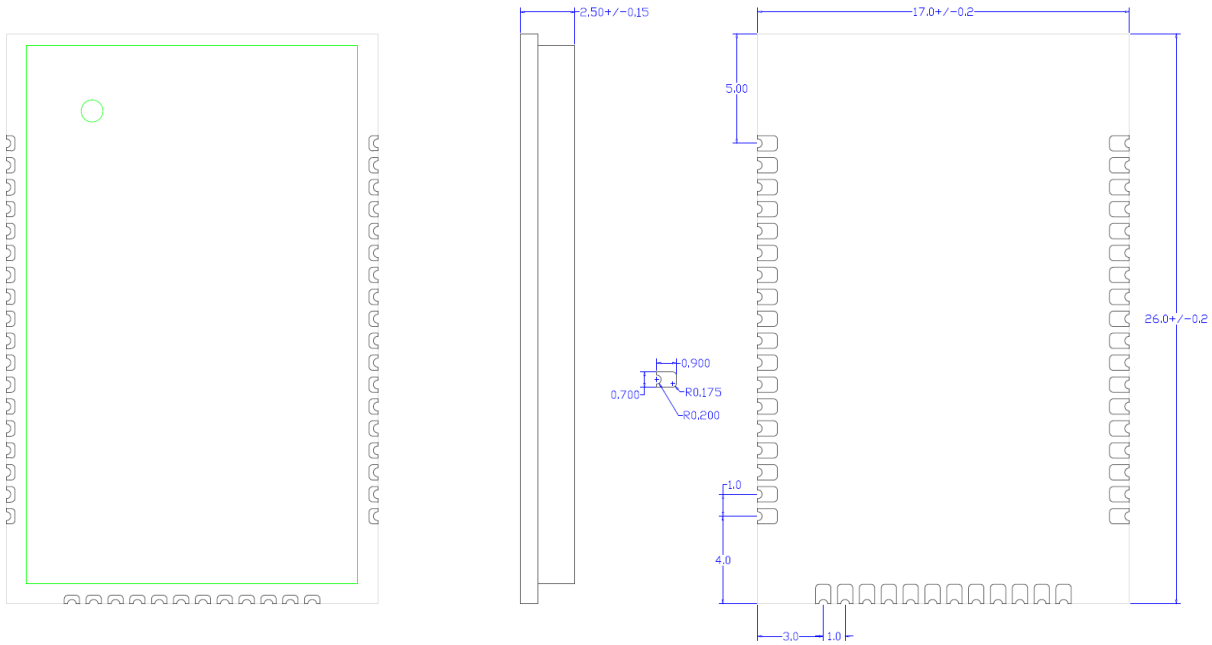

Figure 5-2: Outer Dimensions of the LOM102A00 (top view)

5.3 Recommended Footprint

According to Chapter 5.2, a recommendation for the footprint of the LOM102A00 is given by Figure 5-3.

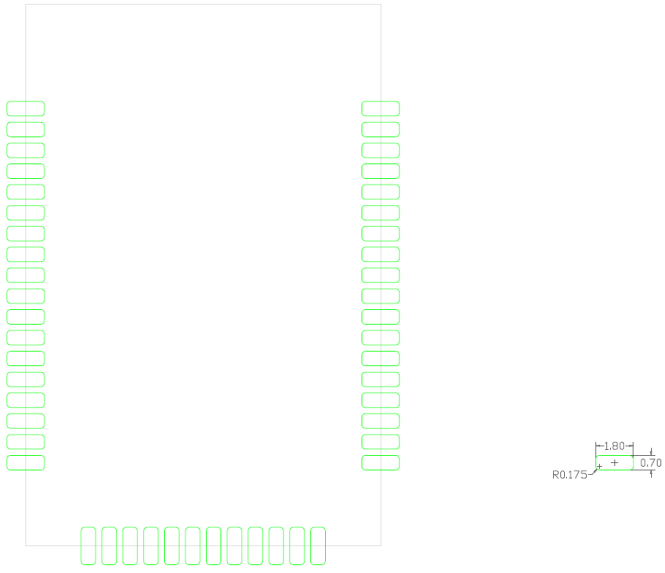

Figure 5-3: Recommended footprint of the LOM102A00 (top view)

6 Integration Guide

The LOM102A00 provides 48 connectors as described in Chapter 5. For integrating the LOM102A00 into an environment, a typically circuit as given in Chapter 6.1 can be used.

6.1 Typical Application Schematic

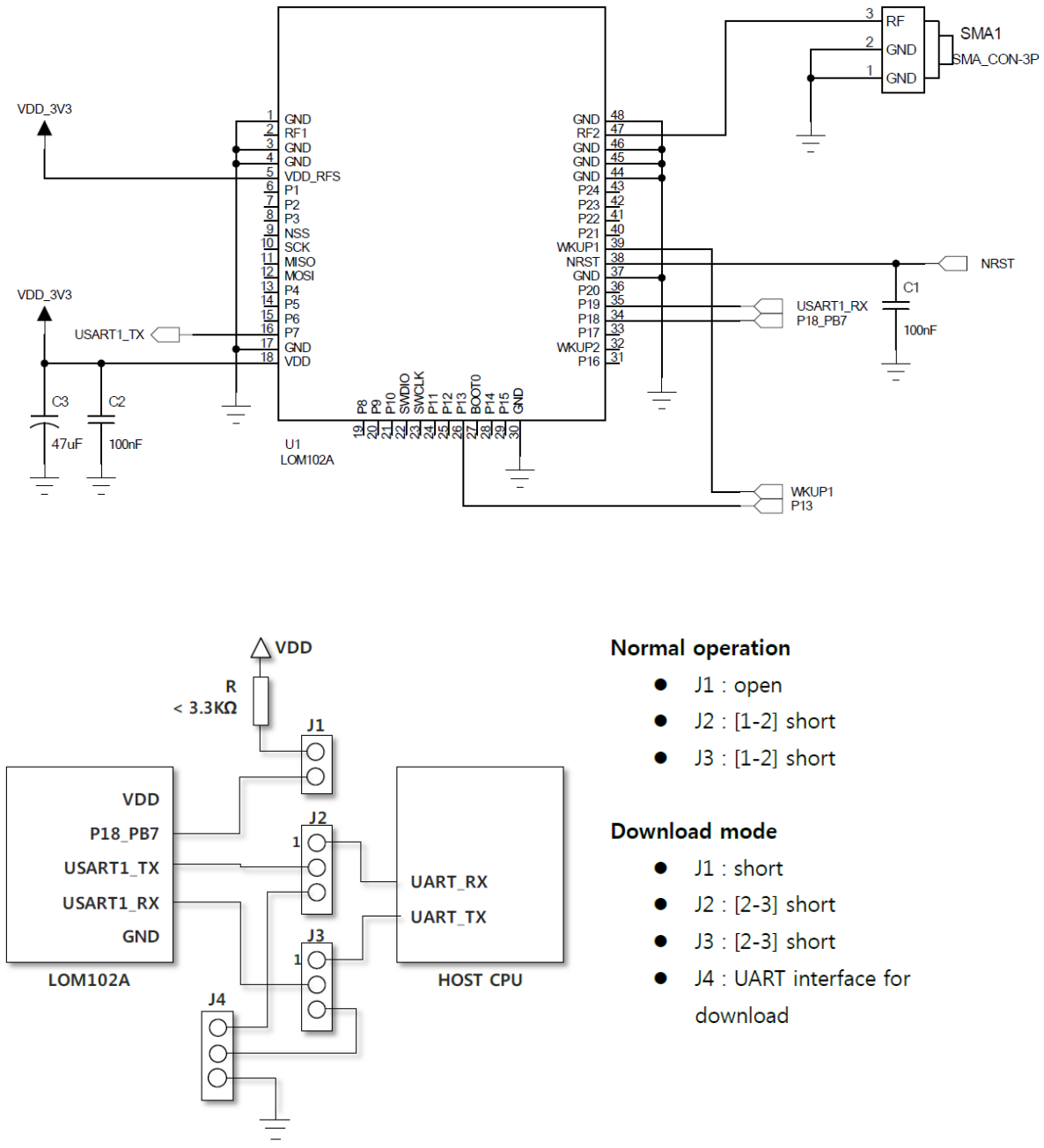

Figure 6-1: Typical Application Schematic for LOM102A00

7 Serial Number Rule

0	**0**	**0**	**0**	**0**	**0**	**1**
(1)	(2)	(3)	(4)	(5)	(6)	(7)

Serial Number is used from 0000001 to 9999999.

8 Label

QR: Model,D-EUI,SN

Model Name: LOM102A00 (9자리)
Device EUI : xxxxxxxxxxxxxxxx (16자리)
SN : xxxxxxx (7자리)
Ex) LOM102A00,xxxxxxxxxxxxxxxx,xxxxxxx (9자리, 16자리, 7자리)

9 Packing

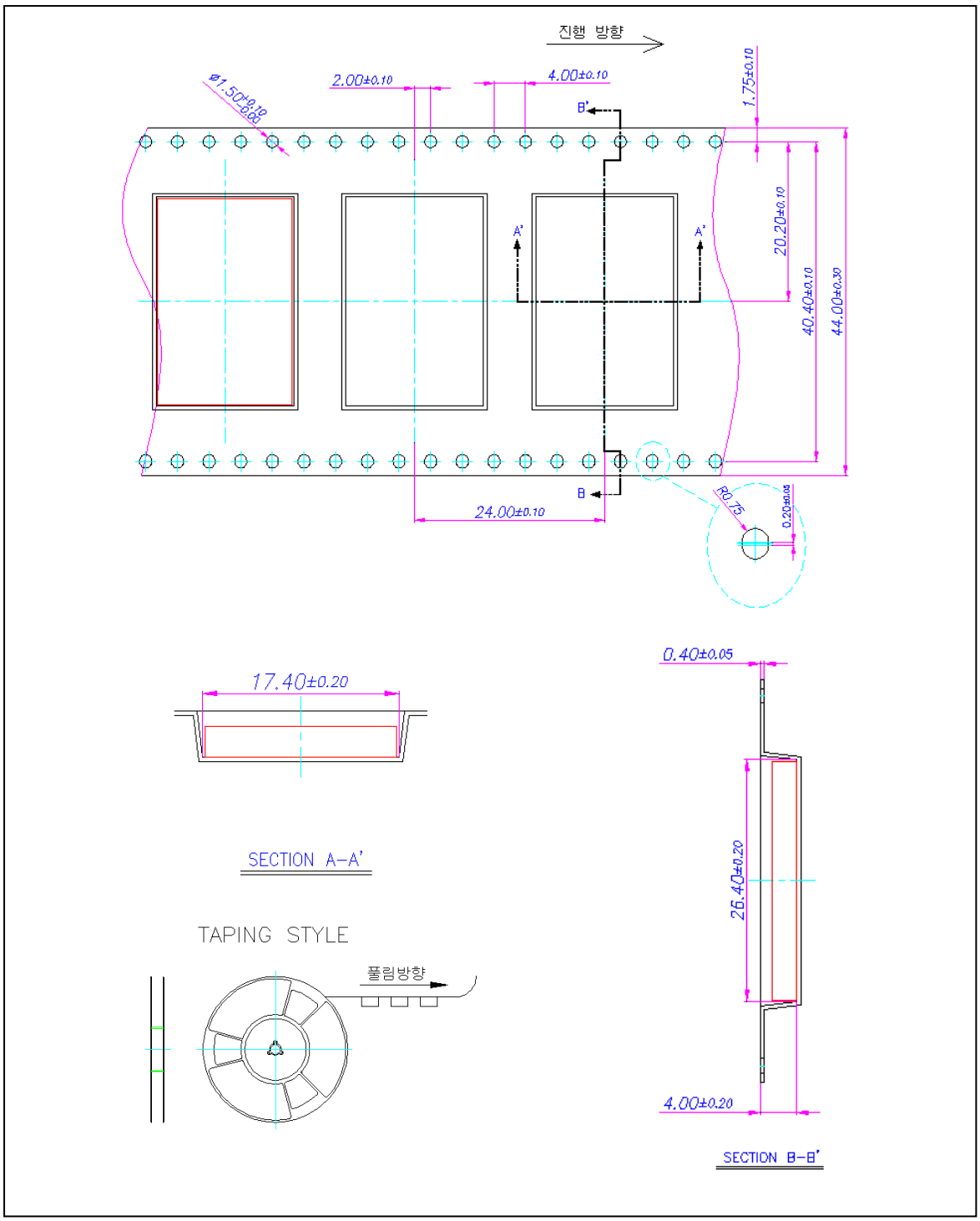

Figure 9: Reel packing of LOM102A00