



BL-M3861LT1

**802.11n 72.2Mbps WLAN
IoT Module Specification**

SHENZHEN BILIAN ELECTRONIC CO., LTD

Add: 10~11/F, Building 1A, Huaqiang idea park, Guangming district, Shenzhen. Guangdong, China

Web: www.b-link.net.cn



(Top View)



(Bottom View)

Module Name: BL-M3861LT1	
Module Type: 802.11n 72.2Mbps WLAN IOT Module	
Revision: V2.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
1.0	Update PIN Description, Add RF Application Circuit,add Interface Timings supply	2020-04-02	
1.1	Update the specification version	2023-04-11	Ch
2.0	Optimizing circuits	2023-10-18	QX

1. Introduction

BL-M3861LT1 is a low-power IoT module designed based on Hi3861L. This module compatible IEEE 802.11 b/g/n standard and provides the maximum PHY rate up to 72.2Mbps, supports standard bandwidth of 20MHz and narrow bandwidth of 5MHz/10MHz. It is suitable for Internet of things applications based on WLAN communication, such as smart locks, wireless doorbells, low-power cameras, intelligent wireless sensor and so on.

1.1 Features

Operating Frequency: 2.4~2.4835GHz

IEEE Standards: IEEE 802.11b/g/n

Wireless PHY rate can reach up to 72.2Mbps

High-performance 32 bit MCU: maximum operating frequency of 160 MHz

Embedded Memory: 352KB SRAM and 2MB Flash

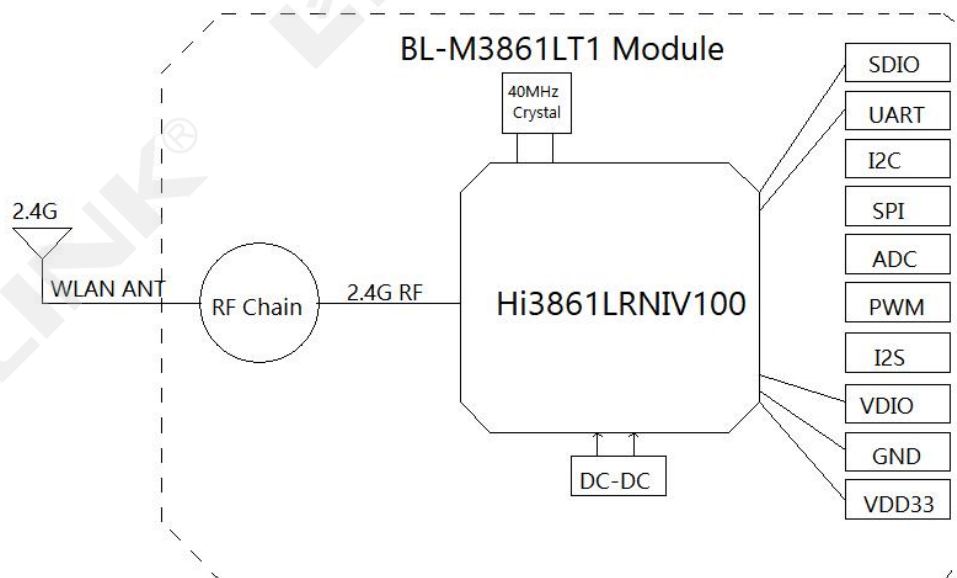
Provides multiple peripheral interfaces

Low power consumption: Ultra deep sleep mode of 3uA and DTIM1 of 0.97mA@3.3V

Wide operating temperature: -40~85°C

DC 3.3V main power and DC3.3V/1.8V IO power supply

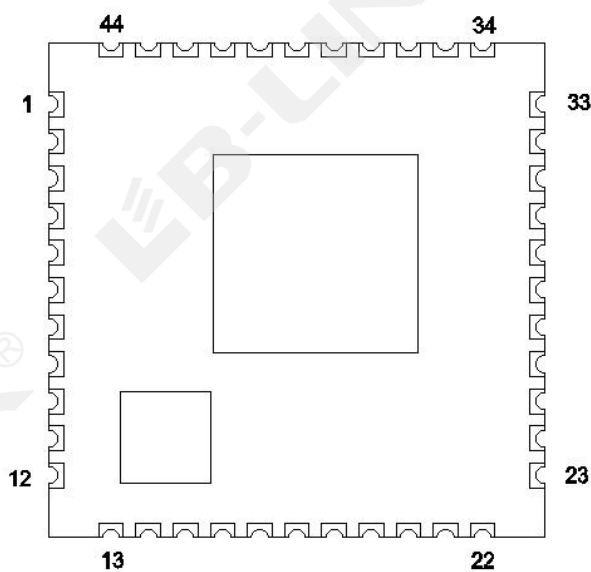
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M3861LT1
Chipset	Hi3861LRNIV100
WLAN Standards	IEEE802.11b/g/n
Host Interface	UART
Antenna	Connect to the external antenna through half hole pad
Dimension	12*12*1.67mm(L*W*H)
Power Supply	DC 3.3V±0.2V @ 450 mA (Max) main power DC 3.3V±0.2V or 1.8V±0.1V I/O power
Operation Temperature	-40°C to +85°C
Operation Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments



(Top view)

2.1 Pin Definition

No.	Pin Name	Type	I/O Level	Module Pin Description
1	GND	RF		RF Ground connections
2	WLAN ANT	RF		2.4G RF pad for WLAN ANT

3	GND	RF		RF Ground connections
4	NC	--		NC
5	NC	--		NC
6	GPIO6	I/O	VDDIO	Function1. General Purpose Input / Output Pin GPIO6 Function2. JTAG_MODE select Boot strapping: 0: (default) normal mode; 1: Design for test mode;
7	GPIO8	I/O	VDDIO	1. General Purpose Input / Output Pin GPIO8 2. JTAG_ENABLE Boot strapping: 0: (default) Common I/O, normal mode; 1: Enable JTAG function;
8	NC	--		NC
9	VDD33	P		DC3.3V main power supply input
10	NC	--		NC
11	NC	--		NC
12	PWR_ON	I/O	VDDIO	Power On input signal, pull high to power up the module and Power down when it pulled low. Internal embedded RC delay circuit with 100K Pull high resistor and 100nF parallel GND capacitor.
13	GPIO2	I/O	VDDIO	1. General Purpose Input / Output Pin GPIO2 2. JTAG_TRSTN, JTAG reset (JTAG function Enable) 3. On module crystal frequency select Boot strapping: 0: (default) 40MHz; 1: 24MHz; 40MHz crystal used on module, do not pull high this pin during the module power on or reset!
14	GPIO9	I/O	VDDIO	General Purpose Input / Output Pin GPIO9
15	GPIO10	I/O	VDDIO	General Purpose Input / Output Pin GPIO10
16	GPIO11	I/O	VDDIO	General Purpose Input / Output Pin GPIO11
17	GPIO12	I/O	VDDIO	General Purpose Input / Output Pin GPIO12
18	GPIO13	I/O	VDDIO	General Purpose Input / Output Pin GPIO13
19	GPIO14	I/O	VDDIO	General Purpose Input / Output Pin GPIO14
20	GND	P		Ground connections
21	NC	--		NC
22	VDDIO	P		DC3.3V or DC1.8V I/O power supply input
23	NC	--		NC

24	GPIO0	I/O	VDDIO	1. General Purpose Input / Output Pin GPIO0 2. 32.768K RTC Crystal oscillator single-ended input (1.8V Level) 3. 32.768K RTC crystal output (1.8V Level) 4. JTAG_TDO, JTAG data output (JTAG function Enable)
25	GPIO1	I/O	VDDIO	1. General Purpose Input / Output Pin GPIO1 2. 32.768K RTC crystal input (1.8V Level) 3. JTAG_TCK, JTAG clock (JTAG function Enable)
26	NC	--		NC
27	NC	--		NC
28	NC	--		NC
29	NC	--		NC
30	NC	--		NC
31	GND	P		Ground connections
32	NC	--		NC
33	GND	P		Ground connections
34	NC	--		NC
35	NC	--		NC
36	GND	P		Ground connections
37	GPIO3	I/O	VDDIO	1. General Purpose Input / Output Pin GPIO3 2. UART_LOG_TX, software debugging and download UART port data TX 3. JTAG_TDI, JTAG data input (JTAG function Enable)
38	GPIO4	I/O	VDDIO	1. General Purpose Input / Output Pin GPIO4 2. UART_LOG_RX, software debugging and download UART port data RX 3. JTAG_TMS, JTAG TMS (JTAG function Enable)
39	GPIO7	I/O	VDDIO	General Purpose Input / Output Pin GPIO7
40	GPIO5	I/O	VDDIO	1. General Purpose Input / Output Pin GPIO5
41	NC	--		NC
42	NC	--		NC
43	NC	--		NC
44	NC	--		NC

P: Power; I: Input; O: Output; I/O: In/Output; RF: Analog RF Port;

2.2 GPIO function multiplexing

The module provides multiple peripheral interfaces: 1 SDIO, 1 I2S, 2 SPI, 2 I2C, 3 UART, 6 PWM, 7 ADC, 15 GPIO, they are multiplexed from 15 GPIO Pins.

For details, see the description of pin multiplexing in software in the Hi3861/Hi3861L/Hi3881 V100 Wi-Fi Chip Data Sheet.

For details about the pin drive strength configuration, see the register description in the Hi3861/Hi3861L/Hi3881 V100 Wi-Fi Chip Data Sheet.

2.2.1 GPIO multiplexing table

NO.	Function0	Function1	Function2	Function3	Function4	Function5	Function6	Function7
GPIO0	GPIO0	UART1_TXD	SPI1_CLK	PWM3_OUT	I2C1_SDA	RTC_OSC_32K_T	RTC32K_XOUT	reserved
GPIO1	GPIO1	UART1_RXD	SPI1_RXD	PWM4_OUT	I2C1_SCL	BT_FREQ	RTC32K_XIN	reserved
GPIO2	GPIO2	UART1_RTS	SPI1_TXD	PWM2_OUT	reserved	SSI_CLK	reserved	reserved
GPIO3	UART0_LOG_TX	UART1_CTS	SPI1_CS1	PWM5_OUT	I2C1_SDA	SSI_DATA	GPIO3	reserved
GPIO4	UART0_LOG_RX	reserved	reserved	PWM1_OUT	I2C1_SCL	reserved	GPIO4	ADC1
GPIO5	UART1_RXD	GPIO5	I2S0_MCK	PWM2_OUT	reserved	BT_STATUS	SPI0_CS1	ADC2
GPIO6	UART1_TXD	GPIO6	I2S0_TX	PWM3_OUT	reserved	COEX_SWITCH	SPI0_CLK	reserved
GPIO7	UART1_CTS	GPIO7	I2S0_CLK	PWM0_OUT	reserved	BT_ACTIVE	SPI0_RXD	ADC3
GPIO8	UART1_RTS	GPIO8	I2S0_WS	PWM1_OUT	reserved	WLAN_ACTIVE	SPI0_TXD	reserved
GPIO9	GPIO9	UART2_RTS	SPI0_TXD	PWM0_OUT	I2C0_SCL	I2S0_MCK	SDIO_D2	ADC4
GPIO10	GPIO10	UART2_CTS	SPI0_CLK	PWM1_OUT	I2C0_SDA	I2S0_TX	SDIO_D3	reserved
GPIO11	GPIO11	UART2_TXD	SPI0_RXD	PWM2_OUT	RF_TX_EN_EXT	I2S0_RX	SDIO_CMD	ADC5
GPIO12	GPIO12	UART2_RXD	SPI0_CS1	PWM3_OUT	RF_RX_EN_EXT	I2S0_CLK	SDIO_CLK	ADC0
GPIO13	GPIO13	UART2_RTS	UART0_LOG_TX	PWM4_OUT	I2C0_SDA	I2S0_WS	SDIO_D0	ADC6
GPIO14	GPIO14	UART2_CTS	UART0_LOG_RX	PWM5_OUT	I2C0_SCL	reserved	SDIO_D1	reserved

Note: In ultra deep sleep mode, wake up can be triggered at the GPIO3/5/7/14 I/O rising edge.

Function0 is the default function after power on reset.

2.2.2 Function Signal description table

Function Interface	Signal Name	Type	Signal Description
WLAN and BT Coexisting PTA (packet traffic arbitration)	BT_ACTIVE	I	BT service request signal
	BT_FREQ	I	BT channel status signal
	BT_STATUS	I	BT service status signal
	WLAN_ACTIVE	O	WLAN service status indicator
	COEX_SWITCH	O	Antenna switching indicator
	RF_RX_EN_EXT	I	Externally input RF RX enable signal
	RF_TX_EN_EXT	I	Externally input RF TX enable signal
I2C master	I2C0/1_SCL	I/O	I2C clock
	I2C0/1_SDA	I/O	I2C data /nSET
I2S master	I2S0_BCLK	O	I2S bit clock signal
	I2S0_MCLK	O	I2S master clock signal
	I2S0_RX	I	I2S data RX signal
	I2S0_TX	O	I2S data TX signal
	I2S0_WS	O	I2S left/right channel select,word select signal
PWM	PWM0/1/2/3/4/5_OUT	O	PWM output signal
ADC	ADC0/1/2/3/4/5/6	I	ADC input signal
SDIO2.0 slave	SDIO_CLK	I	SDIO clock signal
	SDIO_CMD	I/O	SDIO command signal
	SDIO_D0/1/2/3	I/O	SDIO data signal 0~3
SPI master/slave	SPI0/1_CK	I/O	SPI clock signal
	SPI0/1_CSN	I/O	SPI chip select signal
	SPI0/1_RXD	I	SPI data RX signal
	SPI0/1_TXD	I/O	SPI data TX signal
SSI (Synchronous serial interface)	SSI_CLK	I	SSI clock signal
	SSI_DATA	I/O	SSI data signal
Debugging and download UART	UART0_LOG_RX	I	Software debugging and download UART data RX
	UART0_LOG_TX	O	Software debugging and download UART data TX
UART with hardware flow control	UART1/2_CTS_N	I	UART clear to send
	UART1/2_RTS_N	O	UART request to sen
	UART1/2_RXD	I	UART data RX
	UART1/2_TXD	O	UART data TX

3. Electrical and Thermal Specifications

3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-40	25	85	°C
External Antenna VSWR			1.7	2	/
Supply Voltage	VDD33	3.1	3.3	3.5	V
	VDDIO	1.7	1.8	1.9	V
		3.1	3.3	3.5	V

3.2 Current Consumption

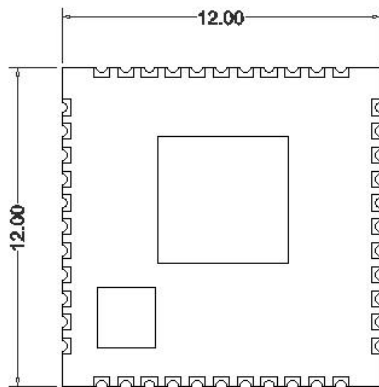
Conditions : VDD33=3.3V ;VDDIO=3.3V Ta:25°C			
Use Case	VDD33 Current		
	Typ(I _{RMS})	Max(I _{Peak})	Units
Ultra deep sleep mode	3	/	uA
DTIM1 (Delivery traffic indication map 1)	0.97	/	mA
DTIM3	0.36	/	mA
DTIM10	0.15	/	uA
WLAN Unassociated	52	61	mA
2.4G WLAN UDP throughput TX 10Mbps	83.3	298	mA
2.4G WLAN UDP throughput RX 10Mbps	81.4	302	mA
2.4G 11b 1Mbps TX @ 19dBm (RF test)	355	366	mA
2.4G 11b 11Mbps TX @ 19dBm (RF test)	352	370	mA
2.4G 11g 6Mbps TX @ 18dBm (RF test)	358	378	mA
2.4G 11g 54Mbps TX @ 16dBm (RF test)	325	362	mA
2.4G MCS0(HT20) TX @ 17dBm(RF-Test)	340	358	mA
2.4G MCS7(HT20) TX @ 15dBm(RF-Test)	312	346	mA
2.4G MCS7(HT20) RX(RF-Test)	53	64	mA

4. WLAN RF Specifications

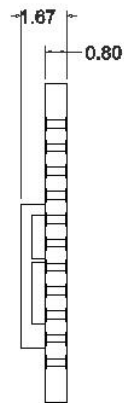
Conditions : VDD33=3.3V ; Ta:25°C			
Features	Description		
WLAN Standard	IEEE 802.11b/g/n		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Ch1~Ch13 (For 20MHz Channels)		
Modulation	802.11b (DSSS): CCK, DQPSK, DBPSK; 802.11g (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64;		
Data Rate	802.11b: 1, 2, 5.5, 11Mbps; 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7 6.5~72.2Mbps;		
Frequency Tolerance	≤±20ppm		
2.4G Transmitter Specifications			
TX Rate	TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1~11Mbps	19	±2	≤-10
802.11g@6Mbps	18	±2	≤-15
802.11g@54Mbps	16	±2	≤-25
802.11n@HT20_MCS0	17	±2	≤-10
802.11n@HT20_MCS7	15	±2	≤-28
2.4G Receiver Specifications			
RX Rate	Min Input Level (Typ.dBm)	Max Input Level (Typ.dBm)	PER
802.11b@1Mbps	-95	-10	< 8%
802.11b@11Mbps	-89	-10	< 8%
802.11g@6Mbps	-92	-10	< 10%
802.11g@54Mbps	-75	-10	< 10%
802.11n@HT20_MCS0	-90	-10	< 10%
802.11n@HT20_MCS7	-73	-10	< 10%

5. Mechanical Specifications

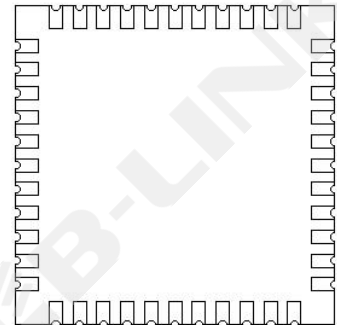
5.1 Module Outline Drawing



(Top View)

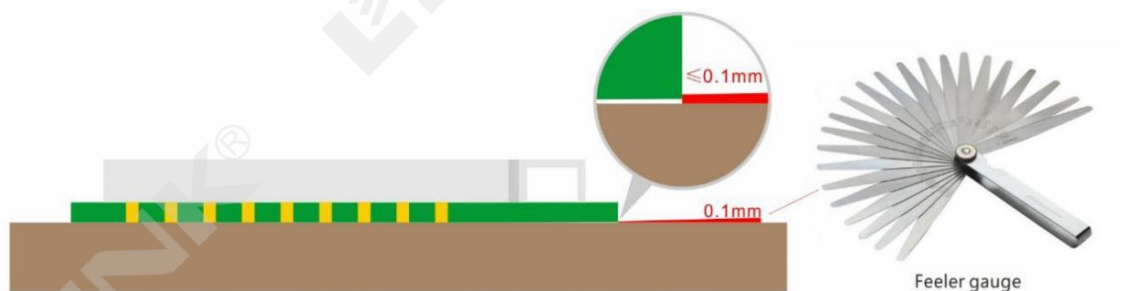


(Side View)



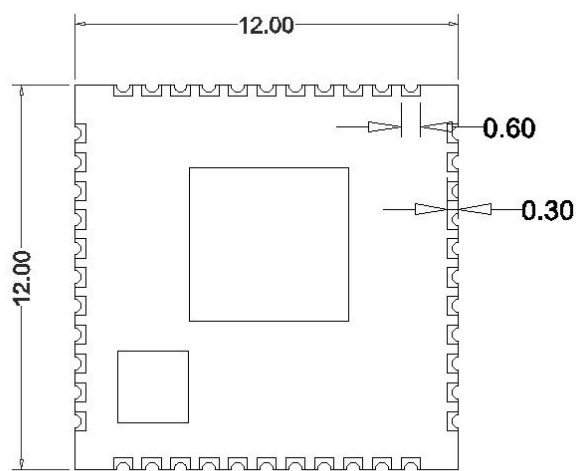
(Bottom View)

Module dimension: 12*12*1.67mm(L*W*H; Tolerance: $\pm 0.3\text{mm}_L/W$, $\pm 0.2\text{mm}_H$)

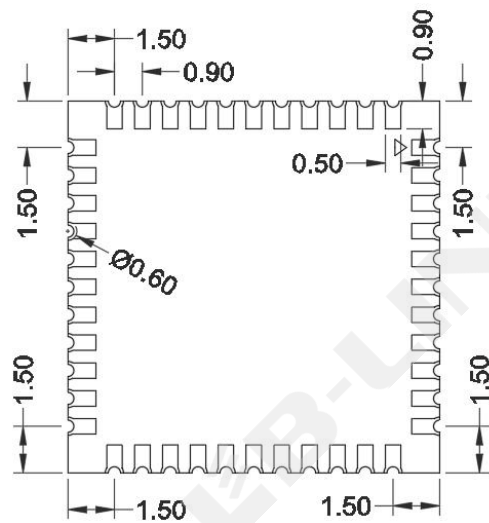


Module Bow and Twist: $\leq 0.1\text{mm}$

5.2 Mechanical Dimensions



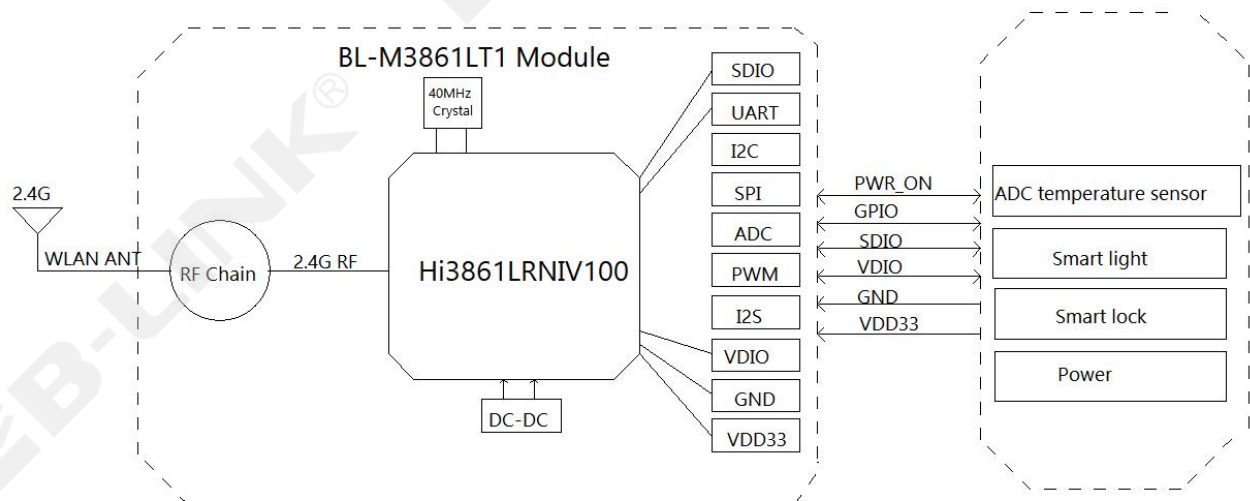
(Top View)



(Bottom View)

6. Application Information

6.1 Typical Application Circuit



6.2 HW Application Note

RTC clock: The module requires a 32.768kHz RTC clock input for low-power processing, which can be provided by an external active single-ended crystal oscillator or an external passive crystal. Their Specifications and reference circuit diagrams are shown below.

Note: the active crystal oscillator is powered by VDDIO, and the passive crystal must use two 27pF matching capacitors.

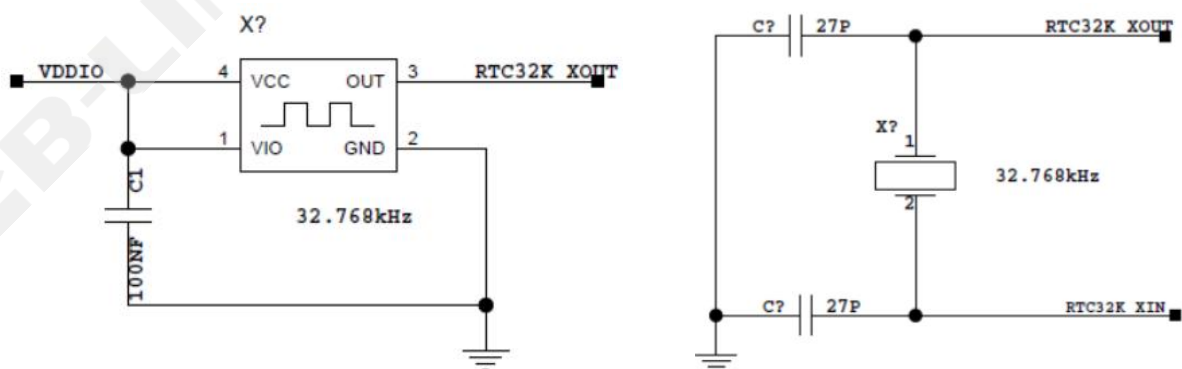
6.2.1 Electrical characteristics requirements for RTC active clocks

Parameter	RTC clock	Units
Clock frequency	32.768	kHz
Clock accuracy	$\leq \pm 200$	ppm
Duty cycle	$\leq \pm 200$	%
Input signal amplitude (Peak-Peak)	900 ~ 1800	mV
Clock Jitter	± 10000	ppm

6.2.2 Characteristics requirements for RTC passive clock appliances

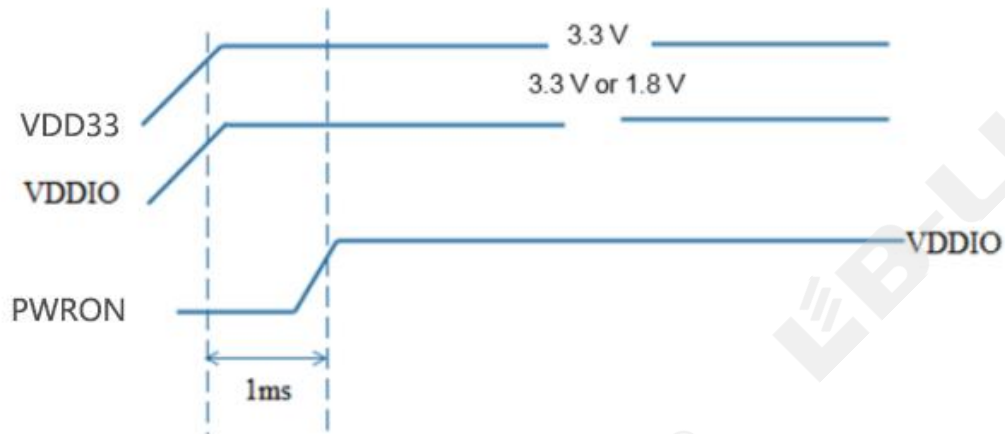
Parameter	RTC clock	Units
Clock frequency	32.768	kHz
Load Capacitance	12.5	Pf
Frequency error	$\leq \pm 50$	ppm
Series resistor	≤ 70	k Ω
Excitation power (max)	≥ 0.5	μ W

6.2.3 RTC clock reference circuit diagram

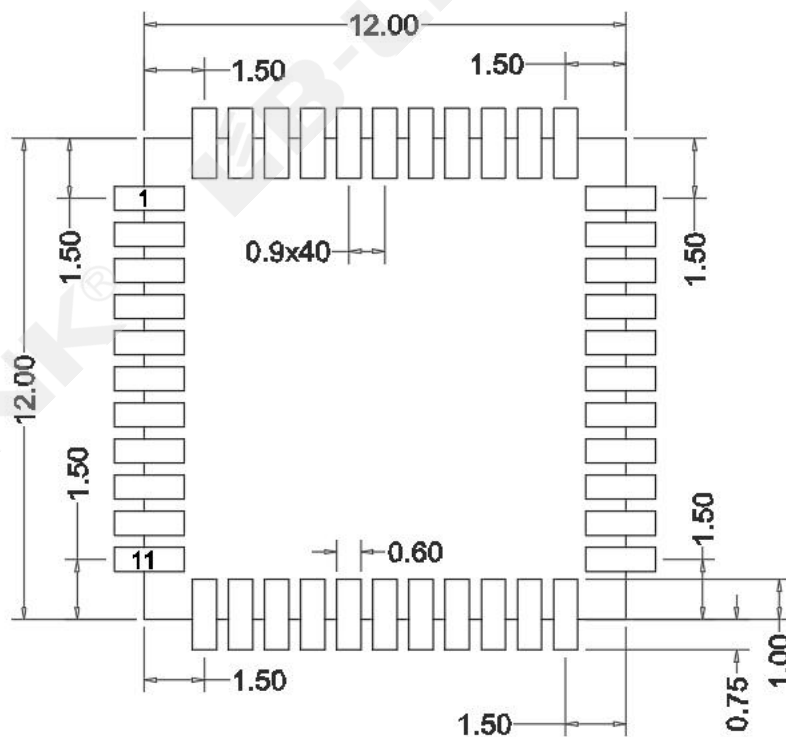


6.2.4 Power-up sequence:

As shown in the figure below, After VDD33 and VDDIO are ready, delay for more than 1ms before releasing the PWRON signal.

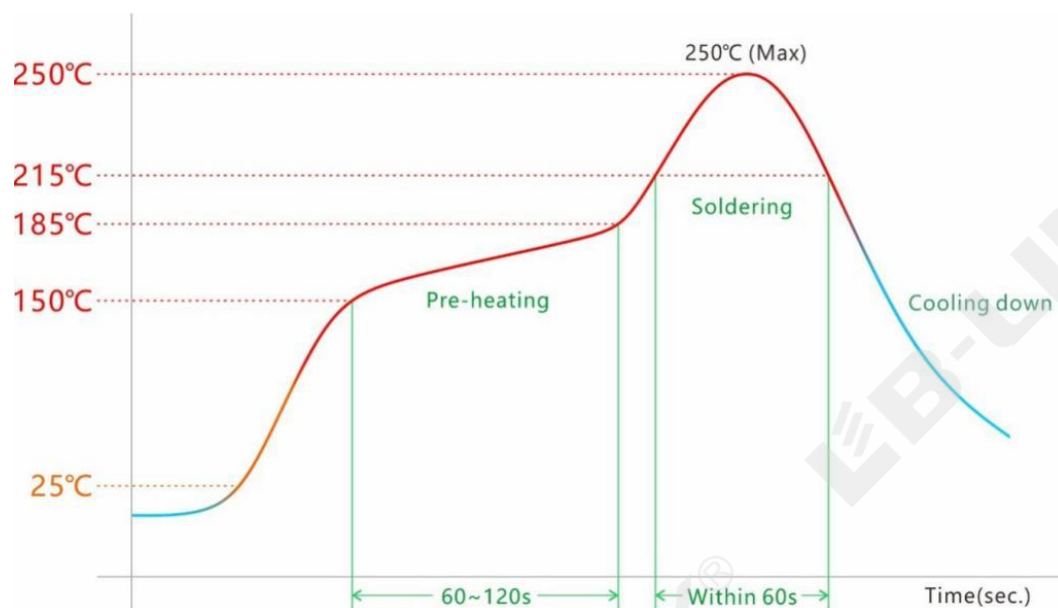


6.3 Recommend PCB Layout Footprint



(Design Unit: mm)

6.4 Reflow Soldering Standard Condition



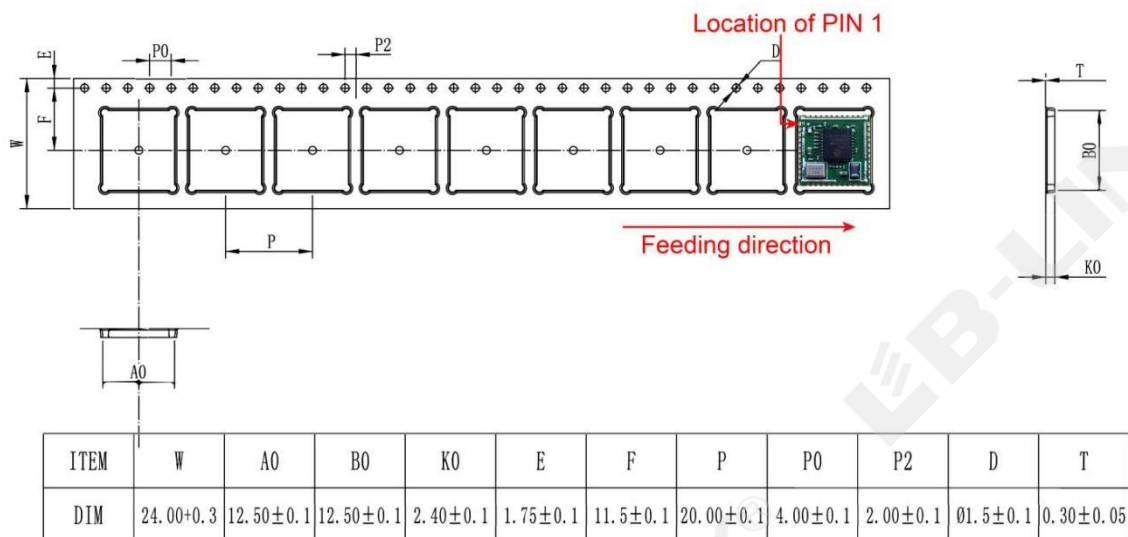
Please use the reflow within 2 times.
Set up the highest temperature within 250°C.

7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	Hi3861LRNIV100	HISILICON CO.,LTD	
2	PCB	BL-M3861LT1	SHEN ZHEN QILI ELECTRON CO.,LTD	
			Quzhou Sunlord Electronics Co.,Ltd	
			ShenZhen Tie Fa Technology Limited	
3	Crystal	40MHz-3225	Chengde oscillator Electronic Technology CO.,LTD	
			LUCKI CM ELECTRONICS CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	

8. Package and Storage Information

8.1 Package Dimensions



Package specification:

- 1,000 modules per roll and 5,000 modules per box.
- Outer box size: 37.5*36*29cm.
- The diameter of the blue environment-friendly rubber plate is 13 inches, with a total thickness of 28mm (with a width of 24mm carrying belt).
- Put 1 package of dry agent (20g) and 1 humidity card in each anti-static vacuum bag.
- Each carton is packed with 5 boxes.

8.2 Storage Conditions

Absolute Maximum Ratings:

Storage temperature: -40°C to +85°C,

Storage humidity: 10% to 95 (Non-Condensing)

Recommended Storage Conditions:

Storage temperature: 5°C to +40°C,

Storage humidity: 20% to 90% RH

Please use this Module within 12month after vacuum-packaged.

The Module shall be stored without opening the packing.

After the packing opened, the Module shall be used within 72hours.

When the color of the humidity indicator in the packing changed, the Module shall be baked before soldering.

Baking condition: 60°C, 24hours, 1time.

ESD Sensitivity:

ESD Protection: 2KV(HBM, Maximum rating)

The Module is a static-sensitive electronic device.

Do not operate or store near strong electrostatic fields.

Take proper ESD precautions!



ESD CAUTION