WAH0070-US

802.11ah Module

Revision: 7.0

Askey Computer Corp.

Date: Dec 13, 2023

Contents:

CHAPTER 0 Revision List

Date	Revision	Comments
2023/06/09	1.0	1st Draft Version
2023/07/24	2.0	Add photo and footprint
2023/07/24	3.0	Add Storage temperature (Tape & Reel)
2023/09/01	4.0	Update TX power
2023/09/22	5.0	Update TX power
2023/10/13	6.0	Update Operating temperature
2023/12/13	7.0	Add power consumption

CHAPTER 1 Scope and Purpose

This Purchasing Specification applies to 802.11ah Module.

1.1 General Description

The WAH0070-US is the IEEE 802.11ah a Wi-Fi HaLow module. It is operating in the Sub 1GHz license-exempt band, offering longer range and lower power connectivity necessary for internet of things (IoT) applications. It enables streamlined data transfer interoperability with existing Wi-Fi networks while meeting up to 1Km long range data transfer with low power onsumption requirements. It integrated Newracom NRC7394 and external RF front end module (FEM) which can increase transmission power up to 20 dBm.It outputs the accurate power for each channel through the temperature sensor integrated in the SoC and calibration at the factory. On-board serial flash can be used for user application program and OTA software update and store MAC address, calibration data and information. It also can support execution in place (XIP) feature with a 16KB internal cache memory

1.2 Features

◆Standard

Full IEEE 802.11ah compatibility with enhanced performance

1/2/4 MHz channel bandwidth, up to 15Mbps data rate

WPA2/WPA3/WPS support

AP and STA, mesh network support

Support transmission of Standby Radio frame

◆Main interface

UART and SPI support for host interface

Serial Flash (2Mbyte, optional 4Mbyte) for XIP

◆Peripherals

GPIO, AUXADC

I2C, SPI and UART

Chapter 2 Hardware Specification

2.1 General Specifications

Host Interfaces	SPI
Form factor	LGA module, 38ins
Chipset	Newracom/NRC7394-ST-Q1AS
Network Standards	IEEE 802.11ah
Modulation Techniques	BPSK,QPSK,16QAM,64QAM
Modulation Technology	OFDM
Supported Data Rate	MCS0~MCS7,MCS10
Network Architectures	AP Client, Iot applications
Antenna Type	External Antenna
Operating Frequency	902~928 MHz
Channel BandWidth	1/2/4MHz
Temperatures (AMBIENT)	Operating temperature -40 to 65 ℃ Storage temperature (Tape & Reel) -20 to 70 ℃
Humidity (non-condensing)	Operating Humidity: 20% to 90% RH Storage Humidity: less than 60% RH
OS Compatibility	TBD
Manufacturer ID Product ID	TBD
Dimension	18mm*13.5mm*2.1mm
Weight	TBD

2.2 Electronic Specification

Power consumption (VDD_IO=3.3V,VBAT=3.3V,VDD_FEM = 5.0V)					
Supplied Voltage	VDD_IO	VBAT	VDD_FEM	Unit	Note
Tx @ 20 dBm	2	140	303	mA	
Continuous Rx	1.8	22	0	mA	
Deep Sleep mode	0.00009	0.0035	0.038	mA	

Note1: Condition at 25℃

Note2: TBD TX Mode

Note3: TBD RX Mode

2.3 Radio Specification

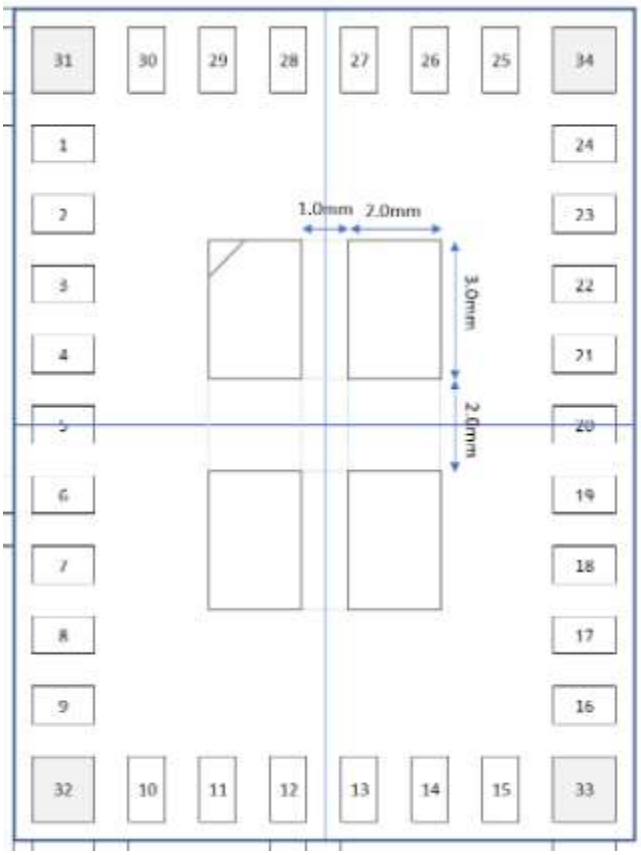
Condition: Temp=25℃

TX Output Power							Note
BW	MCS	Modulation/ Coding Rate	Min	Typical	Max	Unit	
1M	MCS10	BPSK1/2 rep.2x	16	18	20	dBm	
	MCS0	BPSK1/2	16	18	20	dBm	
	MCS1	BPSK3/4	16	18	20	dBm	
	MCS2	16QAM1/2	16	18	20	dBm	
	MCS3	16QAM3/4	16	18	20	dBm	
	MCS4	64QAM2/3	16	18	20	dBm	
	MCS5	64QAM3/4	16	18	20	dBm	
	MCS6	64QAM5/6	16	18	20	dBm	
	MCS7	64QAM3/4	16	18	20	dBm	
2M	MCS0	BPSK1/2	16	18	20	dBm	
	MCS1	BPSK3/4	16	18	20	dBm	
	MCS2	16QAM1/2	16	18	20	dBm	VDD_FEM 5.0V
	MCS3	16QAM3/4	16	18	20	dBm	
	MCS4	64QAM2/3	16	18	20	dBm	
	MCS5	64QAM3/4	16	18	20	dBm	
	MCS6	64QAM5/6	16	18	20	dBm	
	MCS7	64QAM3/4	16	18	20	dBm	
4M	MCS0	BPSK1/2	16	18	20	dBm	
	MCS1	BPSK3/4	16	18	20	dBm	
	MCS2	16QAM1/2	16	18	20	dBm	
	MCS3	16QAM3/4	16	18	20	dBm	
	MCS4	64QAM2/3	16	18	20	dBm	
	MCS5	64QAM3/4	16	18	20	dBm	
	MCS6	64QAM5/6	16	18	20	dBm	
	MCS7	64QAM3/4	16	18	20	dBm	

Receive Sensitivity					Note
BW	MCS	Modulation/ Coding Rate	11ah spec dBm	Unit	
1M	MCS10	BPSK1/2 rep.2x	-98	dBm	
	MCS0	BPSK1/2	-95	dBm	PER<10% 256bytes
	MCS1	BPSK3/4	-92	dBm	
	MCS2	16QAM1/2	-90	dBm	
	MCS3	16QAM3/4	-87	dBm	
	MCS4	64QAM2/3	-83	dBm	

	MCS5	64QAM3/4	-79	dBm	
	MCS6	64QAM5/6	-78	dBm	
	MCS7	64QAM3/4	-77	dBm	
2M	MCS0	BPSK1/2	-92	dBm	
	MCS1	BPSK3/4	-89	dBm	
	MCS2	16QAM1/2	-87	dBm	
	MCS3	16QAM3/4	-84	dBm	
	MCS4	64QAM2/3	-80	dBm	
	MCS5	64QAM3/4	-76	dBm	
	MCS6	64QAM5/6	-75	dBm	
	MCS7	64QAM3/4	-74	dBm	
4M	MCS0	BPSK1/2	-89	dBm	
	MCS1	BPSK3/4	-86	dBm	
	MCS2	16QAM1/2	-84	dBm	
	MCS3	16QAM3/4	-81	dBm	
	MCS4	64QAM2/3	-77	dBm	
	MCS5	64QAM3/4	-73	dBm	
	MCS6	64QAM5/6	-72	dBm	
	MCS7	64QAM3/4	-71	dBm	

2.4 Pin Assignment for WAH0070-US



BOT view

Pin	Name	Type	Primary function	Alternate & Other Function(s)
1	NC	I/O	Do Not Connect	
2	GPIO12	I/O	UART1_TXD	TDO
3	GPIO13	I/O	UART1_RXD	TDI
4	GPIO14	I/O	UART1_CTS	
5	GPIO20	I/O	UART1_RTS	
6	GPIO19	I/O	MODE	
7	GPIO17	I/O	ADC0	
8	GPIO18	I/O	ADC1	
9	GPIO25	I/O		
10	VDD_IO	Power(1.68V~3.6V)	VDD_IO Supply	
11	GND	Power	Ground	
12	GPIO9	I/O	UART0_RXD	
13	GPIO8	I/O	UART0_TXD	
14	GND	Power	Ground	
15	VBAT	Power (2.4V~3.6V)	VBAT Supply	
16	RST	I	PMS_POR	
17	GPIO28	I/O	HSPI_CS	

18	GPIO29	I/O	HSPI_MISO	
19	GPIO6	I/O	HSPI_MOSI	
20	GPIO7	I/O	HSPI_CLK	
21	GPIO30	I/O	HSPI_EIR	
22	GPIO10	I/O	TMS	SWD_IO
23	GPIO11	I/O	TCK	SWD_CLK
24	NC	NC	Do Not Connect	
25	VDD_FEM	Power(3.15V~5.2V)	PA power Supply	
26	GND	Power	Ground	
27	NC	I/O	Do Not Connect	
28	NC	I/O	Do Not Connect	
29	GND	Power	Ground	
30	RF_ANT	Analog	Antenna	
31	GND	Power	Ground	
32	GND	Power	Ground	
33	GND	Power	Ground	
34	GND	Power	Ground	
35	GND	Power	Ground	
36	GND	Power	Ground	
37	GND	Power	Ground	
38	GND	Power	Ground	

Chapter 3 Mechanical Specifications

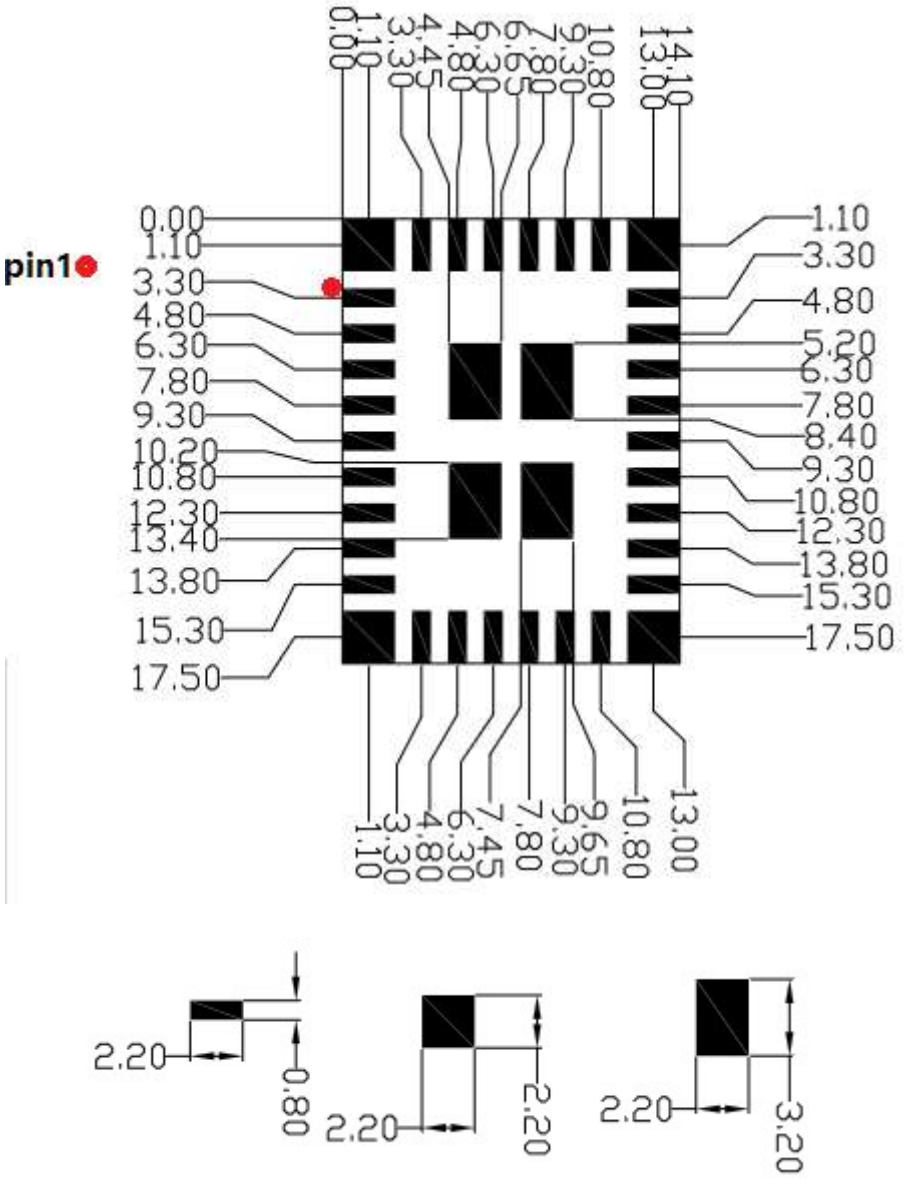
3.1 PCB Mechanical Drawing:

- 13.5 mm x 18.0mm x 2.1mm

Chapter 4 Module Engineering Suggestions

4.1 Footprint

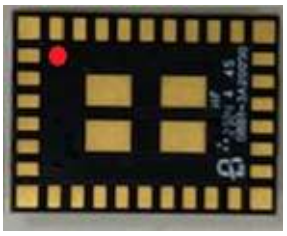
Unit：mm



Chapter 5 Module photo

TOP

BOT



pin1