8BIT-LW01H Application Development Guide

Version: V1.2

Date: 2024.04.25

Important Notice:

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.Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
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.
Exposure to Radio Frequency Radiation. This equipment must be installed and operated in accordance
with provided instructions, and the antenna(s) used for this transmitter must be installed to provide a
separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.
This Modular Approval is limited to OEM installation for mobile and fixed applications only. The antenna installation and operating configurations of this Modular, including any applicable source based time averaging duty factor, antenna gain and cable loss must satisfy MPE categorical Exclusion
Requirements of 2.1091.
if the host is marketed so that end users do not have straight forward commonly used methods for access
to remove the module so that the FCC ID of the module is visible; then an additional permanent label
referring to the enclosed module: Contains Transmitter Module FCC ID: 2BGK68BIT-LW01H or Contains FCC ID: 2BGK68BIT-LW01H must be used.

Maintain records

version	date	author	Audit	illustrate
V1.0	2023-12-12	lbg	lbg	Initial release
V1.1	2024-4-19	mh	mh	Added model description
V1.2	2024-4-25	lbg	lbg	Added descriptions of common AT commands

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1. Product Introduction

1.1. Product Overview

8BIT-LW01H is a LoRaWan module designed and developed by Xi'an Babbit Technology Co., Ltd., which is used for ultra-long-distance spread spectrum communication. The chip ASR6601 is a general-purpose LPWAN wireless communication SoC that integrates an RF transceiver, modem, and a 32-bit RISC MCU. The MCU uses an ARM core and operates at up to 48MHz. The 8BIT-LW01H module supports LoRa modulation.

The 8BIT-LW01H module provides ultra-long-range and ultra-low-power communication for LPWAN applications, and can be widely used in many application scenarios such as smart metering, smart logistics, smart buildings, smart cities, and smart agriculture.

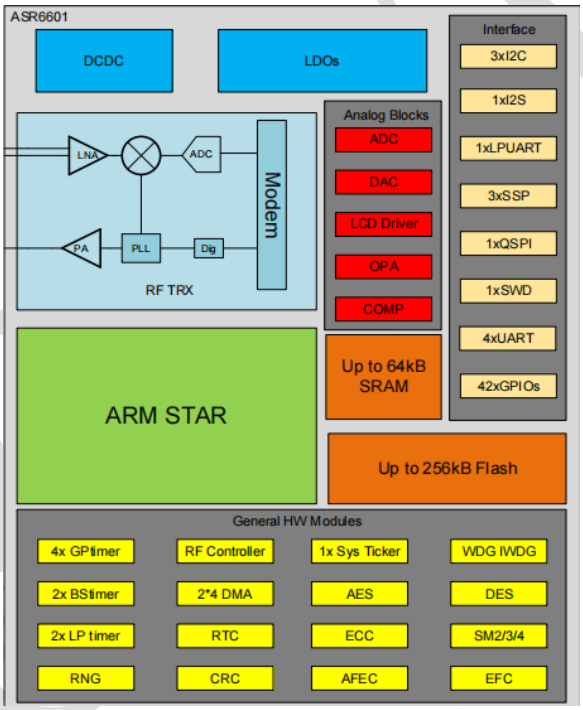
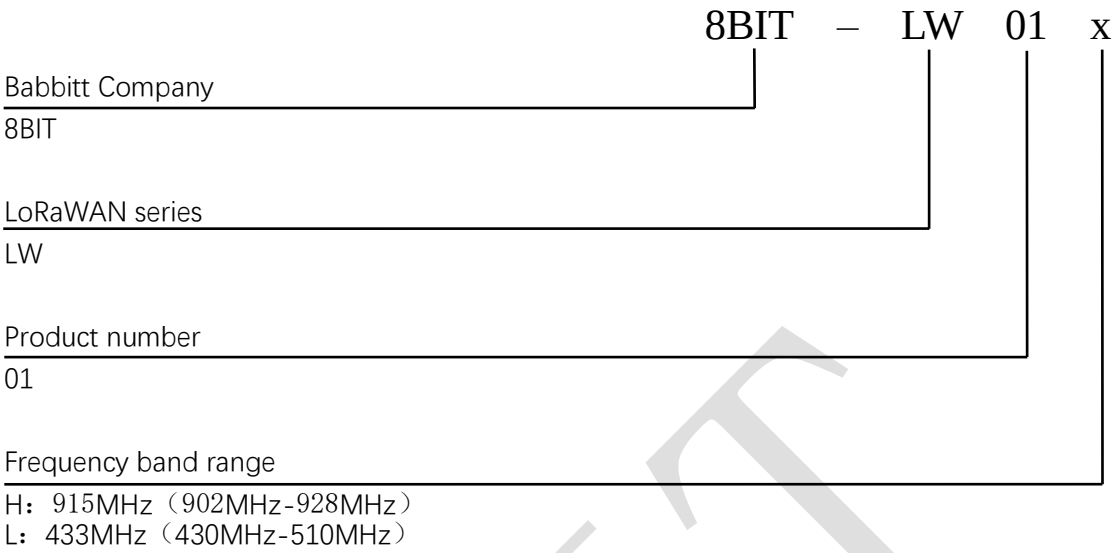


fig 1 Chip architecture

1.2. Functional features of the module:

- ✧ Stamp hole encapsulation
- ✧ Frequency bands: 902MHz-928MHz
- ✧ The operating voltage is 3.3V, and the theoretical maximum transmit power is +22dBm
- ✧ High sensitivity: -136dBm @125Kz SF12
- ✧ Spread spectrum factor: SF5/SF6/SF7/SF8/SF9/SF10/SF11/SF12
- ✧ 128KB FLASH，16KB SRAM
- ✧ Supports LoRa modulation
- ✧ Power consumption is as low as 1.3uA in sleep mode

2. Model description



3. Specifications

Module model	8BIT-LW01H
encapsulation	Stamp holes
size	16.0*16.0(±0.2)m
Antenna form	m Half-hole pads
Frequency range	902MHz-928MHz
Operating temperature	-40 ℃ ~ 85 ℃
Storage environment	-40 ℃ ~ 125 ℃ , < 90%RH
Power supply range	The supply voltage is 1.7V~3.6V (3.3V recommended), and the supply current > 500mA
Interfaces are supported	UART/GPIO/ADC/DAC/I2C/I2S/SPI/PWM
Number of IOs available	4 pcs
Serial port rate	The default is 9600bps, and LPUART is supported
Flash	128KB
Transmission Protocols	LoRaWAN，LinkWAN

3.1. Electrical characteristics

parameter	name	minimum	Typical	maximum	unit	remark
Operating temperature	TOPR	-40	25	85	℃	
Supply voltage	VDD	2.7	3.3	3.6	V	⩾ 3.3V can guarantee the output power
power consumption	Hibernate mode		1.3		uA	
	Mode of operation		3.8		mA	Power on
	Full load mode （TX:21dBm）		115.7		mA	
	Receive mode （RX:SF10）		9.13		mA	

3.2. Digital port features

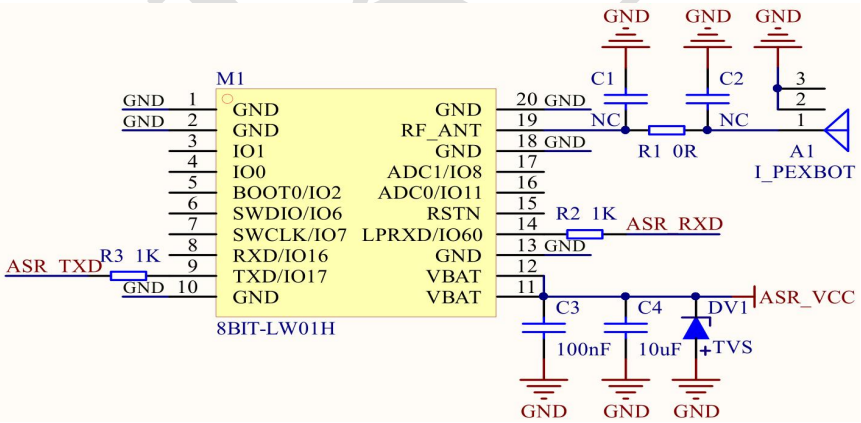
port	name	minimum	Typical	maximum	unit
IO level	VIO	2.7	3.3	3.6	V
The input logic level is low	VIL	One	One	0.2	V
The input logic level is high	VIH	0.8	One	One	V
The output logic level is low	VOL	One		0.1	V
The output logic level is high	VOH	0.9	One	One	V

3.3. RF parameters

Output power					
mode	Band	minimum	Typical	maximum	unit
Transmit power	902. 45MHz		22		dBm
Transmit power	915. 00MHz		22		dBm
Transmit power	927. 55MHz		22		dBm
Receiver sensitivity, modulation bandwidth, 125kHz					

mode	minimum	Typical	maximum	unit
SF7		-124		dBm
SF8		-126		dBm
SF9		-128		dBm
SF10		-131		dBm
SF11		-135		dBm
SF12		-136		dBm

3.4. Module application guidance circuit



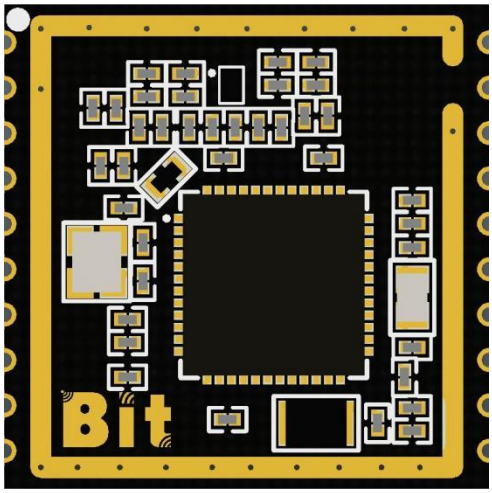
Explanation:

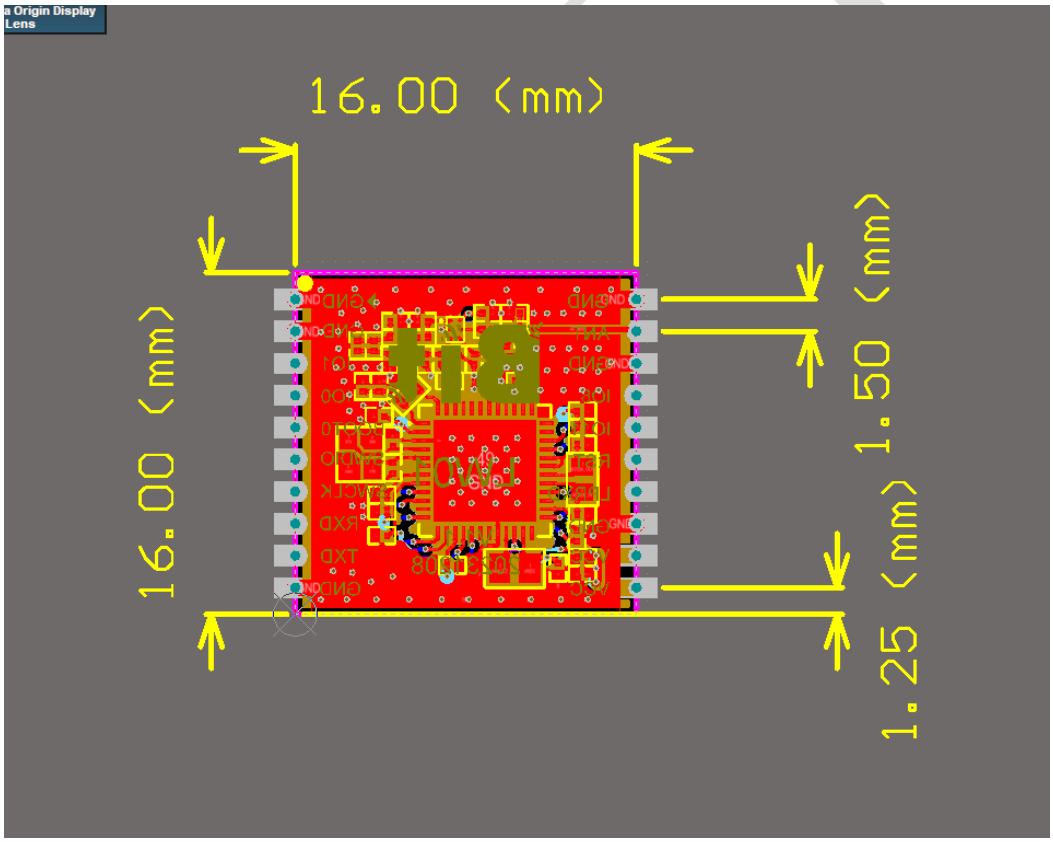
1. The customer's antenna should be located at the corner or edge of the main circuit board and connected to the RF-ANT pin of the module through a microstrip line. The impedance matching of the microstrip line must be controlled at 50 ohms. The circuit needs to reserve a π matching circuit to optimize RF performance. The default R1 resistance is 0 ohms, and C1 and C2 are not soldered.

2. The power pins of the module need to be designed with 100nF and 10uF capacitors, as well as TVS components.

3. The IO port of the module needs to be connected in series with a resistor to suppress interference. If the IO port level of the control chip is not 3.3V, then the level matching problem needs to be considered.

4. Exterior dimensions





5. Pin layout

The PIN number	name	function
1	GND	GND
2	GND	GND
3	IO1	Serial data indication pin
4	IO0	Normal IO
5	IO2 BOOT0	Boot pin
6	IO6 SWDIO	SWD pins
7	IO7 SWCLK	SWD pins
8	IO16 RXD	Download the serial RX
9	IO17 TXD	Download/AT serial port TX
10	GND	GND
11	VCC 3V3	VCC
12	VCC 3V3	VCC
13	GND	GND
14	IO60 LPRXD	AT serial port RX
15	RSTN	reposition
16	IO11 ADC0	Normal IO
17	IO8 ADC1	Normal IO
18	GND	GND
19	RF ANT	antenna
20	GND	GND

6. List of functional pins

Pin Num	GPIO	function	direction	illustrate
3	IO1	Serial data indication pin	O	The serial port of the module is used to notify the MCU when data is sent, and the pin outputs a 100us high pulse, and the high pulse time can be set
5	IO2 BOOT0	Boot pin	I	It is used to enter boot when burning, and pull up the boot foot to enter boot burning mode when the module starts
6	IO6 SWDIO	SWDIO	/	
7	IO7 SWCLK	SWCLK	/	
8	IO16 RXD	Burn the serial RX	I	It is used to receive data during firmware burning

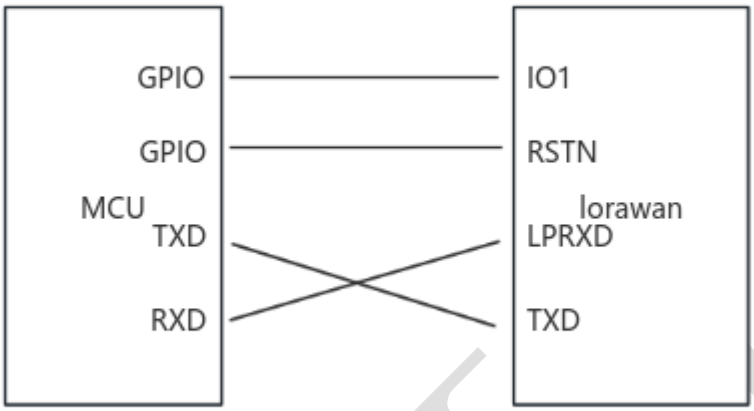
9	IO17 TXD	Burning/AT serial TX	O	It is used to send serial port data during firmware programming and AT command interaction
14	IO60 LPRXD	AT serial port reception	I	It is used for serial port reception during AT command interaction, and supports LPUART
15	RSTN	Reset pin	I	It is used for the hardware reset of the module
19	RF ANT	Antenna interface	/	

7. A summary of common AT commands

AT Command	illustrate
AT+CGMR?	Read the version ID
AT+CGSN?	Read the product serial number identification
AT+CJOINMODE	Set or read the join mode
AT+CDEVEUI	Setting or Reading DevEUI (Used in OTAA Mode)
AT+CAPPEUI	Setting or Reading AppEUI (Used in OTAA Mode)
AT+CAPPKEY	Setting or Reading an AppKey (OTAA Mode)
AT+CDEVADDR	Setting or Reading DevAddr (used in ABP mode)
AT+CAPPSKEY	Setting or Reading AppSKey (for use in ABP mode)
AT+CNWKSKEY	Setting or Reading NwkSKey (Used in ABP Mode)
AT+CFREQBANDMASK	Set or read the frequency group mask
AT+CJOIN	Set the Join
AT+DTRX	Send data
+RECV	Receive data
AT+CCONFIRM	Set or read the upstream transfer type
AT+CAPPPORT	Set or read the upstream data port number
AT+CNBTRIALS	Set or read the maximum number of sends
AT+IREBOOT	Restart the mod
AT+ILOGLVL	Set the log level
AT+CBAND	Switch frequency bands
AT+CTIME	Obtain the UTC time from NS
AT+CDEVSTATUS	Query the JOIN status in OTAA mode
AT+CHOTDATAUPDATE	Update hot-start data in hot-start mode
AT+CTXCW	Continuous Transmission (Continuous Transmission Test at a Specified Frequency)
AT+CTX	Cycle sending mode every 1s (test use)
AT+CRX	Continuous reception at a specified frequency (test use)

8. Apply pin recommendations

IO1 is used to wake up the MCU, when a module has data sending, IO1 first pulls up 100us to wake up the MCU, and then sends the data to the MCU.



Manufacture:Xi'an 8Bit Information Technology Co., Ltd.
Add:Room 10908-10909, Building C, Xi'an National Digital Publishing Base, West Section of Keji 6th Road,High tech Zone, Xi'an City, Shaanxi Province