



Product Specification

Revision	V1.1		
Date	2019-07-15		
Model Name	BL-M8821CU1		
Product Name	IEEE 802.11a/b/g/n/ac(1T1R) USB WIFI+BT Combo Module		
Bilian Approve Field			
Engineer	QC	Sales	
Can Zhang			
Customer Approve Field			
Engineer	QC	Manufactory	Purchasing

Shenzhen Bilian Electronic Co., Ltd

Address: 10-11F, Building A1, Huaqiang idea park, Guangming district, Shenzhen.Guangdong, China

Homepage: www.b-link.net.cn

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Revision History

Date	Document Revision	Product Revision	Description
2017/04/06	0.1	V0.1	Preliminary release
2017/09/26	1.0	V1.0	Update the product pictures
2019/06/18	1.1	V1.1	Revise the descriptive error and the dimension of product

1. Introduction

1.1 General Description

BL-M8821CU1 is the module designed by a highly integrated IEEE 802.11a/b/g/n/ac MAC/Baseband/RF WLAN and Bluetooth Baseband/RF single chip. It combines a WLAN MAC, a 1T1R capable WLAN baseband, BT Protocol (LM, LL and LE), BT Baseband, modem, and WLAN/BT RF in a single chip. The module provides a complete solution for a high-performance wireless LAN and Bluetooth device. The BT controller supports BT 4.2 system and compatibles Bluetooth 2.1+EDR.

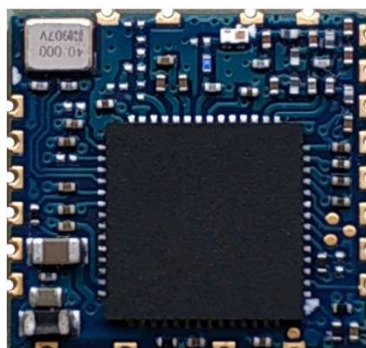


Figure 1 Top View



Figure 2 Bottom View

Note: The above pictures are for reference only

1.2 Features

- Operating Frequencies :
BT:2.402~2.48GHz(BT)
2.4GWIFI:2.412~2.472GHz(USA 11Channels, Europe and others 13 channels)
B5GWIFI:5.18~5.24GHz/5.745~5.825GHz
- Host Interface is USB 2.0 for WLAN and BT controller
- IEEE Standards : IEEE 802.11a/b/g/n/ac
- Wireless data rate can reach up to 433.3Mbps
- Bluetooth Low Energy Support
- Connect to external antenna through the half hole
- Power Supply:3.3V±0.2V

1.3 Applications

- MID
- IP Camera
- STB
- Smart TV
- E-book
- Other devices which need to be supported by wireless network

2. Functional Block Diagram

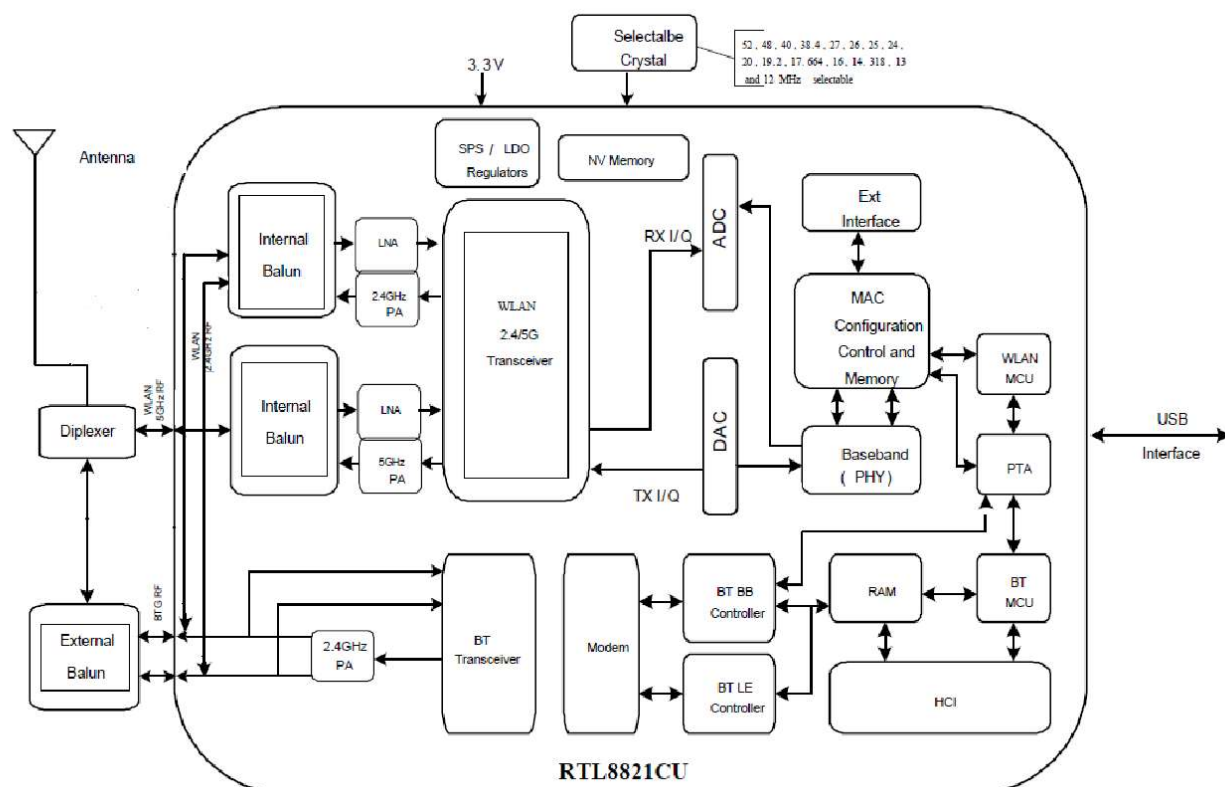


Figure 3 BL-M8821CU1 block diagram

3. Product Technical Specifications

3.1 General Specifications

Item	Description
Product Name	BL-M8821CU1
Main Chip	RTL8821CU-CG
Host Interface	USB 2.0
IEEE Standards	IEEE 802.11a/b/g/n/ac
Operating Frequencies	BT:2.402~2.48GHz(BT) 2.4GWIFI:2.412~2.472GHz(USA 11Channels, Europe and others 13 channels) B5GWIFI:5.18~5.24GHz/5.745~5.825GHz

Modulation	WiFi: 802.11b: CCK, DQPSK, DBPSK 802.11a/g: 64-QAM, 16-QAM, QPSK, BPSK 802.11n: 64-QAM, 16-QAM, QPSK, BPSK 802.11ac: 256-QAM, 64-QAM, 16-QAM, QPSK, BPSK BT: 8DPSK, $\pi/4$ DQPSK, GFSK
Working Mode	Infrastructure, Ad-Hoc
Wireless Data Rate	WiFi: 802.11b: 1, 2, 5.5, 11Mbps 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: HT20 reach up to 72.2Mbps, HT40 reach up to 150Mbps 802.11ac: MCS0~8, VHT20 reach up to 173.3Mbps, VHT40 reach up to 239Mbps, MCS0~9, VHT80 reach up to 433.3Mbps BT: 1Mbps for Basic Rate 2,3 Mbps for Enhanced Data Rate
Rx Sensitivity	-96dBm (Min)
Antenna Type	Connect to external antenna through the half hole
Dimension(L*W*H)	13.0*12.2*1.5mm (L*W*H) , Tolerance: ± 0.15 mm
Power Supply	3.3V ± 0.2 V
Power Consumption	Standby 82mA@3.3V (Max) TX mode 420 mA@3.3V (Max)
Clock Source	40MHz
Working Temperature	-10° C to +50° C
Storage Temperature	-40° C to +70° C

ESD CAUTION: Although this module is designed to be as robust as possible, Electrostatic Discharge (ESD) can damage this module. It must be protected from ESD at all times and handled under the protection of ESD.

3.2 DC Power Consumption

Vcc=3.3V, Ta = 25 °C, unit: mA				
Supply current	Typ.		Max	
Standby (RF disabled)	95		105	
802.11b	1Mbps		11Mbps	
Supply current	Typ.	Max.	Typ.	Max.
TX mode	341	368	331	381
Rx mode	93	126	92	128

802.11g	6Mbps		54Mbps	
Supply current	Typ.	Max.	Typ.	Max.
TX mode	325	388	240	376
Rx mode	85	112	86	116
802.11n HT20	MCS0		MCS7	
Supply current	Typ.	Max.	Typ.	Max.
TX mode	320	380	239	372
Rx mode	87	112	88	116
802.11n HT40	MCS0		MCS7	
Supply current	Typ.	Max.	Typ.	Max.
TX mode	286	352	215	360
Rx mode	89	116	90	120
802.11a	6Mbps		54Mbps	
Supply current	Typ.	Max.	Typ.	Max.
TX mode	340	420	270	380
Rx mode	90	120	91	124
802.11n HT40(5G)	MCS0		MCS7	
Supply current	Typ.	Max.	Typ.	Max.
TX mode	320	392	240	384
Rx mode	92	124	93	128
802.11ac	MCS0		MCS9	
Supply current	Typ.	Max.	Typ.	Max.
TX mode	281	352	254	368
Rx mode	111	144	110	150

3.3 RF Specifications

TX Power	2.4GWIFI:15.95dBm(Max.) 5.2GWIFI:12.88dBm(Max.) 5.8GWIFI:10.95dBm(Max.) 2.4GBT:4.93dBm(Max.) 2.4GBLE:3.84dBm(Max.)
TX Constellation Error(EVM)	2.4G: 802.11b: <-22dB@11Mbps 802.11g: <-28dB@54Mbps

	802.11n-HT20: <-28dB@72.2Mbps 802.11n-HT40:< -28dB@150Mbps 5G: 802.11a: <-28dB@54Mbps 802.11n-HT20: <-28dB@72.2Mbps 802.11n-HT40: <-28dB@150Mbps 802.11ac-VHT80:< -32dB@433Mbps
Receiver Minimum Input Sensitivity@PER	1Mbps: -96dBm@PER<8%; 11Mbps:-90dBm@PER<8%; 54Mbps:-72dBm@PER<10%; 150Mbps:-69dBm@PER<10%; 433Mbps:-59dBm@PER<10%;

4. Pin Assignments

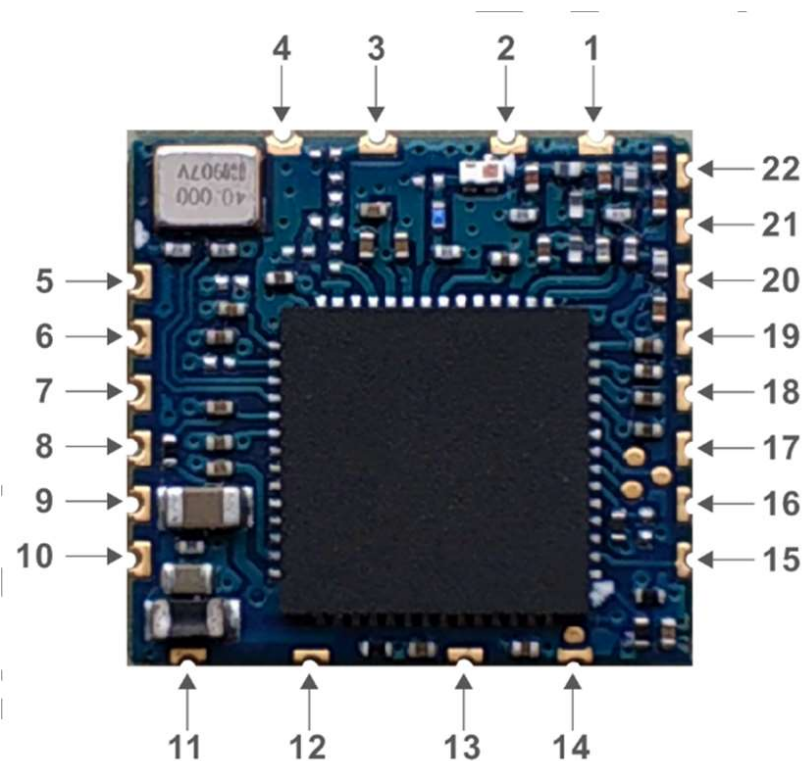


Figure 4 Pin Assignments (Top view)

The following signal type codes are used in the tables:

I:Input

O:Output

O/D: Open Drain

P:Power Pin

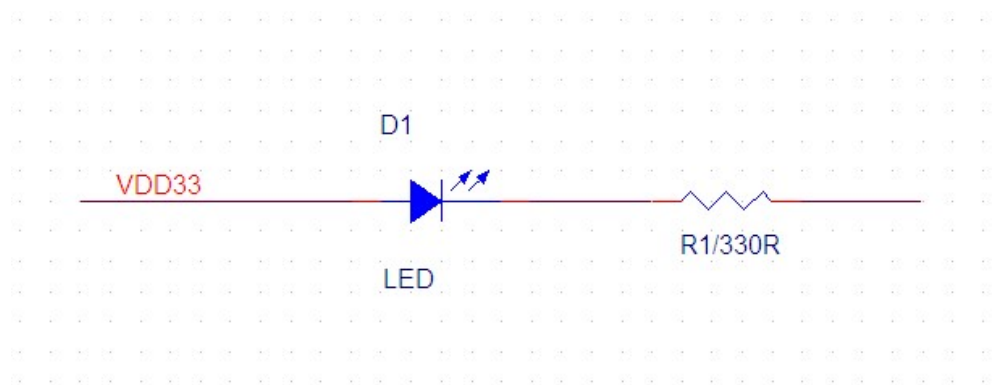
Pin No:	Pin Name	Type	Description
1	GND	P	Ground
2	RF_0	I/O	2G&5G WIFI and BT ANT
3	NC	/	/
4	GND	P	Ground

5、6、7、8	NC	/	Floating(Don't connected to ground)
9	BT_WAKE_HOST	O	Bluetooth device to wake up HOST
10	HOST_WAKE_BT	I	HOST to wake up Bluetooth device
11	VIN	P	VDD 3.3V Power Supply
12	USB_DM	I/O	USB Transmitter/Receiver Differential Pair
13	USB_DP	I/O	USB Transmitter/Receiver Differential Pair
14	GND	P	ground
15	3DD_SYNC	I/O	PCM_OUT/GPIO1
16	WL_DIS	I	WIFI DISABLE (Low potential)
17	BT_DIS	I	BT DISABLE (Low potential)
18	CHIP_EN	I	High asserting for use/ Low asserting reset
19	HST_WAKE_WL	I	HOST to wake up WIFI
20	WL_WAKE_HST	O	WIFI to wake up HOST
21	WPS	I/O	WPS Switch (GPIO)
22	LED	I/O	External LED Control(GPIO)

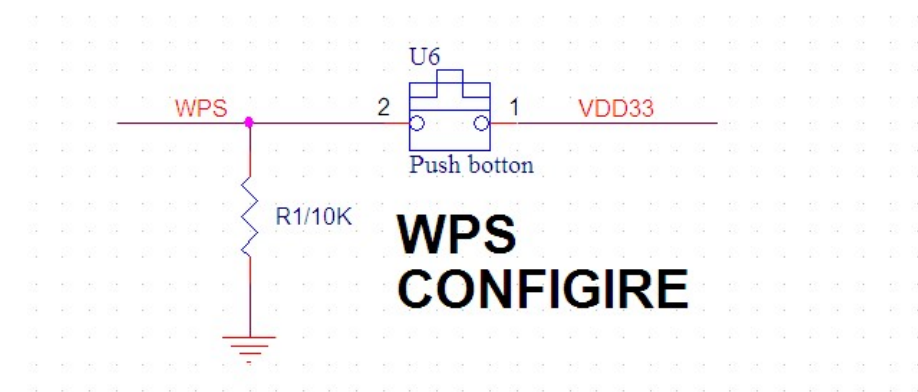
5. Application Information

5.1 Typical Application Circuit

LED Circuit



WPS Circuit



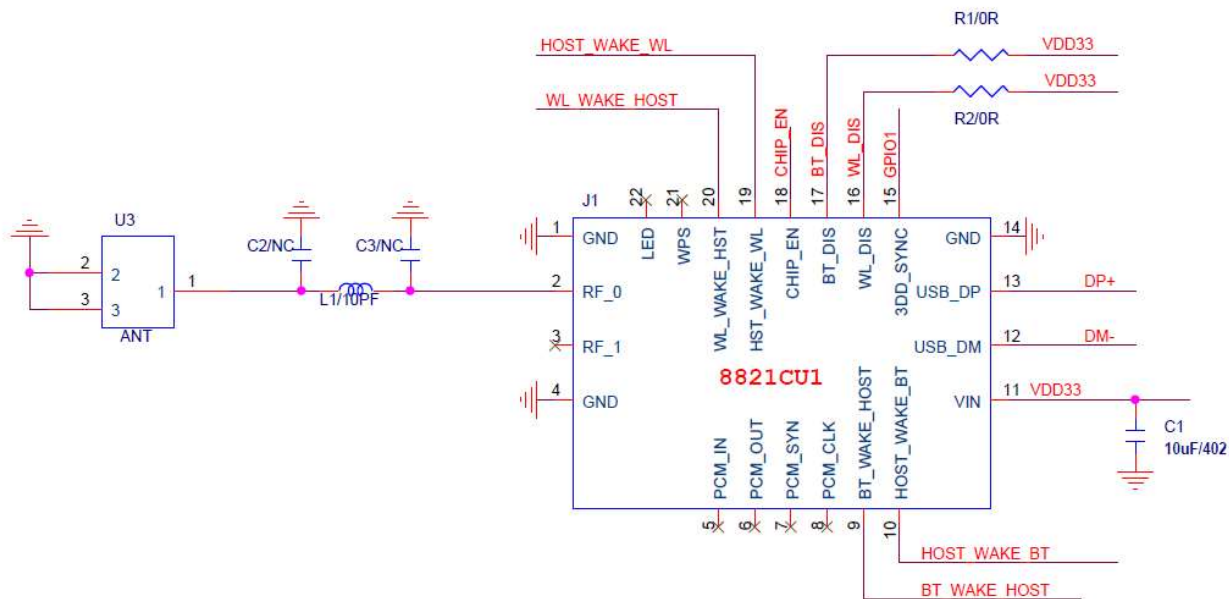


Figure 5 Typical application circuit

NOTE:

- 1、RF trace need to keep 50 ohm impedance.
- 2、USB differential pair need to keep 90ohm impedance.
- 3、C1 10uF closed to Module pin 11
- 4、Reserved 0R between Module pin 16 pin 17 and Host
- 5、LED active low.

Recommended alternatives or upgrades

If you just use WiFi (only connect the pin 1/2/11/12/13/14), you can replace it with the following solution:

BL-R7601MU2 / BL-R8188EU1 / BL-R8801MU2

Details please refer to : www.b-link.net.cn

6. Mechanical Specifications

Module dimension: Typical (L*W * H): 13.0mm*12.2mm*1.50mm Tolerance : +/-0.15mm

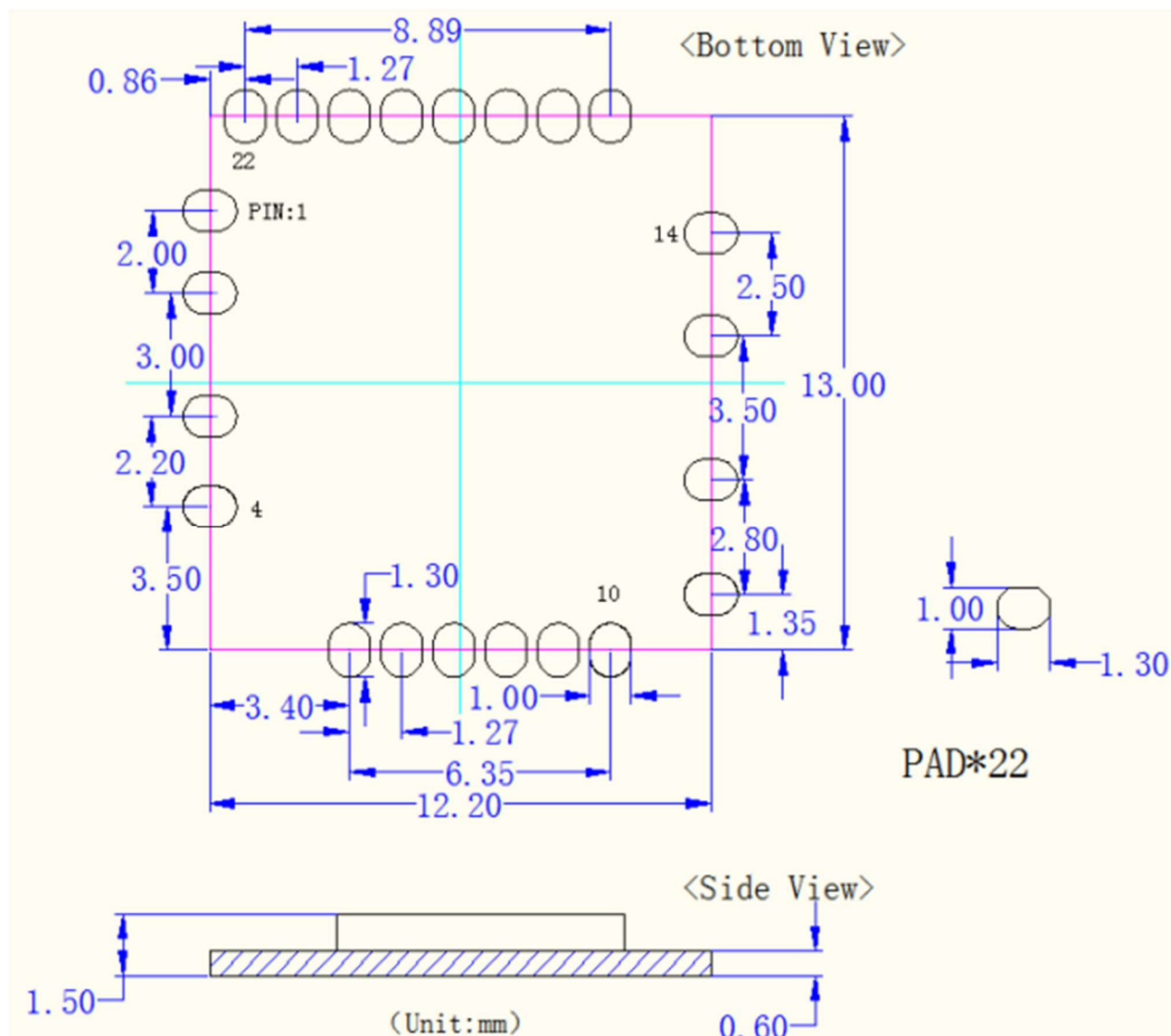


Figure 6 Module dimension

7. Others

7.1 Package Information



Figure 7 Package Information

7.2 Storage Temperature and Humidity

1. Storage Condition: Moisture barrier bag must be stored under 30°C, humidity under 85% RH.
The calculated shelf life for the dry packed product shall be a 12 months from the bag seal date.
Humidity indicator cards must be blue, <30%.
2. Products require baking before mounting if humidity indicator cards reads > 30% temp < 30°C,
humidity < 70% RH, over 96 hours.
Baking condition: 125°C, 12 hours.
Baking times: 1 time.

7.3 Recommended Reflow Profile

Reflow soldering shall be done according to the solder reflow profile, Typical Solder Reflow Profile is illustrated in Figures 8. The peak temperature is 245°C.

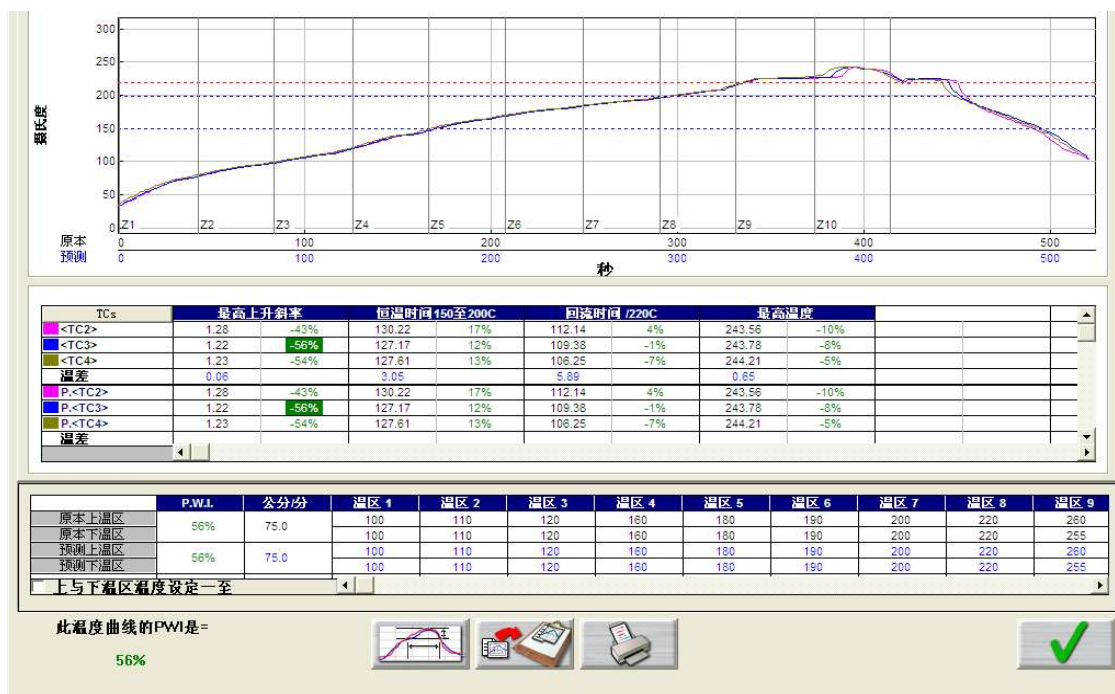


Figure 8 Typical Solder Reflow Profile

FCC Statement

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 important announcement

Important Note:

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 0cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,
3. For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change. (if modular only test Channel 1-11)

As long as the three conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Important Note:

In the event that these conditions cannot 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 cannot 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: **2AL6KBL-M8821CU1** "

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.

The end user manual shall include all required regulatory information/warning as show in this manual.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

This module is Limited single modular without shielding, host manufacturer have to consult with module manufacturer for the module limiting conditions when integrate the module in the host. module manufacturer should reviews detailed test data or host designs prior to giving the host manufacturer approval.

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

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

2.7 Antennas

This radio transmitter **2AL6KBL-M8821CU1** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Model	Type	Connector	Peak gain (dBi)				
			2400-2483.5 MHz	5150-5250 MHz	5250-5350 MHz	5470-5725 MHz	5725-5850 MHz
2400-2483.5 MHz	PIFA/ Dipole	/	2.0dBi	/	/	/	/
2.4GWIFI	PIFA/ Dipole	/	2.0dBi	/	/	/	/
5GWIFI	PIFA/ Dipole	/	/	2.0dBi	/	/	2.0dBi

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains FCC ID:2AL6KBL-M8821CU1".

2.9 Information on test modes and additional testing requirements

Host Host manufacturer which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C:15.247&FCC part 15E:15.407 and 15.209 requirement, only if the test result comply with FCC part 15.247&FCC part 15E:15.407 and 15.209 requirement, then the host can be sold legally.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.