秘密级别： 公开
生效时间：2024 年 1 月 19
保密期限： 长期

Model NL-H873-USA1 Datasheet

1T1R WIFI6+BT+ NearLink

[SoC WS73U]

for 802.11b/g/n/ax+BLE5.2+SLE1.0

Version： 0.3

<Specification may be changed without prior notice>

Sichuan AI-Link Technology Co., Ltd

四川爱联科技股份有限公司

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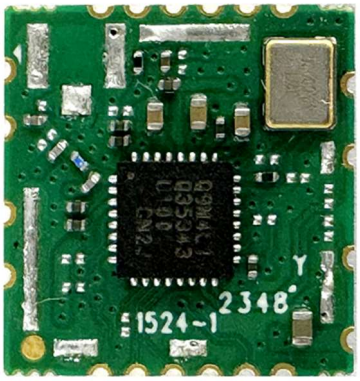
Typed Name	Signature	Date
Please sign and return this page and the front page to our company by email or fax, or by courier to the following address: Address: Anzhou Industrial Park, Mianyang, Sichuan, P.R.C Company: Sichuan AI-Link Technology Co., Ltd.		

Module Name		**NL-H873-USA1**	
	Designed by	Reviewed by	Approved by
Signature	YANG,bingquan	FAN, Xijun	DING,Shuangpeng
Date	1/19/2024	1/19/2024	1/19/2024

Model NL-H873-USA1

- **Compatible WLAN Standards**

  IEEE Std. 802.11 b/g/n/ax
  BLE5.2
  SLE1.0



- **SoC**

  AiW9761UE

- **Product Size**

  12.2mm×12.9mm×1.9mm

	Sichuan AI-Link Technology Co., Ltd.
	Anzhou Industrial Park, Mianyang, Sichuan, P.R.C
	+86-0816-2438701
	http://www.ailinkiot.com
	ai-link@ailinkiot.com

RoHS

Features

WLAN

- IEEE 802.11 b/g/n/ax
- 1T1R
- Support 802.11n 20MHz/40MHz, 802.11ax 20MHz bandwidth.
- Maximum PHY data rate up to 150 Mbps@HT40 MCS7, 114.7Mbps @HE20 MCS9

BLE

- BLE5.2
- Data rate up to 2 Mbps
- Support BLE Mesh and BLE gateway

Nearlink

- SLE1.0
- Support SLE 1MHz/2MHz/4MHz bandwidth
- Data rate up to 12Mbps

CPU

- 32-bit microprocessor with a maximum operating frequency of 240MHz.
- Internal SRAM、ROM

Interface

- USB2.0

Revision Record

Revision	Date	Description	Edited by
V0.1	11/22/2023	/	YANG,Bingquan
V0.2	12/14/2023	Modify PIN Definition	YANG,Bingquan
V0.3	1/19/2024	Add more information	YANG,Bingquan

Contents

1 General Description

1.1 System Overview

NL-H873-USA1 is based on WS73U. WS73U is a highly integrated Combo chip that supports 2.4GHz Wi-Fi, BLE, and SLE. It integrates a high-performance 32-bit microprocessor and security processing engine.

NL-H873-USA1 supports USB2.0 interface with a maximum speed of 480Mbps. It can be mounted on a host MCU and operated through the USB interface as a slave device.

NL-H873-USA1 supports OpenHarmony, FreeRTOS, Huawei LiteOS, Android, and Linux systems, providing a more open development environment and faster system operation environment. It is suitable for IoT smart terminal applications such as consumer IP cameras, dashcams, entry-level smart TVs, robotic vacuum cleaners, drones, and other IoT devices.

1.2 System Properties

Dimension	Typically, 12.2mm×12.9mm×1.9mm
Chipset	WS73U
Operating Frequency	2.4GHz:2.402~2.484 GHz
Antenna	1T1R，Stamp hole
Operating Voltage	3.3V±10%
PCB Information	2-layers design
Peripheral Interface	USB
Rate	WIFI: 11b: 1, 2, 5.5 and 11Mbps 11g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~7, up to 150Mbps 11ax：MCS0~9，up to 114.7Mbps BLE: up to 2Mbps SLE: up to 12Mbps
Operating Temperature	-10℃ to +70℃
Storage Temperature	-40℃ to +125℃
ESD Protection	HBM：2000V

1.3 Diagram

The general HW architecture for the module is shown in Figure 1. This Module design is based on WS73U. The 40MHz crystal oscillator provides the clock. The WiFi, BLE, and SLE signals all share a single antenna channel and are time-division multiplexed. The module communicates with the main controller through a USB2.0 interface.

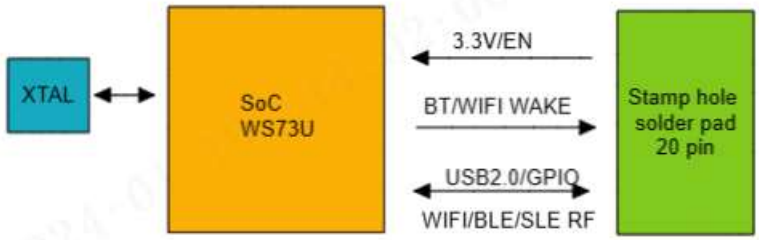
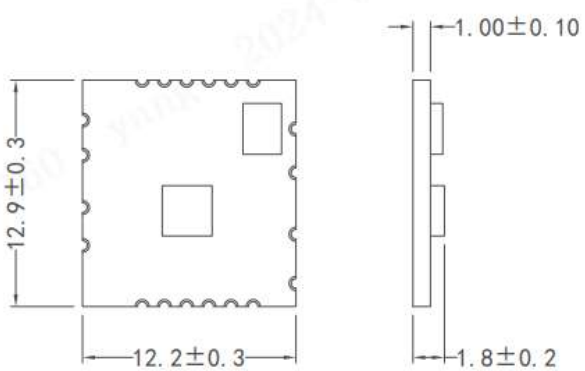


Figure 1: NL-H873-USA1 Block Diagram

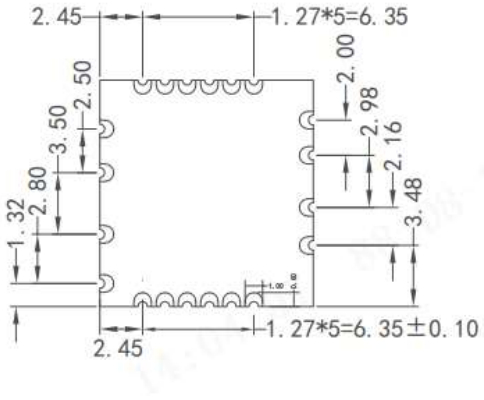
2 Mechanical Dimensions

2.1 Mechanical Outline Drawing

- Typical Dimension (W x L x T): 12.2mm×12.9mm×1.9mm
- General tolerance: ±0.2mm

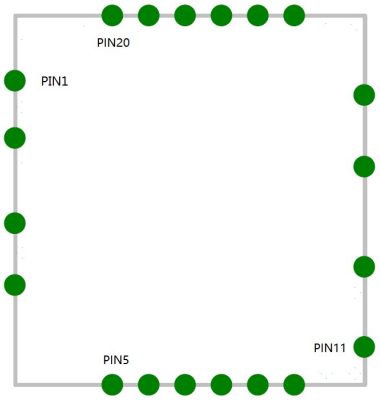


Top View



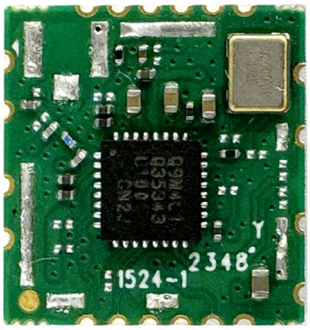
Bottom View

2.2 Pin definitions

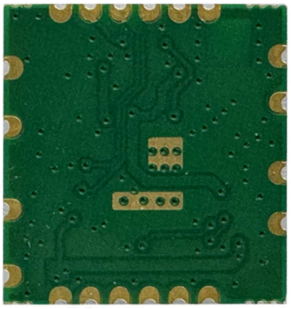


Pin	Define	Function
1	GND	Connect to ground
2	ANT	Connect to ANT
3	NC	Not connect
4	GND	Connect to ground
5	GPIO2	GPIO
6	GPIO7	GPIO
7	GPIO6	GPIO
8	NC	Not connect
9	GPIO10/WAKE	BT/WIFI wake up host, active low.
10	NC	Not connect
11	3.3V	3.3V Power supply.
12	USB_DM	USB single Data-
13	USB_DP	USB single Data+
14	GND	Connect to ground
15	NC	Not connect
16	EN	Enable pin for the WS73U，Internal 20K pull-up, Drive low to disable WS73U.
17	TX	UART_TX for debug
18	RX	UART_RX for debug
19	NC	Not connect
20	NC	Not connect

2.3 Product Photos



Top View



Bottom View

3 RF Characteristics

3.1 Wi-Fi Subsystem

Items	Contents	
WLAN Standard	IEEE 802.11b/g/n/ax	
Frequency Range	2.400 GHz ~ 2.484 GHz (2.4 GHz)	
Channels	CH1 to CH13 @ 2.4G	
Modulation Mode	802.11b: DBPSK, DQPSK ,CCK	
	802.11 g: BPSK, QPSK, 16QAM, 64QAM	
	802.11 n: BPSK, QPSK, 16QAM, 64QAM	
	802.11 ax: BPSK, QPSK, 16QAM, 64QAM, 256-QAM	
Output Power & EVM	Power Value	EVM
	802.11b /11Mbps: 17dBm ± 2dBm	≤ -10dB
	802.11g /54Mbps: 15dBm ± 2dBm	≤ -26dB
	802.11n HT20 /MCS7: 14dBm ± 2dBm	≤ -28dB
	802.11n HT40 /MCS7: 14dBm ± 2dBm	≤ -28dB
	802.11ax HE20/MCS9: 14dBm ± 2dBm	≤ -32dB
Receiver Sensitivity @2.4G PER≤ 10%	Rate Type	Max
	802.11b /11Mbps (PER≤8%)	-83dBm
	802.11g /54Mbps	-70dBm
	802.11n HT20 /MCS7	-69dBm
	802.11n HT40 /MCS7	-66dBm
	802.11ax HE20/MCS9	-63dBm

3.2 Bluetooth Subsystem

Items	Contents			
TX Characteristics				
Channel	CH0 to CH39			
Modulation	GFSK			
TX Power	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1M	-	10	-
	2M	-	10	-
RX Characteristics				
RX (PER<30.8%)	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1M	-	-90	-
	2M	-	-90	-

3.3 SLE Subsystem

Items	Contents			
TX Characteristics				
Channel	CH0 to CH39			
Modulation	GFSK/BPSK/QPSK/8PSK			
TX Power	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1M	-	10	-
	2M	-	10	-
	4M	-	10	-
RX Characteristics				
RX (PER<30.8%)	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1M	-	-90	-
	2M	-	-90	-
	4M	-	-90	-

** Note: [1] The RF Characteristics are tested at room temp.25℃, provided VBAT is 3.3V.*

4 Interface

The module supports the USB (USB v2.0 specification) device port.

5 Electrical Current Consumption

5.1 Wi-Fi Current Consumption

Description	Average value	Peak value	Unit
Power Consumption (WIFI TX@11b/1M)	292.56	305.96	mA
Power Consumption (WIFI RX@11b/1M)	111.81	115.74	mA

5.2 Bluetooth Current Consumption

Description	Average value	Peak value	Unit
Power Consumption (BT TX@BLE 1M)	278.11	319.42	mA
Power Consumption (BT RX@BLE 1M)	103.32	104.96	mA

5.3 SLE Current Consumption

Description	Average value	Peak value	Unit
Power Consumption (BT TX@SLE 1M)	114.44	252.25	mA
Power Consumption (BT RX@SLE 1M)	103.36	104.27	mA

**Note:*

[1] This Electrical Current Consumption Results are measured provided VDD33 is 3.3V. The temperature is 25℃.

6 Software Information

6.1 Normal Driver

Linux，android

**Note:*

[1] The software (driver) package version is subject to change without notice because it may encounter several updates. It is advised to consult with AI-Link for the best right driver package.

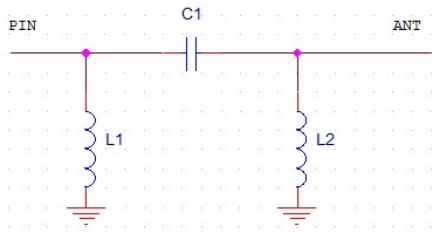
7 Reference Design

Design Considerations:

1) The EN pin is the enable pin of the main chip WS73U. It has an internal 20K pull-up resistor. When pulled low, the main chip WS73U is turned off.

2) The BT_WAKE pin corresponds to GPIO10 of the main chip WS73U, and this pin can also be reused as WIFI_WAKE.

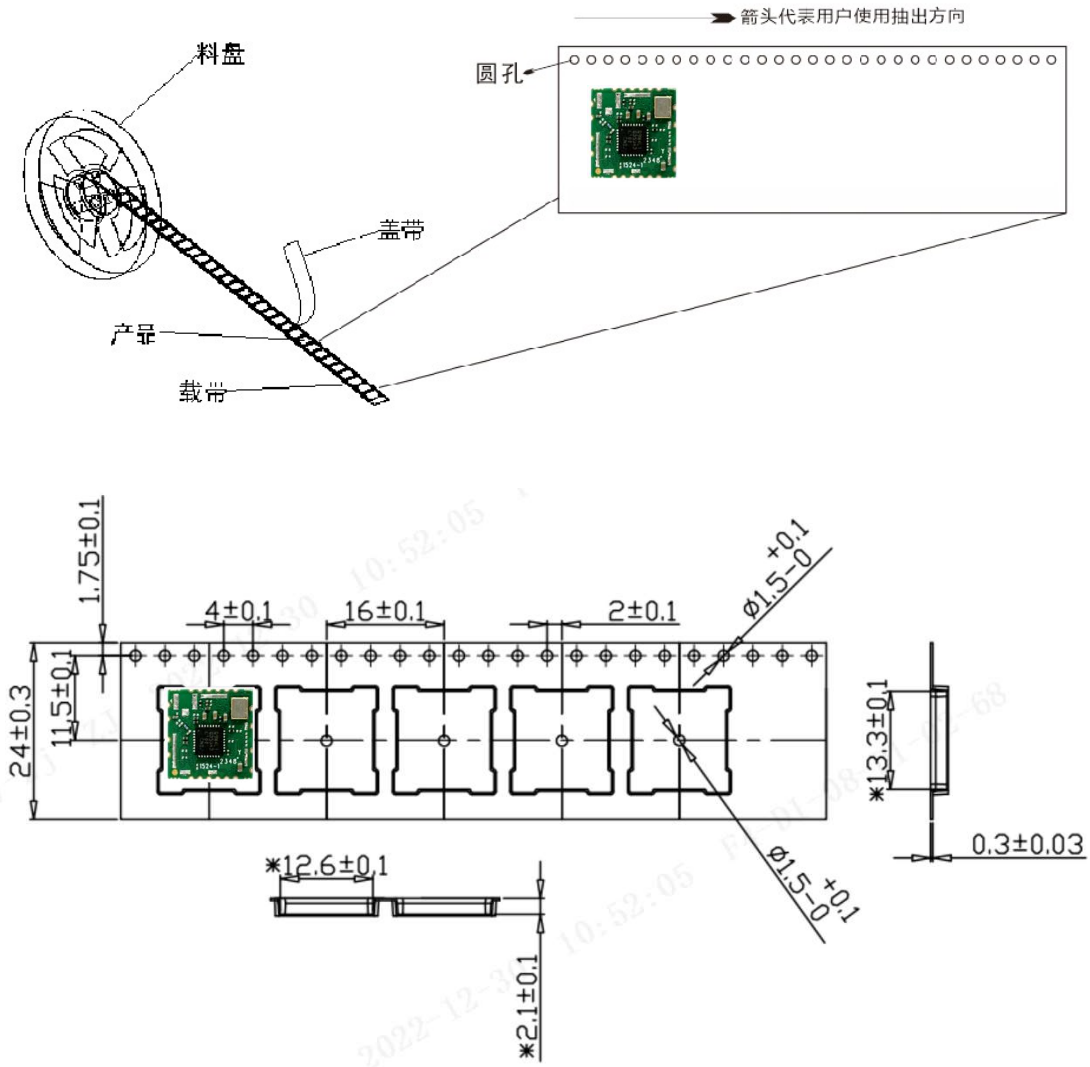
3) The 2th Pin connect to antenna, The coplanar impedance between Pin2 and antenna is required to be 50Ω. It is recommended to use arc and straight line with the length as short as possible. L1, L2 and C1 form a π type matching network and are close to the antenna interface design, which is adjusted according to the actual measurement effect of antenna recommendation and typesetting design.



4) The back of the module, below the chip, has two solder pads for chip heat dissipation. When designing the motherboard, grounding is not necessary, but be careful not to cause interference.

8 Package, Storage & Disposal

8.1 Package



1) The product placement direction, label placement position, and packaging should be done according to the illustration.

2) Each roll contains 2000 products, and each small box contains 1 roll. There are a total of 8 small boxes in a large box, with a total of 16,000 products per box.
3) The external dimensions of the box are 370mm x 300mm x 370mm, and the dimensions of the small box are 360mm x 360mm x 37mm.
4) Place 2 bags of 2g desiccant and 1 6-color humidity card inside the vacuum pack.
5) Any other matters not mentioned should be carried out according to the customer’ s packaging requirements.

8.2 Storage

All electronic components must be stored in a clean, well-ventilated place free of corrosive gas. Unless otherwise specified, the temperature and humidity of the storage place must meet below requirements:

- Temperature：-40~125℃;
- Humidity：20%~75%;
- Humidity sensitivity grade： MSL 3
- Container Requirement: products shall be placed in a container well-functioning as an electrostatic shielding.

8.3 Disposal

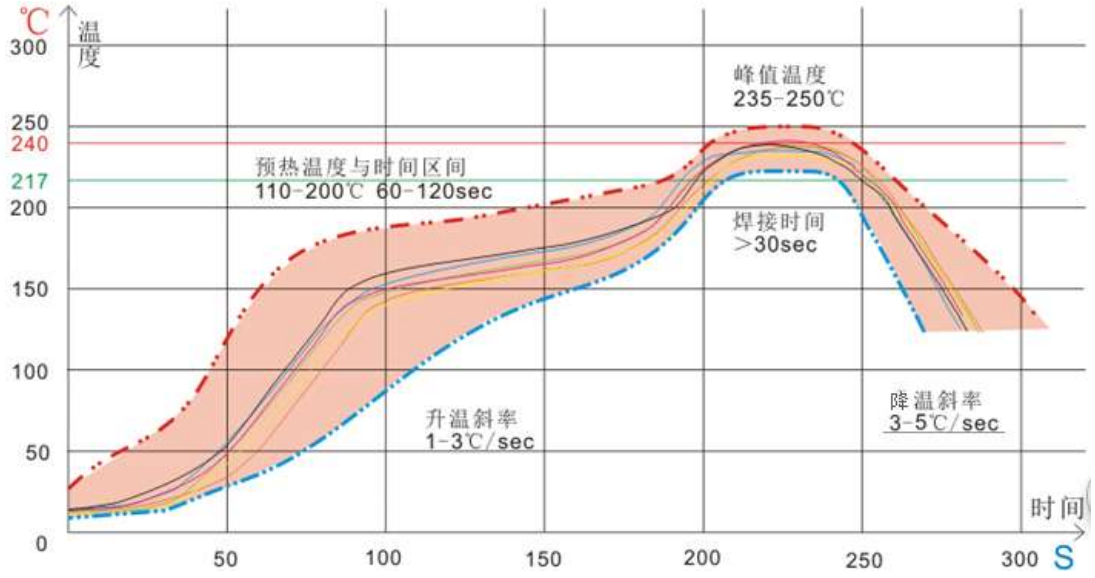
The waste disposal of this product and the package should comply with the applicable local/regional /state/ international regulations.

9 Appendix

Key Components List

NO.	Name	Model	Specification	Manufacturer
1	IC	WS73U	/	Hisilicon
2	PCB	JUI7.820.1494 series	FR-4, 2-lay	IQE, TBD RJX
3	Crystal	/	3225 40MHz	JWT TKD Faith Long ECEC

10 Refelow Standard Condition



Heating zone: temperature: < 150 °C, time: between 60 and 90 seconds, the slope is controlled between 1 ~ 3 °C / S.
Preheating constant temperature zone: temperature: 150 °C ~ 200 °C, time: between 60-120 seconds, slope between 0.3-0.8.
Reflow soldering area: peak temperature 235 °C ~ 250 °C (recommended peak temperature < 245 °C), time 30-70 seconds.
Cold area: temperature: 217 °C ~ 170 °C, slope between 3 ~ 5 °C / S.
The solder is lead-free solder in tin-silver copper alloys/Sn&Ag&Cu Lead-free solder (SAC305).

11 Certification Information:

TBD