

## DATASHEET

# Wi-Fi HaLow Sub-GHz Wireless Module

# MM610X-001

**FC** Federal Communications Commission

**IC CE**



## Description

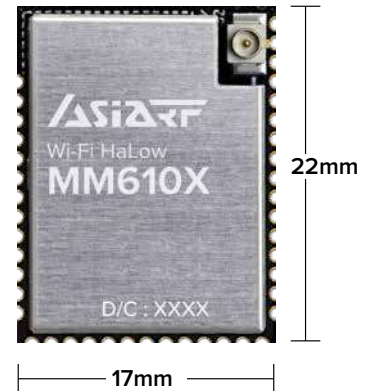
MM610X-001 is a Wi-Fi HaLow Sub-GHz wireless module based on the Morse Micro® MM6108 RF SOC. HaLow is a low-power, long-range version of the IEEE 802.11 Wi-Fi standard, designed for IoT applications.

The module operates below 1 gigahertz (GHz) and offers longer range and lower power connectivity. It complies with the Wi-Fi Alliance 802.11ah specification and is Wi-Fi CERTIFIED HaLow™. It provides excellent RF performance, with high sensitivity, selectivity, and blocking performance. The module also features a U.FL connector for an external Sub-GHz antenna.

It offers various IO interfaces including UART, SDIO, SPI, I2C, and GPIOs for PWM and switch functions. The module supports communication up to 2 kilometers Line of Sight (LOS), making it suitable for both indoor and outdoor IoT applications.

The MM610X-001 module delivers a UDP throughput of 20Mbps, offering superior capacity compared to other long-distance wireless IoT solutions. Its PHY data rate is 32.5Mbps. The module is certified with FCC, IC, CE, TELEC, NCC, and RCM.

In summary, the MM610X-001 module provides reliable and long-range connectivity for IoT applications, with excellent RF performance, versatile IO interfaces, and high throughput capabilities.



Wi-Fi CERTIFIED HaLow™ for IoT	
Features	Benefits
<ul style="list-style-type: none"> <li>Sub-1 GHz spectrum operation</li> <li>Narrow band OFDM channels</li> <li>Several device power saving modes</li> <li>Native IP support</li> <li>Latest Wi-Fi® security</li> </ul>	<ul style="list-style-type: none"> <li>Long range: approximately 1 km</li> <li>Penetration through walls and other obstacles</li> <li>Supports coin cell battery devices for months or years</li> <li>No need for proprietary hubs or gateways</li> </ul>

### Wi-Fi HaLow 11ah related reading:

- [Discover Wi-Fi CERTIFIED HaLow - Wi-Fi Alliance](#)
- [IEEE 802.11ah - Wikipedia](#)

**For more detailed information, please contact our sales team: [sales@asiarf.com](mailto:sales@asiarf.com) / +886 2 2940 7880**





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## MM610X-001

### Content

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1.	Description .....	P.1
2.	Features .....	P.3
3.	Model Selection Table .....	P.5
4.	Applications .....	P.6
5.	MM610X-001 Module Diagram .....	P.7
6.	Module Pins Diagram .....	P.7
7.	Module PCB PADs. ....	P.8
8.	Pins Description .....	P.9
9.	Electronic Specification .....	P.10
10.	Power Consumption .....	P.11
11.	Ordering Information .....	P.11
12.	Package .....	P.11
13.	Reflow Profile .....	P.12
14.	Electrical Characteristics .....	P.12
	Timing Sequence .....	P.13
	SDIO Bus Timing. ....	P.14
	SPI Bus .....	P.14
	UART Bus. ....	P.14
15.	12C Bus Timing .....	P.14
16.	Mechanical Information .....	P.15
17.	Application Design Note .....	P.16
	Revision History .....	P.17





# Wi-Fi HaLow Sub-GHz Wireless Module MM610X-001

## Features

### Protocol

- 802.11ah OFDM PHY supporting future WFA HaLow certification
- BPSK & QPSK, 16-QAM & 64-QAM Modulation
- Automatic frequency & gain control
- Packet detect & channel equalization
- Forward Error Correction (FEC) coding & decoding
- Supports Modulation and Coding Scheme (MCS) levels MCS 0-7 and MCS 10
- Supports 1 MHz duplicate mode
- Supports optional Traveling Pilot
- 11ah MAC supporting future WFA HaLow certification
- Support for STA and AP roles
- Listen-Before-Talk (LBT) access with energy detect
- 11 power save
- 11 fragmentation and defragmentation
- Power-Saving Target Wake Time (TWT) support for long battery life
- Automatic and manual MCS rate selection

### Radio Operation

- Single-stream max data rate of 32.5 Mbps (MCS=7, 64-QAM, 8MHz channel, 4 uSec GI)
- Radio supporting worldwide Sub-1 GHz frequency bands
- Frequency Range: 850-950 MHz
- Channel width options of 1/2/4/8 MHz

### Transmitter Performance

- Tx output power (dBm): +21 dBm (Typical) MCS0

### RF Interface

- External antenna connector

### Power Consumption

- 37 mA RX current @ Listen
- 40 mA RX current @ Active Receive

### Power Management Unit (PMU) for various modes of operation

- Power-down (interrupt driven wake)
- Hibernate mode (internal / external wake)
- Target Wake Time mode
- Active Receive / Transmit mode
- Integrated DC-DC converter supports a wide supply voltage, from 1.8V to 3.6V

### Dimensions

- 22 mm  $\pm 10\%$  x 17.0 mm  $\pm 10\%$  x 2.0 mm  $\pm 10\%$  (module)

### Security

- AES encryption engine
- Hardware support for SHA1 and SHA2 hash functions (SHA-256, SHA-384, SHA-512)
- WPA3 including protected management frames (PMF)
- Opportunistic Wireless Encryption (OWE)

### Additional information

- Weight : 0.005 kg



# Wi-Fi HaLow Sub-GHz Wireless Module MM610X-001

## Features

### • MCU Peripherals

- 12-bit 1 Msps SAR ADC
- 12 × GPIO
- 3 × UART, 1 × SPI, 1 × I2C
- 2 × 16-bit Timer/Counter
- 1 × 32-bit Timer/Counter
- 32-bit Real Time Counter
- 24-bit Low Energy Timer for waveform generation

- 2 × Watchdog Timer
- Power Management Unit for power state switching
- SDIO 2.0 compliant slave interface
- SDIO 2.0 Default Speed (DS) at 25MHz
- SDIO 2.0 High Speed (HS) at 50MHz
- Support for both 1-bit and 4-bit data mode
- Support for SPI mode operation

### • Regulatory Certifications

- FCC : TKZMM610X-001
- IC : 9968A-MM610X001
- TELEC : 217-231135
- NCC : CCAF23Y10110T6

- CE
- RCM
- ESD: HBM 2KV / MM 200V, Latch-up: 150mA
- Halogen-free / RoHS 2.0 / Reach Annex 14 & 17

### • Printing Information Indicator

