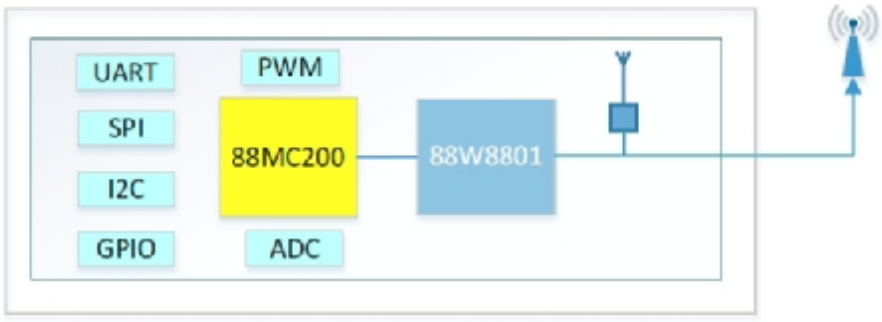
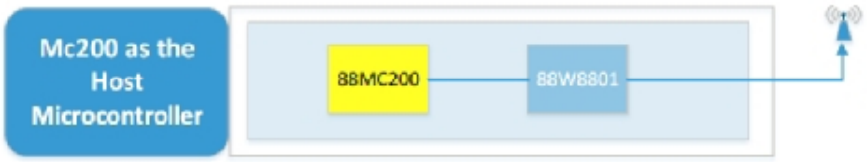
Tuya Smart Wi-Fi Module

This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.
TYW001 is an ultra-compact, low-power embedded Wi-Fi module based on Marvell 88MC200 and Marvell 88w8801. It integrated wireless LAN MAC、Baseband、Radio and an ARM Cortex-M3 that runs Wi-Fi networking stack and software application library. TYW001 has 1M bytes flash, 512KB RAM bytes and rich peripherals for your IOT Wi-Fi application.

A simplified block diagram of the TYW001 module is depicted in the figure below



There are two mothed to use the TYW001 module as follows:



1.2 Applications

- Building Automation / Access Control
- Smart home appliances
- Medical/Health Care
- Industrial Automation Systems
- Point Of Sale system (POS)
- Auto electronics

1.3 Key Features

Single operation voltage:
- 3.3V

Power consumption:
- Only ~7mA while module is connected to access point and no data is transmitting
- Only ~24mA while sending data under 20kbps
- Only 8μA under standby mode.

High performance MCU:
- ARM 32-bit Cortex-M3 CPU
- Frequency: 200MHz
- flash size: 1M bytes
- RAM size: 512k bytes

On-chip functionality Single-chip:
- MAC/BB/RF

Wi-Fi connectivity:

- 802.11b, 802.11g, 802.11n (single stream) on channel 1-14@2.4GHz
- WEP, WPA/WPA2 PSK/Enterprise
- Transmit power : 18 dBm@11b , 15 dBm@11g ,14 dBm@11n
- MIN Receiver Sensitivity: -96 dBm
- Max Data rate : 11Mbps@11b , 54Mbps@11g , 72Mbps@11n HT20
- Wi-Fi modes : Station, Soft AP and Wi-Fi direct
- Advanced 1x1 802.11n features
- Full/Half Guard Interval Frame Aggregation
- Space Time Block Coding (STBC)
- Low Density Parity Check (LDPC) Encoding
- Hardware Encryption: WEP, WPA/WPA2
- WPS 2.0, EasyLink
- Multiple power save modes
- On-board chip antenna , IPEX connector for external antenna
- CE , FCC compliant

Operating Temperature:

- -40℃ to 85℃

RoHS Compliant:

- Lead Free design which supporting Green design requirement

3. Dimensions and Footprint

This section provides the dimensions and foorprint of the TYW001 module

3.1 Dimensions

The size and thickness of the TYW001 module is "17 mm (W) x 36 mm (L) x 2.1 mm (H) +/- 0.1 mm" (Including metal shielding)

2. Technical Specification

4.1 Absolute Maximum Rating

Supply Power	Max +3.6 Volt	
Non Operating Temperature	- 40° to 85° Celsius	
Voltage ripple	+/- 2%	Max Values not exceeding Operating voltage

4.2 Recommendable Operation Condition

4.2.1 Tempetaure and Humidity

The TYW001 module has to withstand the operational requirements as listed in the table below.

Operating Temperature	0° to 60° Celsius	
Humidity range	Max 95%	Non condensing, relative humidity

The maximum operating ambient temperature range can up to 85degC, but exposure to absolute-maximum-rated conditions may cause performance degradation and affect device reliability.

4.2.2 Voltage

Power supply for the TYW001 module will be provided by the host via the power pins.

Symbol	Parameter	Min	Typ	Max	Unit
VCC	power supply for IMW1001	3.0	3.3	3.6	V

4.3 Wireless Specifications

Features	Description	
WLAN Standards	IEEE 802 11 b/g/n	
Frequency Band	2412-2462MHz	
Number of Sub Channels	CH1 to CH11	
Modulation	DSSS, CCK, OFDM, BPSK, QPSK,16QAM, 64QAM	
Supported data rates	11b	1, 2, 5.5, 11 (Mbps)
	11g	6, 9, 12, 18, 24, 36, 48, 54 (Mbps)
	11n	HT20 MCS0(6.5Mbps) to HT20 MCS7(65Mbps)

4.4 Specifications of Wi-Fi's output power、evm、sensitivity

Characteristics		TYP.	Criteria	Unit
RF Average Output Power, 802.11b CCK Mode	1M	18	+/- 2	dBm
	11M	18	+/- 2	dBm
RF Average Output Power, 802.11g OFDM Mode	6M	15	+/- 2	dBm
	54M	14	+/- 2	dBm
RF Average Output Power, 802.11n OFDM Mode	MCS0	14	+/- 2	dBm
	MCS7	13	+/- 2	dBm

WiFi TX EVM follow the IEEE spec that as list in the table below:

Characteristics		IEEE Spec	Unit
RF Average Output EVM (11b)	@1 Mbps	-26	dB
	@11 Mbps	-26	dB
RF Average Output EVM (11g)	@6 Mbps	-27	dB
	@54 Mbps	-35	dB
RF Average Output EVM (11n)	@ MCS0	-29	dB
	@ MCS7	-35	dB

Receiver Characteristics	TYP.	MAX.	Unit
PER <8%, Rx Sensitivity @ 1 Mbps	-96	-92	dBm
PER <8%, Rx Sensitivity @ 11 Mbps	-86	-83	dBm
PER <10%, Rx Sensitivity @ 6 Mbps	-89	-87	dBm
PER <10%, Rx Sensitivity @ 54 Mbps	-72	-69	dBm
PER <10%, Rx Sensitivity @ MCS0	-90	-87	dBm
PER <10%, Rx Sensitivity @ MCS7	-70	-67	dBm

*Follow IEEE Spec

4.5 Typical Power Consumption performance

4.5.1 Typical Current Consumption [2.4GHz operation]-Continuous Receive

(Typical spec is defined @3.3V 25℃)

Current Consumption	TYP.	MAX.
Tx output power @16 dBm on 11b 1M	215 mA	280 mA
Tx output power @ 16 dBm on 11b 11M	200 mA	280 mA
Tx output power @ 15 dBm on 11g 6M	205 mA	280 mA
Tx output power @ 13 dBm on 11g 54M	160 mA	250 mA
Tx output power @ 14 dBm on 11n MCS0	200 mA	280 mA
Tx output power @ 12 dBm on 11n MCS7	130 mA	200 mA

4.5.2 Typical Current Consumption [2.4GHz operation]-Continuous Transmit

(Typical spec is defined @3.3V 25℃)

Current Consumption	TYP.	MAX.
Rx @ 11b 1M	125 mA	160 mA
Rx @ 11b 11M	125 mA	160 mA
Rx @ 11g 6M	120 mA	160 mA
Rx @ 11g 54M	120 mA	160 mA
Rx @ 11n MCS0	120 mA	160 mA
Rx @ 11n MCS7	120 mA	160 mA

4.5 I/O Port characteristics

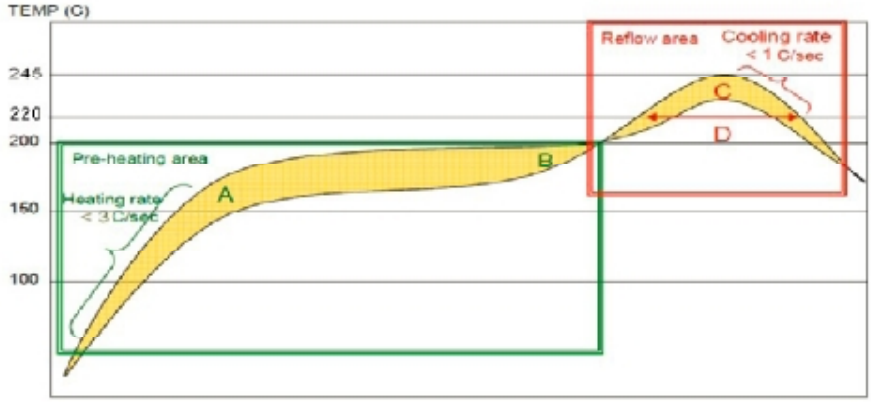
Unless otherwise specified, the parameters given as below *Table*.

For detail information of I/O injection parameters and conditions, please refer to 88MC200 I/0 manual.

Table4.1 I/O Static Characteristics on 3.3V VDD_IO

Specifications	Condition	Min	Nominal	Max	Unit
VDDO	--	2.97	3.3	3.63	V
VIL	--	-0.4	—	VDDO*30%	V
VIH	--	VDDO*70%	—	VDDO+0.4	V
Pullup strength (applicable to pullup pad only)	V(PAD)=0.5*VDDO	10	—	50	μA
Pulldown strength (applicable to pulldown pad only	V(PAD)=0.5*VDDO	10	—	50	μA
Iol@0.4V	--	4	--	--	mA
Ioh@VDDo-0.4V	--	4	--	--	mA
Input capacitance	--	--	--	5	pF
Input leakage 1	VDDO is ON, 0<V(PAD)<VDDO	--	--	2	μA

6. Recommend Reflow Profile



(1) Solder paste alloy ; SAC305 (Sn96.5/Ag3.0/Cu0.5) (Lead Free solder paste.)
(2) A-B. Temp.: 150~200℃; soak time:60~120sec.(Base on Flux type, reference only)
(3) C. Peak temp: <245℃
(4) D. Time above 217 ℃: 40~90sec.(Base on SAC305)
(5) Suggestion: Optimal cooling rate is <1℃/sec. from peak to 217 ℃.
(6) Nine heater zones at least for Reflow equipment.
(7) Nitrogen usage is recommended and be controlled the value less than 1500 ppm.
Note: Need to inspect solder joint by X-ray post reflow

FCC Caution: Any changes or modifications not expressly
approved by the party responsible for compliance could void the user's
authority to operate this equipment.
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, and (2) this device must accept any interference
received, including interference that may cause undesired operation.
This device and its antenna(s) must not be co-located or operating in conjunction
with any other antenna or transmitter.
15.105 Information to the user.
(b) For a Class B digital device or peripheral, the instructions furnished the
user shall include the following or similar statement, placed in a prominent
location in the text of the manual:
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.

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

Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an
uncontrolled environment.
This transmitter must not be co-located or operating in conjunction with any other
antenna or transmitter.
The availability of some specific channels and/or operational frequency bands
are country dependent and are firmware programmed at the factory to match
the intended destination.
The firmware setting is not accessible by the end user.

The final end product must be labelled in a visible area with the following:
“Contains Transmitter Module 2AFNLMA8801”
This radio module must not installed to co-locate and operating simultaneously with other radios in host system, additional testing and equipment authorization may be required to operating simultaneously with other radio.

This LMA does not have RF shielding and is tested and approved as standalone configuration, additional evaluation may be required for any system integrated this radio module.