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<b>Product Specification</b>
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**IEEE 802.11b/g/n 2T2R USB WiFi Module**

Project Name	11n USB WiFi Module with RT5372L
CyberTan Part No	T77H387.00
Customer	Hisense
Customer Part No.	1127000
CyberTan Model Name	WU172HS

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## 0. Revision History

Date	Document revision	Product revision	Change Description
2013/01/28	00	005	1. Initial release(preliminary),
2013/02/18	01	005	1. Remove I-PEX RF connector
2013/03/01	02	005	1. Update the power consumption and RF performance at section3. 2. Add package information at section5
2013/03/20	03	015	1. Update the sample picture. 2. Add the antenna's performance
2013/06/03	04	015	1. Change 11b power from 16dBm to 13dBm to pass CE and C-tick certification 2. Change FW ver to V2.0
2013/08/05	05	015	1. Add customer PN 2. Update Label information(add CE and C-tick logo) 3. Update sample photo
2014/01/14	06	015	1. Add FCC Federal Communication Commission Interference Statement 2. Update working frequency to meet FCC Regulation

## 1. Introduction

Project Name: 11n USB WiFi Module with RT5372L

Project Number: T77H387.00

This documentation describes the engineering requirements specification of WiFi module with RT5372. It is a confidential document of CyberTan.

### 1.1 RF module Overview

The general HW architecture for the module is shown in Figure 1. This WLAN Module design is based on Ralink RT5372L. It is a highly integrated single-chip MIMO (Multiple In Multiple Out) Wireless LAN (WLAN) USB2.0 network interface controller complying with the 802.11n specification. It combines a MAC, a 2T2R capable baseband, and RF in a single chip. The RT5372 provides a complete solution for a high throughput performance wireless client.

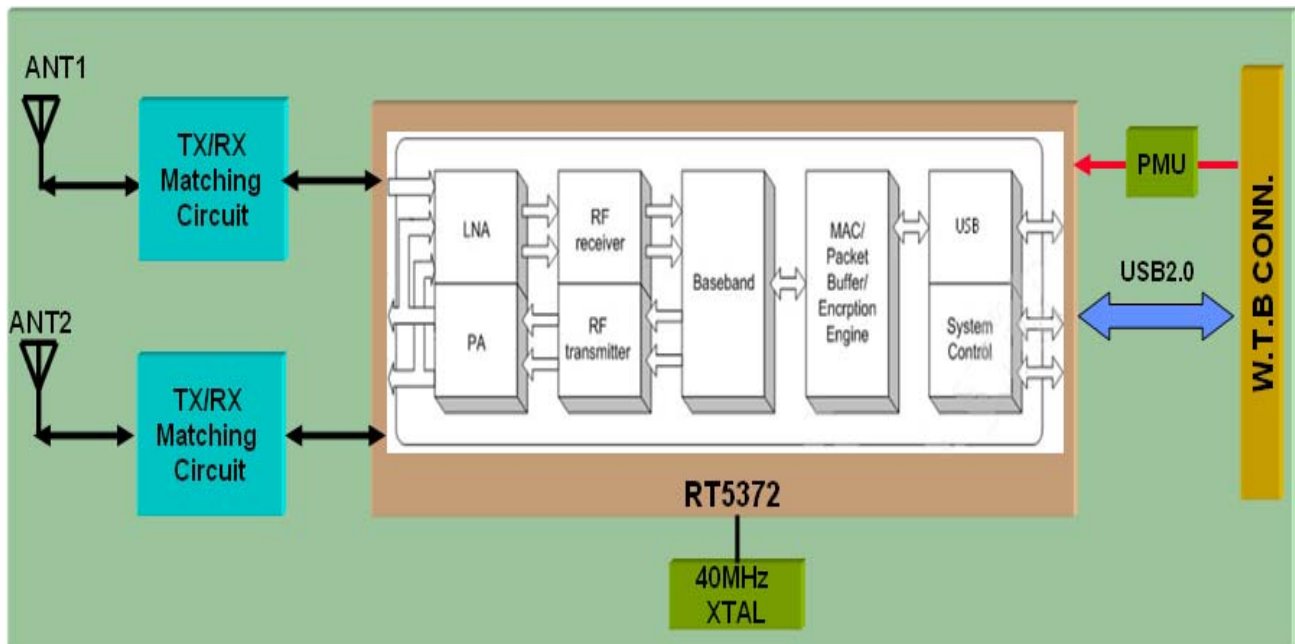


Figure 1 Module Block Diagram

### 1.2 Specification reference

This specification is based on additional references listed below.

- IEEE Std. 802.11b
- IEEE Std. 802.11g
- IEEE Std. 802.11n

### 1.3 System Functions

Table1: General Specification as below:

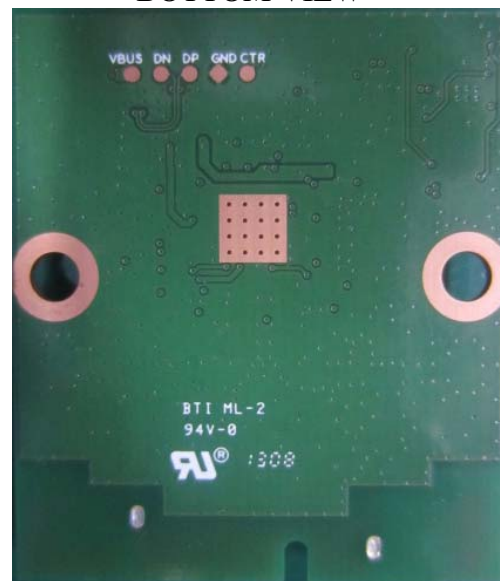
Main Chipset	Mediatek RT5372L
Operating Frequency	2.412~2.462GHz
WiFi Standard	802.11b/g/n(2x2)
FW version	V2.0 (To read this version, refer to <i>Appendix B</i> )
Modulation	11b: DBPSK, DQPSK and CCK and DSSS 11g: BPSK, QPSK, 16QAM, 64QAM and OFDM 11n: MCS0~15 OFDM
PHY Data rates	11b:1, 2, 5.5 and 11Mbps 11g:6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~15, up to 300Mbps
Form factor	5pin side entry type WTB CONN, 1.25mm pitch,
Host Interface	USB 2.0
PCBA Dimension	Typical, 40mm(W)*46.45mm(L)*5mm(T) (The height including WTB connector and antenna)
Antenna	Two Metal Antennas on-board design

Sample picture as bellow

TOP VIEW



BOTTOM VIEW

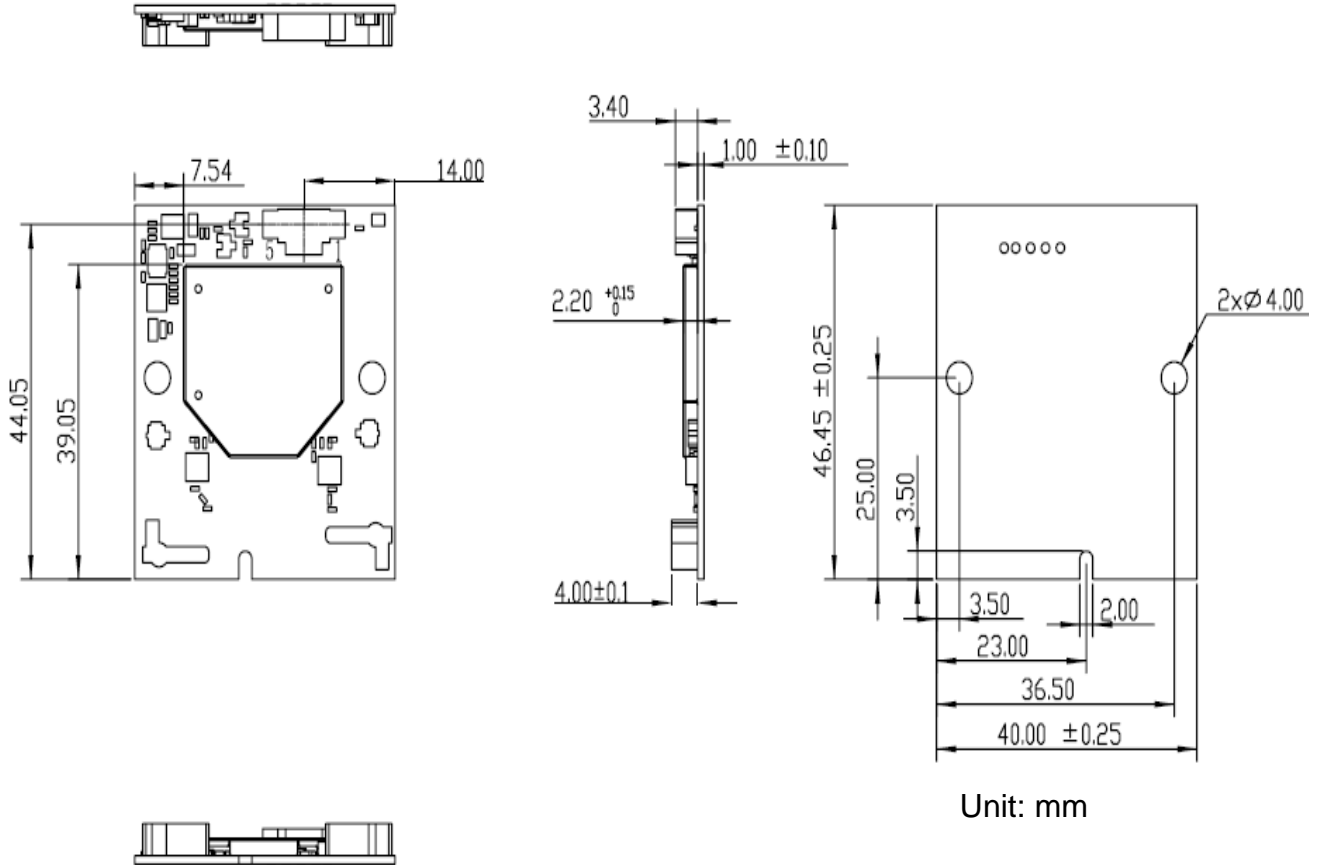


\* note1, the sample picture is just for reference only.

## 2. Mechanical Specification

### 2.1 Mechanical Outline Drawing

Typical Dimension (W x L): 40.00mmx 46.45mm.



### 2.2 WTB CONNECTOR Pin definition

- 5Pin, 1.25mm pitch, SMD, side entry type.
- Pin No. of WTB connector is remarked in PCBA ME drawing on above item2.1.

Pin #	Name	Description
1	VBUS	5V DC power supply input
2	D-	USB Data DN
3	D+	USB Data DP
4	GND	Ground
5	CTR	WLAN Radio on/off control Low→Disable module. High→Normal working mode. (Module internally pull-high to 3.3V,no need for external pull-high)

### 3. Electrical Specification

#### 3.1 Operating Condition

Parameter	Condition	Min.	Typ.	Max.	Unit
DC power input	---	4.5	5.0	5.5	V
DC Current (Average.) @5V power input	11b TX throughput mode	-	300	500	mA
	11b RX throughput mode	-	159	500	
	11g TX throughput mode	-	276	500	
	11g RX throughput mode	-	156	500	
	11n-HT20 TX throughput mode	-	358	500	
	11n-HT20 RX throughput mode	-	164	500	
	11n-HT40 TX throughput mode	-	350	500	
	11n-HT40 RX throughput mode	-	203	500	
	Power down mode(CTR pull-low)	-	35	500	
	Standby mode , not connected with AP.	-	78	500	
Operating Temperature	--	0		+60	°C
Storage Temperature	--	-40		+85	°C

#### 3.2 WiFi RF Specification(@5V/25°C)

##### 3.2.1 802.11b Mode

Items	Contents				
Mode	IEEE802.11b				
Channel	CH1 to CH11				
Data rate	1, 2, 5.5, 11Mbps				
1. Target Power Levels (*note2)					
1) 11b Output power	11	13	14	dBm	
2. Spectrum Mask @ target power					
1) fc +/-11MHz to +/-22MHz	-	-48	-30	dBr	
2) fc > +/-22MHz	-	-58	-50	dBr	
3. Frequency Error	-15	-1	+15	ppm	
<b>RX Characteristics(per each chain)</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>	
4 Minimum Input Level Sensitivity					
1) 1Mbps (FER ≤ 8%)	-	-96	-88	dBm	
2) 2Mbps (FER ≤ 8%)	-	95	-85	dBm	
3) 5.5Mbps (FER ≤ 8%)	-	-92	-83	dBm	
4) 11Mbps (FER ≤ 8%)	-	-89	-80	dBm	
5 Maximum Input Level (FER ≤ 8%)	-10		-	dBm	

### 3.2.2 802.11g Mode

Items	Contents				
Mode	IEEE802.11g				
Channel	CH1 to CH11*				
Data Rate	6, 9, 12, 18, 24, 36, 48, 54Mbps				
<b>TX Characteristics (per each chain)</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>	
1. Target Power Levels (*note2)					
1) 11g Output power	13	15	16.5	dBm	
2. Spectrum Mask @ target power					
1) at fc +/- 11MHz	-	-43	-20	dBr	
2) at fc +/- 20MHz	-	-44	-28	dBr	
3) at fc > +/-30MHz	-	-54	-40	dBr	
3 Constellation Error(EVM)@ target power					
1) 6Mbps	-	-	-5	dB	
2) 9Mbps	-	-	-8	dB	
3) 12Mbps	-	-	-10	dB	
4) 18Mbps	-	-	-13	dB	
5) 24Mbps	-	-	-16	dB	
6) 36Mbps	-	-	-19	dB	
7) 48Mbps	-	-	-22	dB	
8) 54Mbps	-	-30	-25	dB	
4 Frequency Error	-15	-1.1	+15	ppm	
<b>RX Characteristics (per each chain)</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>	
5 Minimum Input Level Sensitivity					
1) 6Mbps (PER $\leq$ 10%)	-	-91	-85	dBm	
2) 9Mbps (PER $\leq$ 10%)	-	-90	-84	dBm	
3) 12Mbps (PER $\leq$ 10%)	-	-88	-82	dBm	
4) 18Mbps (PER $\leq$ 10%)	-	-86	-80	dBm	
5) 24Mbps (PER $\leq$ 10%)	-	-83	-77	dBm	
6) 36Mbps (PER $\leq$ 10%)	-	-81	-73	dBm	
7) 48Mbps (PER $\leq$ 10%)	-	-77	-69	dBm	
8) 54Mbps (PER $\leq$ 10%)	-	-75	-68	dBm	
6 Maximum Input Level (PER $\leq$ 10%)	-20		-	dBm	

### 3.2.3 802.11n HT20 Mode



Items	Contents				
Mode	IEEE802.11n HT20 @ 2.4GHz				
Channel	CH1 to CH11*				
Data Rate	MCS0/1/2/3/4/5/6/7/8/9/10/11/12/13/14/15, up to 150Mbps				
<b>TX Characteristics(per each chain)</b>	Min.	Typ.	Max.	Unit	
1. Target Power Levels (*note2)					
1) 11n-HT20 Output power	13	15	16.5	dBm	
2. Spectrum Mask @ target power					
1) at fc +/- 11MHz	-	-38	-20	dBr	
2) at fc +/- 20MHz	-	-43	-28	dBr	
3) at fc > +/-30MHz	-	-53	-45	dBr	
3. Constellation Error(EVM)@ target power					
1) MCS0	-	-	-5	dB	
2) MCS1	-	-	-10	dB	
3) MCS2	-	-	-13	dB	
4) MCS3	-	-	-16	dB	
5) MCS4	-	-	-19	dB	
6) MCS5	-	-	-22	dB	
7) MCS6	-	-	-25	dB	
8) MCS7	-	-32	-28	dB	
4. Frequency Error	-15	-1.2	+15	ppm	
<b>RX Characteristics (per each chain)</b>	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity					
1) MCS0 (PER $\leq$ 10%)	-	-89	-82	dBm	
2) MCS1 (PER $\leq$ 10%)	-	-88	-79	dBm	
3) MCS2 (PER $\leq$ 10%)	-	-86	-77	dBm	
4) MCS3 (PER $\leq$ 10%)	-	-83	-74	dBm	
5) MCS4 (PER $\leq$ 10%)	-	-80	-70	dBm	
6) MCS5 (PER $\leq$ 10%)	-	-76	-66	dBm	
7) MCS6 (PER $\leq$ 10%)	-	-74	-65	dBm	
8) MCS7 (PER $\leq$ 10%)	-	-72	-64	dBm	
6. Maximum Input Level (PER $\leq$ 10%)	-20		-	dBm	

### 3.2.4 802.11n HT40 Mode

Items	Contents				
Mode	IEEE802.11n HT40 @ 2.4GHz				
Channel	CH3 to CH9				
Data Rate	MCS0/1/2/3/4/5/6/7/8/9/10/11/12/13/14/15, up to 300Mbps				
<b>TX Characteristics(per each chain)</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>	
1. Target Power Levels (*note2)					
1) 11n-HT20 Output power	12	14	15.5	dBm	
2. Spectrum Mask @ target power					
1) at fc +/- 11MHz	-	-37	-20	dBr	
2) at fc +/- 20MHz	-	-40	-28	dBr	
3) at fc > +/-30MHz	-	-50	-45	dBr	
3. Constellation Error(EVM)@ target power					
1) MCS0	-	-	-5	dB	
2) MCS1	-	-	-10	dB	
3) MCS2	-	-	-13	dB	
4) MCS3	-	-	-16	dB	
5) MCS4	-	-	-19	dB	
6) MCS5	-	-	-22	dB	
7) MCS6	-	-	-25	dB	
8) MCS7	-	-32	-28	dB	
4. Frequency Error	-15	-1.3	+15	ppm	
<b>RX Characteristics (per each chain)</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Unit</b>	
5. Minimum Input Level Sensitivity					
1) MCS0 (PER $\leq$ 10%)	-	-88	-79	dBm	
2) MCS1 (PER $\leq$ 10%)	-	-85	-76	dBm	
3) MCS2 (PER $\leq$ 10%)	-	-83	-74	dBm	
4) MCS3 (PER $\leq$ 10%)	-	-80	-71	dBm	
5) MCS4 (PER $\leq$ 10%)	-	-77	-67	dBm	
6) MCS5 (PER $\leq$ 10%)	-	-72	-63	dBm	
7) MCS6 (PER $\leq$ 10%)	-	-71	-62	dBm	
8) MCS7 (PER $\leq$ 10%)	-	-68	-61	dBm	
6. Maximum Input Level (PER $\leq$ 10%)	-20		-	dBm	

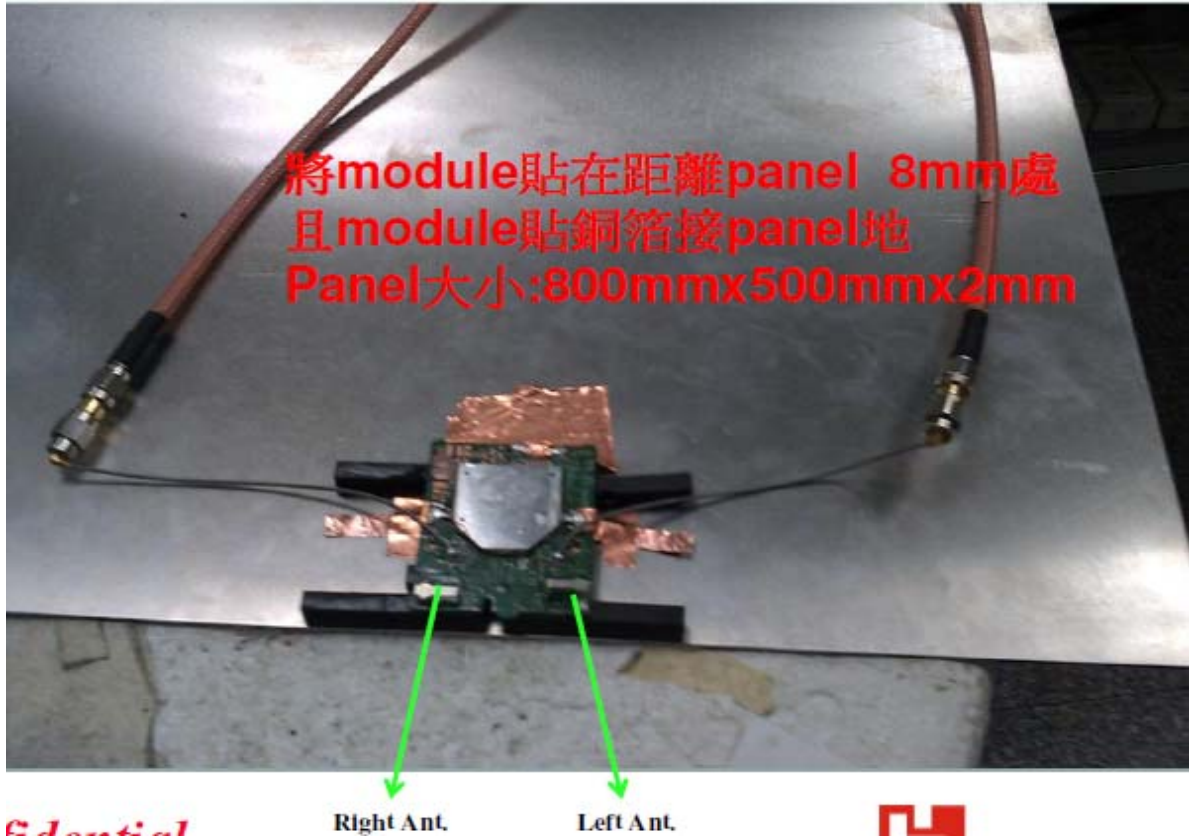
\*note2: the target power level will be changed later based-on regulatory testing result.

### 3.3 On-board Antenna Specification

Operating Frequency	2.412~2.472GHz
VSWR(max)	$\leq$ 2.5:1

Isolation	$\geq 10\text{dB}$
Peak Gain	2.80dBi
Antenna Type	Metal

\*note: the antenna performance is measured based-on below test setup environment.



#### 4. Quality

The product quality must be followed-up by CyberTan factory quality control system.

# 5. Appendix

## Appendix A-Label Information

REV.	MARK	ECR/ECN NO.	DATE	UPDATE DESCRIPTION	SIGNATURE
0	N/A	N/A	13/05/18	First Release	Taim

All font:Arial 3pt  
 Human readable(可讀部分):  
 B. MAC ID:XXXXXXXXXX  
 MAC ID Barcode, follow Foxconn standard.(MAC ID區間參考Foxconn標準)  
 C.MO:MO-VVSS  
 a. 第一個MO:為文字  
 b. 第二個MO is Foxconn MO, follow Foxconn standard(為工單號, 參考Foxconn標準)  
 c. VV: the engineering version(refer to Foxconn label Rev column in the cover of the MFG document)  
 VV為工程版本(參考製造文件封面Foxconn Label Rev.欄位)  
 d. SS: the version of A300/A400 product(refer to Doc Rev.in the cover of MFG document)  
 SS為A300/A400產品之版本(參考製造文件封面Doc Rev.之主版本)

Scannable(掃描部分):  
 A. XXXXXXXXXXXX  
 MAC ID Barcode, follow Foxconn standard(MAC ID 區間參考Foxconn標準)  
 Barcode type: code 39  
 Barcode height:2.5mm

label stick position

標籤製作黏貼方式/T77H387.00/03/ 1 OF 4

size:18mm\*13mm R=1

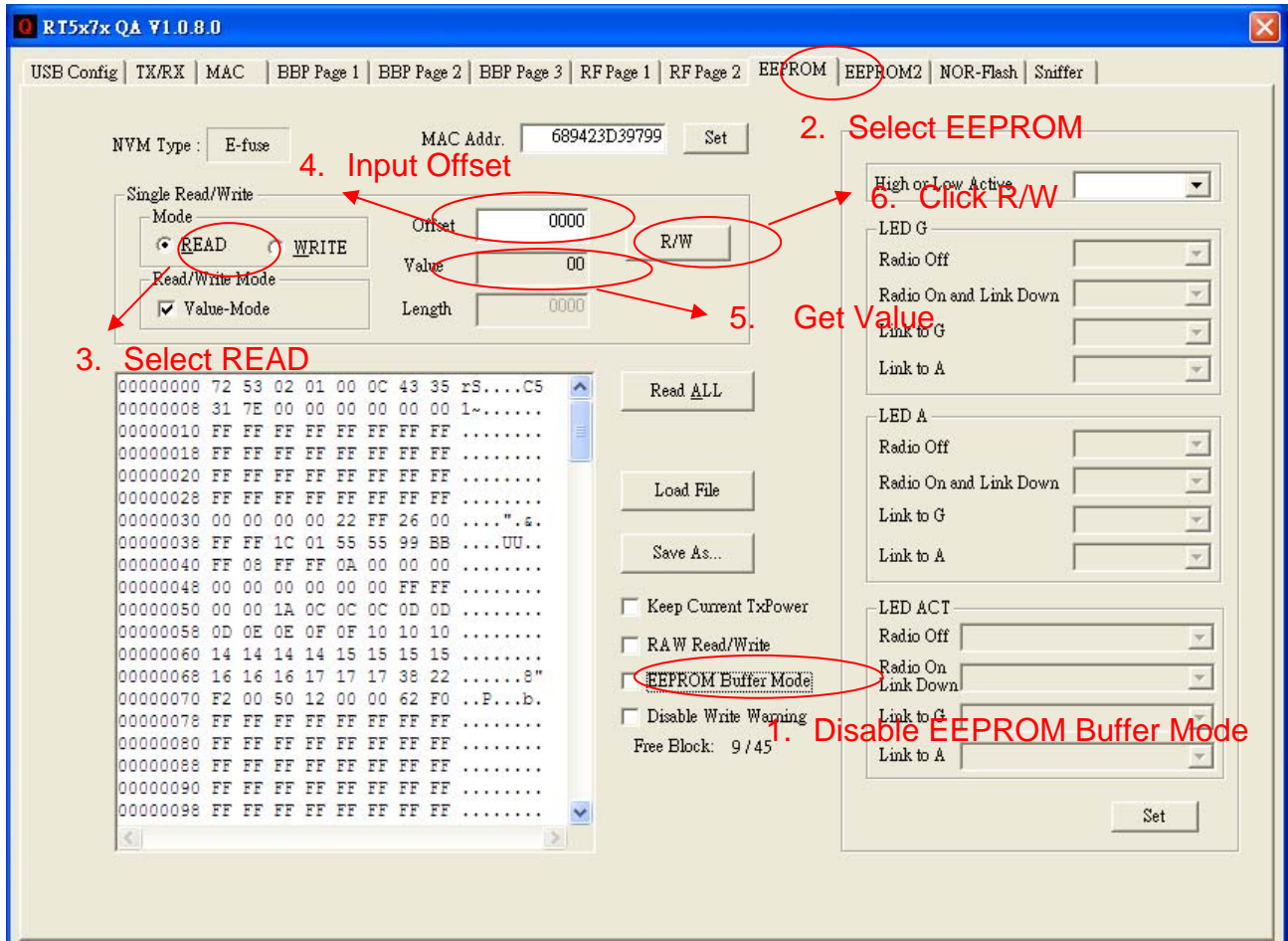
MATERIAL (SPEC.)		SCALE	FOXCONN	
50# mylar			HON HAI PRECISION IND. CO., LTD.	
FINISH		SHEET	CNSBG	
		1/1	PART NAME	
			MAC ID label	
UNIT		MODEL	PART NO.	DESIGNED
MM		T77H387.00	500.01625.005	Taim
SIZE		CUSTOMER MODEL	CUSTOMER PART NO.	APPROVED
A4				Sunny wu

Select	Q1	A	B	C	EPS	EPE	BAG	CTN	Label	UNIT
0~6	0.05	0.05	0.10							USR
6~30	0.10	0.15	0.20	0.50	0.50	3.00				0.20
30~120	0.15	0.20	0.30	0.50	0.50	5.00	2.00	0.25		
120~300	0.20	0.30	0.40	1.00	1.00	10.00	3.00	0.50		
300~450	0.25	0.40	0.50	2.00	2.00	15.00	5.00	0.50		
450~600	0.30	0.50	0.60	3.00	3.00	20.00	5.00	0.80		

## Appendix B-How to get FW version of your module

1. Plug in module and install RT5372 QA Test USB WDM Driver in your PC with XP OS.
2. Open QA tool and switch to **EEPROM** page and disable **EEPROM Buffer Mode**, select **READ** mode.
3. Input **03F0** in **Offset** and click **R/W**, you will get a number **0X**;  
Input **03F1** in **Offset** and click **R/W**, you will get another number **0Y**.  
Then the FW version is **VY.X**.



### Appendix C-Package Information

REV.	MARK	ECR/ECN NO.	DATE	UPDATE DESCRIPTION	SIGNATURE
0	N/A	N/A	13.02.25	First Release	Annie Huang

The top layer used as shield cover, without products.

tray

paper board

carton

Tray ID label

carton label

1. QTY: 1 carton=15 trays\*28 pcs=420pcs  
 2. The top layer used as shield cover, without products.  
 3. The two neighboring layers always laid reversely.

MATERIAL (SPEC.)				SCALE	<b>FOXCONN</b> HON HAI PRECISION IND. CO., LTD. CNSBG
FINISH				SHEET	
5	tray ID label	503.00090.005	15/420	1/1	PART NAME PALLET ASSY
4	carton label	503.00098.005	1/420		
3	carton	520.00794.005	1/420		MODEL T77H387.00    PART NO.    DESIGNED Annie Huang
2	paper board	522.00976.005	2/420		
1	tray	513.xxxxx.005	16/420		CUSTOMER MODEL    CUSTOMER PART NO.    APPROVED Sunny wu
ITEM	DESCRIPTION	FOXCONN P/N	QTY		

Select	QTY	A	B	C	EPS	EPE	BAG	CTN	Label	USR	UNIT	MM
0-6	0.05	0.05	0.10							0.20		
6-30	0.10	0.15	0.20	0.50	0.50	3.00				0.20		
30-120	0.15	0.20	0.30	0.50	0.50	5.00	2.00	0.25			SIZE	A4
120-300	0.20	0.30	0.40	1.00	1.00	15.00	3.00	0.30				
300-450	0.25	0.40	0.50	2.00	2.00	15.00	5.00	0.50				
450-600	0.30	0.50	0.60	3.00	3.00	20.00	5.00	0.80				
DRAFT TOLERANCE ±0.2*												
CRITICAL DIM. MARK *												



## **Appendix D-Federal Communication Commission Interference Statement**

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 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.

### **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.

### **FCC Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter. This End equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

### **IMPORTANT NOTE:**

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

### **End Product Labeling**

The final end product must be labeled in a visible area with the following: "Contains FCC ID: N89-WU172HS" .

### **Manual Information to the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.