

Technical Description

The brief circuit description is listed as below:

Main Control Board Circuit

- 1) U1 acts as master MCU (PAN159).
- 2) Y1 acts as 16MHz crystal for U1.
- 3) U2 acts as Sensor Board (BMI058).
- 4) AX3268 acts as CMOS portion for camera.
- 5) KH25L1606 acts as CMOS serial Flash portion.
- 6) U6 and U7 act as power unit.

WiFi Module Circuit

- 1) MT7601 acts as WiFi module.
- 2) 40MHz crystal oscillator is providing clock for MT7601.

Antenna Type: Internal antenna

Antenna Gain: 2dBi

Operating Mode	Nominal Conducted Power (dBm)
802.11b	24.1
802.11g	25.4
802.11n(HT20)	24.8

Peak conducted output power ranges from +24dBm to +26dBm.

WiFi Module Data Sheet

802.11b/g/n Module

Version:V1.0

Customer			
Date			
Model Name	K1-MT7601MU1		
Part NO.			
Approve Field			
ENGINEER	QC	SALES	
Customer Approve Field			
ENGINEER	QC	MANUFACTORY	PURCHASING

Reversions

Version	Date	Description	Comments
V1.0	2016/07/08	First release	

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1. General Description

The **K1-MT7601MU1** is a professional WIFI module which based on MTK-MT7601 chipset supporting the IEEE802.11 b/g/n standard. **K1-MT7601MU1** support 150Mbps PHY rate to provide a high-speed and unrivaled wireless performance for your devices, with a faster wireless connection, you can get a better WLAN/Internet experience.

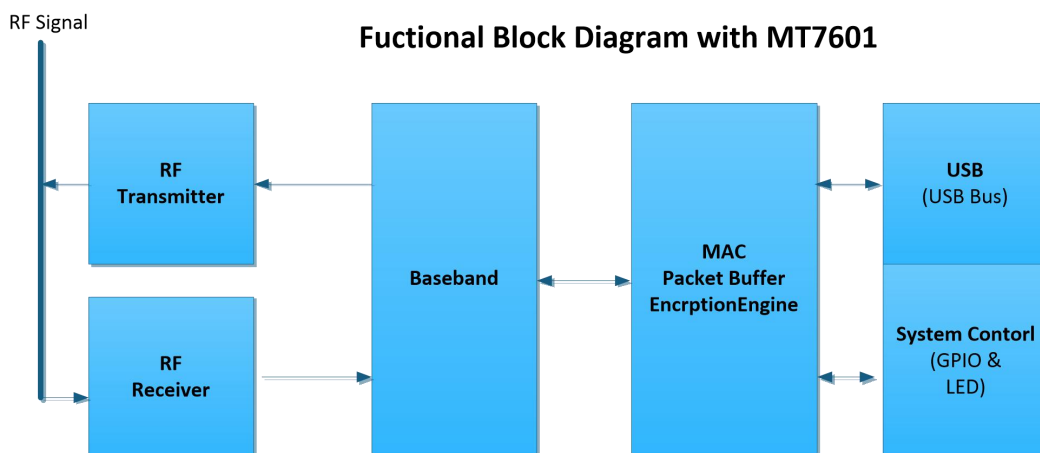
2. Product Features

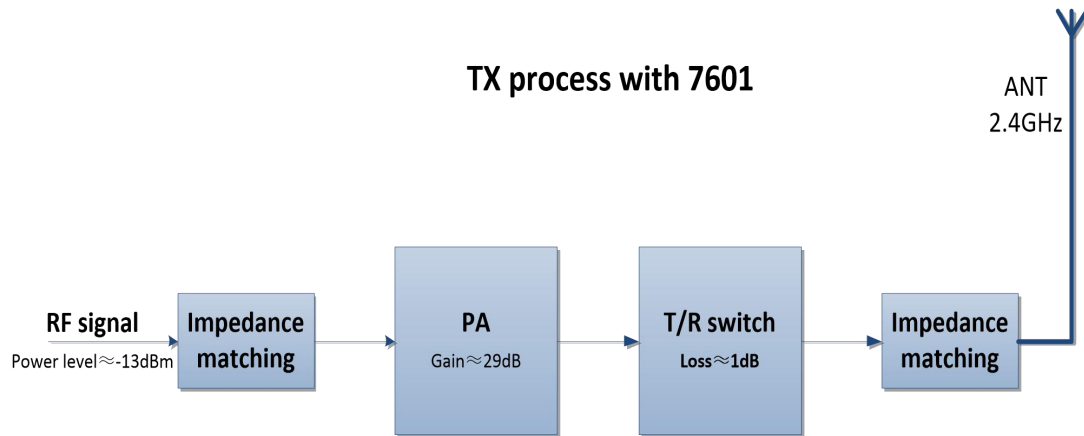
- ✧ 1T1R Mode with 150Mbps PHY Rate
- ✧ Supports WPS2.0 (Wi-Fi Protected Setup)
- ✧ Supports 64/128-bit WEP, complies with 128 bit WPA standard(TKIP/AES)
- ✧ Compatible with 11b/g/n equipment
- ✧ Supports Windows 2000 ,XP32/64, Vista32/64,WIN7 32/64, win10、 Linux
- ✧ 3.3V power supply
- ✧ USB 2.0

3. Application

- ✧ IP Camera
- ✧ DVR/NVR
- ✧ Desk-Top PC
- ✧ Blue-ray Disk
- ✧ Set-Top Box
- ✧ Wireless devices etc.

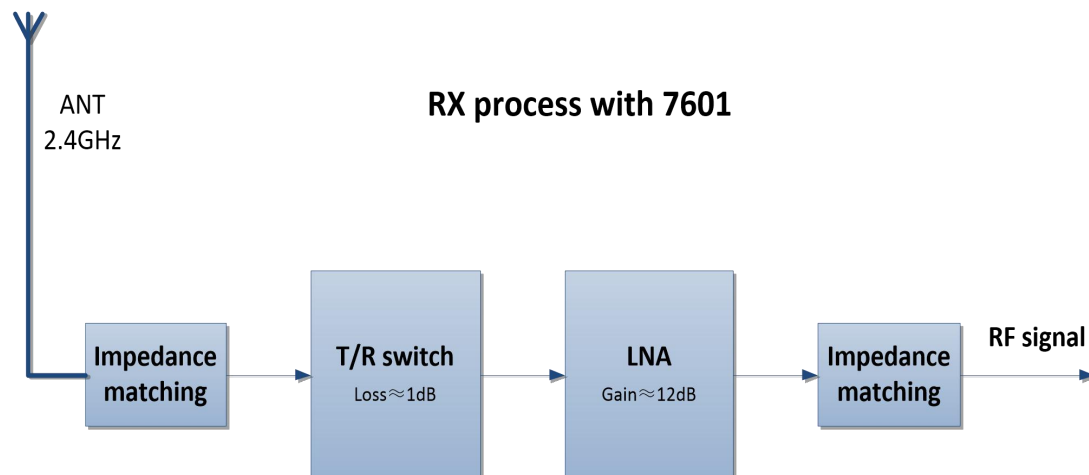
4. Function Principle





4.1 Transmit

As shown, RF signal's level is about -13dBm from MT7601 through a Impedance matching network to Power Amplifier, The RF signal gains about 29dB with PA. T/R switch controls the module at TX status, its can bring insertion loss about 1dB. Then, the end of the matching network to match the PA out impedance with antenna. The matching network makes RF signal transmitting nearly 50ohm. The WIFI signal's level is about 15dBm in the finally



4.2 Receive

As shown, antenna receives WIFI signal from an access point through the Impedance matching network to the switch IC, in this time, T/R switch controls the module at RX status. WIFI signal enter to Low Noise Amplifier Gains about 12dB. After the final impedance matching into BB.

The matching network makes WIFI signal transmitting nearly 50ohm.

Maximum receive sensitivity is -72 dBm@10% PER (54Mbps)

5. Product Specifications

5.1 Main Specifications

Item	Description	
Standard	IEEE 802.11b/g/n	
Interface	USB 1.1/2.0	
Module Size	13*12.2*1.8±0.2mm	
Data Rate	802.11b	11,5.5,2,1 Mbps
	802.11g	54,48,36,24,18,12,9,6 Mbps
	802.11n	MCS 0 to 7 for HT20MHz MCS 0 to 7 for HT40MHz
Modulation Techniques	802.11b	CCK,DQPSK,DBPSK
	802.11g	64QAM,16QAM,QPSK,BPSK
	802.11n	64QAM,16QAM,QPSK,BPSK
Operating Channel	CH 1~11(United States)	
	CH 1~13(Europe)	
	CH 1~14(Japan)	
Frequency Range	2.412~2.4835Ghz	
Security	WEP64/128,WPA,WPA2,TKIP,AES	
Operating Voltage	3.3V±3%	
OS Supported	Windows 2000,XP,Vista,WIN7,WIN10,Linux	

5.2 Main WIFI Specifications

Mode:802.11b. Bandwidth:20MHz. Data Rate:11Mbps.

Channel			2412MHz	2437MHz	2462MHz
External Atten			1.5dB Path attenuation		
Items		Standard	Test Data		
1	Transmitter Power	Note 1	22.9dBm	23.5dBm	24.1dBm
2	Spectrum Mask	Note 2	OK	OK	OK
3	Error Vector Magnitude	<-10dB	-35	-35	-34.5
4	Power On Ramp	<2uS	0.3	0.3	0.3
5	Power Down Ramp	<2uS	0.1	0.1	0.1
6	RMS Phase Error	<3 Degrees	1.08	1.02	1.05
7	Frequency Error	≤ ± 25ppm	-3.6	-4.3	-4.8
8	System Clock	≤ ± 25ppm	-1.75	-1.8	1.9
9	RX Sensitivity	≤ -76dBm	-91		

10	RX Maximum Input Level	$\geq -10\text{dBm}$	-10
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Mode:802.11g. Bandwidth:20MHz. Data Rate:54Mbps.

Channel			2412MHz	2437MHz	2462MHz
External Atten			1.5dB Path attenuation		
Items		Standard	Test Data		
1	Transmitter Power	Note 1	24.9dBm	24.8dBm	25.4dBm
2	Spectrum Mask	Note 2	OK	OK	OK
3	Error Vector Magnitude	<-25dB	-29	-30	-31
4	Spectral Flantness	Note 3	OK	OK	OK
5	LO Leakage	<-15dB	-34	-36	-35
6	RMS Phase Error	<3 Degrees	2.5	2.0	1.9
7	Frequency Error	≤±20ppm	-3.8	-4.3	-4.6
8	System Clock	≤±20ppm	-1.8	-1.1	-.08
9	RX Sensitivity	≤-65dBm	-72		
10	RX Maximum Input Level	≥-20dBm	-16		

802.11n: Bandwidth:20MHz. Data Rate:65Mbps.

Channel			2412MHz	2437MHz	2462MHz
External Atten			1.5dB Path attenuation		
Items		Standard	Test Data		
1	Transmitter Power	Note 1	24.6dBm	24.7dBm	24.8dBm
2	Spectrum Mask	Note 2	OK	OK	OK
3	Error Vector Magnitude	<-25dB	-28	-29	-29
4	Spectral Flantness	Note 3	OK	OK	OK
5	LO Leakage	<-15dB	-35	-34	-34
6	RMS Phase Error	<3 Degrees	1.8	1.1	1.2
7	Frequency Error	≤±20ppm	-3.6	-4	-4.5
8	System Clock	≤±20ppm	-1.2	-2	-2
9	RX Sensitivity	≤-65dBm	-68		
10	RX Maximum Input Level	≥-20dBm	-15		

Note1: Transmit Power

802.11b\g\n:

The maximum allowable output power, as measured in accordance with practices specified by the appropriate regulatory bodies

Maximum output Power	Geographic location	Compliance document
1000 mW	USA	FCC 15.247
100 mW (EIRP)	Europe	ETS 300-328
10 mW/MHz	Japan	MPT ordinance for Reg-ulating Radio Equip-ment, Article 49-20

Note2: Transmit spectrum mask

802.11b:

fc=Center Frequency. The measurements shall be made using a 100 kHz resolution bandwidth and a 100 kHz video bandwidth. The transmitted spectral products shall be less than -30 dB (dB relative to the SINx/x peak) for
 $f_c - 22 \text{ MHz} < f < f_c - 11 \text{ MHz}$; and $f_c + 11 \text{ MHz} < f < f_c + 22 \text{ MHz}$;
and shall be less than -50 dB for
 $f < f_c - 22 \text{ MHz}$; and $f > f_c + 22 \text{ MHz}$

802.11g:

The measurements shall be made using a 100 kHz resolution bandwidth and a 30 kHz video bandwidth. The transmitted spectrum shall have a 0 dB (dB relative to the maximum spectral density of the signal) bandwidth not exceeding 18 MHz, -20 dB at 11 MHz frequency offset, -28 dB at 20 MHz frequency offset and -40 dB at 30 MHz frequency offset and above. The transmitted spectral density of the transmitted signal shall fall within the spectral mask.

在802.11n:

The measurements shall be made using a 100 kHz resolution bandwidth and a 30 kHz video bandwidth.

20MHz Bandwidth:

the transmitted spectrum shall have a 0 dB (dB relative to the maximum spectral density of the signal) bandwidth not exceeding 18 MHz, -20 dB at 11 MHz frequency offset, -28 dB at 20 MHz frequency offset, and the maximum of -45 dB and -53 dBm/MHz at 30 MHz frequency offset and above. The transmitted spectral density of the transmitted signal shall fall within the spectral mask.

40MHz Bandwidth:

the transmitted spectrum shall have a 0 dB bandwidth not exceeding 38 MHz, -20 dB at 21 MHz frequency offset, -28 dB at 40 MHz offset, and the maximum of -45 dB and -56 dBm/MHz at 60 MHz frequency offset and above. The transmitted spectral density of the transmitted signal shall fall within the spectral mask.

Note3: Spectral Flatness

802.11b is not required

在802.11g:

The average energy of the constellations in each of the spectral lines -16.. -1 and +1.. +16 will deviate no more than ± 2 dB from their average energy. The average energy of the constellations in each of the spectral lines -26.. -17 and +17.. +26 will deviate no more than ± 2 dB from the average energy of spectral lines -16.. -1 and +1.. +16. The data for this test shall be derived from the channel estimation step.

在802.11n:

In a 20 MHz channel and in corresponding 20 MHz transmission in a 40 MHz channel, the average energy of the constellations in each of the subcarriers with indices -16 to -1 and +1 to +16 shall deviate no more than ± 2 dB from their average energy. The average energy of the constellations in each of the subcarriers with indices -28 to -17 and +17 to +28 shall deviate no more than ± 2 dB from the average energy of subcarriers with indices -16 to -1 and +1 to +16.

In a 40 MHz transmission (excluding PPDU in MCS 32 format and non-HT duplicate format), the average energy of the constellations in each of the subcarriers with indices -42 to -2 and +2 to +42 shall deviate no more than ± 2 dB from their average energy. The average energy of the constellations in each of the subcarriers with indices -43 to -58 and +43 to +58 shall deviate no more than ± 2 dB from the average energy of subcarriers with indices -42 to -2 and +2 to +42.

5.3 Throughput Test Data

With the shielding BOX, The throughput data as below:



Throughput Chart With 802.11n(BW=40)@RTX

Data tables at Different Mode with 802.11:

Mode	TX	RX	RTX
802.11b	5.1 Mbps	5.2 Mbps	5.2 Mbps
802.11g	22.7 Mbps	20 Mbps	21.1 Mbps
802.11n BW=20	54.6 Mbps	51.4 Mbps	50 Mbps
802.11n BW=40	86 Mbps	86.5 Mbps	82.5 Mbps

5.4 Aging Data

5.4.1 The video of fluency and clarity

Testing the TS1300 with IP camera, the results are as follows:

Testing 7*24hours, the video is clear and smooth with random times.

Besides, IP camera doesn't appear the phenomenon of death.

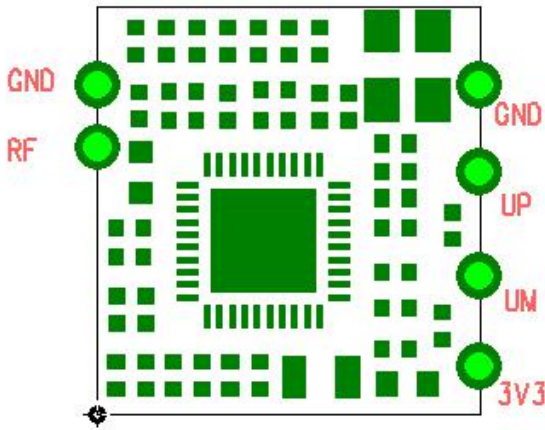
5.4.2 The BER with long time working

Sent	707916
Received	707603
Lost	313
Loss Rate	0.04%

Min Time	1 ms
Max Time	1372 ms
Avg. Time	10 ms
Avg. TTL	64

By sending 700000, the BER is 0.04%, Communication quality is stable.

5.5 PIN Description

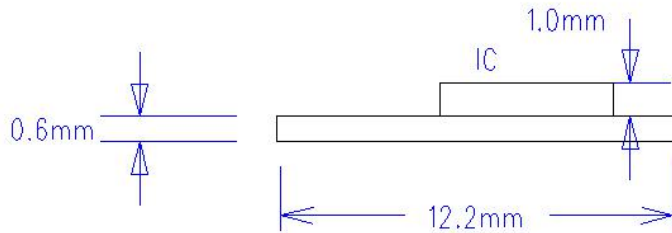


5.6 Actual picture

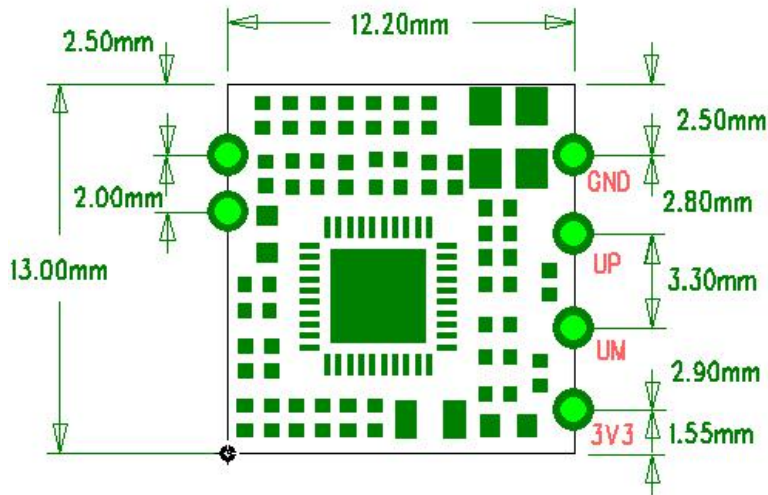


6. Product Dimensions

6.1 Side View (*All dimensional accuracy=0.2mm*)



6.2 Top View



7. Using Conditions

7.1 Supply Voltage and Current

Voltage: $3.3V \pm 3\%$

Current: Load capacity $\geq 300mA$

7.2 Environment Conditions

Feature	Detail & Description
Operating temperature condition	$-10^{\circ}C \sim 50^{\circ}C$
Operating humidity condition	10%~90%RH
Storage temperature condition	$-40^{\circ}C \sim 85^{\circ}C$

8. Notice

8.1 Module Pallet packing with 96 PCS per disc.

8.2 Pay attention to move the WIFI module

8.2.1 Don't touch the WIFI module bare hands when needs, must wear the gloves and static ring.

8.2.2 To be careful in handling or transporting products because excessive stress may break products.

8.2.3 Handle with care if products may have cracks or damages on their terminals, the characteristics of products may change. Do not touch products with bear hands that may

result in poor solder-ability and destroy by static electrical charge.

8.3 Storage and use WIFI module control should comply with the following matters.

8.3.1 Module of storage life.

Storage life: 12 months. (Conditions: T. $<40^{\circ}\text{C}$.Relative humidity : $<90\%\text{R.H}$)

8.3.2 Mounted within 168 hours at factory after opening.

- a. The factory conditions should like this: T. $\leq 30^{\circ}\text{C}$, R.H. $\leq 60\%$
- b. To protect the module Absorb moisture, Relative humidity should less than 30% R.H. Check the humidity card (30%~40%@pink& greater than40%@red)

8.3.3 If the modules need baking, conditions are as follows:

- a. through the baking to remove module moisture problem.
- b. Baking temperature: 120°C , 8 hours.
- c. After baking, put proper amount of desiccant

8.4 Module pallet packaging items as follows:

Storage life: 12 months.(Conditions: T. $<40^{\circ}\text{C}$.Relative humidity : $<90\%\text{R.H.}$)

9. Packing

