LEEDARSON LA02302 WI-FI and Bluetooth SMART Combo Module User Manual

LEEDARSON

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Contents

Introduction

1.1 Overview

The LA02302 is a Leedarson-developed universal Wi-Fi and Bluetooth SMART (BLE) combo module. It uses the Espressif Inc. ESP32-U4WDH System in Package that integrates an embedded 4MB flash.

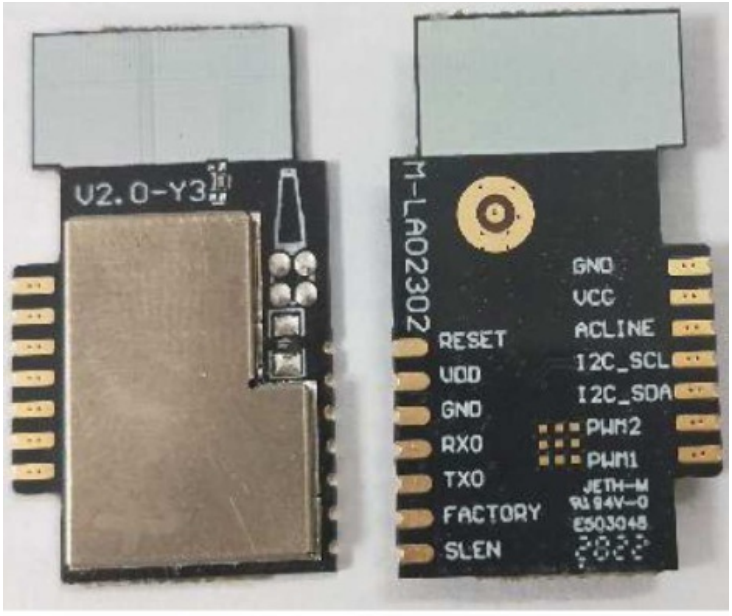


Figure 1.1. LA02302 Module

The LA02302 module is designed for a variety of IoT products such as Power Drivers, Sensors, Plugs, Lighting, Switches, etc.

Plug Switch Sensor Light Power Driver

Figure 1.2. Product Application

1.2 Key features

- Embedded Xtense 32-bit LX6 microprocessor, with a clock up to 160MHz
- Data Memory: 520KB internal SRAM and 448KB internal ROM,4MB Flash
- Power supply voltage: 3.0V~3.6V
- Operating temperature: -40~105 Deg-C
- Frequency of crystal oscillator: 40MHz \32.768KHz
- Operating frequency: 2400~2483.5MHz
- Support WIFI 802.11b/g/n up to 150Mbps
  Compliant with Bluetooth LE specifications
  Wi-Fi 802.11 b/g/n and BLE can't transmission simultaneous
- Interface:
  ■ Horizontal Mount (Plug-In)
  ♦ 2 PWMs (GPI0s)
  ♦ 1 I2C
  ♦ 1 Dedicated Triac Dimmer Detection Pin
  ■ Vertical (SMD)
  ♦ 1 GPIOs
  ♦ 1 UART

1.3 Block Diagram

The LA02302 module is a highly-integrated, high-performance system with all the hardware components needed

to enable 2.4GHz wireless connectivity and support Wi-A and BLE protocols.
Built around the ESP32-U4WDH Wireless SoC, the LA02302 includes a built-in PCB trace antenna, supply decoupling and filtering components, a 40MHz reference crystal, a 32.768KHz crystal, and an RF shield. A general block diagram of the module is shown below.

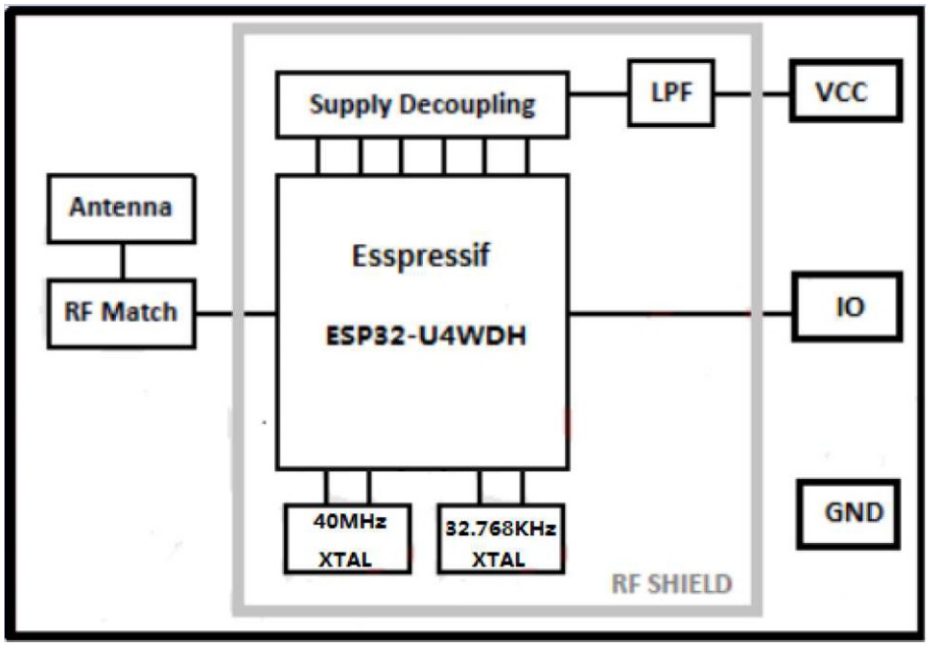


Figure 1.3. LA02302 Block Diagram

1.4 Power Supply

The LA02302 requires a single nominal supply level of 3.3V. All the necessary decoupling and filtering components are included in the module. The supply voltage noise tolerance of the module should be less than 100mVpp and the supply current should be more than 500mA.

1.5 Module Certification Information

Table 1.5. Module Certification Information

Module	Certification Type	Certification Information
LA 02302	FCC	
	IC	

Electrical characteristics

2.1 Absolute maximum ratings

Stresses above those listed below may cause permanent damage to the device. This is a stress rating only and functional operation of the devices at those or any conditions above those indicated in the operation listing of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Table 2.1. Absolute maximum ratings

Symbol		Min.	Max	Units
VCC	Power Supply	_0.1	+3.6	V
GND	Ground of Module		0	V
VIO	The voltage of Module I0	0.	+3.6	V

Storage temperature		-40	+125	Deg-C
MSL	Moisture Sensitivity Level			
ESD HBM	Human Body Model		+1.5	KV
ESD CDM	Charge Device Mode		+5(X)	V

2.2 General Operating Conditions

This table specifies the general operating temperature range and supply voltage range for all supplies, the minimum and maximum values of all other tables are specified over this operating range unless otherwise noted.

Table 2.2. General Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Units
NC	Supply voltage, normal	3.0	3.	4.	V
TA	Operation temperature [1]	-40	25	105	Deg-C
ICC peak	Supply Current Peak [2]	–	400	450	mA
ICC average	Supply Current average [2]	–	150		mA

Note:

1. It refers in particular to the surface temperature on the 40MHz reference crystal of the LA02302 when it is working, if the surface temperature of the 40MHz reference crystal is above 105 Deg-C, the RF parameters will be worse.
2. It is measured when the nodule runs the RF test Firmware (Th 10% duty cycle and 25 Deg-C ambient temperature.

2.3 DC Specifications

Unless otherwise indicated, typical conditions are VCC=3.3V.TA=25 Deg-C.

Table 2.3. DC Specifications

Symbol	Parameter(condition)	Min.	Typ.	Max.	Units
VIA	Input high voltage	0.75 x VCC		VCC	V
VIL	Input low voltage	GND	–	0.25x VCC	V
VEOH	Output high voltage	0.8 x VCC	–	–	V
VOL	Output low voltage	–		0.1x VCC	V
IOT	Output high current	–	40	–	mA
IOL	Output low current	–	28	–	mA
RPO	Pull-up resistance	–	45	–	k Ω
RPD	Pull-down resistance	–	45	–	k Ω
ITX 802.11b peak	Transmit 11b DSSS 1Mbps Pout=+19dBm	–	382		mA
ITX 802.11b averag e	Transmit 11b DSSS 1Mbps Pout=+19dBm	–	148	–	mA
ITX 802.11b peak	Transmit 11b DSSS 11Mbps Pout=4-19dB m	–	378	–	mA
ITX 802.11b averag e	Transmit 11b DSSS 11Mbps Pout=-1-19d Bm	–	146	–	mA
ITX 802.11g peak	Transmit 11g OFDM 6Mbps Pout=+17dBm	–	332	–	mA
ITX 802.11g averag e	Transmit 11g OFDM 6Mbps Pout=+17dBm	–	139	–	mA
ITX 802.11g peak	Transmit 11g OFDM 54Mbps Pout=+13 dB m	–	272	–	mA
ITX 802.11g averag e	Transmit 11g OFDM 54Mbps Pout=+13 dB m	–	130	–	in \
ITX 802.11n peak	Transmit 11n OFDM MCSO Pout=+17.5 d Bm	–	328	–	mA
ITX 802.1 In averag e	Transmit 11n OFDM MCSO Pout=+17.5 d Bm	–	140	–	mA
ITX 802.1In peak	Transmit 11n OFDM MCS7 Pout=+I2 dBm	–	256	–	mA
ITX 802.1In average	Transmit 11n OFDM MCS7 Pout=+I2 dBm	–	128	–	mA
IRX 802.1 lb/g/n	Rx average current	–	108	–	mA
ITX BLE	Pout=8 dBm	–	236	–	mA
ITX BLE average	Pout=8 dBm	–	184	–	mA
IRX BLE	Rx avenge current	–	115	–	mA
Note: The current is measured with the module running the RF test Firmware @ 10% duty cycle					

2.4 RF Specifications

Unless otherwise indicated, typical conditions are VCC=3.3V TA=2S Deg-C.

Table 2.4. Wi-Fi Specifications

Symbol	Description	Min.	Typ.	Max.	Units
Fop	Operating frequencies	2412	–	2484	MHz
PRFI 1b	1lb DSSS IMbps output power	–	19	–	dBm
	1lb DSSS 11Mbps output power	–	19	–	dBm
PRI 11g	11g OFDM 6Mbps output power	–	17	–	dBm
	11g OFDM 54Mbps output power	–	13	–	dBm
PRFI 1n	11 n OFDM HT20 MCSO output power	–	17	–	dBm
	11 n OFDM HT20 MCS7 output power	–	12	–	dBm
	1ln OFDM HT40 MCSO output power	–	16	–	dBm
	1ln OFDM HT40 MCS7 output power	–	11	–	dBm
PSENS11b	Receiver sensitivity @ 1lb DSSS 1Mbps	–	-95	–	dBm
	Maximum receiving level @ 1lb DSSS 1Mbps	–	5	–	dBm
	Receiver sensitivity @1lb DSSS 11Mbps	–	-86	–	dBm
	Maximum receiving level @11b DSSS 11Mbps	–	5	–	dBm
PSENS11g	Receiver sensitivity @ 11g OFDM 6Mbps	–	-91	–	dBm
	Maximum receiving level @ 1lg OFDM 6Mbps	–	0	–	dBm
	Receiver sensitivity @ 11g OFDM 54Mbps	–	-73	–	dBm
	Maximum receiving level @ 1lg OFDM 54Mbps	–	-8	–	dBm
PSENS 11n	Receiver sensitivity @ 11n OFDM HT20 MCSO	–	-90	–	dBm
	Maximum receiving level @ l1n OFDM HT20 MCS O	–	0	–	dBm
	Receiver sensitivity @ 11n OFDM HT20 MCS7	–	-71	–	dBm
	Maximum receiving level @ 11n OFDM HT20 MCS 7	–	-8	–	dBm
	Receiver sensitivity @ 11n OFDM HT40 MCSO	–	-88	–	dBm
	Maximum receiving level @ 11n OFDM HT40 MCS O	–	0	–	dBm
	Receiver sensitivity @ l1n OFDM HT40 MCS7	–	-68	–	dBm
	Maximum receiving level @ 11n OFDM HT40 MCS 7	–	-8	–	dBm

Table 2.5. BLE Specifications

Symbol	Description	Min.	Typ.	Max.	Units
Fop	Operating frequencies	2402	–	2480	MHz
PRFLE	LE Output Power	–	8	–	dBm
	LE Out Power Control range	–	24	–	dB
	LE Out Power Control step	–	3	–	dB
PSENSLE	LE Receiver sensitivity	–	-90	1	dBm
	LE Maximum receiving level	–	0	–	dBm

Pin Definition

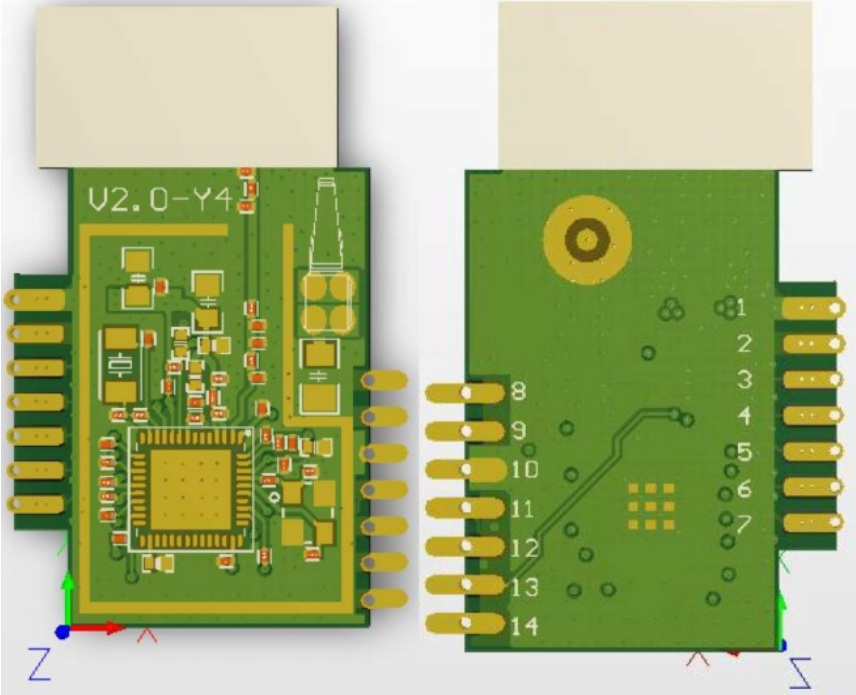


Figure 3. Module Pin Number

Table 3. Module Pin Number

Module No	Pin of IC	Pin Definition	Pin Function Description	Direction
1	49	GND	ground of module	—
2	1,3,4,19,26,37,43,46	VCC	Power Supply	—
3	11_VDET_2	AC_TR1AC_DETECT 1	Triac Dimmer Detect 0 – VCC (0 – 3.3 V)	I
4	21_MTDO	I2C_SCK	I2C Clock pin	I/O
5	20 MTCK	I2C_SDA	I2C Data pin	I/O
6	15_GPIO26	PWM2/IO1	PWM channel 2 output / GPIO 1	I/O
7	17_MTMS	PWM 1/100	PWM channel 1 output / GPIO 0	I/O
8	9_CHIP_PU	/Reset	Reset, Low Active	I
9	1,3,4,19,26,37,43, 46	VCC	Power Supply	—
10	49	GND	ground of module	—
11	40 UORXD	RXO	FACTORY UART_RX data in (RX)	I
12	41_UOTXD	TXO	FACTORY UART_TX data out (TX)	0
13	10 VDET_1	FACTORY MODE N	FACTORY MODE enables, low active	I
14	23_GPIOO	SLEN	BM SEL for UART boot; Default: weak pull up	I/O

Note:
1. AC TRIAC_DETECT is used to detect if a device is powered through a Triac dimmer and to determine the dimmer settings. The circuit that feeds this signal should give a scaled DC voltage representation of the average AC voltage integrated over approximately 200ms. If the triac is set to chop the AC waveform 50%, the AC_TRIAC_DETECT signal should be at 50% of VCC. If the Triac dimmer is turned up completely, the AC waveform will be minimally chopped and the AC_TRIAC_DETECT signal should be at 100% of VCC.

Package Specifications

4.1 Single Module Dimension

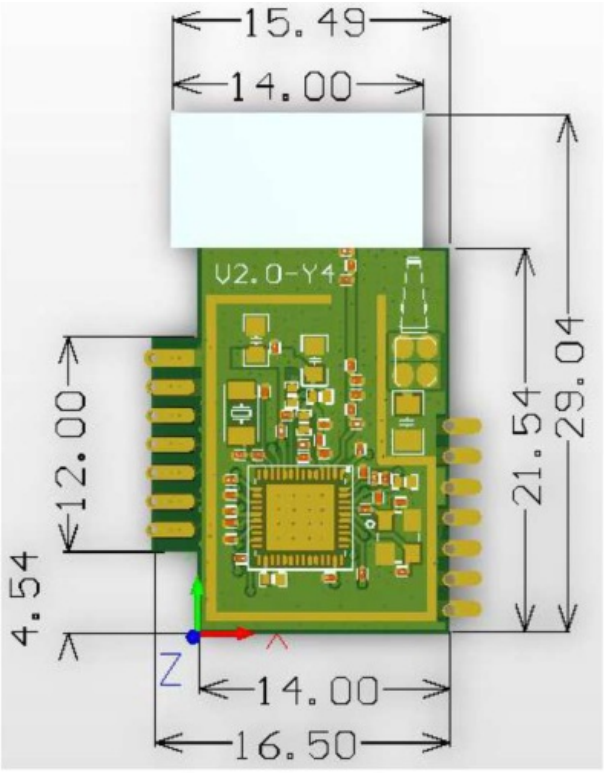


Figure 4.1. Single Module Dimensions (Unit: mm)

4.2 Layout Package Suggestion

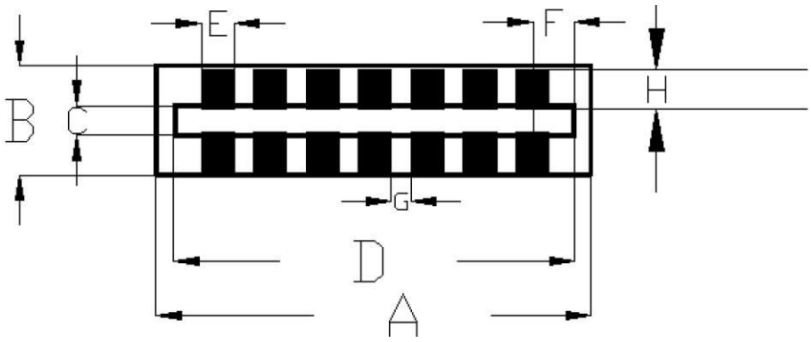


Figure 4.2. Layout Package Suggestion (Unit: mm)

Table 4.2. Layout Package Suggestion

Symbol	Dimension (mm)			Dimension (mil)		
	Min.	Typ	Max.	Min.	Typ	Max.
A	13.16	13.26	13.36	518.11	522.05	529.98
B	3.26	3.36	3.46	128.35	132.28	136.22
C	0.8	0.9	1.0	32.5	35.43	39.37
D	12.1	12.2	12.3	476.38	480.3	484.25
E	0.9	1	1.1	35.43	39.37	43.31
F	1.2	1.3	1.4	47.24	51.18	55.12
G	0.5	0.6	0.7	19.685	23.62	27.56
H	1.1	1.2	1.3	43.31	47.24	51.18

Soldering Recommendations

Refer to the below information for SMT temperature settings. Note that the number of times reflow should not be above 2 times.

Table 5.1. SMT temperature setting

Set points(t)										
Zone	1	2	3	4	5	6	7	8	9	10
Top	140	180	190	180	180	190	245	260	265	210
Bottom	140	180	190	180	180	190	245	260	265	210
Conveyor Speed (cm/min) : 130.0										

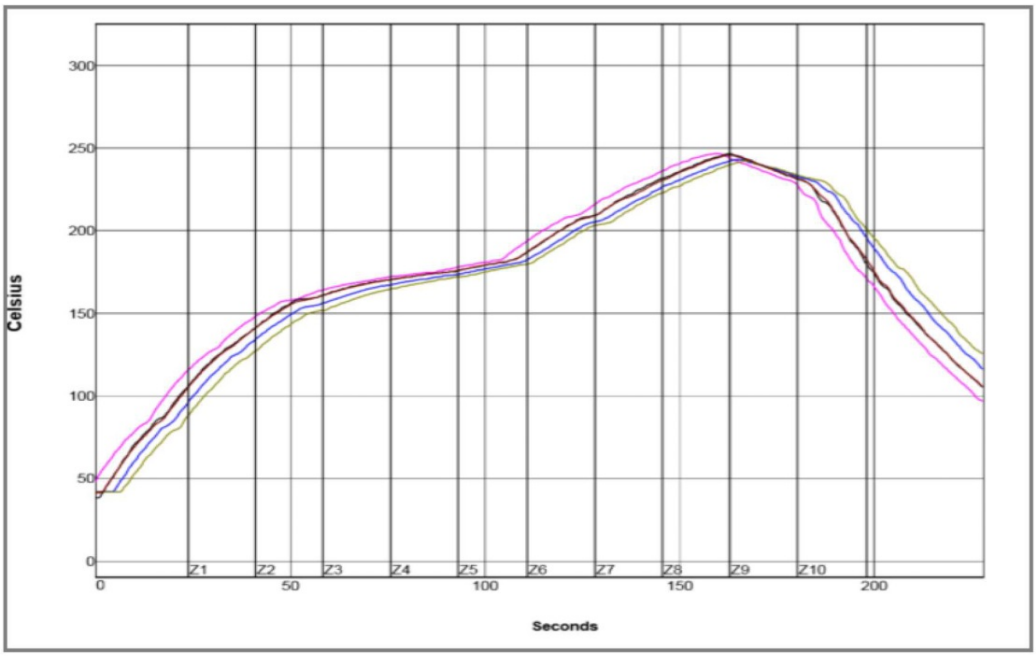


Figure 5.1. SMT temperature setting curve

Declaration

FCC Statement

1. 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.
   (2) This device must accept any interference received, including interference that may cause undesired operation.

15.21

Note: The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

15.105(b)

NOTE: 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 or more 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.
- Consult the dealer or an experienced radio/TV technician for help

RF exposure Statement

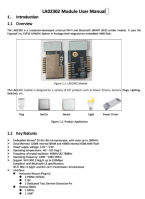
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science, and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Host labeling requirement: "Contains transmitter module:
FCC ID: 2AB2Q-MLA02302,
IC: 10256A-MLA02302

Documents / Resources

	LEEDARSON LA02302 WI-FI and Bluetooth SMART Combo Module [pdf] User Manual MLA02302, 2AB2Q-MLA02302, 2AB2QMLA02302, LA02302 WI-FI and Bluetooth SMART Combo Module, LA02302, WI-FI and Bluetooth SMART Combo Module