

# HK NATER TECH LIMITED

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## NT-6620-M Combo Module specification

**Customer:** \_\_\_\_\_

**Description:** NT-6620-M V1.0

**Customer P/N:** \_\_\_\_\_

**Date:** \_\_\_\_\_

Customer		
Approve	Auditing	Admit

Provider		
Approve	Auditing	Admit

Customer:

Add:

Tel:

Fax:

Attn:

E-mail:

Web:

Provider:HK NATER TECH LIMITED

Add: 2F,NO.27,2 Baomin Rd.,Baoan Dist.SZ City,China

Tel:0086-755-61522172/13510620050

Fax:0086-755-61522171

Attn:Lingo

E-mail:hsdgood@163.com

Web:http://www.natertech.com

# SPECIFICATIONS

**IEEE 802.11 b/g/n 2.4GHz 1T1R**  
WIFI+GPS+BT+FM Module

**NT-6620-M**

**WF+BT+FM+GPS Combo Module**

Version 1.0

# 1. Introduction

NT-6620-M is a new generation of SDIO Wifi products module. accord with Wifi wireless network standard SDIO module, the built-in wireless network protocol IEEE802.11 protocol stack, and TCP/IP protocol stack, save electricity intelligent control procedures

Embedded RISC core for better system level management; Coexistence: IEEE 802.15.2 external three-wire coexistence scheme to support additional wireless technologies such as 3G, GPS and WiMAX; Self calibration; Integrated switching regulator enables direct connection to battery. Best-in-class current consumption performance; Intelligent BT/WLAN coexistence scheme that goes beyond PTA signaling (for example, transmit window and duration that take into account of protocol exchange sequence, frequency, etc.)

## 2. Features

NT-6620-M is the small size and low power module for IEEE 802.11b/g/n wireless LAN. NT-6620-M is based on MTK 6628Q/MT6628T/MT6620 solution.

- 2.4GHz single stream 802.11 b/g/n MAC/BB/RF
- Bluetooth : UART, PCM
- FM : UART, Audio, I2S
- GPS : UART
- 802.11 d/h/k compliant
- Security: WPA/WPA2 personal, WPS 2.0, WAPI (hardware)
- Supports 802.11n optional features: STBC, A-MPDU, Block-Ack, RIFS, MCS Feedback, 20/40
- Supports 802.11w protected managed frames
- Interface: SDIO 2.0 (4-bit & 1-bit)

## 3. Ordering Information

Model	Description
NT-6620-M	WF+BT+FM+GPS Module

## 4. Module Block Diagram

A simplified block diagram of the NT-6620-M Sip molding is depicted in the figure below. The connections between internal modules, as well as, external interfaces can be found in figure 2.

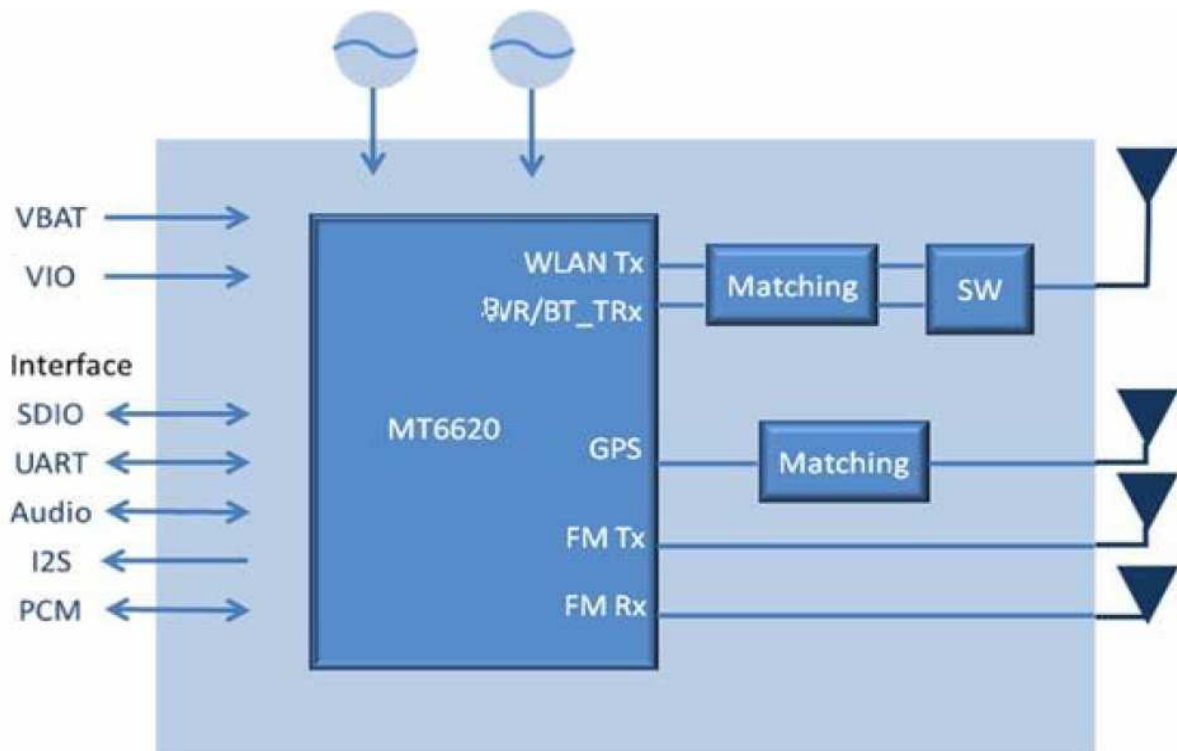


Figure 1 MT6620 functional block diagram

## 5. Block Diagram

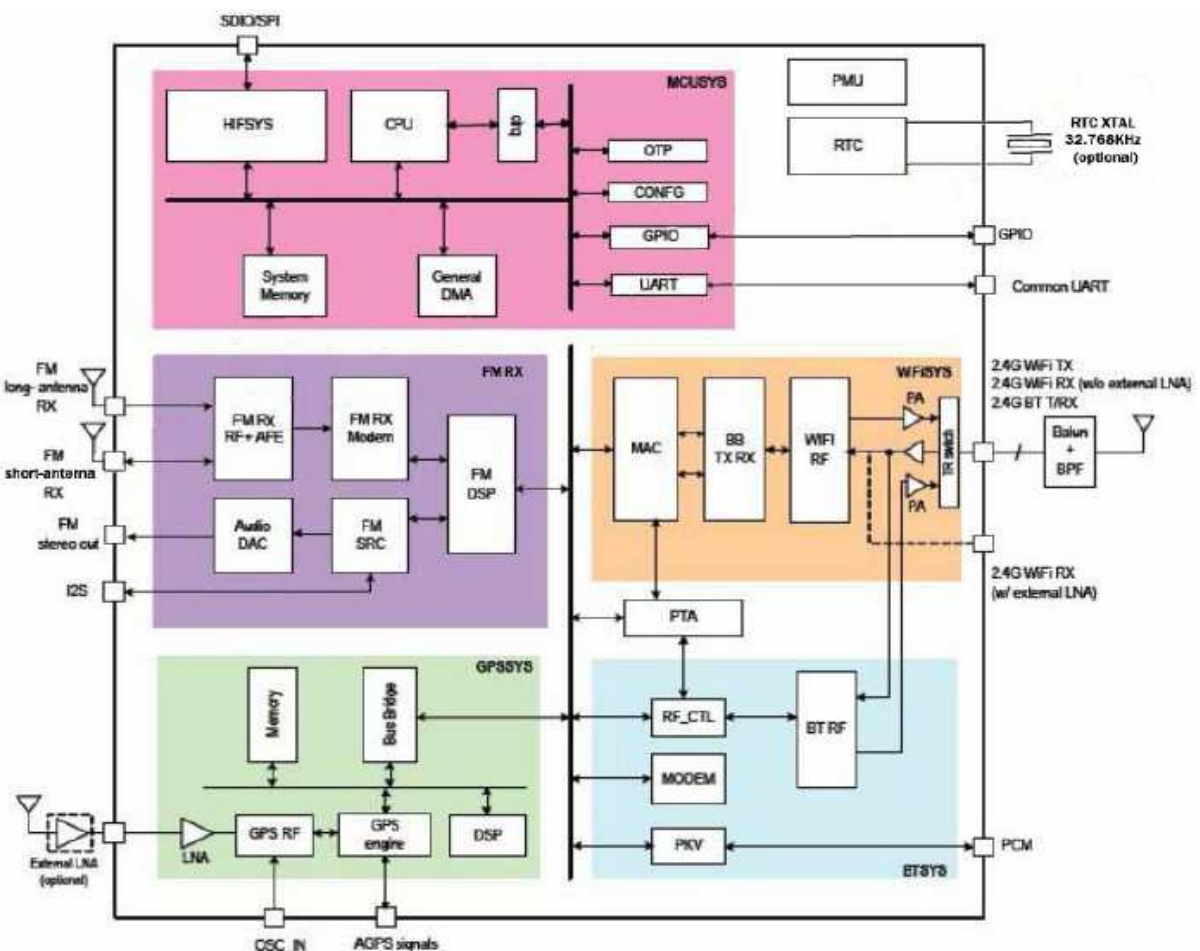


Figure 2 MT6620 block diagram

## 6. Absolute Maximum Ratings

Caution : The specifications in Table 1 define levels at which permanent damage to the device can occur. Function operation is not guaranteed under these conditions. Operating at absolute maximum conditions for extend periods can adversely affect the long-term reliability of the device.

Parameter	Min	Max	Unit
Storage Temperature	+20	+40°C	°C
Storage Humidity (40°C)	-	90%	%

< Table 1 Absolute Maximum Ratings > . Other conditions

- 1) Do not use or store modules in the corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are contained. Also, avoid exposure to moisture.
- 2) Store the modules where the temperature and relative humidity do not exceed 5 to 40 and 20 to 60%.
- 3) Assemble the modules within 6 months.  
Check the soldering ability in case of 6 months over.

## 7. Standard Test Conditions

The Test for electrical specification shall be performed under the following Condition unless otherwise specified.

- 1). Ambient condition  
Temperature:  $30^{\circ}\text{C} \pm 10^{\circ}\text{C}$   
Humidity:  $65\% \pm 5\%$  R.H.
- 2). Power supply voltages  
2.8V input power at the Module
- 3). Current consumption over recommended range of supply voltage and operating conditions is like below.  
When it's tested, it must be supplied more than 2 times of maximal current.

## 8 .Specification

Model Name	NT-6620-M
Product Description	
Network Standard	IEEE 802.11b/g/n, BT 2.1+EDR, FM, GPS
Host Interface	SDIO / UART / Audio / PCM / I2S
Operation Conditions	
Temperature	Operating : -45℃ ~ +85℃
Humidity	Operating : 10 ~ 95% (Non-Condensing) Storage : 5 ~ 95% (Non-Condensing)
Dimension	15mm X 15mm X 0.6mm (Max.)
Package	Tape packaging
WiFi Part	
Standard	IEEE 802.11 b/g/n
Host Interface	SDIO
Bluetooth Part	
Standard	Bluetooth 2.1+EDR 3.0 + HS compliance V4.0 Low Energy (LE)
Host Interface	UART,PCM
FM Part	
Function	Transmitter ,Receiver
Host Interface	Audio in ,Audio out ,I2S
GPS Part	
Type	Host based
Host Interface	UART

## 9. Electrical Specifications

### 1) DC Characteristics

Current Consumption	Min.	Typ.	Max.	Unit
TX Mode ( MCS7)	-	470	-	mA
Idle and Associated state	-	215	-	
Radio disabled state	-	100	-	

### 2) RF Characteristics for IEEE802.11b ( 11Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11b			
Mode	DSSS/CCK			
Channel frequency	2400 ~ 2483 MHz			
Data rate	1,2,5.5,11Mbps			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level	17	18	19	dBm
Spectrum Mask				
1 <sup>st</sup> side lobes ( to fc ±11MHz)	-	-43	-30	dBr
2 <sup>nd</sup> side lobes ( to fc ±22MHz)	-	-58	-50	dBr
Modulation Accuracy (EVM)	-	30	30	%
Power On/Off ramp	-	0.5	2.0	Usec
Freq. Tolerance	-15	-	15	ppm
Chip Clock Freq. Tolerance	-15	-	15	ppm
RX Characteristics	Min	Typ.	Max	Unit
Minimum Input Level Sens (FER ≤ 8%)	-	-88	-76	dBm
Maximum Input Level (FER ≤ 8%)	-10	-	-	dBm

\* Normal Condition : 25 °C, VDD= 2.8V.

3) RF Characteristics for IEEE802.11g ( 54Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE502.11g			
Mode	OFDM			
Channel frequency	2400 ~ 2483 MHz			
Data rate	6,9,12,18,24,36,48,54Mbps			
TX Characteristics	Min	Typ	Max	Unit
Power Level	13	14	15	dBm
Spectrum Mask				
at $f_c \pm 11\text{MHz}$	-			
at $f_c \pm 20\text{MHz}$	-			
at $f_c \geq \pm 30\text{MHz}$	-			
Constellation Error (EVM)	-			
Freq. Tolerance	-15			
Chip Clock Freq. Tolerance	-15			
RX Characteristics	Min	Typ	Max	Unit
Minimum Input Level Sens. (PER $\leq$ 10%)	-	-75		ppm
Maximum Input Level (PER $\leq$ 10%)	-20	-		ppm

\*Normal Condition : 25℃, VDD=2.8V



4) RF Characteristics for IEEE802.11 n (MCS7 mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11n - 2.4GHz			
Mode	OFDM			
Channel frequency	2400 ~ 2483 MHz			
Data rate	6513195263952585,65Mbps.,,,,.			
TX Characteristics	Min	Typ	Max	Unit
Power Level	13	14	15	dBm
Spectrum Mask				
at fc $\pm 11$ MHz	-	-32	-20	dB
at fc $\pm 20$ MHz	-	-35	-28	dB
at fc $\geq \pm 30$ MHz	-	-45	-40	dB
Constellation Error (EVM)	-	-32	-28	dB
Freq. Tolerance	-15	-	15	ppm
Chip Clock Freq. Tolerance	-15	-	15	ppm
RX Characteristics	Min	Typ	Max	Unit
Minimum Input Level Sens.(HT20,PER $\leq 10\%$ )	-	-71	-64	ppm
Minimum Input Level Sens.(HT40,PER $\leq 10\%$ )		-70	-62	ppm
Maximum Input Level (PER $\leq 10\%$ )	-20			ppm

# 10. Bluetooth Specification

Bluetooth Specification Conditions : VBAT=2.8V ; Temp:25°C

Feature	Description		
General Specification			
Bluetooth Standard	Bluetooth V3.3 of 1, 2 and 3 Mbps.		
Host Interface	UART		
Antenna Reference	Small antennas with 0~2 dBi peak gain		
Frequency Band	2.400 GHz ~ 2483.5 GHz		
Number of Channels	79 channels		
Modulation	FHSS, GFSK, DPSK, DQPSK		
RF Specification			
	Min	Typical	Max
Output Power (Class 1.5)		10	
Output Power (Class 2)		2	
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-86	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)		-86	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-80	
Maximum Input Level	GFSK (1Mbps):-20dBm		
	$\pi/4$ -DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

## 11.FM Specification

FM Specification (TBD) Conditions : VBAT=2.8V ; Temp:25°C

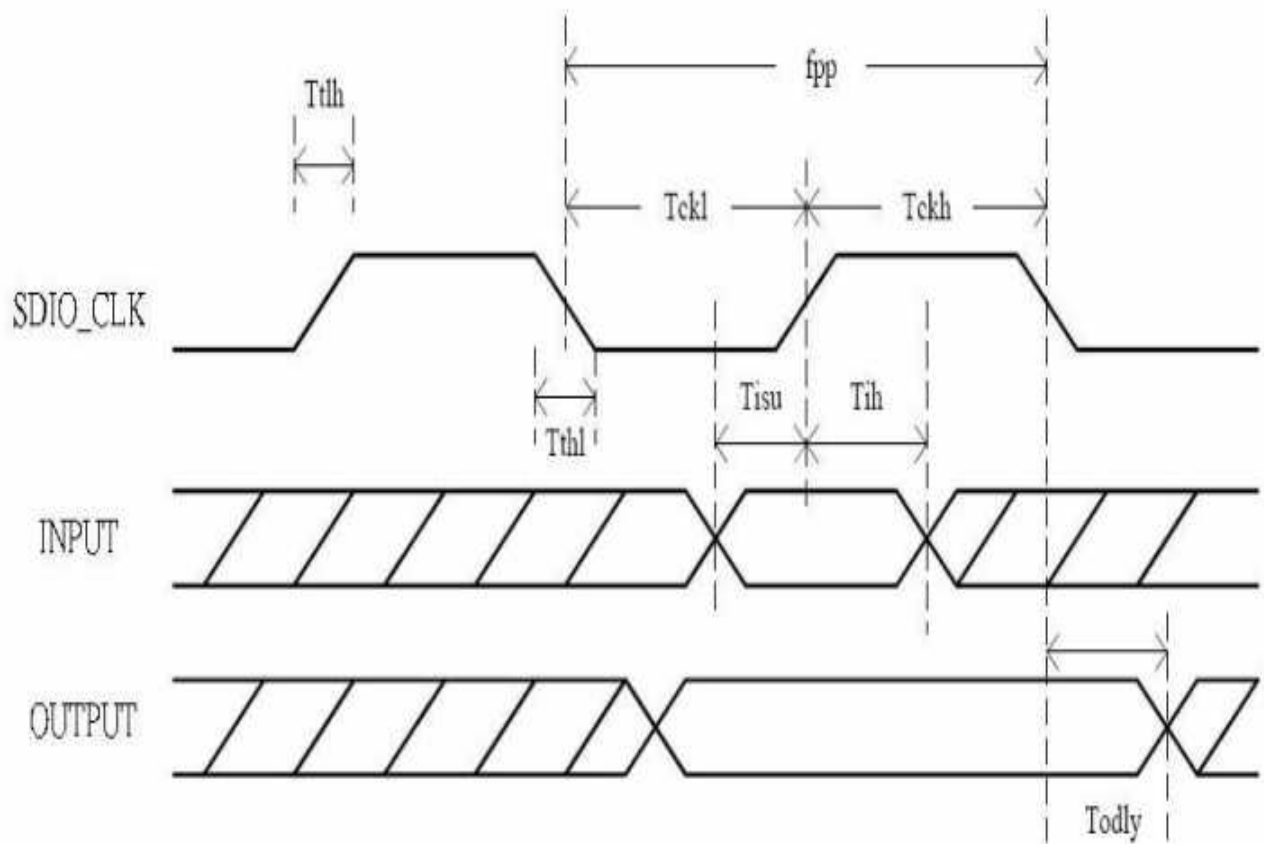
### RF characteristics for FM Receiver

Item	Condition	Min	Typ	Max	Unit
Frequency range		76		108	MHz
Sensitivity	DQPSK	-100	-109		dBm

## 12. System performance for GPS

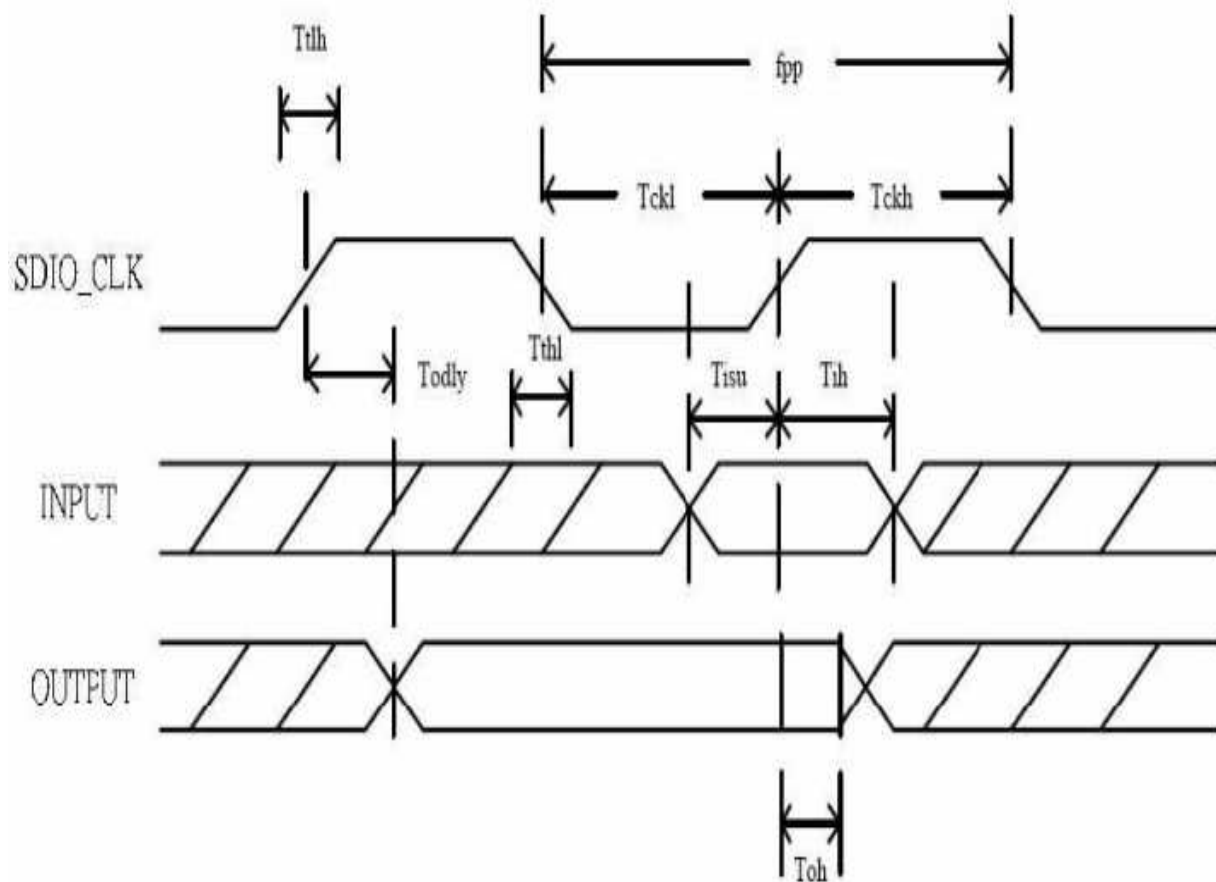
Parameter	Description	Performance
C/N @ -130 (w/o LNA)		40 dB
Horizontal Position Accuracy(LNA)	Without Aid	3.0 Meter
	DGPS	2.5 Meter
Velocity Accuracy(LNA)	Without Aid	0.1 Meter/sec
	DGPS	0.05 Meter/sec
	Tracking	-130 dBm
TTFF(LNA)	Cold start	<35 sec
	Warm start	<34 sec
	Hot start	<30 sec

## 13. SDIO Host Interface Protocol Timing



Symbol	Parameter	Min.	TYP.	MAX.	UNIT
fpp	Clock Frequency	0		25	MHz
Tckl	Clock Low Time	10			nS
Tckh	Clock High Time	10			nS
Ttlh	Clock Rise Time			10	nS
Tthl	Clock Fall Time			10	10
Tisu	Input Setup Time	5			nS
Tih	Input Hold Time	5			nS
Todly	Output Delay Time	0		11	nS

## 14. SDIO 50MHz Timing Diagram



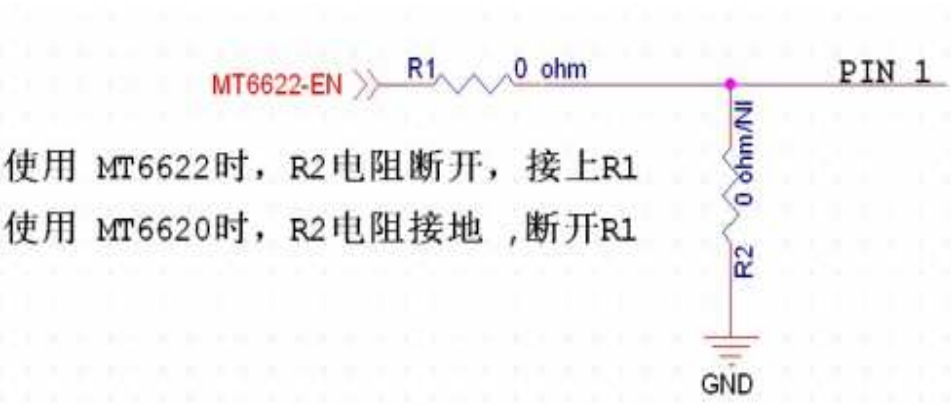
Symbol	Parameter	Min.	TYP.	MAX.	UNIT
$f_{pp}$	Clock Frequency			50	MHz
$T_{ckl}$	Clock Low Time	7			nS
$T_{ckh}$	Clock High Time	7			nS
$T_{tlh}$	Clock Rise Time			3	nS
$T_{thl}$	Clock Fall Time			3	10
$T_{isu}$	Input Setup Time	6			nS
$T_{ih}$	Input Hold Time	2			nS
$T_{oh}$	Output Hold Time	2.5			
$T_{odly}$	Output Delay Time	0		12	nS

## 15. Pin Definition

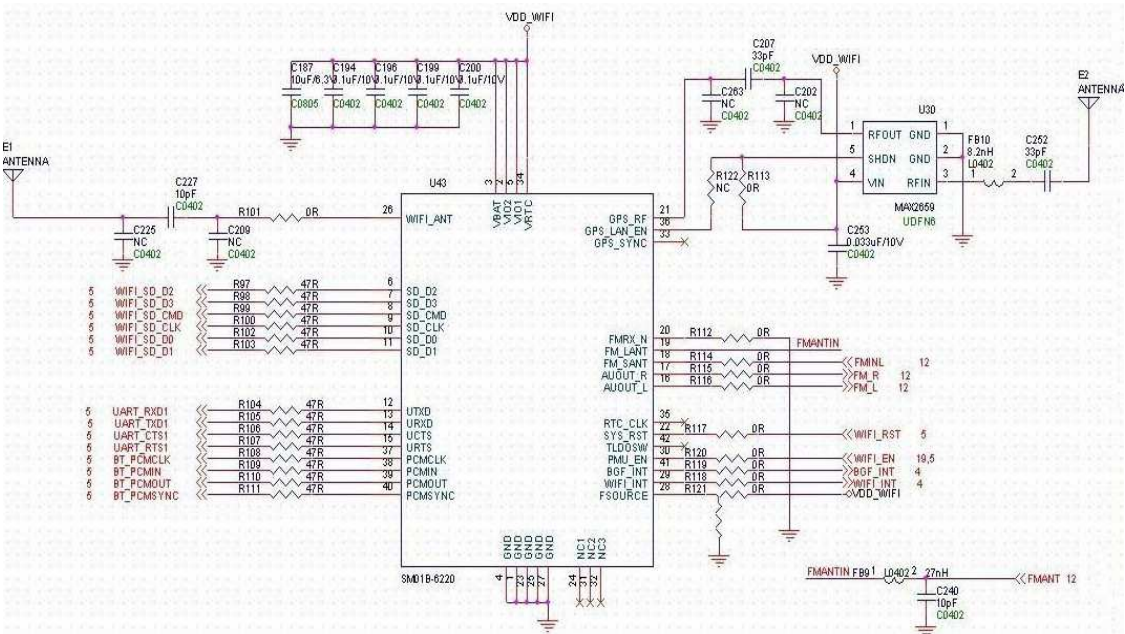
Pin	Definition	I/O	Description
1	MT6622 PMU EN / GND (MT6620)		If access 6622 chip, use a resistance jump line access 1 pin. If access 6620 chip, access GND
2	DVDDIO18		$VDD2.8 \pm 0.5V$
3	VBAT		$VDD3.8 \pm 0.5V$
4	GND		Ground
5	DVDD_S DIO		$VDD2.8 \pm 0.5V$
6	SD1_DAT2		Data pin of SDIO
7	SD1_DAT3	I/O	Data pin of SDIO
8	SD1_CMD		Command pin of SDIO
9	SD1_CLK		Clock pin of SDIO
10	SD1_DAT0		Data pin of SDIO
11	SD1_DAT1		Data pin of SDIO
12	UART1_UTXD	I/O	UART
13	UART1_URXD	I	UART
14	UART1_CTS		High-Speed UART CTS
15	UART1_RTS		High-Speed UART RTS
16	FM_AUOUT_R	I/O	FM analog output, R channel
17	FM_AUOUT_L	I/O	FM analog output, L channel
18	FM_SANT		FM short ANT
19	FM_LANT		FM differential input- P port
20	FM_RX_N	O	FM differential input- N port. A short trace should be reserved and connected to ground
21	GPS_ANT	I/O	GPS ANT

22	SYSRST_B	I	External system reset active low
23/25/27	GND		Ground
24/31/32	NC		
26	WIFI_ANT	I/O	WIFI_RFPORT
28	FSOURCE	I/O	Resistancefor 10K for low
29	WIFI_INT_B		to cpu gpio
30	PMU_EN	I	PMU enable pin
33	GPS_SYNC	I	external AGPS SYNC signal
34	VRTC		VDD28±0.5V
35	RTCCLK	O	RTC xtal / external RTC 32KHZ clock input port
36	GPS_LNA_EN	O	GPIO LNA EN
37	PCM1CLK	I/O	PCM
38	PCM1IN	I/O	PCM
39	PCM1OUT	I	PCM
40	PCM1SYNC	I/O	PCM
41	BGF_INT_B	I/O	BT/GPS/FM interrupt pin
42	TLDO_S W	I/O	NC

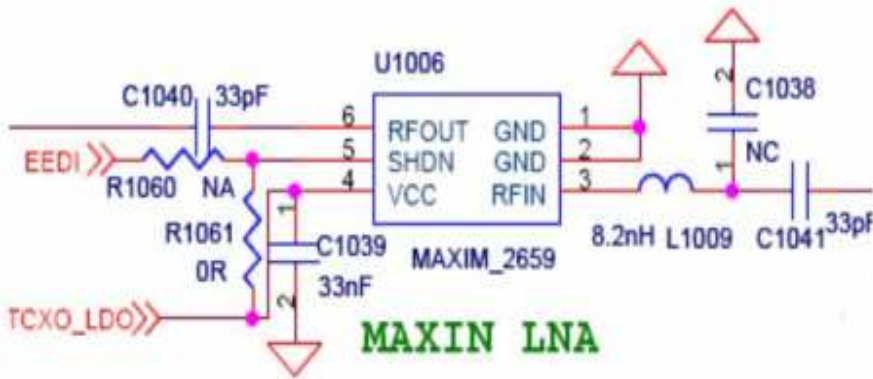
# PIN 1 Reference design



# Peripheral principle diagram reference

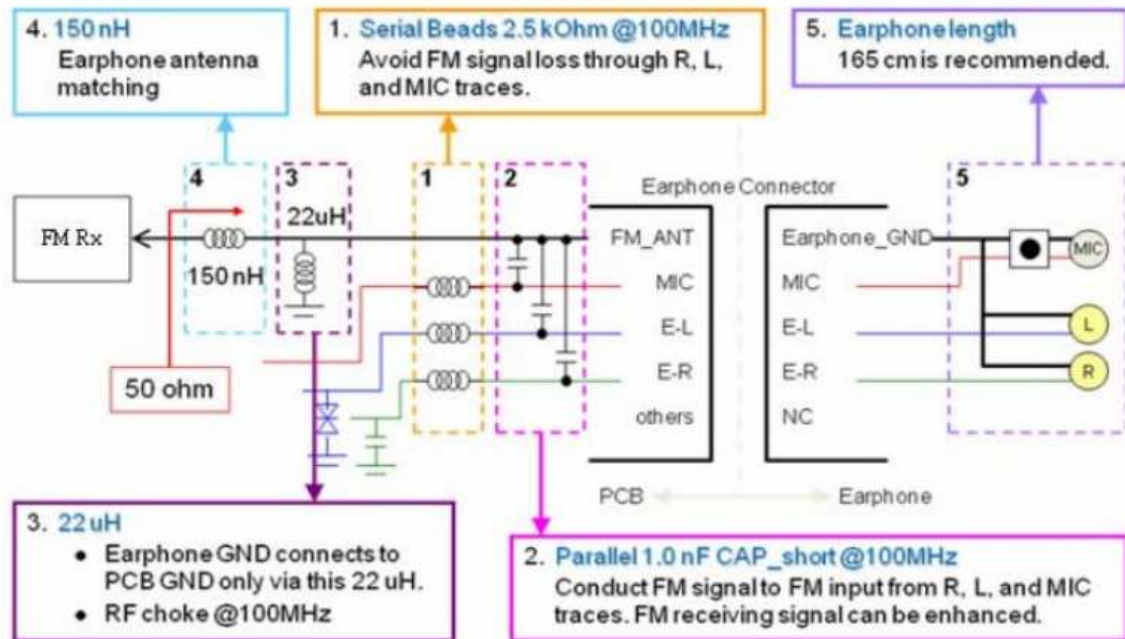


# GPS external LAN

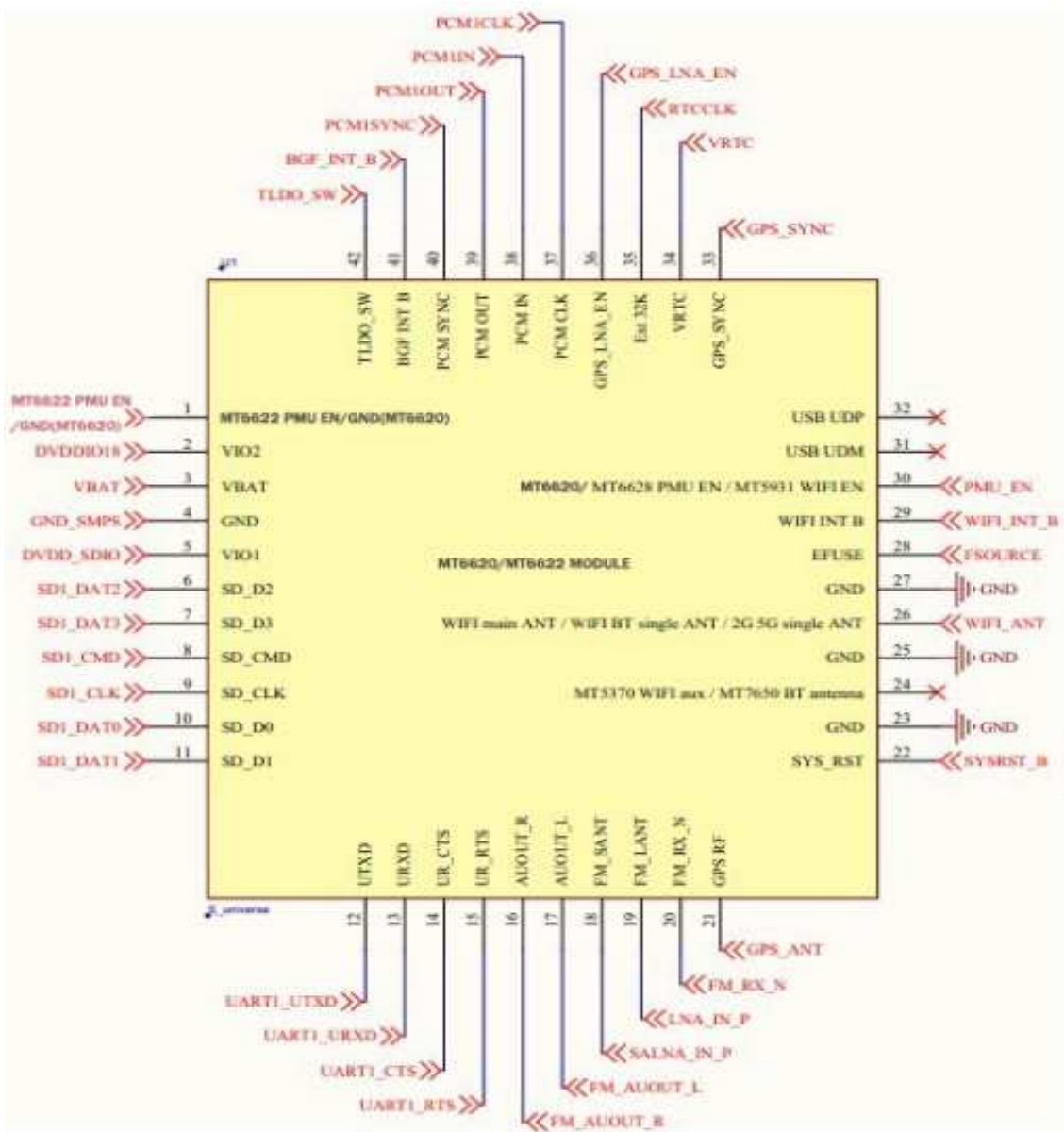




## FM earphone antenna



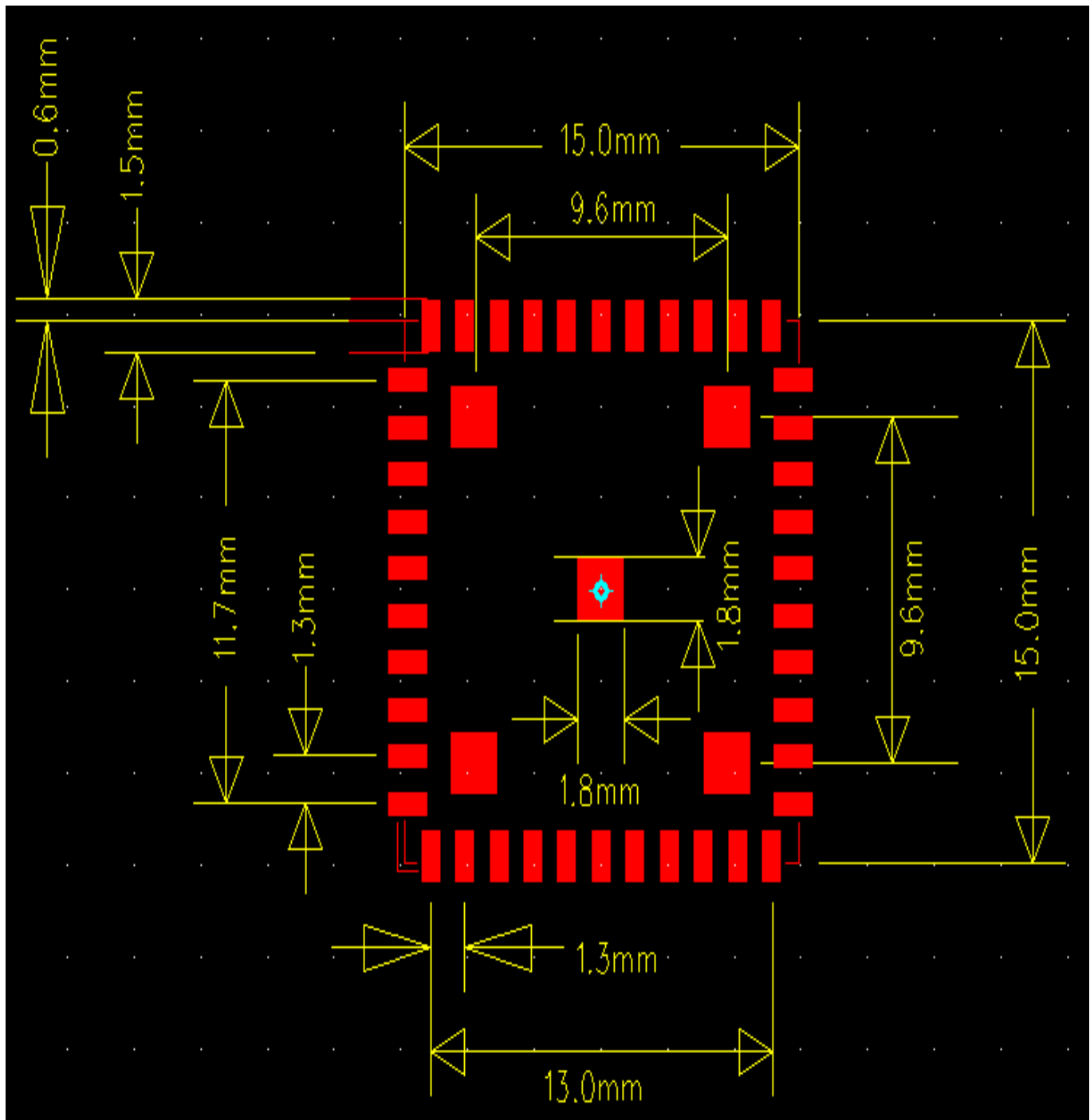
## 16. Mechanical Dimensions



## 17. Size reference

### Mechanical

Dimensions (mm)	Length	Width	Height
	15	15	1.9
	(Tolerance: $\pm 0.2\text{mm}$ )	(Tolerance: $\pm 0.2\text{mm}$ )	(Tolerance: $\pm 0.2\text{mm}$ )



## 18. Environment Tests

Item	Test Conditions	Specifications
Heat Load	Initial values are measured at standard test condition. Leave samples in $60^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for $96 \pm 5$ hours, and in standard test condition for 30 minutes, then take measurements within 1 hour. - Supply voltage : standard $\pm 5\%$ - Supply voltage cycle : 1.5h on, 0.5h off	•TX Power : $\pm 4\text{dB}$ Max Min Input Level : $\pm 4\text{dB}$ Max
Humidity Load Test	Initial values are measured at standard test condition. Leave samples in $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , 90 ~ 95% RH for $96 \pm 5$ hours, and in standard test condition for 30 minutes, then take measurements within 1 hour. - Supply voltage : standard $\pm 5\%$ - Supply voltage cycle : 1.5h on, 0.5h off	
Cold Test	Initial values are measured at standard test condition. Leave samples in $-10^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for $96 \pm 5$ hours, and in standard ambient for 1 hour with Standard power Supply then take measurements within 1 hour.	
Temperature	Take measurements in standard test condition. Temp. : $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$ Duration : 30 min Ramp-up & Ramp-down for 5 min Cycle : 100cycle	

## 19. Recommended Reflow Profile

