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CONFIDENTIAL INFORMATION

eLR-900H

Product manual

Ver 1.0

2022.05.17

PRODUCT : LoRa Module

MODEL NAME : eLR-900H

APPTOVAL	REMARK

Revision	History	Date
eLR-900H-REV0.1	Initial release	2022.05.17

Designed	Checked	Approved	eWBM Co., Ltd.	
			DOCUMENT No.	eLR-900H
			PAGE	

1. Product Introduction

The eLR-900H is a low-power LoRa (Long Range Wide-Area Network) module.

LoRa Module eLR-900H

The data transfer rate is 980bps~21.0Kbps.

This module is applicable to smart tracking, sensor and control solutions of various devices that support security systems.

2. Purpose

This specification applies to "eWBM LoRa module".

3. eLR-920H Mechanical Dimensions

Size	14.90mm(W) x 17.90mm(L) x 2.4mm(T)
Weight	1.0g
Interface	LQFP-48

3.1 External Appearance



Figure 3-1 eLR-900H Top

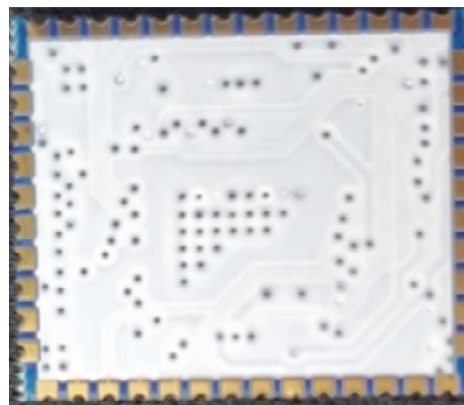
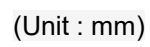


Figure 3-2 eLR-900H Bottom



The top view of the microchip layout is shown with dimensions in millimeters. The overall width is 14.9 mm and the overall height is 17.9 mm. The layout includes a central area labeled '(Top view)'. Dimensions for the central area are 1.6 mm (width) and 0.7 mm (height). The layout also shows dimensions for the outer areas: 1.2 mm (width) and 1.2 mm (height). The layout includes a central area labeled '(Top view)'. Dimensions for the central area are 1.6 mm (width) and 0.7 mm (height). The layout also shows dimensions for the outer areas: 1.2 mm (width) and 1.2 mm (height). The layout includes a central area labeled '(Top view)'. Dimensions for the central area are 1.6 mm (width) and 0.7 mm (height). The layout also shows dimensions for the outer areas: 1.2 mm (width) and 1.2 mm (height).

4. Specifications of supported functions

- 1) LoRa Modulation technology.
- 2) Use the 'STM32WL' MCU with security system.
- 3) eLR-900H support UART, SPI interface.
- 4) 902.3MHz ~914.9MHz ISM band operates.
- 5) Module outline dimension : 14.90 x 17.90 x Max. 2.40 (mm)
- 6) 32.768kHz and 32MHz crystal embedded.
- 7) LPUART Data Rate : 9600bps (AT Commend)

5. Electrical Characteristics

1) Recommended Operating Rating

Parameter	Min	Max	Unit
Operating Temperature	-30	70	°C
Supply Voltage (VDD)	3.0	3.6	V

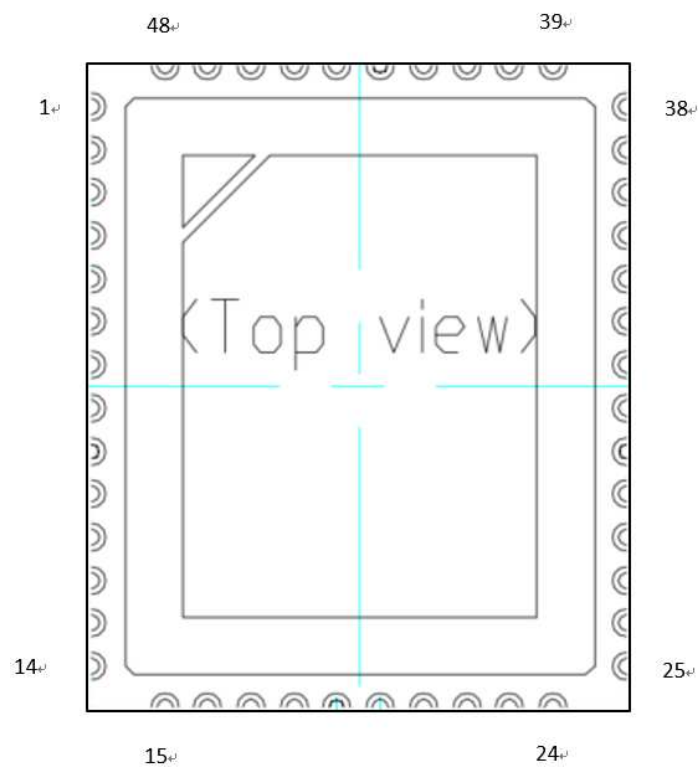
2) Current Consumption

Mode	Description	Total Typ. Current at 3.3V
Tx Mode	Tx Mode Operating (Tx power = 18.5dBm)	≒ 96.0mA
Rx Mode	Rx Mode Operating	≒ 4.8mA
Sleep Mode	CLI Commend (Module Master)	≒ 11.0uA
Deep Sleep Mode	CLI Commend (Module Slave)	≒ 1.0uA

3) RF Characteristic

Parameter		Min	Typ	Max
TX	Frequency (MHz)	902.3	-	914.9
	Frequency Tolerance (KHz) , 25°C	-20	-	+20
	Output Power Max (dBm)	Pout ≥ 18.5 over		
RX	Receiving Sensitivity (dBm),Conductive (F=12 ,BW= 125KHz)	Sensitivity ≤ -136		

6. eLR-900H PIN Assignment



7. ELR-900H PIN Description

7.1 I/O Parameter Description

Abbreviation	Definition	Remarks
S	Supply pin	
I	Input only pin	
IO	Input / output pin	
O	Output only pin	
RF	Radio RF pin	

Table 7-1 I/O Parameter Descriptions

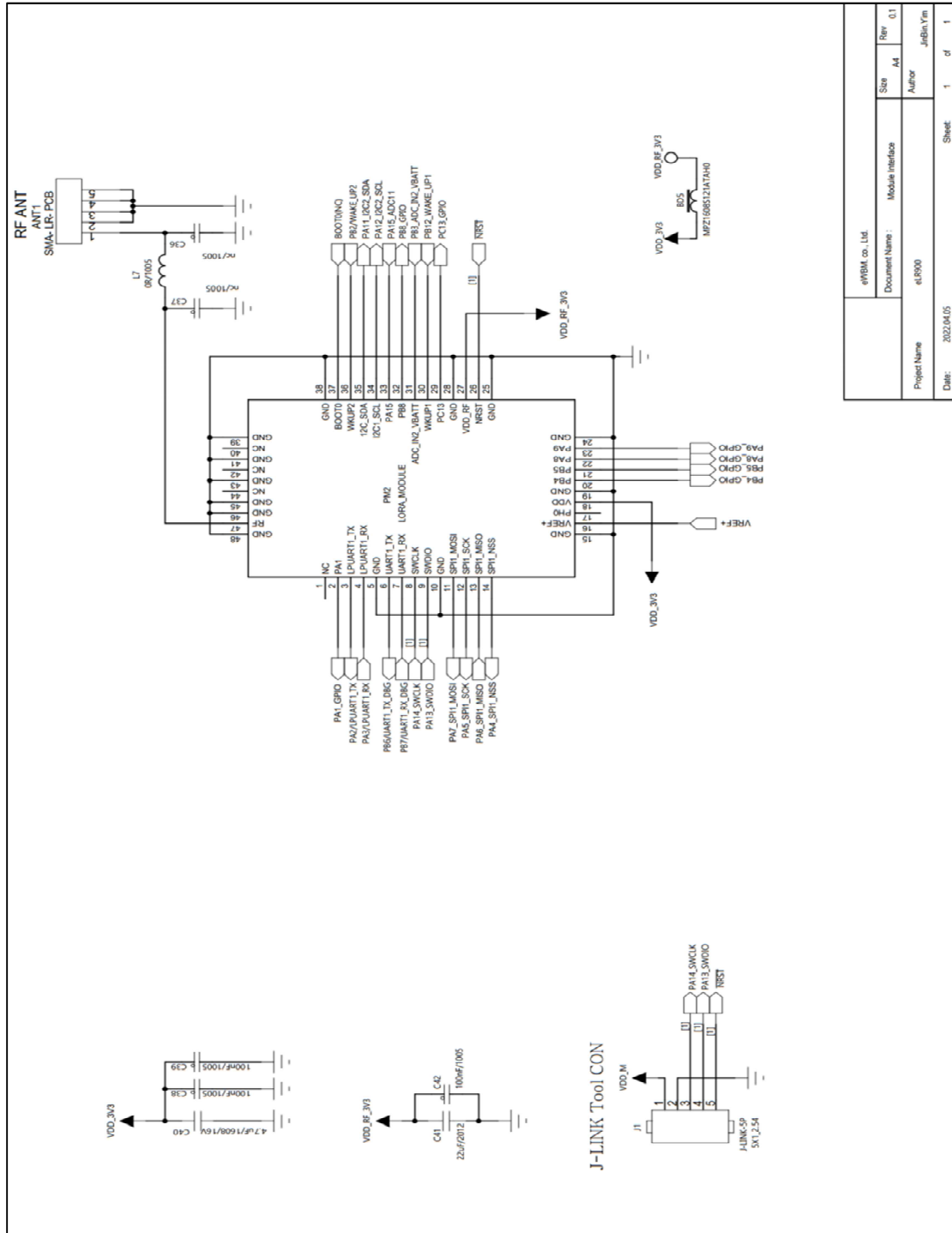
7.2. Pin Description

PIN	PIN Name		Functional Description	Remark
1	NC	-	N.C	NC
2	PA1	I/O	PA1_GPIO	PA1
3	LPUART1_TX	O	PA2/LPUART1_TX_Commend_download	LPUART1_TX
4	LPUART1_RX	I	PA3/LPUART1_RX_Commend_download	LPUART1_RX
5	GND	Supply	Ground connection	GND
6	UART1_TX	I/O	PB6/UART1_TX	UART1_TX
7	UART1_RX	I/O	PB7/UART1_RX	UART1_RX
8	SWCLK	I	SWCLK	SWCLK
9	SWDIO	I	SWDIO	SWDIO
10	GND	Supply	Ground connection	GND
11	SPI1_MOSI	I/O	PA7_SPI1_MOSI	SPI1_MOSI
12	SPI1_SCK	I/O	PA5_SPI1_SCK	SPI1_SCK
13	SPI1_MISO	I/O	PA6_SPI1_MISO	SPI1_MISO
14	SPI1_NSS	I/O	PA4_SPI1_NSS	SPI1_NSS
15	GND	Supply	Ground connection	GND
16	VREF+	Supply	Positive reference voltage	VREF+
17	PH0	-	N.C	PH0

LoRa Module eLR-900H

18	VDD	Supply	Supply voltage-3.3V	VDD
19	GND	Supply	Ground connection	19
20	PB4	I/O	PB4_GPIO	20
21	PB5	I/O	PB5_GPIO	21
22	PA8	I/O	PA8_GPIO	22
23	PA9	I/O	PA9_GPIO	23
24	GND	Supply	Ground connection	24
25	GND	Supply	Ground connection	25
26	NRST	I	Reset (Active Low)	26
27	VDD_RF	RF_Supply	RF Supply voltage-3.3V	27
28	GND	Supply	Ground connection	28
29	PC13	I/O	PC13_GPIO	29
30	WKUP1	I/O	PB12_WAKE_UP1: Rising Edge, Payload data bit2	30
31	ADC_IN2_VBATT	I/O	PB3_ADC_IN2_VBATT	31
32	PB8	I/O	PB8_GPIO	32
33	PA15	I/O	PA15_ADC11	33
34	I2C1_SCL	I/O	PA12_I2C2_SCL	34
35	I2C1_SDA	I/O	PA11_I2C2_SDA	35
36	WKUP2	I/O	PB2/WAKE_UP2	36
37	BOOT0	-	BOOT0(NC)	37
38	GND	Supply	Ground connection	38
39	GND	Supply	Ground connection	39
40	NC	-	N.C	40
41	GND	Supply	Ground connection	41
42	NC	-	N.C	42
43	GND	Supply	Ground connection	43
44	NC	-	N.C	44
45	GND	Supply	Ground connection	45
46	GND	Supply	Ground connection	46
47	RF	RF I/O	External 50Ω port for Antenna connection	47
48	GND	Supply	Ground connection	48

1) eLR-900H Circuit
Module Application Circuit



ANTENNA

Please perform the antenna design that followed the specifications of the antenna

About the signal line between an antenna and a module

It is a 50-ohm line design. (SMA Reverse)

Fine tuning of return loss etc. can be performed using a matching network.

However, it is required to check "Class1 change" and "Class2 change" which the authorities define then.

The concrete contents of a check are the following three points.

- 1) It is the same type as the antenna type of antenna specifications.
- 2) An antenna gain is lower than a gain given in antenna specifications.
- 3) The emission level is not getting worse.

Antenna gain

Electrical Data	Specifications
Frequency Range	902.3 ~ 914.9MHz
Impedance	50Ω Normal
V.S.W.R	Less Than 1:2.5
Gain (Peak)	0.91dBi
Radiation Pattern	Omni-Directional
Polarization	Linear

Antenna Specification

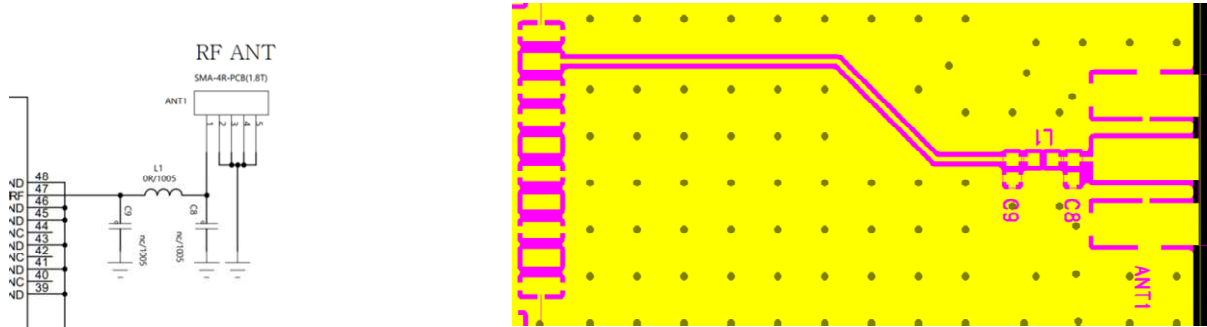
Antenna Reference Trace Design

RF traces from eLR-900H module pads pin 47 and ANT1 pin 1 to the antenna must be made using micro-strip traces. This micro-strip trace must respect the design of the Gerber file associated with the following figures in order to obtain a uniform transmission line with a characteristic impedance of 50 ohms.

The reference trace design is shown as the pink trace along with the side copper filled with vias on the left side. of Figure where components C8, C9 are not installed; they were options on the reference board for future uses; these uses are not FCC authorized yet.

As preliminary information the traces width of all sections are all 0.5mm and the length of eLR-900H pad to ANT1 connector are 50mm; However, refer to associated Gerber files for more details on dimensions and refer to eWBM Inc for more details on the Gerber files. Table 1 shows the parts used in the reference trace design.

Antenna Reference Trace Design

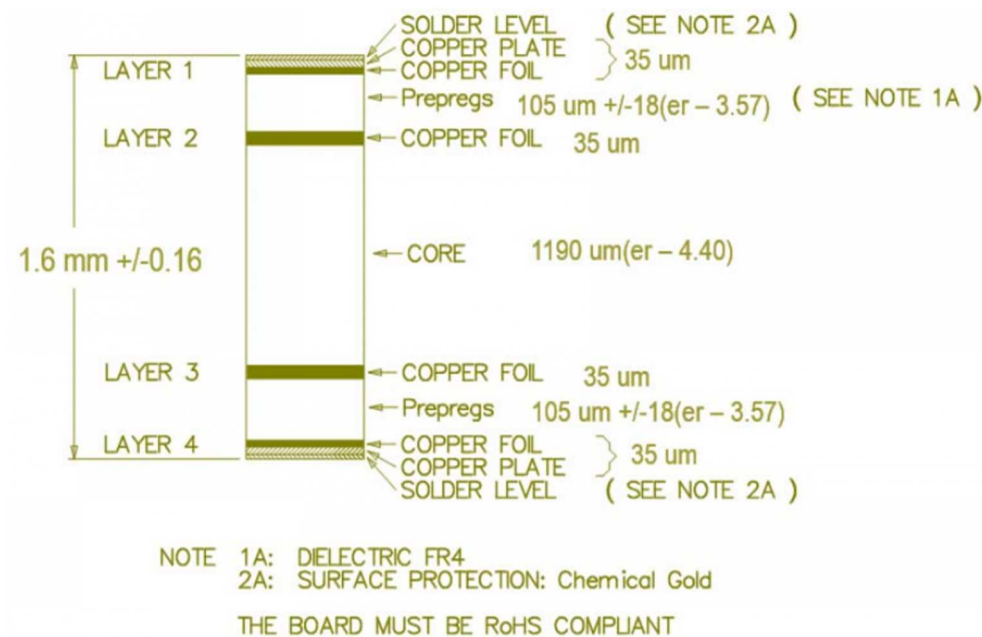


Part Number	Reference	Description	Manufacture
WR04X0000FTL	L1	0 ohm, 1%	WALSIN
SMA-4R-PCB(1.8T)	ANT1	SMA, Subminiature Coaxial Connector 50 ohm	Sungjin
N/A	C8, C9	Not Installed	N/A

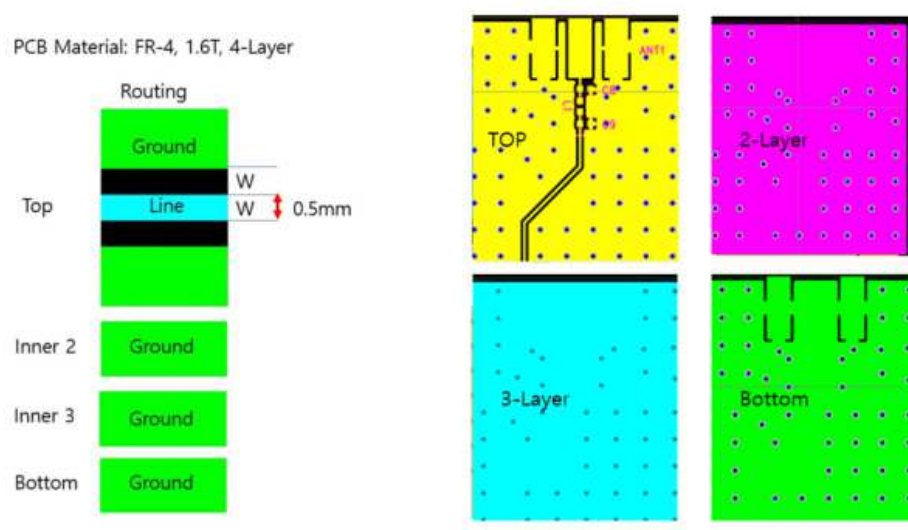
Antenna Micro-strip Trace Parts

PCB Stack-Up and Trace

PCB Stack up for the reference board:



PCB Stack-Up



PCB Trace

Test Procedure for ensuring compliance

The below test is to be performed both at design verification stage and in production for ensuring compliance.

Verify RF power through conducted measurement at junction ANT1

The measured Tx power should be within the datasheet specification for Transmit output power.

FCC Statement

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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

INTEGRATION INSTRUCTIONS

The module complies with Part 15.247/RSS-247.

The modular transmitter is only FCC authorized for the specific rule part (i.e., FCC transmitter rules) listed on the grant. The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

The module is authorized with trace antenna design type.

And the module is designed to operate with a Helical antenna.

(Connector: SMA - R / peak gain: 0.91dBi)

The trace antenna design must be performed as specified in the manual. The use of any other antenna or any changes to the reference trace design are subject to additional testing and authorization through a Class II permissive change.

The module is a limited single-modular transmitter that complies with the § 15.212(a) modular rules which requires the host operating condition as ; The host product should supply the regulated power of 3.3V DC to module. The power design should be performed as specified in the manual.

The module is limited to installation in mobile or fixed applications. At least 20 cm of separation distance between the transmitting antenna device and the user's body must be maintained 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.

The OEM integrator will be responsible to satisfy SAR/ RF Exposure requirements, when the module is integrated into the host device.

The module is labeled with its own FCC ID certification. If the FCC ID

Certification Number are 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: 2ARG9-eLR900H

Host User Manual

The host manual shall include the following regulatory statement; Part 15.19: 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. Part 15.21: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. 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.

Host Product labeling

The module is labeled with its own FCC ID certification. If the FCC ID Certification Number are 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: 2ARG9-eLR900H