

# WLT5856A

## Audio Bluetooth module

Product specification

V2.3

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# 1 Summary

WLT5856A is an audio Bluetooth module developed by WLT , and a single chip audio Bluetooth solution based on RDA5856. Audio protocol stack with built-in Bluetooth and various applications profile, It can easily realize the interconnection, data transmission, voice, music and other applications of the user's Bluetooth device

## Functional characteristics

- Support Bluetooth HFP ,A2DP, HID, AVRCP...
- Support transparent / protocol data transfer mode AT + instruction set configuration
- Support UART communication interface, UART interface up to 3Mbps.
- Built-in 16-bit audio DAC and 16-bit audio ADC
- Built-Capless headphone amplifier
- Built-in MIC bias and amplifier
- Support multiple analog audio input
- Onboard PCB antenna, the customer can also be an external antenna
- Single-supply operation 3.5~4.2V
- Stamp hole pin, easy and reliable welding.
- Small size: 13x27mm
- Flexible software platform to provide customized services



## Application area

- Bluetooth Speaker
- Bluetooth music transponder
- Car Bluetooth hands-free
- Health care
- Wireless POS machine
- Portable printer

## 2 Electrical characteristics

### Basic characteristics

Absolute Maximum Ratings	Min	Max	Unit
Power supply Voltage (LDOIN)	-0.5	+5.0	V
Voltage of I/O pins	-0.5	+3.6	V
Storage Temperature	-55	+125	°C

table 1. Absolute maximum

Recommended Operating Conditions	Min	TYP	Max	Unit
Power supply Voltage (LDOIN)	3.5	3.8	4.2	V
Voltage of I/O pins	0	3.3	3.6	V
Operating Temperature	-30	25	75	°C

table 2. Recommended working conditions

<b>Wireless Standard</b>	Bluetooth BR/EDR/LE	
<b>Frequency</b>	2.402GHz~2.480GHz	
<b>TX power</b>	4dBm	
<b>Antenna</b>	PCB antenna	

table 3. Antenna characteristics

# Radio frequency performance

## Bluetooth BR

Receiver Characteristics --- Basic Data Rate (VBAT = 4.0 V, TA = +27°C, unless otherwise specified)

SYMBOL	PARAMETER	CONDITION	MIN	TYP.	MAX	UNIT
General Specification						
	Sensitivity @ 0.1% BER		/	-93	/	dBm
	Maximum input @ 0.1% BER		0	/	/	dBm
	C/I co-channel		/	/	9	dB
Adjacent channel selectivity C/I		F = F0 + 1 MHz	/	/	-12	dB
		F = F0 - 1 MHz	/	/	-10	dB
		F = F0 + 2 MHz	/	/	-40	dB
		F = F0 - 2 MHz	/	/	-40	dB
		F = F0 + 3 MHz	/	/	-45	dB
		F = F0 - 3 MHz	/	/	-45	dB
		F = F_image	/	/	-10	dB
Out-of-band blocking		30MHz–2000MHz	-10	/	/	dBm
		2000MHz–2400MHz	-20	/	/	dBm
		2500MHz–3000MHz	-20	/	/	dBm
		3000MHz–12.5GHz	-10	/	/	dBm
	Inter-modulation		-34	/	/	dBm

table 4 BluetoothBR Receiving characteristics

Transmitter Characteristics --- Basic Data Rate (VBAT = 4.0 V, TA = +27°C, unless otherwise specified)

SYMBOL	PARAMETER	CONDITION	MIN	TYP.	MAX	UNIT
General Specification						
	Max RF output power		/	8	/	dBm
	Power control step		/	3	/	dB
	20dB bandwidth		/	0.92	/	MHz
Adjacent channel transmitter power		M – N  = 2 MHz	/	/	-52	dBm
		M – N  >= 3 MHz	/	/	-55	dBm
	Δ f1avg Maximum modulation		/	152	/	kHz
	Δ f2avg/Δf1avg		/	0.97	/	/
	ICFT		/	/	10	kHz
	Drift (1 slot packet)		/	10	/	kHz
	Drift (5 slot packet)		/	10	/	kHz

table 5 BluetoothBR Emission characteristics

## Bluetooth EDR

Receiver Characteristics --- Enhanced Data Rate (VBAT = 4.0 V, TA = +27°C, unless otherwise specified)

SYMBOL	PARAMETER	CONDITION	MIN	TYP.	MAX	UNIT
<b><math>\pi/4</math> DQPSK</b>						
	Sensitivity @0.01% BER		/	-92.5	/	dBm
	Maximum input @ 0.1% BER		-3	/	/	dBm
	C/I co-channel		/	/	10	dB
Adjacent channel selectivity C/I		F = F0 + 1 MHz	/	/	-10	dB
		F = F0 - 1 MHz	/	/	-8	dB
		F = F0 + 2 MHz	/	/	-39	dB
		F = F0 - 2 MHz	/	/	-39	dB
		F = F0 + 3 MHz	/	/	-45	dB
		F = F0 - 3 MHz	/	/	-45	dB
		F = F_image	/	/	-8	dB
<b>8DPSK</b>						
	Sensitivity @0.01% BER		/	-82.5	/	dBm
	Maximum input @ 0.1% BER		-5	/	/	dBm
	C/I co-channel		/	/	20	dB
Adjacent channel selectivity C/I		F = F0 + 1 MHz	/	/	-2	dB
		F = F0 - 1 MHz	/	/	0	dB
		F = F0 + 2 MHz	/	/	-28	dB
		F = F0 - 2 MHz	/	/	-28	dB
		F = F0 + 3 MHz	/	/	-38	dB
		F = F0 - 3 MHz	/	/	-38	dB
		F = F_image	/	/	0	dB

table 6 BluetoothEDR Receiving characteristics

Relative transmit power		/	-1.5	/	dB	
$\pi/4$ DQPSK max $w_0$		/	-5	/	kHz	
$\pi/4$ DQPSK max $w_i$		/	20	/	kHz	
$\pi/4$ DQPSK max $ w_i + w_0 $		/	17	/	kHz	
8DPSK max $w_0$		/	-2	/	kHz	
8DPSK max $w_i$		/	17	/	kHz	
8DPSK max $ w_i + w_0 $		/	17	/	kHz	
$\pi/4$ DQPSK Modulation Accuracy	RMS DEVM	/	10	/	%	
	DEVM < 30%	/	100	/	%	
	Peak DEVM	/	/	24	%	
8DPSK Modulation Accuracy	RMS DEVM	/	10	/	%	
	DEVM < 30%	/	99.8	/	%	
	Peak DEVM	/	/	22	%	
$\pi/4$ DQPSK In-band spurious emissions	$ M - N  = 1$ MHz	/	/	-38	dBc	
	$ M - N  = 2$ MHz	/	/	-36	dBm	
	$ M - N  \geq 3$ MHz	/	/	-41	dBm	
8DPSK In-band spurious emissions	$ M - N  = 1$ MHz	/	/	-37	dBc	
	$ M - N  = 2$ MHz	/	/	-36	dBm	
	$ M - N  \geq 3$ MHz	/	/	-40	dBm	
EDR Differential Phase Coding		/	100	/	%	
<b>Transmitter Characteristics --- Enhanced Data Rate (VBAT = 4.0 V, TA = +27°C, unless otherwise specified)</b>						
SYMBOL	PARAMETER	CONDITION	MIN	TYP.	MAX	UNIT
<b>General Specification</b>						
	Max RF output power		/	4	/	dBm

table 7 BluetoothEDR Emission characteristics

(VDD = 2,7 to 5,5V, TA = -25°C to 85 °C, unless otherwise specified)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
<b>General Parameters</b>						
F <sub>in</sub>	FM Input Frequency	BAND=00	87		108	MHz
		BAND=01	76		91	MHz
		BAND=02	76		106	MHz
		BAND=03	65		76	MHz
V <sub>rf</sub>	Sensitivity <sup>1,2,3</sup>	(S+N)/N=26dB		2		μV EMF
R <sub>in</sub>	LNA Input Resistance <sup>7</sup>			150		Ω
C <sub>in</sub>	LNA Input Capacitance <sup>7</sup>		2	4	6	pF
(S+N)/N	Maximum Signal Plus Noise to Noise Ratio <sup>1,2</sup>		55	60	-	dB
THD	Audio Total Harmonic Distortion <sup>1,3,6</sup>			0.15	0.2	%
R <sub>L</sub>	Audio Output Loading Resistance	Single-ended		32		Ω
<b>Pins L<sub>NAN</sub>, L<sub>NAP</sub></b>						
V <sub>com_rfin</sub>	Pins L <sub>NAN</sub> and L <sub>NAP</sub> Input Common Mode Voltage			0		V
V <sub>com</sub>	Audio Output Common Mode Voltage		0.95	1	1.05	V

table 8 FM RF characteristics

### Audio characteristics

Parameter	Min	Type	Max	Unit
SNR	-	93.5	-	dB
THD	-	-85.5	-	dB
Output voltage	-	598	-	m V rms

table 9 Audio performance



### 3 Hardware introduction

#### Functional block diagram

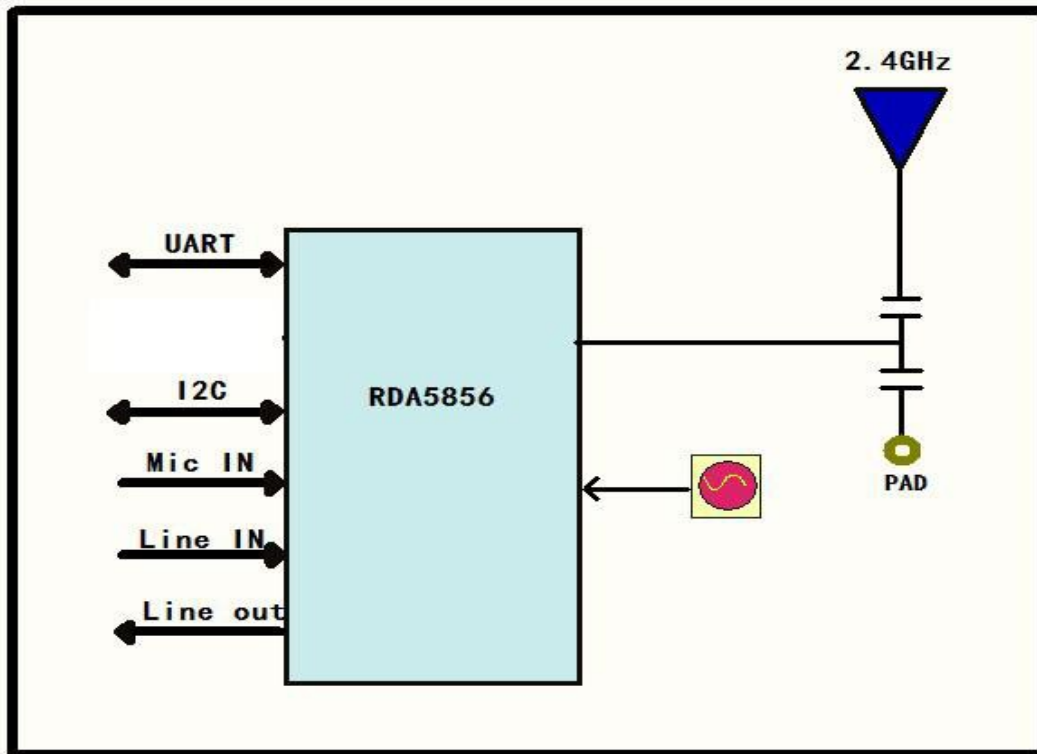


figure 1. WLT5856A Block diagram of the module

WLT5856A There are two main parts inside the module :

1. Bluetooth part: Contains the Bluetooth chip RDA5856, 2.4GHzPCB Antenna and external interface.
2. Audio section: RDA5856 integrated Audio Codec, Provides analog audio input and output,Digital audio input and output,Headphone amplifier and so on, Support for Bluetooth HFP, A2DP (Source 和 Sink) Other audio applications.

## Module size and pin arrangement

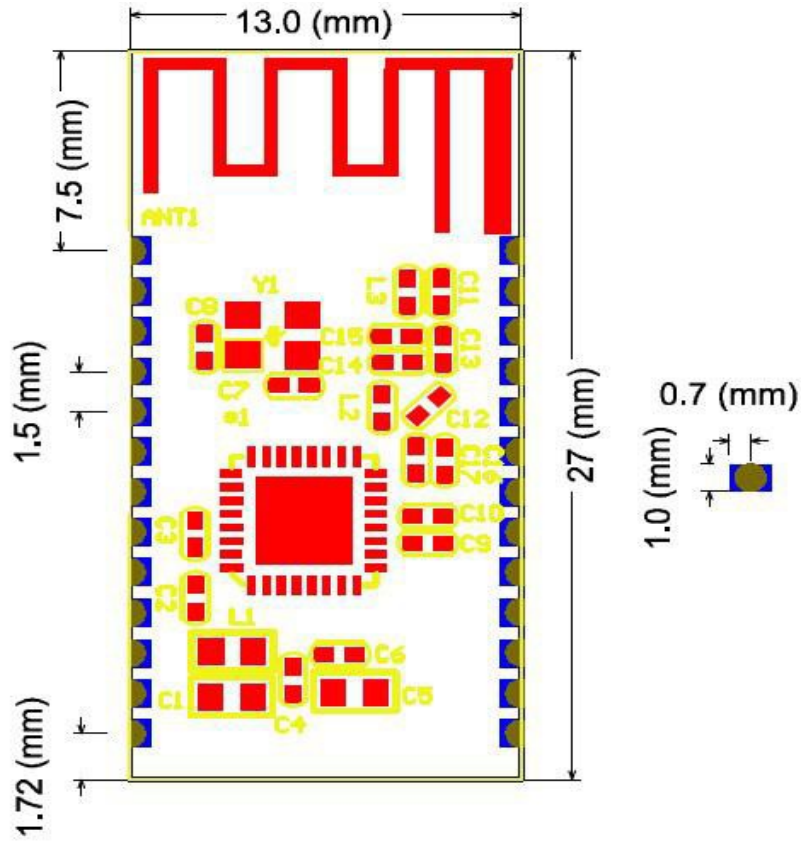


figure2. WLT5856A Module Dimensions (Front)

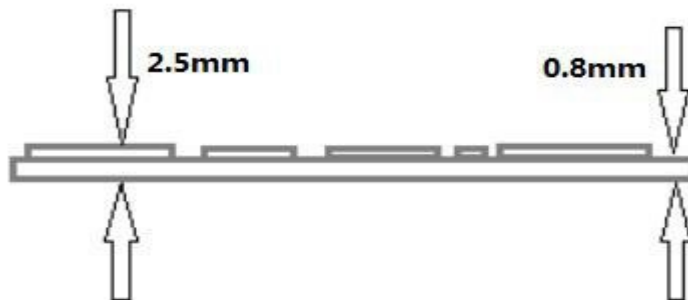


figure3. WLT5856A Module thickness

## Pin definition

Pin #	Name	Type	Description
1	UART_TX	I/O	GPIO3_1
2	UART_RX	I/O	GPIO3_0
3	UART_CTS	I/O	GPIO3_2
4	GPIO0_4	I/O	GPIO0_4



5	NC	I/O	NC
6	GPIO3_7	I/O	GPIO3_7
7	GPIO4_0	I/O	GPIO4_0
8	SD_DAT	I/O	GPIO4_3
9	SD_CLK	I/O	GPIO4_4
10	SD_CMD	I/O	GPIO4_5
11	RESET	-	External reset input, active low
12	VDD	POWER	Battery power supply
13	GND	POWER	Digital Ground
14	USB_DN	I/O	USB negative input
15	USB_DP	I/O	USB positive input
16	LINEIN_L	I/O	Line input left
17	LINEIN_R	I/O	Line input right
18	DACOUT_L	I/O	Line input left
19	DACOUT_R	I/O	Line input right
20	MIC_P	ANALOG	Microphone input positive
21	MIC_N	ANALOG	Microphone input negative
22	MIC_BIAS	POWER	Microphone bias
23	FM_RFN	ANALOG	FM_RFN
24	FM_RFP	ANALOG	FM_RFP
25	ANT	-	External ANT PIN
26	AGND		Analog Ground

table 10 WLT5856A Pin definition

## Reference schematic diagram

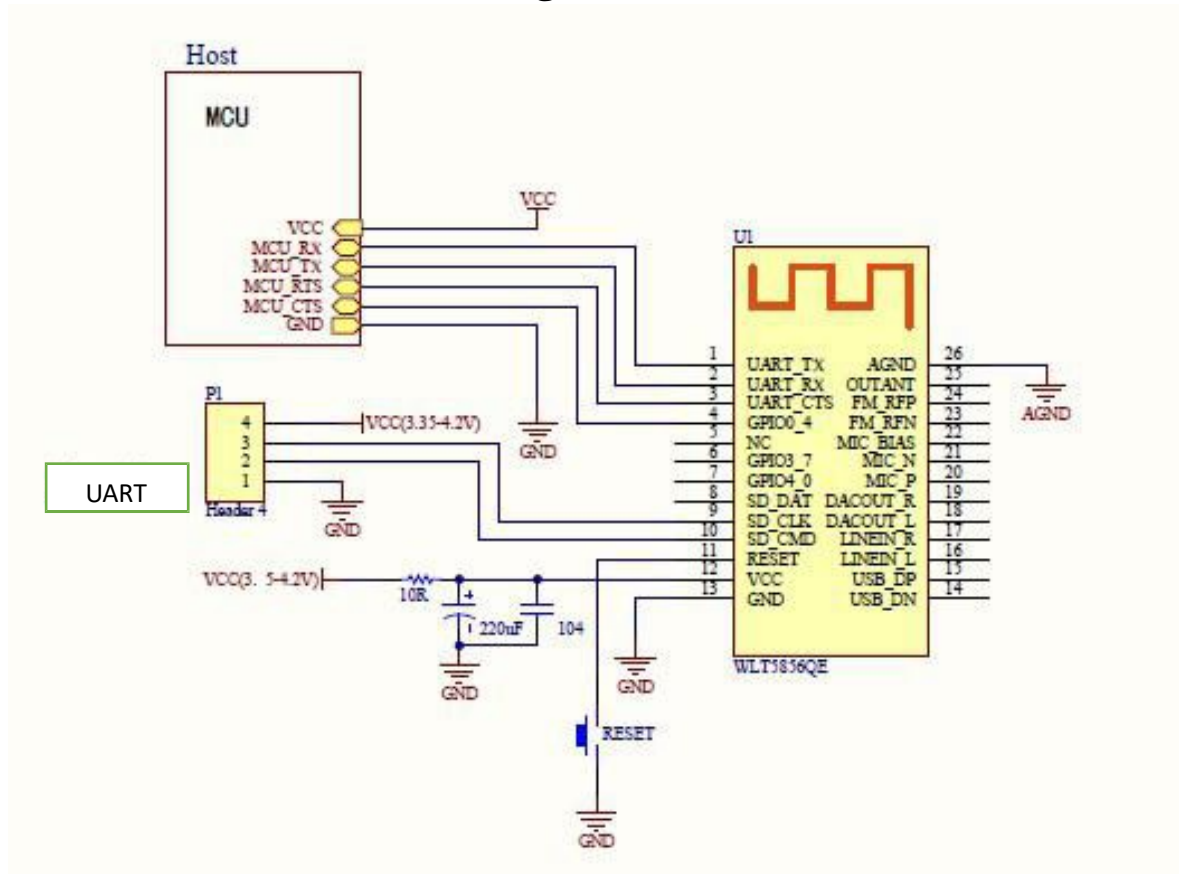


figure 4. WLT5856A Reference design

## Module Schematic diagram

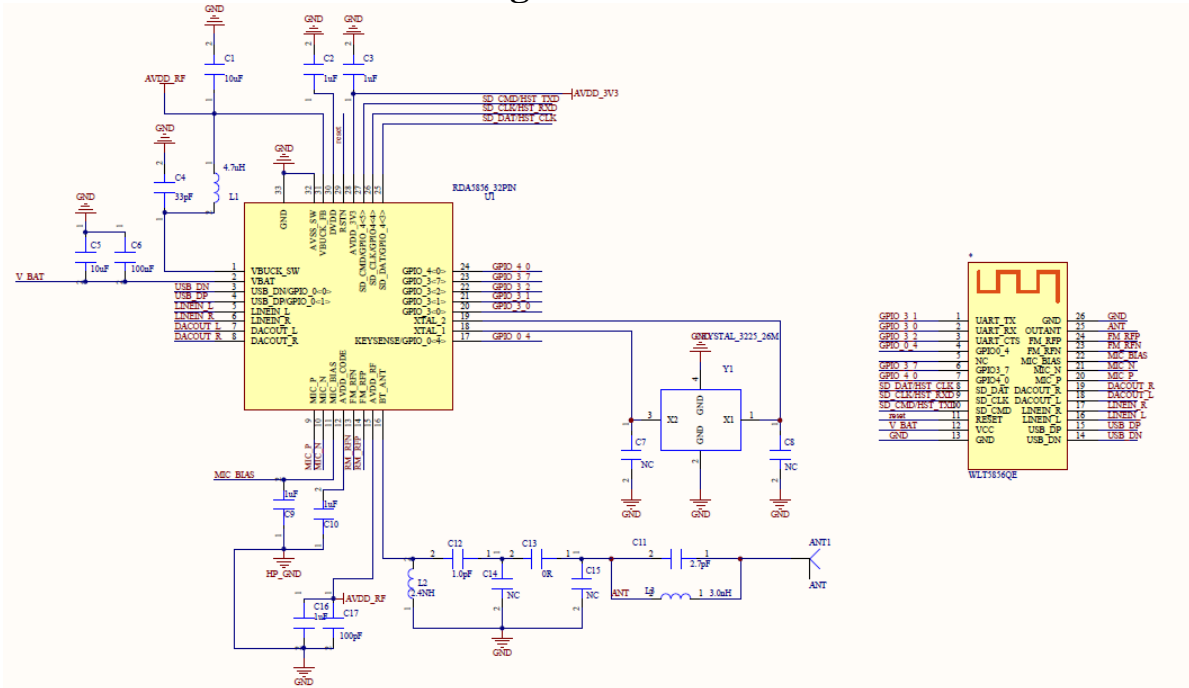


figure 5. WLT5856A Module Schematic diagram

## Antenna circuit

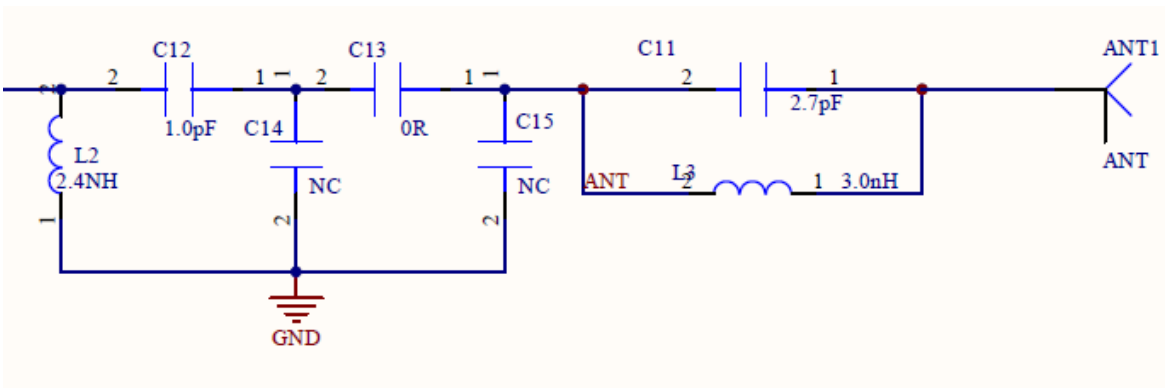


figure 6. WLT5856A Module Antenna circuit

The PCB antenna on the design on 40-TMAX50-VFD2G is a PCB Antenna.( See Figure4-1) The PCB Antenna was designed to match an impedance of 50 ohm at 2.45 GHz. Antenna Gain : **2.5dBi**.

## 4 PCB Design

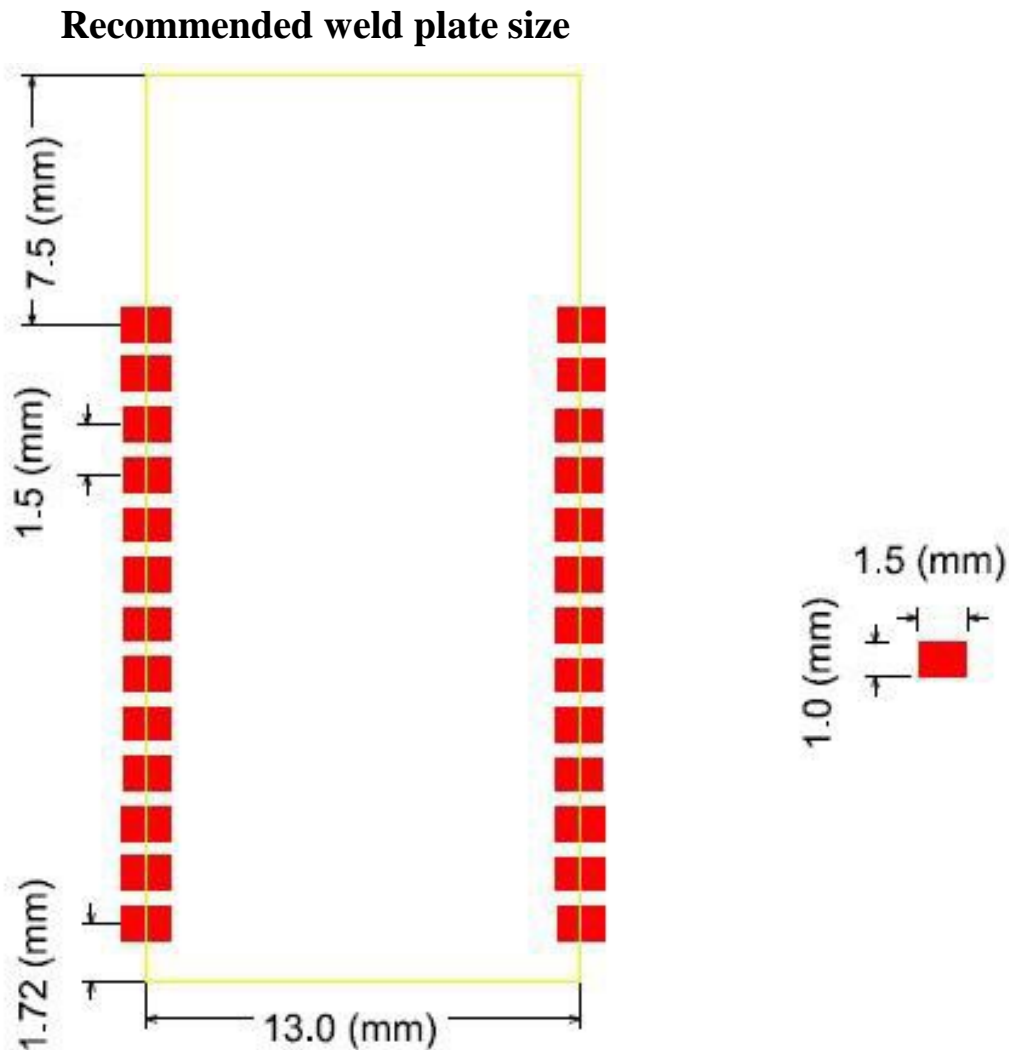


figure 7. WLT5856A Package size reference

### PCB layout Matters needing attention

Bluetooth is working 2.4GHz Under the frequency,Should try to avoid the impact of various factors on the wireless transceiver, pay attention to the following points:

1. The part of the product enclosure that surrounds the module avoids the use of metal, and if the enclosure is metallic, consider using an external antenna.
2. Metallic screws inside the product should be kept away from the RF part of the module.
3. Module should be placed around the motherboard, the antenna part of the edge or angle, the module antenna below the motherboard area does not allow copper shop or alignment.

# PCB Layout

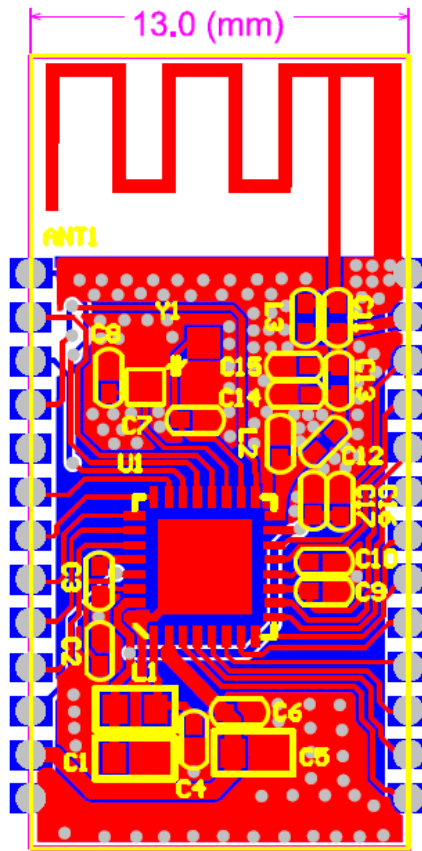


figure 8. WLT5856A PCB Layout

## 5 Reflux parameter recommendation

Reflow parameters can refer to the following settings:

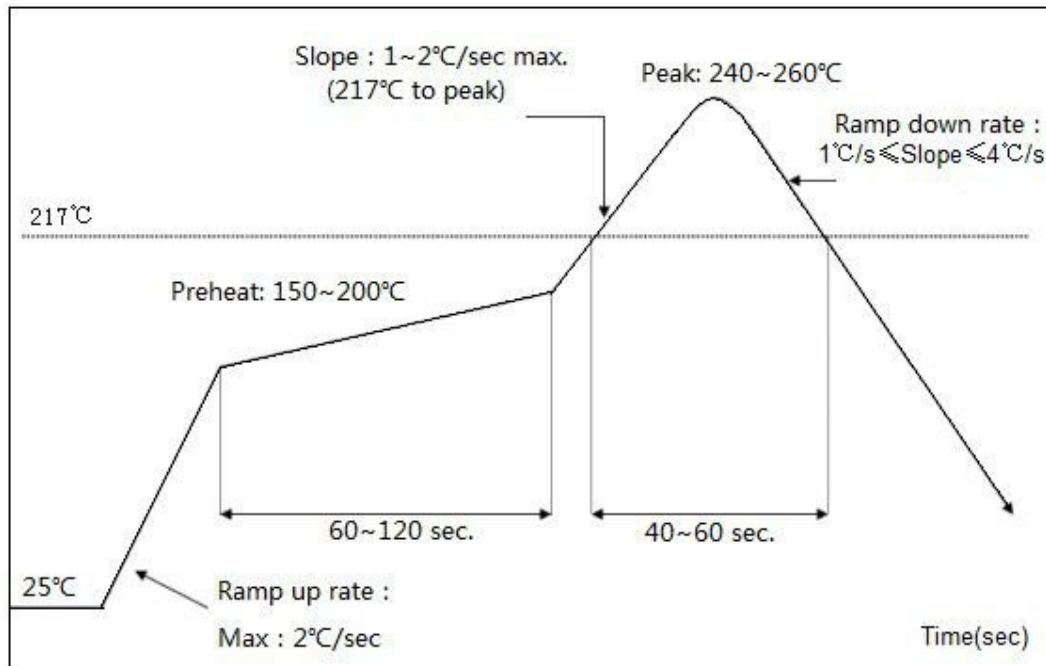


figure 9. Reflow recommended curve

Temperature range	Time	Key parameters
Preheat zone(<150°C)	60-120S	Ramp up rate: ≤2S
Uniform temperature zone(150-200°C)	60-120S	Ramp up rate: <1S
Recirculation zone(>217°C)	40-60S	Peak: 240-260°C
Cooling zone		Ramp down rate: 1°C/s ≤ Slope ≤ 4°C/s

table 11. Reflow recommended parameters



## 6 Antenna S11 Parameter



figure 10.

## 7 Software application

WLT5856A is an audio Bluetooth module that supports Audio Codec. The module integrates audio Bluetooth protocol stack, supports a variety of traditional Bluetooth applications and Bluetooth low energy applications. For example: HFP, A2DP, AVRCP and so on.

WLT5856A module supports UART AT+ command mode to configure and select the mode of operation, the specific command, please see the relevant WLT5856A module software application documentation.

WLT5856A module to support custom software, please contact our company.

## 8 FCC Statement

Warning: Changes or modifications to this unit 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

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

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 RF Radiation Exposure Statement Caution: To maintain compliance with the FCC's RF exposure guidelines, The Module can be installed in portable Device.

This device complies with Part 15, Part 15.247 of the FCC Rules. The FCC ID for this device is YMX-EI8602A.

If the FCC ID is not visible with the module is installed inside another device, then it must be still responsible for the FCC compliance requirement of the end product which referring to the enclosed module and it also must display a label, such as the following:

Contains Transmitter module FCC ID: YMX-EI8602A or contains FCC ID: YMX-EI8602A

The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

The end user manual shall include all required regulatory information / warning as shown in this manual, include: This product must be installed and operated with less than 20 cm between the radiator and user body.