RTL8763B Hardware Instruction

1. RTL8763B reference circuit

Below are the reference circuits for

- **RTL8763BM/BF for headset**
- **RTL8763BS for headset and speaker**
- **RTL8763BA for speaker application**

Application Circuit

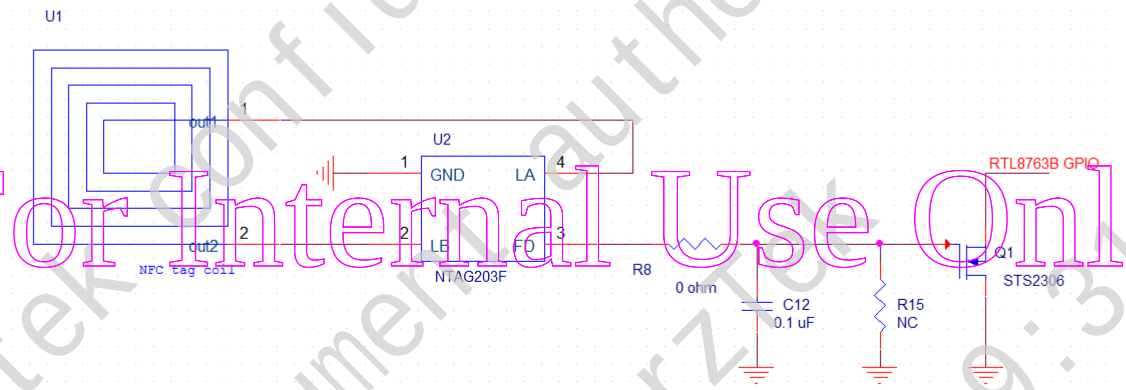
2.1 NFC

NFC application incorporates NTAG203F to interface with external NFC devices.
When the NTAG is positioned in the RF field, the RF communication interface allows the transmission of the data between NTAG and devices
.

The FD output signal can be used as interrupt source to wake up RTL8763B or trigger further actions. Typical applications include simple Bluetooth pairing.
For low trigger, add R15 and Q1, however, the high trigger is also do-able in this application. By high trigger, R15 and Q1 could be saved.

Without any filter the signal on field detection pin may show significant noise. So R~~1~~8 and C~~1~~12 may be used as a low-pass filter, to decrease the noise level at the gate of Q1.

An external pull-up resistor may be placed on RTL8763B GPIO input pin in case no internal pull-up is present.



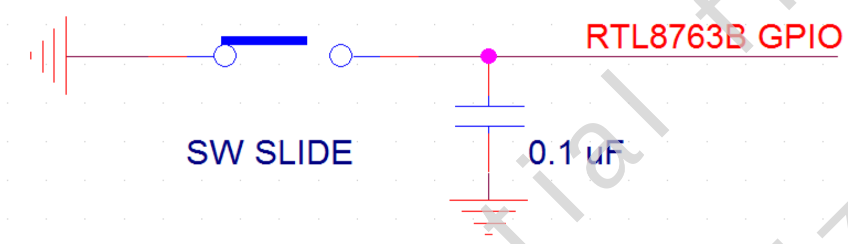
2.2 Slide switch

Slide switch feature is supported to facilitate main power turn-on and turn-off, which reduces BoM cost and design complexity.

RTL8763B will detect the GPIO voltage level in the slide switch application circuit (set in UI) and do the corresponding behavior, the design logic is very straight forward:

Low: Power on

High: Power off



2.3 SPI Flash

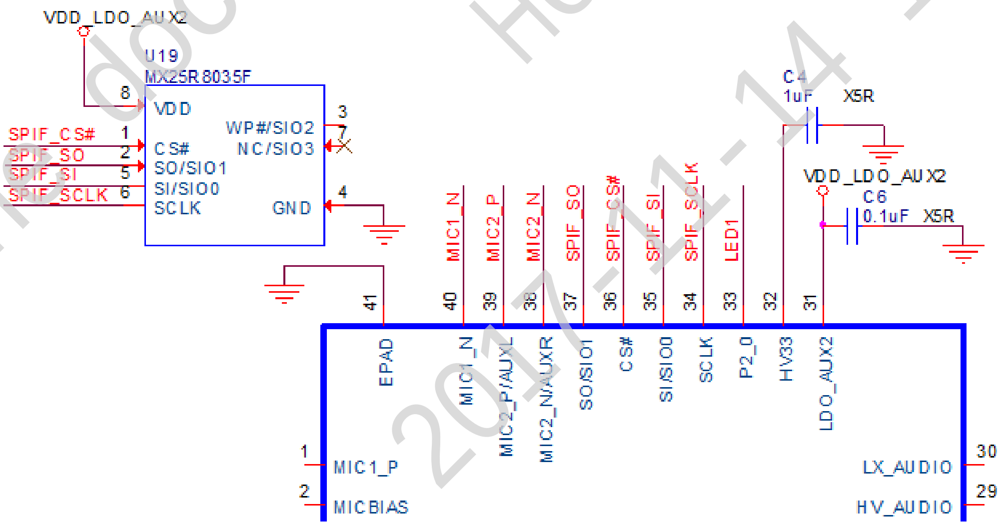
RTL8763BF supports 8M-bits on chip serial FLASH memory, it is recommended to use this solution for PCB area sensitive designs.

RTL8763BM, RTL8763BS, RTL8763BA do not support internal FLASH memory, but SPI interfaces are available to connect to external serial FLASH memory.

RTL8763BM and RTL8763BS support 1-bit and 2-bit mode.
RTL8763BA support 1-bit, 2-bit and 4-bit mode.

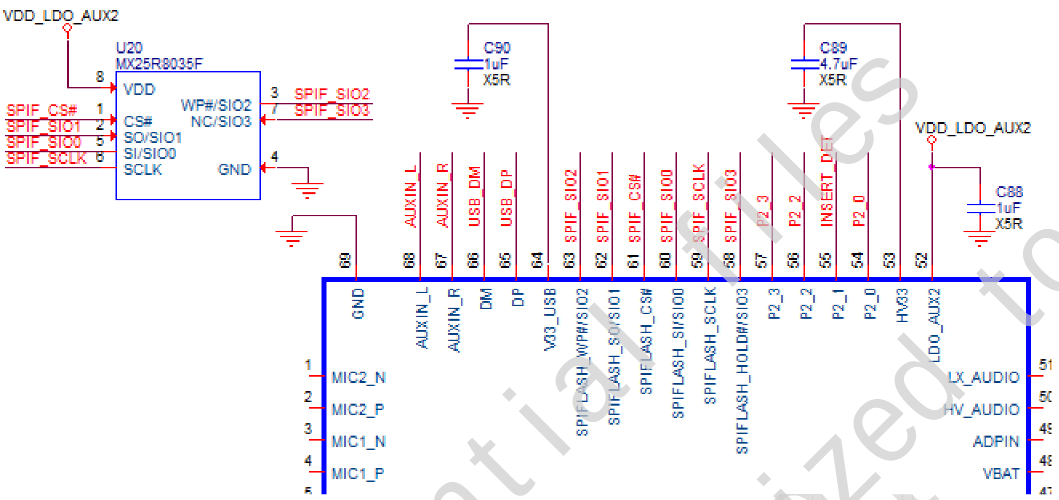
RTL8763B has dedicated pins for external flash memory device connection.

For 1 and 2-bit mode SPI flash, flash IC should be connected to RTL8763B as below



For 4-bit mode SPI flash, flash IC should be connected to RTL8763BA as below

RTL8763BA

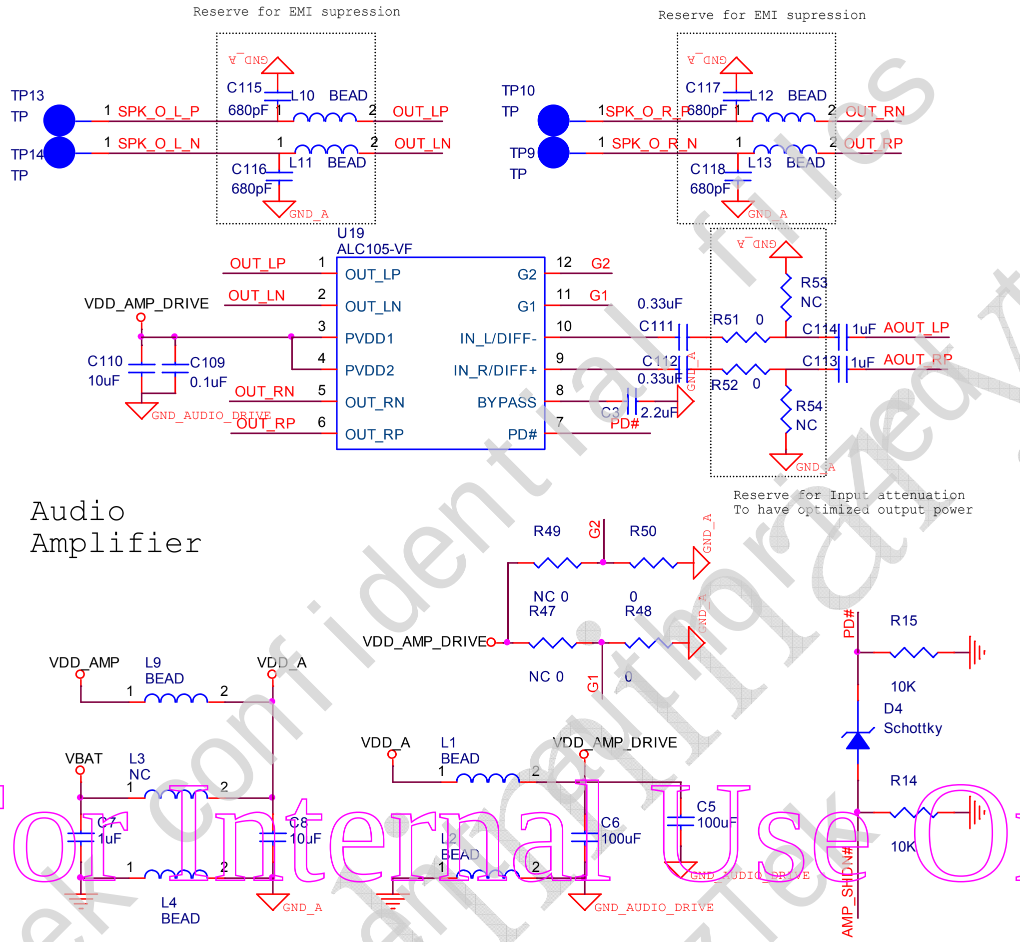


Two decoupling capacitor, 0.1uF and 10uF, should be placed on flash IC power pin VDD_LDO_AUX2.

When RTL8763B is in DLPS state, SPIFLASH_CS# should always be high if flash power is present. FW procedure should pay attention to SPI pin level state in DLPS mode according to the specific flash IC used in the design.

The layout placement of the flash should be close to RTL8763B, the signal trace should be as short as possible in order to reduce the possible EMI issue. For the layout rule suggestion, please refer to the layout guide.

2.4 Audio Amplifier



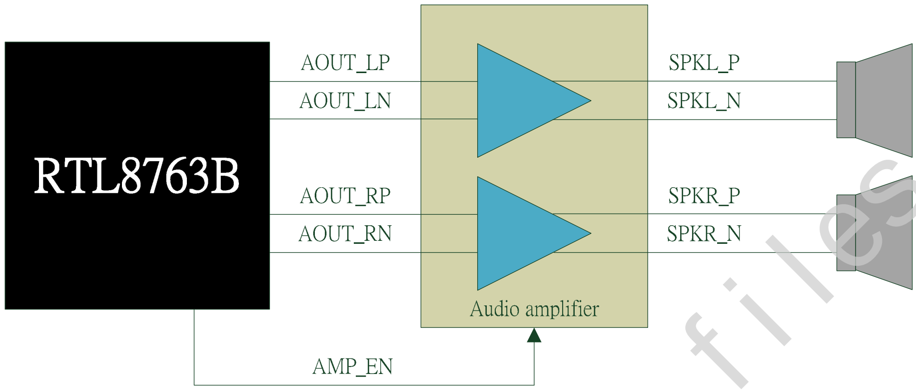
Amplifier power is divided into two parts, VDD_AMP and VDD_AMP_DRV.

It is suggested to separate the power by ferrite bead, that is, VDD_A to VDD_AMP and VDD_A to VDD_AMP_DRV respectively, and the ground plan is also suggested to be separated, especially GND_AMP_DRIVE due to its large power noise.

VDD_A should be from external boost output or from Li-Ion battery directly, it is not suggested to be from USB directly due to its max current limitation to 500mA in BT1.1 and BT2.0 unless the USB power could be from a power adapter.

D4 SCHOTTKY diode should be reserved as option to avoid power leakage from audio amplifier to BT chip.

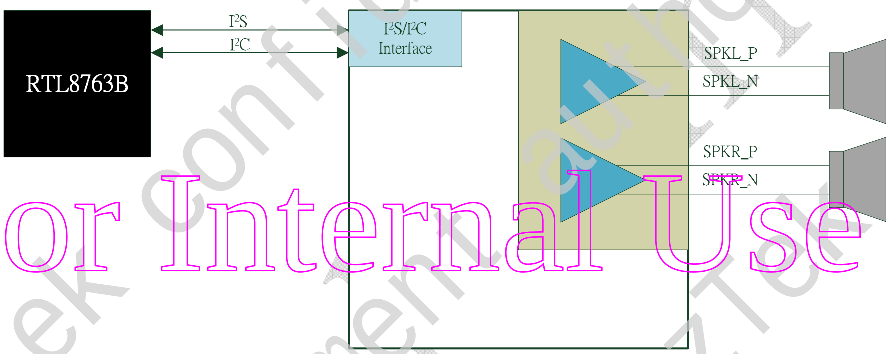
RTL8763B audio supports excellent SNR in codec performance, the SNR could be up to 102dBA. With differential output setting and codec powered at 2.8V, 5Vp-p swing at right and left channel (AOUT_LP-AOUT_LN and AOUT_RP-AOUT_RN) could use to support 50W audio system with external amplifier setting at 20dB gain



For a 20W audio system, with 14dB gain
For a 50W audio system, with 18dB gain
For a 100W audio system, with 21dB gain

RTL8763B could achieve a loud speaker design with minimum BOM cost.

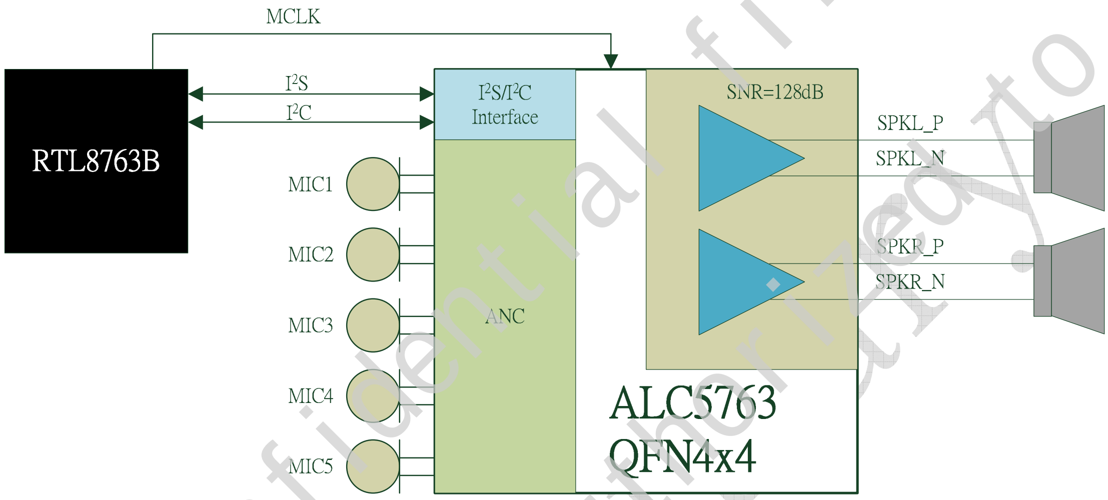
RTL8763B also supports I^2S audio amplifier and I^2C control interface.



REALTEK supports several kinds of audio amplifier, they are:
(1) ALC1003: analog input mono 3W amplifier
(2) ALC105-VF: analog input stereo 3W amplifier
(3) ALC122: analog input stereo 3W amplifier, volume control by I^2C
(4) ALC1304: analog input stereo 20W amplifier
(5) ALC1310: digital I^2S input stereo 10W amplifier
(6) ALC1312: digital I^2S input stereo 25W amplifier

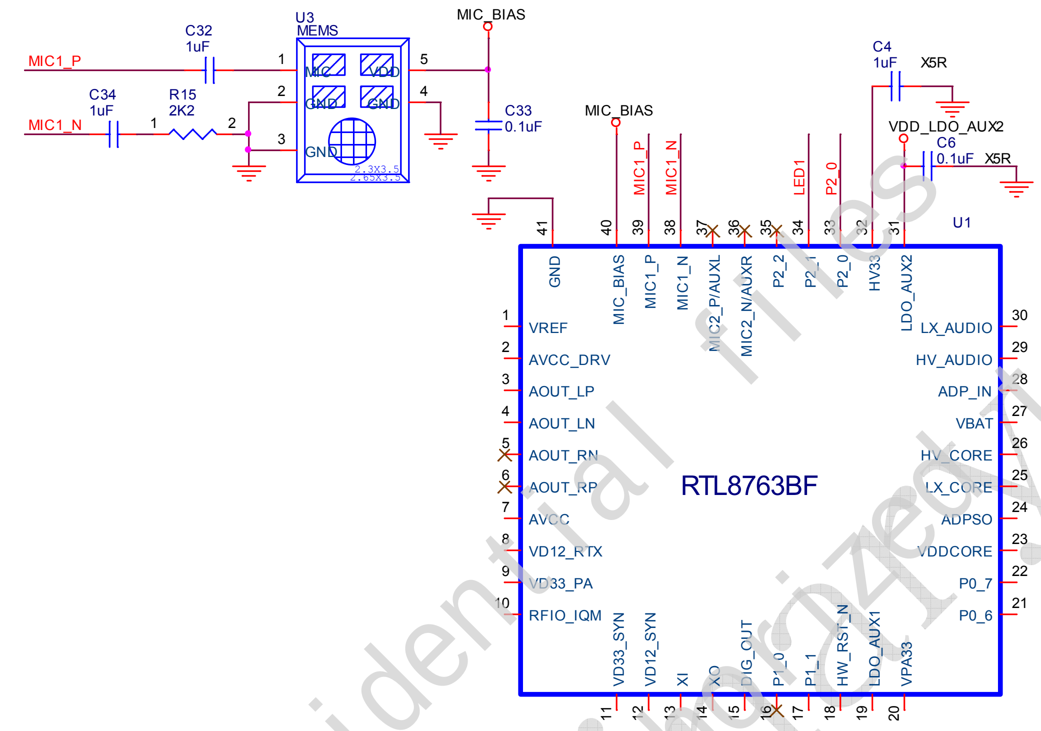
2.5 ANC

REALTAK RTL8763B and REALTEK ALC5763 together to form a competitive solution for high-end audio. This solution supports a rich feature, ANC and Hi-Fi codec with 128dB SNR. The package size of ALC5763 is 4x4mm^2. For the design notice of how to make a good ANC headset, please refer to ALC5763 application note.



2.6 Analog MEMs MIC

Differential AMIC connection to RTL8763B is shown in the following circuit.
It is suggested to use differential connection from the MEMs to the BT chip in case there is some noise on the PCB board, the differential connection could help to suppress the common mode noise

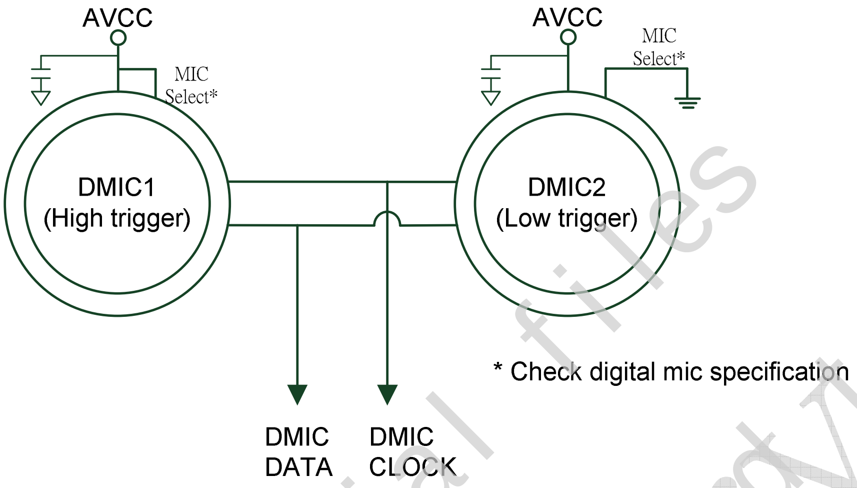


2.7 Digital MIC

RTL8763B supports most of the industrial digital microphone in PDM format.
It is composed of one set of digital microphone core and one set of DMIC interface including clock and data.
With RTL8763B being able to latch data at both rising and falling edges, dual digital microphone can be applied.
For the DMIC1 and DMIC2 digital microphone definition, please check the spec from your digital microphone vendor. The figure below is an example of DMIC connection.

Two digital MICs can share clock and data lines, with one DMIC set to output data at the rising edge and the other at falling edge through DATA_SEL. Whether DATA_SEL line is tied to low or high should consult DMIC vendors.

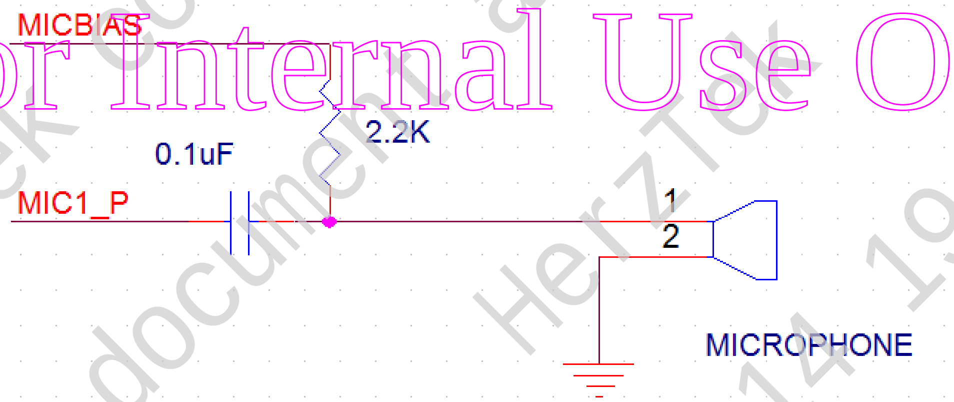
If there's only one DMIC in the design, the same connection can be used and the state of DATA_SEL would be fine either way.



The MEMs power could be connected with MIC_BIAS, MIC_BIAS level is adjustable in UI tool according to the DMIC spec.

2.8 Omnidirectional Condenser MIC

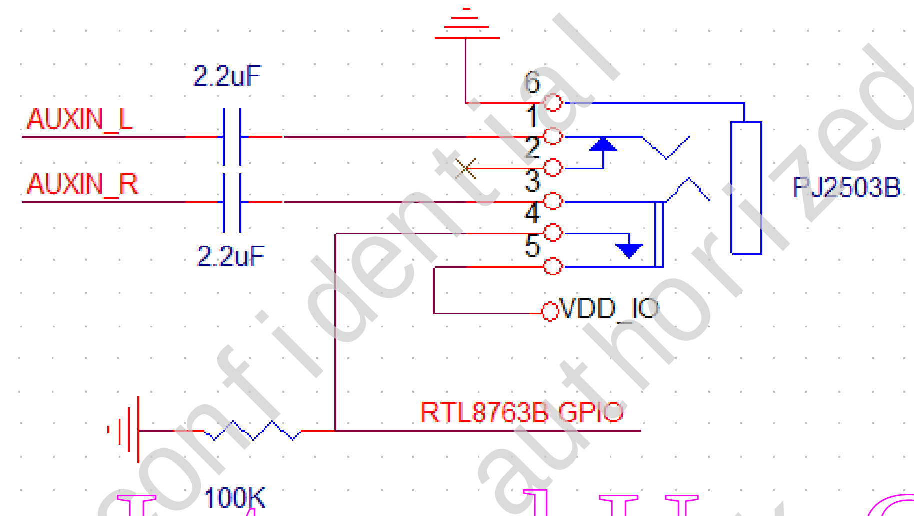
For condenser microphones, it could be connected in single end or differential mode.



2.9 AUX-IN

RTL8763B provides an audio AUX-IN function. Below is an application reference circuit. An extra GPIO can be used to indicate AUX-IN plug-in.
The aux-in priority could be defined in UI tool.
Generally, the priority: eSCO > AUX-IN > A2DP.
When in AUX-IN mode, the system could be switched back to eSCO link while a phone call comes.

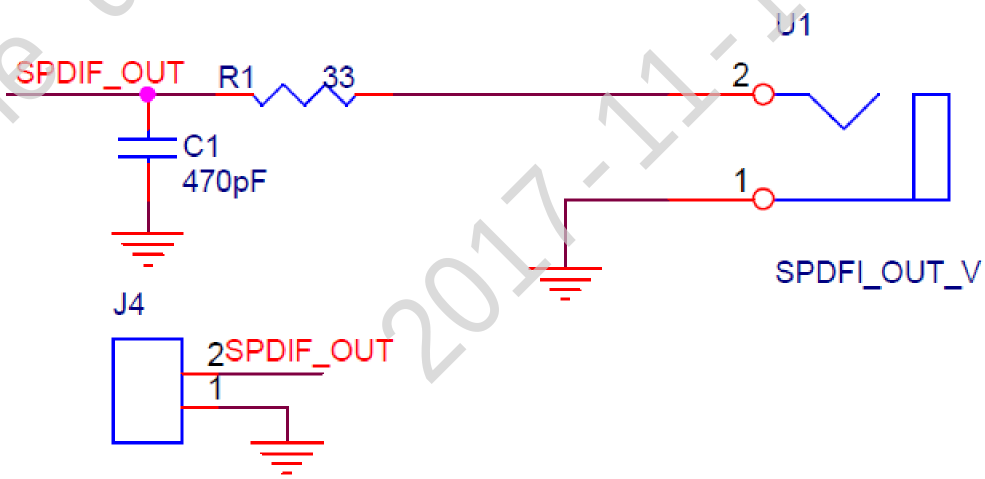
In AUX-IN mode, the system could be auto switched off in a defined time interval if there is no audio signal existed, the power off threshold and time interval could be defined in DSP tool.



2.10 S/PDIF

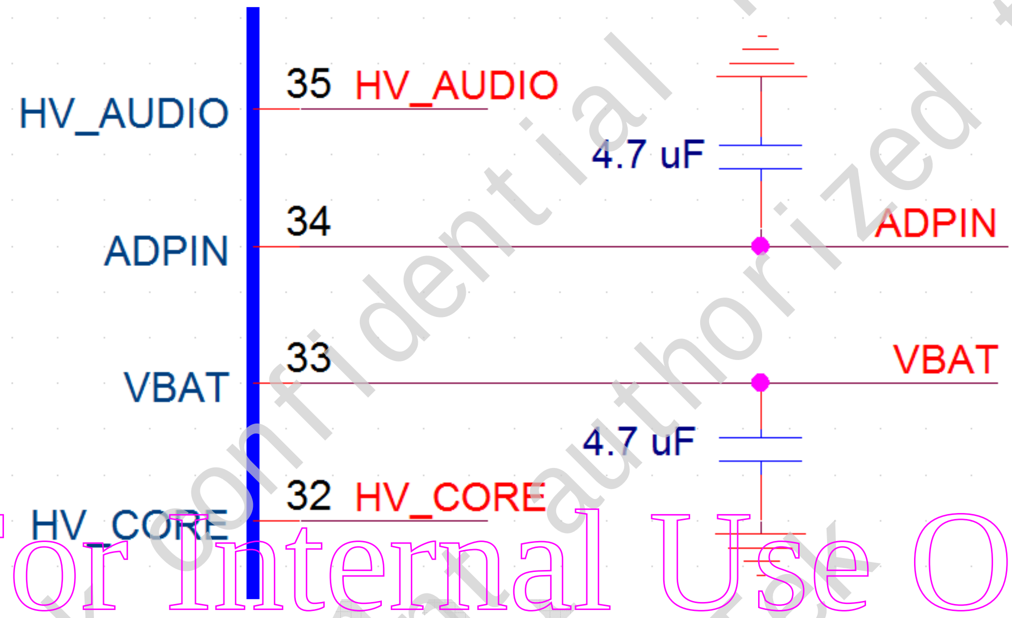
RTL8763B supports S/PDIF (**S**ONY/**P**HILIPS **D**igital **I**nter**F**ace) output, the purpose is to transfer the digital audio data among digital devices with minimum loss.

The output of S/PDIF can be connected to external audio amplifiers and implemented to be Bluetooth speakers.



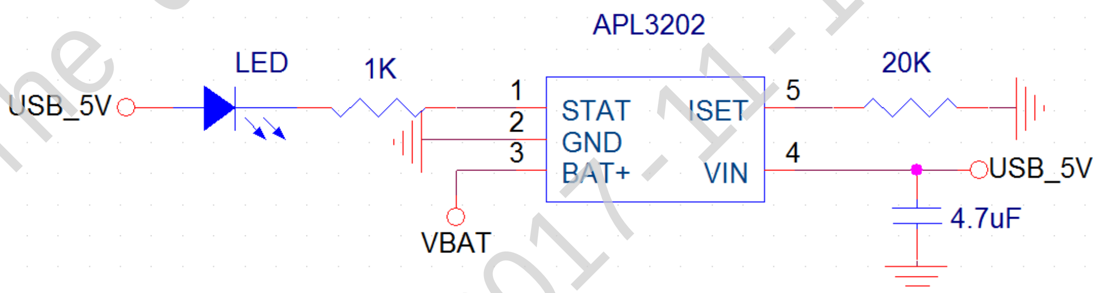
2.11 Charger

RTL8763B integrates an internal charger for Li-Ion battery application.
ADPIN can be connected to USB 5V, 5V DC power jack or any other 5V power source.
VBAT is connected to the battery.
The adapter input max is 6.5V, the design should make sure the adapter overshoot voltage not to exceed this level, the external 4.7uF/X5R/16V is mandatory, an extra 4.7uF/X5R/16V or 10uF/X5R/16V is suggested to reserve as back up.
The supported charger current could be programmed in UI tool, with maximum to be 400mA with thermal protection. (check ambient detection chapter)



The internal charger function can also be turned off if the charger current request is more than 400mA, under this condition, an external battery charger is needed.
Below is an–application circuit for external PMU with APL3202, in this example, the maximum charger current could be up to 1A depending on the resistor at the ISET pin.

External PMU



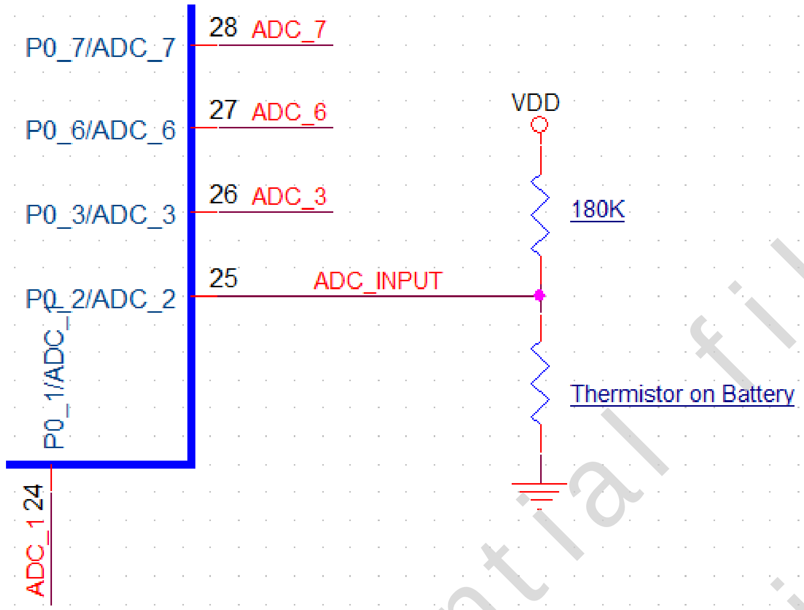
2.12 Battery Learning

RTL8763B supports powerful battery learning capability.
It could be used to show the battery remains gauge in the APP.
Step1: to charge a battery used in a headset to full (4.2V)
Step2: to discharge the battery with 5mA-10mA loading, discharge from 4.2V to 3.0V, get the discharge raw data by a multi-meter.
Step3: to divide the discharge curve into 12, each level to configure in UI tool.
Example: to get a discharge curve and derive the voltage number.

2.13 Ambient Detection

RTL8763B supports an excellent, high precision ambient detection algorithm design with the reference circuit below and with specified external thermistor located in battery pack. With this specified thermistor (QVL: Murata, part number: NCP18WB473F10RB), the detection temperature 0~5°C and 40~45°C could be achieved and is within +/-2°C difference. When in charger mode, if the reading temperature of the battery pack is out of (0~45°C) range, the charger will stop until the temperature is back to this range again. The stop and re-start temperature could be programmed in UI tool.

Below is the reference circuit for ambient detection.
FW procedure can determine whether to turn off the charger according to ADC input voltage, i.e. ambient temperature. VDD could be VDD_LDO_AUX1 and designer should check the resistance in thermistor spec, to find out the value under 0 and 45°C, and calculate the ADC input voltage accordingly. The thermistor is suggested to be attached on the device under test, for example, battery pack.
If the detected voltage is over the defined normal interval, the charger will stop and we support two following behaviors if the detected voltage is within defined interval again (* setting in UI)
(1) Stop charger always until the adapter is plug out and plug in again
(2) Re-start the charger if the detected number is within the defined interval.



2.14 AUX ADC

RTL8763B integrates an AUX-ADC for general analog to digital conversion purpose.
RTL8763B supports high quality ADC input, design in 12-bit, and could be multiplexed with digital GPIO function.

AUX ADC has 8 independent channels and can work in single-end mode and differential mode.
For all ADC channels, maximum input voltage must not exceed VDDIO level.
AUX ADC full scale swing is 3.3V.

When ADC is turned on, there is an input impedance of 44Kohm.

For each ADC channel, there are two working mode available, one shot mode and continuous mode. ADC samples the input signal once and stops in one shot mode while in continuous mode it samples the input signal continuously until it's manually stopped.

The exact value of R1 and R2 should be chosen according to the battery voltage for the voltage on ADC input pin to fall within the required range.

In differential mode, ADC samples two channels simultaneously and outputs the voltage difference.

2.15 PCB Antenna

A PCB antenna occupies PCB area, but the cost is cheaper. It can be easily manufactured and has the acceptable wireless range.

An antenna is usually a quarter-wavelength straight wire. Although a meander wire antenna is often the case for a compact size in portable device applications. But for PCB antenna design, the antenna size is a trade-off. It is not possible to have a smaller antenna with larger bandwidth and higher efficiency. So the size of the clearance is a key issue in antenna design. It is strongly recommended to follow the antenna clearance guideline of PCB antenna document.

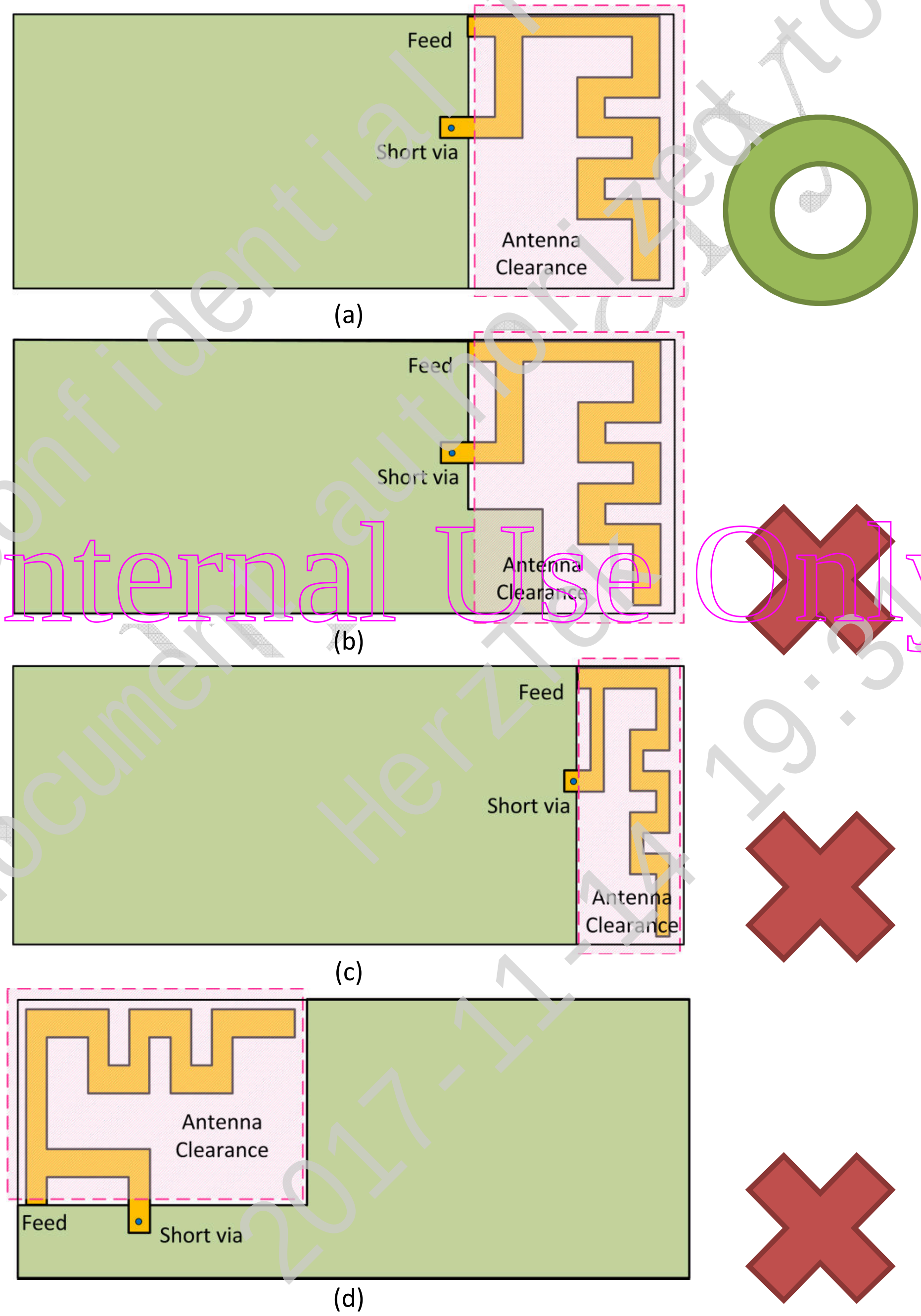


Fig. Antenna design

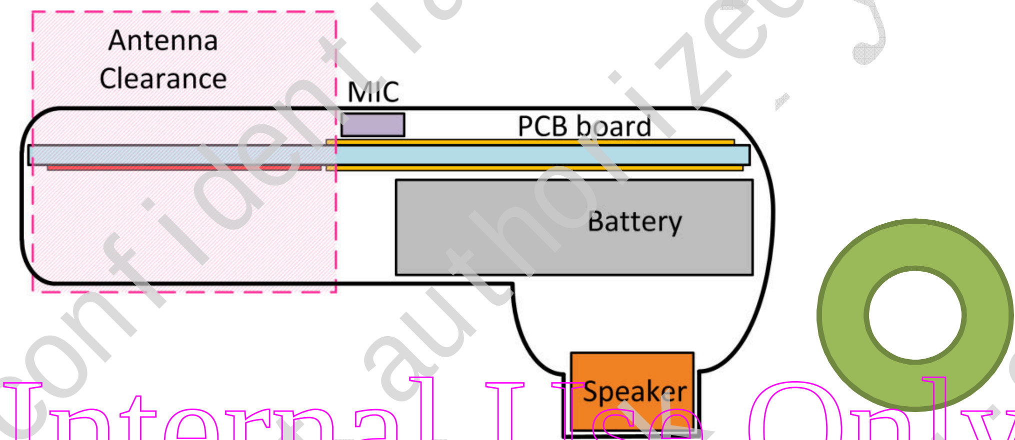
The clearance region is a defined area where no other metal material, except for the antenna itself, is allowed to enter. Fig.(a) – Fig.(d) are 4 different designs. Fig.(a) has the best performance of all. It has a reasonable clearance and ground plane is removed.

If the size of the clearance is too small, as illustrated in fig.(c), the performance and bandwidth will be limited, even though the wire length is about 1/4-wavelength.

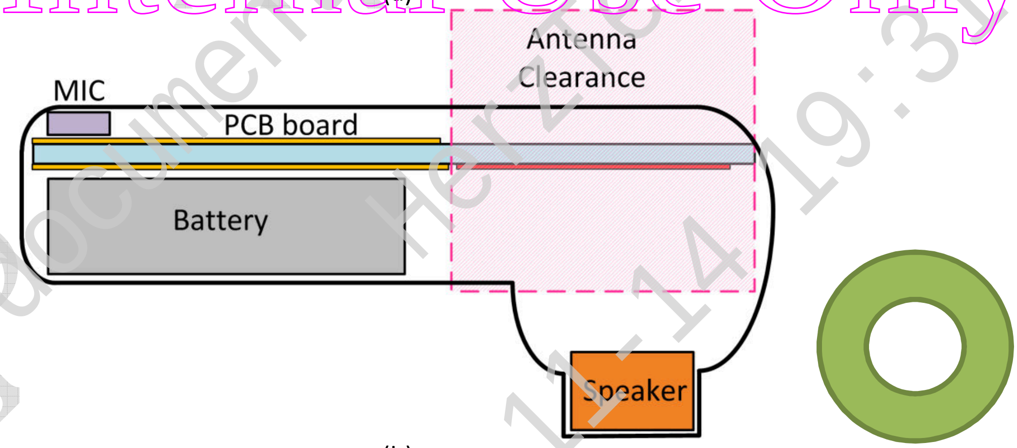
As a rule of thumb, metal must be kept out of the clearance region. Otherwise, the performance of the antenna will be heavily degraded.

Although the design in fig.(d) satisfy the above requirements, the performance is not as good as the design in fig.(a), because the ground plane is located at the radiation direction of the antenna.

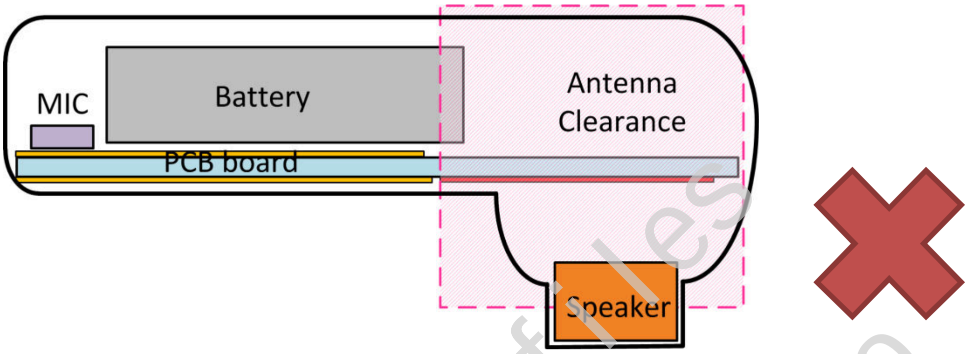
The antenna could not be directly shrink or enlarged, if the clearance is too small, try to find another PCB antenna or use chip type antenna instead.



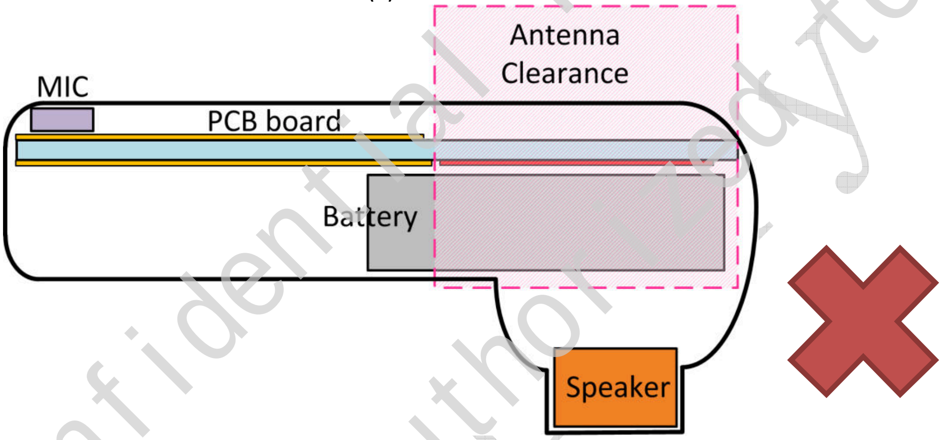
(a)



(b)



(c)



(d)

Fig. Antenna placement

There are 2 points to keep in mind when placing the antenna:

1. Keep the antenna as far from human body as possible.
2. Keep any metal material away from the clearance region.

Fig.(a) has the best performance of all in antenna point of view, for it best satisfies the descriptions above. As a trade-off, MIC is moved away and thus sacrifices the recording performance. The design in Fig.(a) is recommended in applications where MIC is not necessary.

Fig.(b) is also a good design, compare to Fig.(c) which antenna is too closer to human body and the speaker.

Fig.(d) is forbidden since it against the rule of thumb. Notice that the clearance is actually a 3-dimensional region, so the battery must not be placed beneath the antenna.

Other things that worth mention is:

- Antenna performance is affected by the size the ground plane and the overall design of product.
- Usually, a larger ground will lead to a larger bandwidth (And also a slight shift in resonance frequency), and vice versa.
- Battery is considered as a part of the ground.
- Pi-matching network is required for fine-tuning at later stage of the design process.
- As a key radiating element for wireless device, the antenna must be considered at early stage of the design, and fine-tuning should be performed at later stage of the design.

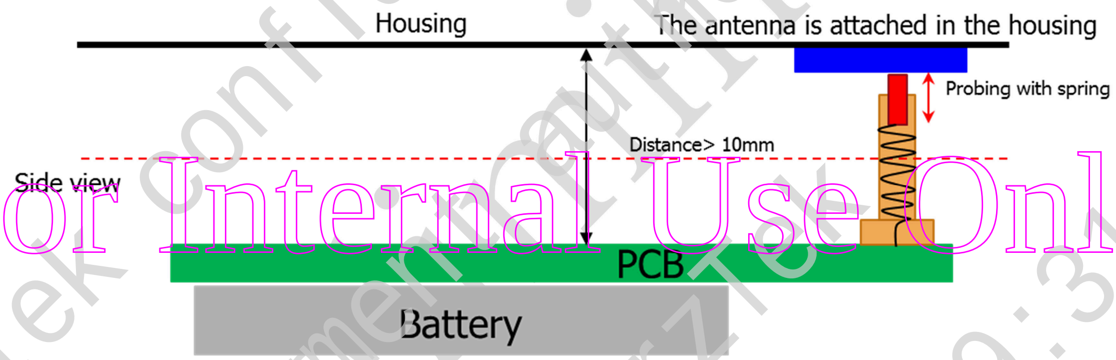
2.16 Chip type antenna

If the antenna clearance is too limited, please use chip type antenna instead.
For RWS headset design, chip antenna is preferred due to its limited antenna area and mechanical parts close by. Try to use a biggest antenna that could be fitted into the headset, generally, the bandwidth of 8010 type chip antenna is wider than that of 5320/5020/3216 type. If the bandwidth is wider, we could get more advantage to fit on different head model and different use case.
The chip antenna QVL list:
UNICTRON: https://www.unictron.com/antenna/chip-antennas/chip-antennas/

Yageo: http://www.yageo.com

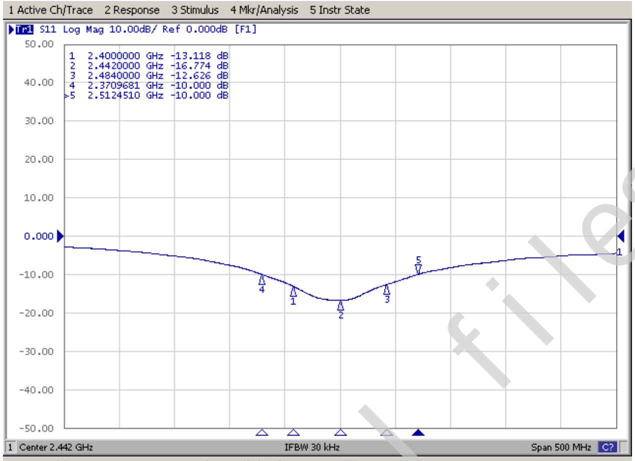
2.17 Thimble antenna

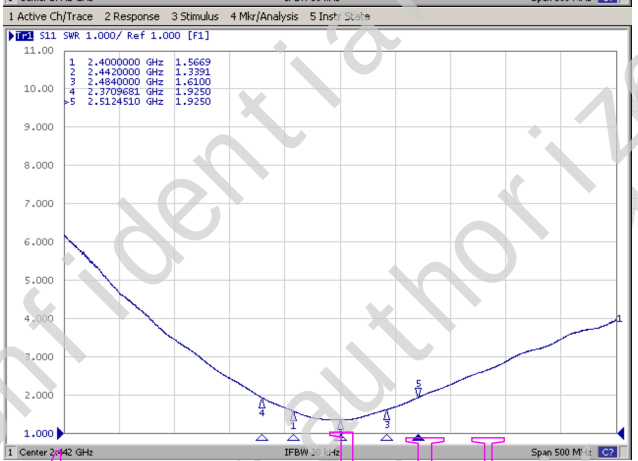
Thimble antenna is also a solution in Bluetooth headset, it is a good way to keep the antenna far away from the human head, there is a limitation in the housing, the distance from the housing to the PCB must be larger than 10mm to keep a good antenna radiation pattern.



2.18 Antenna measurement

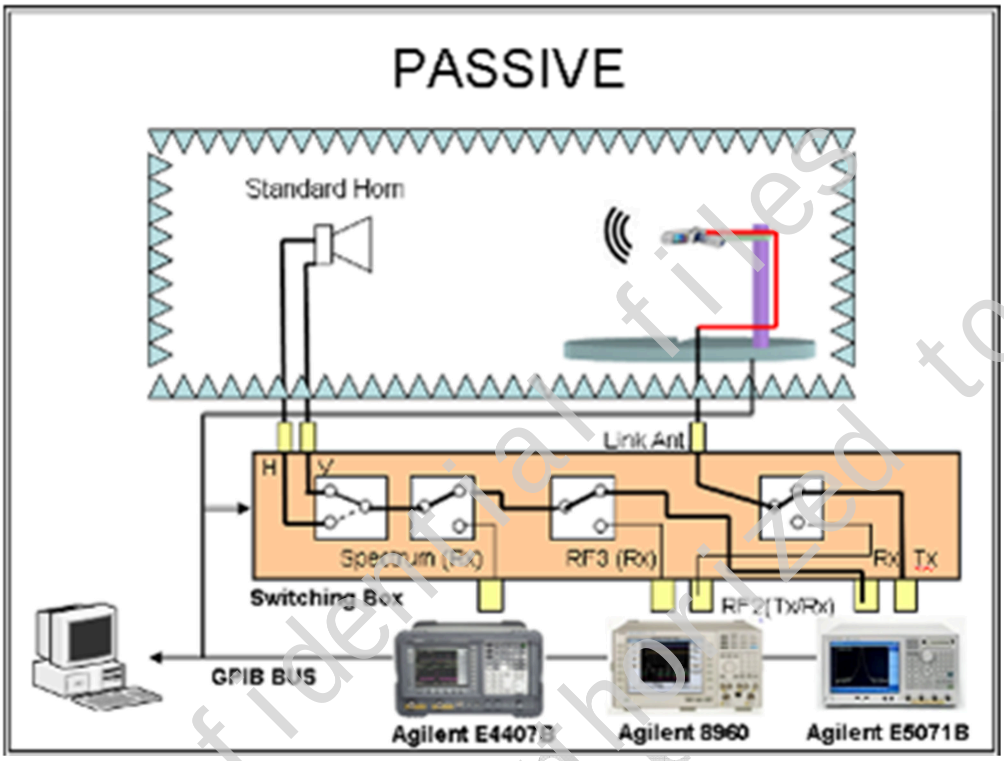
Antenna measurement flow:
Step1:
Fine tune the antenna bandwidth and resonance frequency with network analyzer, better to wear the headset on fake head to fine tune.
The sample should be as complete as possible, like a complete headset, not to fine tune on a bare PCB.



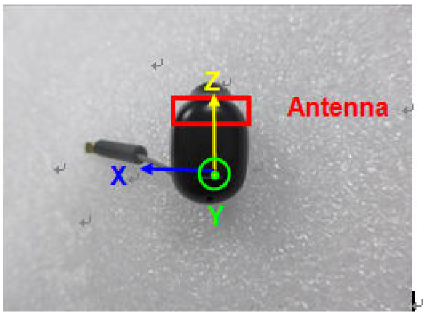


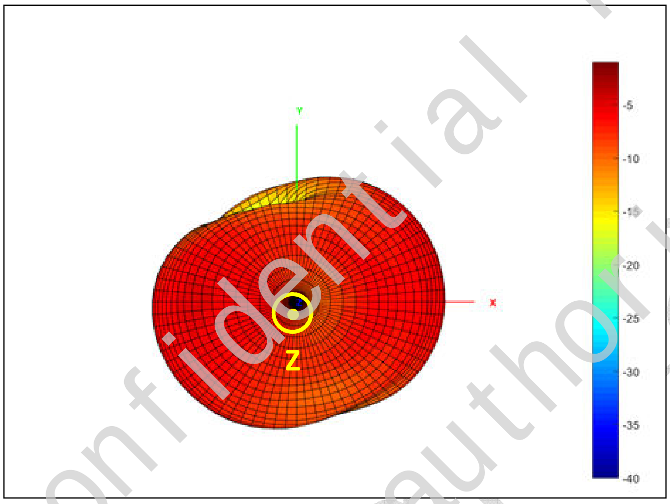
Step2:
Antenna pattern check: tested with a standard horn antenna, this test should be completed in an antenna lab.
The radiation pattern should be carefully checked to get the best performance.

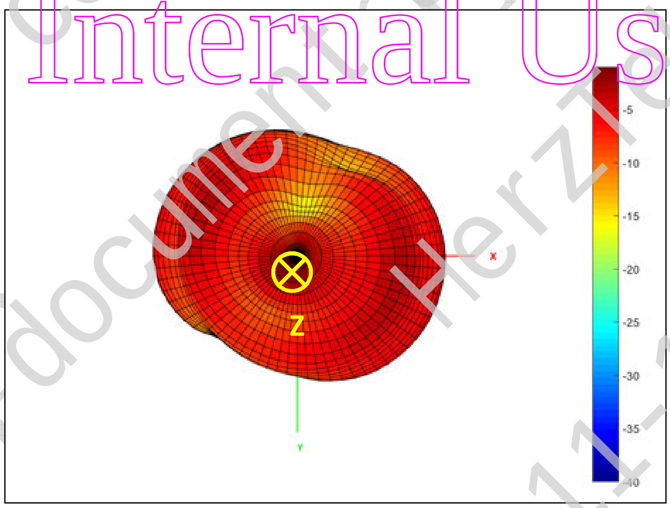
Instrument

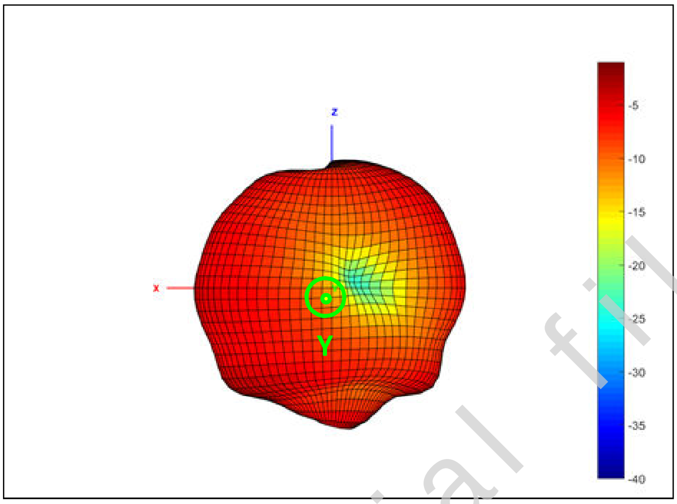

PASSIVE
Standard Horn
Link Ant
H
V
Spectrum (Rx)
RF3 (Rx)
Rx
Tx
Switching Box
RF2 (Tx/Rx)
GPIB BUS
Agilent E4407B
Agilent 8960
Agilent E5071B

Antenna radiation pattern check

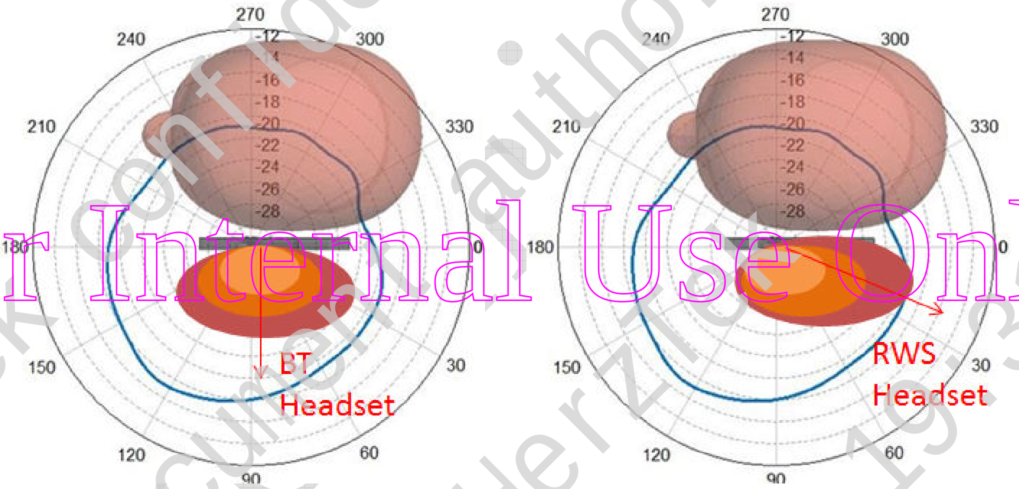








Radiation pattern suggestion:



2.19 RF Notice

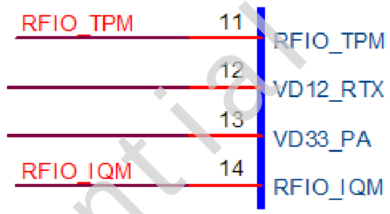
RFIO_IQM / RFIO_TPM

RTL8763BS and RTL8763BA integrate 2 sets of high performance RF transmitter and receiver, named as IQM and TPM path, while RTL8763BM and RTL8763BF support IQM only.

RFIO_IQM is for dual-mode Bluetooth radio, and is available for RTL8763BF, RTL8763BM, RTL8763BS and RTL8763BA, with up to +10dBm TX power.

RFIO_TPM is specific for BLE with lower power consumption and is supported in RTL8763BS and RTL8763BA only with up to +4dBm TX power.

The dual RF design is good for low power system application.



RF power pin

VD33_PA, VD33_SYN, VD12_PA, VD12_SYN and VD12_RTX are the power input pin for RF transmitter and receiver.

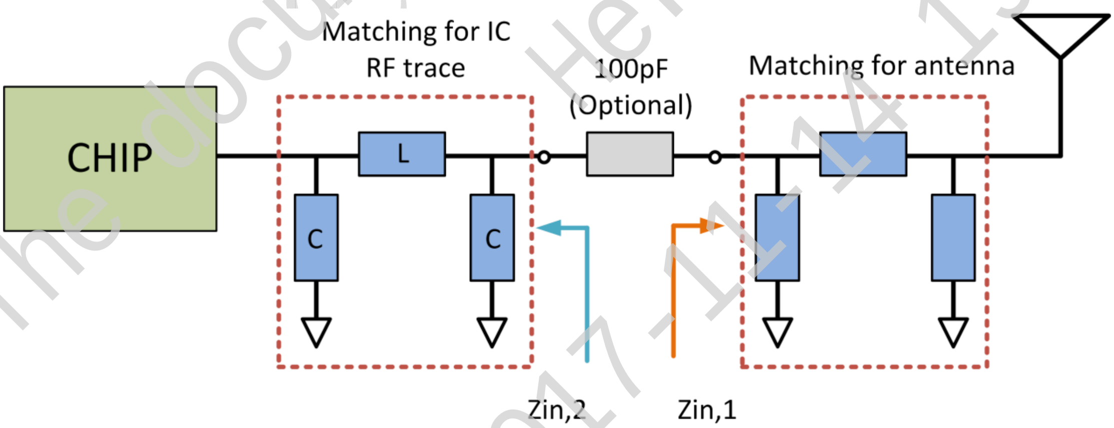
VD33_PA and VD33_SYN should be applied with 3.3V which sources from VPA33 with internal-built LDO.

VD12_PA, VD12_SYN and VD12_RTX should be applied with 1.2V, and could source from LX_CORE.

Decoupling capacitor should be added and placed right in front of the power input pin.

Matching circuit

In order to achieve efficient power transfer from RFIO to antenna, a matching circuit is required. For a return loss greater than 10 dB means that 90% of the power is transmitted to the antenna.



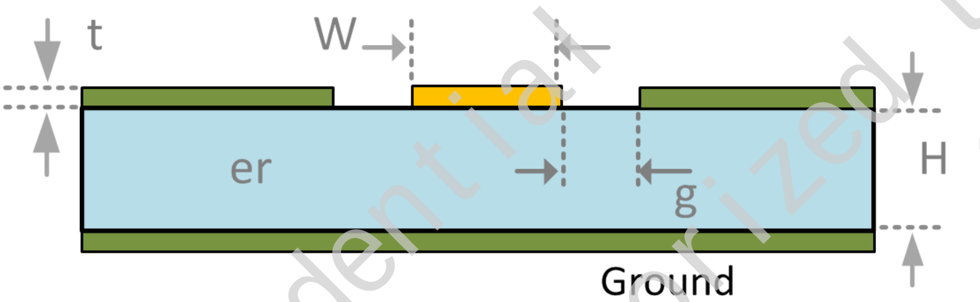
In the above figure, 3 components are used for matching the IC RF trace and 3 components are for matching the antenna. The target is to have 50 ohm input impedance for both Zin,1 and Zin,2. The 100pF capacitor for DC blocking may be optional only if the chosen antenna is PCB or chip antenna.

The matching network in IC RF trace is also designed for harmonic suppression. The suggested value is 1.2pF-3.9nF-1.2pF. It is strongly recommended to follow Realtek HDK document, and choose exactly the same material from QVL. Otherwise, the performance may not be guaranteed.

The chosen value for antenna matching depends on the design. Sometimes, antenna matching can be achieved by using only 2 components. However, the space for 3 components should be saved, because fine-tuning is performed at the later stage of the design.

RF trace impedance

The trace for RF signal should be designed for 50 ohm. The impedance depends on the following factors and should be design carefully:



1. Trace width
   Smaller W will lead to higher impedance.
2. Height from trace to ground
   The impedance decreases when H is increased.
3. The gap between RF trace and adjacent ground
   The impedance decreases when g is decreased. Noticed that gap must be symmetrical on both sides of the trace.
4. Copper thickness
   The impedance increases when t is decreased.
5. Substrate dielectric constant
   Larger er will leads to smaller impedance.

The above parameters for RF trace should be considered. Several free impedance calculators could be found online. Use these calculators to calculate for a proper designed geometry for RF trace.

The impedance must be constant throughout the RF signal trace. Therefore, trace width and the gap between RF trace and adjacent ground should be maintained.

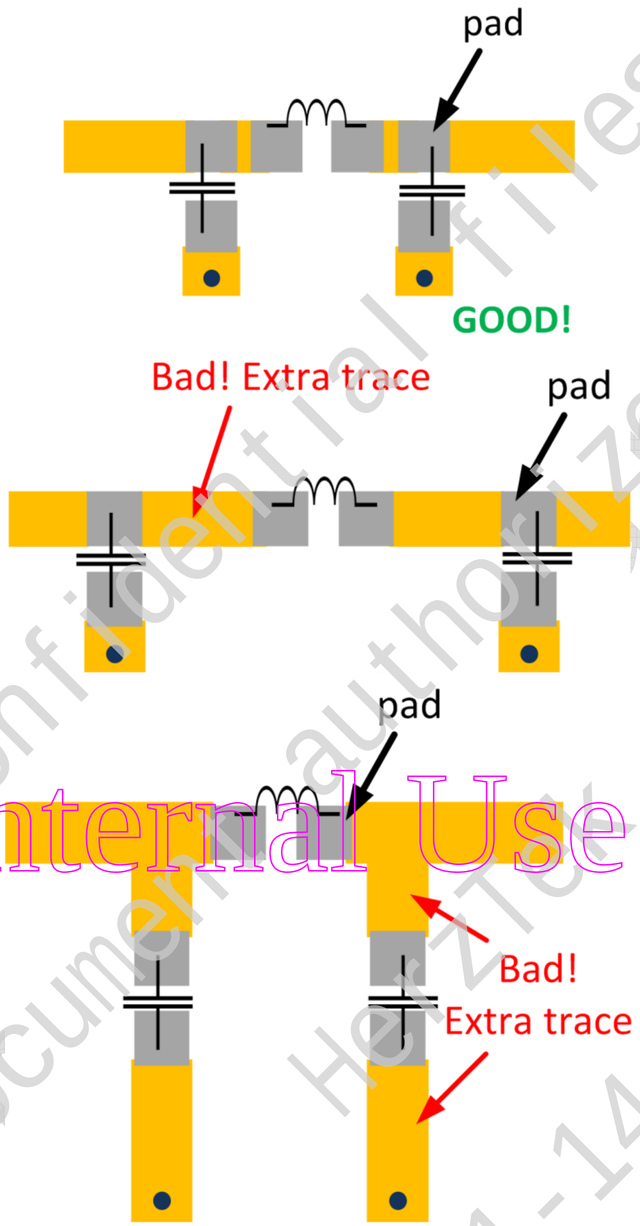
Different from other signal traces, the RF trace must be guarded with ground, such that it forms a CPWG guided wave structure. Any other traces must not be placed close to the RF trace. Otherwise, mutual coupling between traces will cause severe inference problem.

RF trace layout

As a rule of thumb, ground plane beneath the RF signal trace must not be split in any condition.

Generally speaking, the total length of the RF signal trace (from RFIO to the antenna) should be as short as possible, so that the transmission loss can be minimized. Also, RF trace should be on the top layer. Do not penetrate through other layer by via.

Layout for matching network is illustrated as below. Components should be placed close to each other and there must not be extra connecting line. For shunt components, it is best to place the soldering pad right on the RF signal trace.



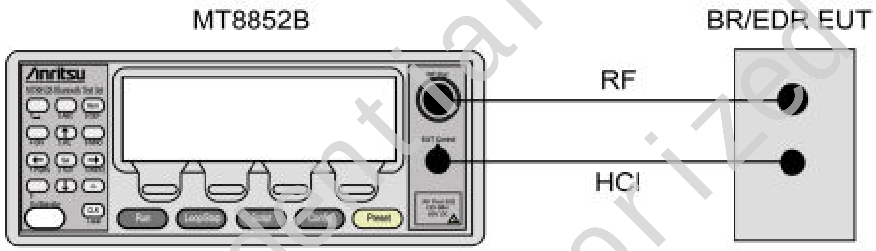
RF Test interface

It used HCI UART as RF test interface, P0_6 is UART RX (input); P0_7 is UART TX(output). These pins should connect to BT Tester before RF Test by UART. It may be add level shifter board because different signal level.

RF should connect to BT Tester by cable, and cable loss should be calculated in result.

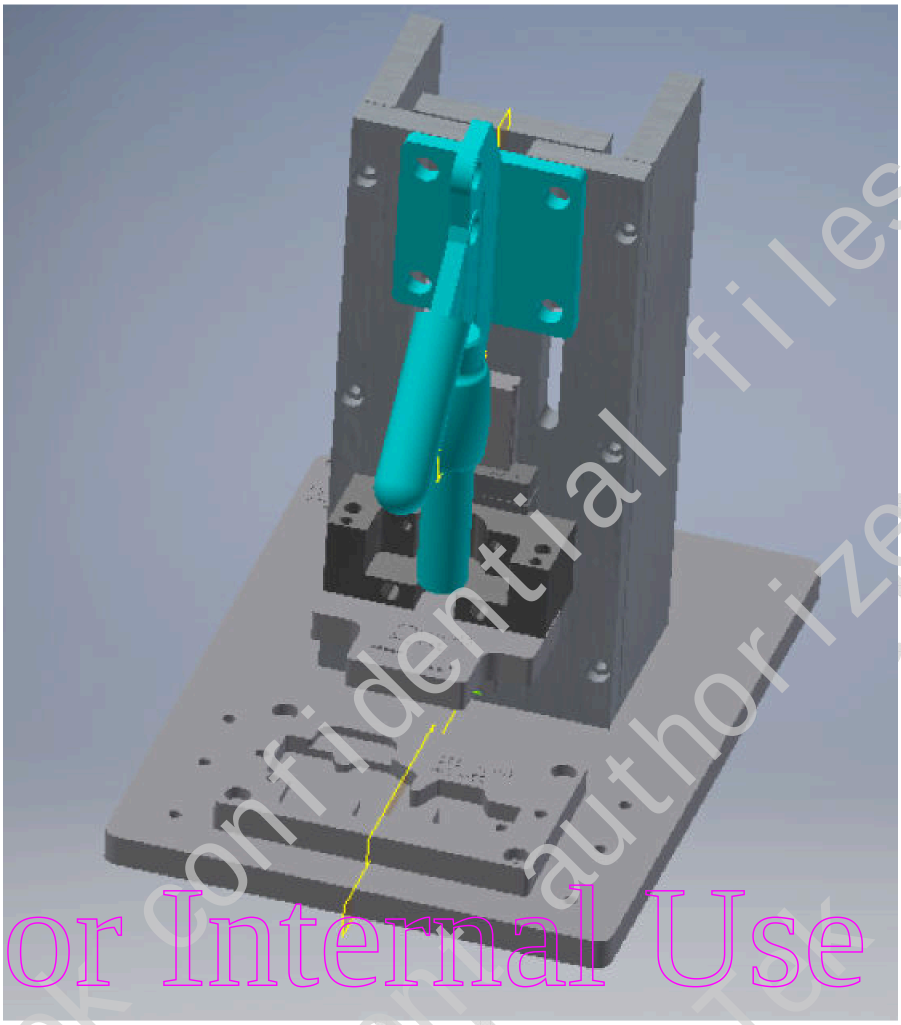
HCI UART parameter:

Baud rate: 115200
Data length: 8bits
Stop bits:1 bit
Parity bit: none
HW flow control: No



2.20 Mass production

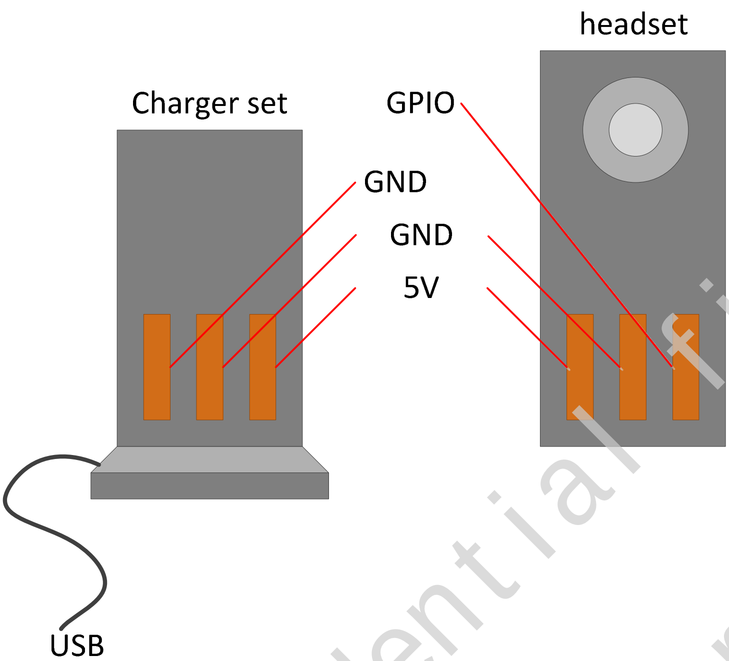
The customer is encouraged to make a robust mass production tooling. It could help to improve the yield and the correctness of the PCBA measurement. REALTEK designed MP controller board "GENESIS" is a convenient tooling to control the mass production flow, include power on/off sequence, PMU, RF calibration. For the detail, please refer to mass production document.



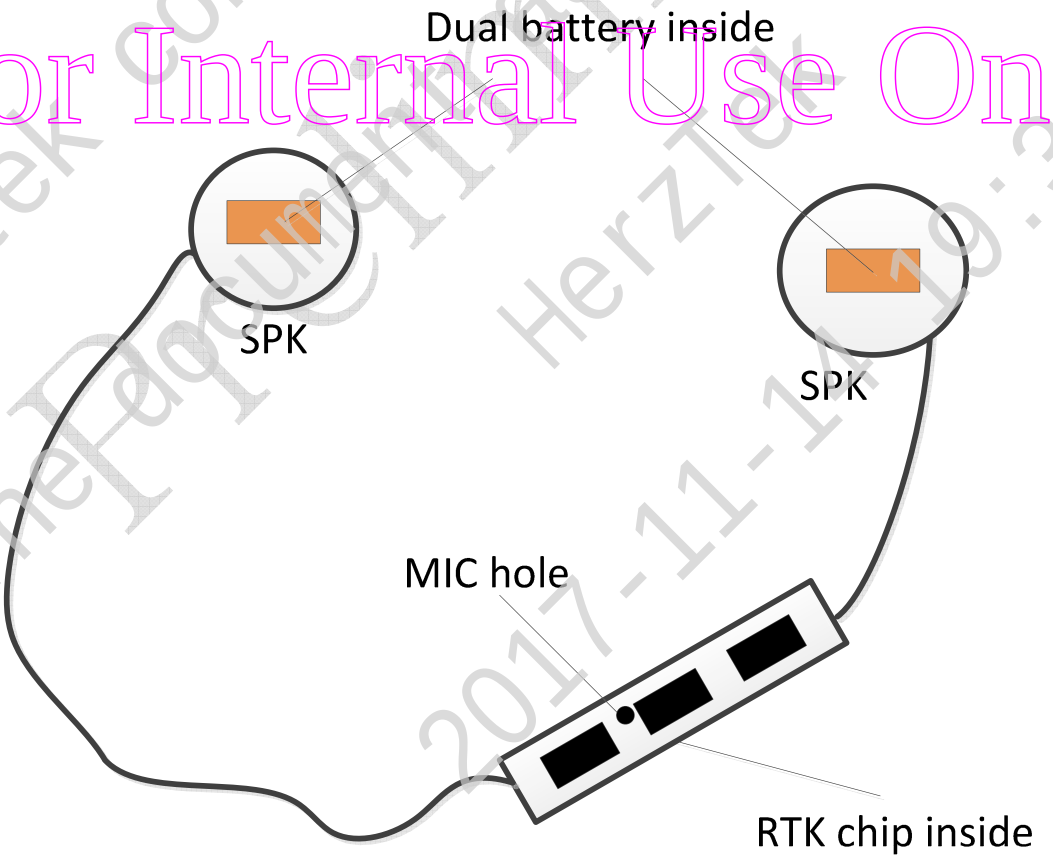
2.21 Special application

Headset with charge set

Hang off to power off, and take off to power on and link back, answer the call.
When the headset is on the charger set, GPIO will contact with GND and enter DLPS mode
When takeoff, GPIO will be switched to high and leave DLPS mode, link back handset and answer the call directly.
There is no need to add extra circuit, much more competitive than the others.



SPORTS headset



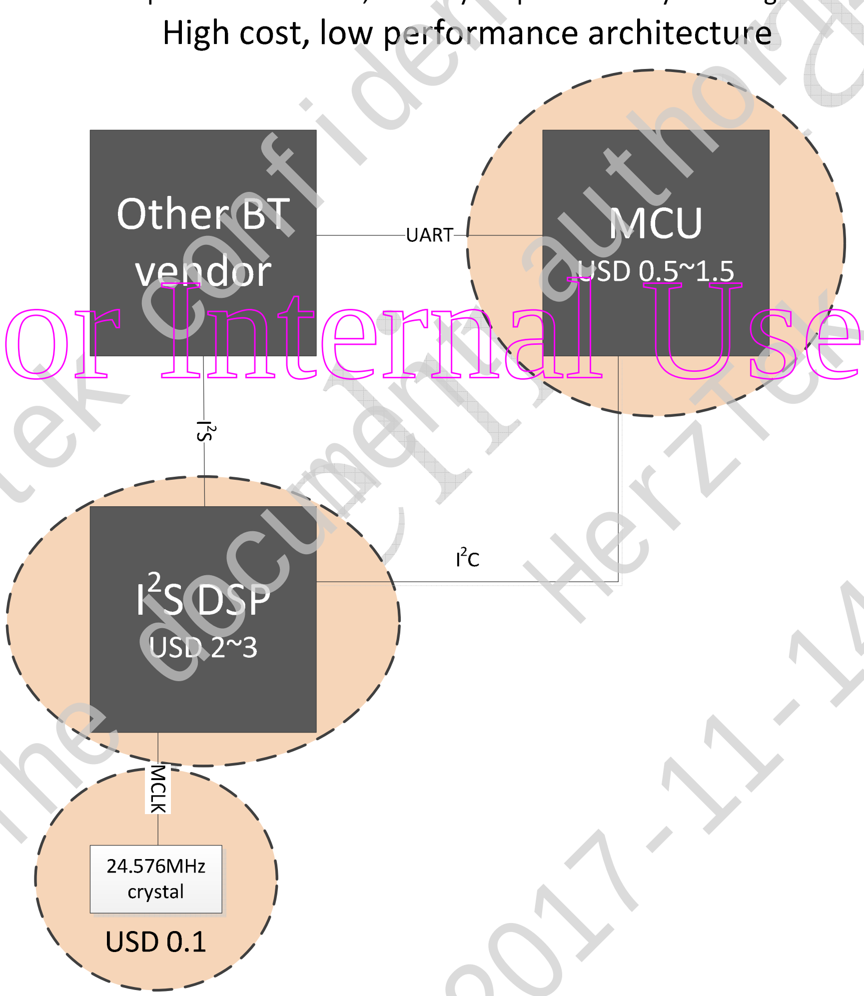
RTL8763B supports dual battery thermal detection, two thermal resistors are necessary, each one attached on the battery pack and connect to two ADCs respectively. If one of the battery, the detected temperature is over the defined interval, the charger will stop.

The battery in this kind of application, should be at about the same voltage (suggest to charge to full) when assembling, make sure the voltage difference not to over 0.2V.

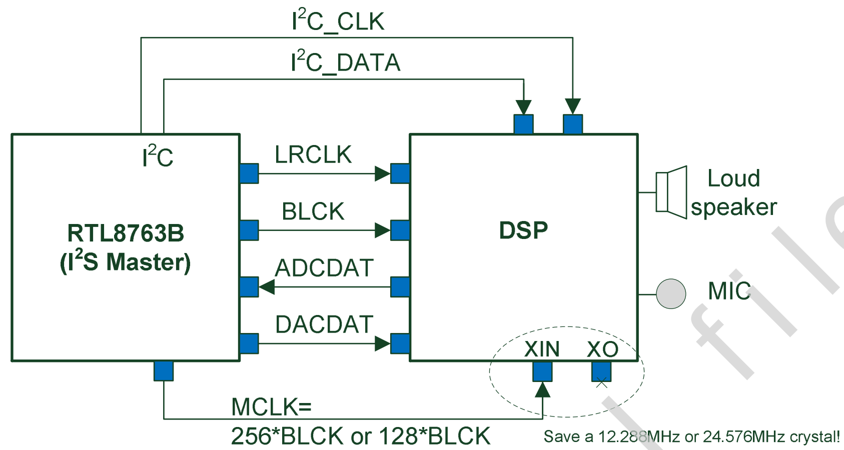
The MIC hole is suggested to close to the human mouth, hence the wire length should be adjusted, the two wires should not be in the same length.

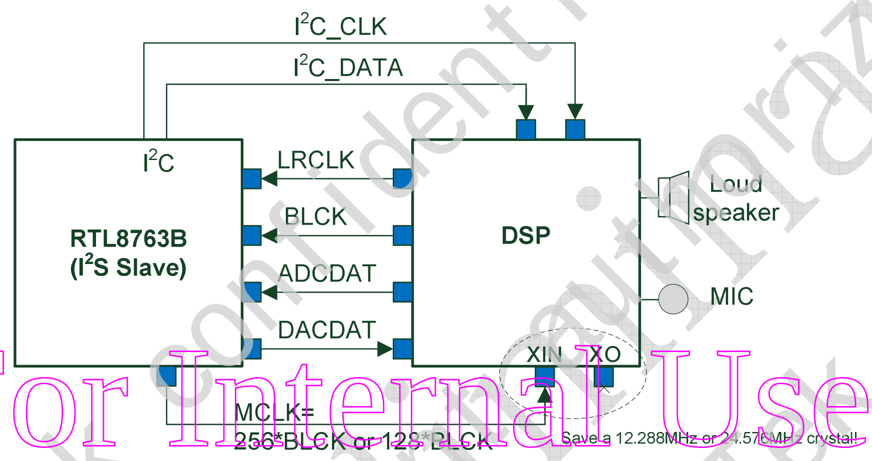
2.22 MCU application

RTL8763B integrates ARM Cortex M4F inside, which is very powerful to replace the external MCU, the design does not have to add an external MCU with RTL8763B solution unless it is very special design.
With the simplified architecture, it is very simple for the layout design.

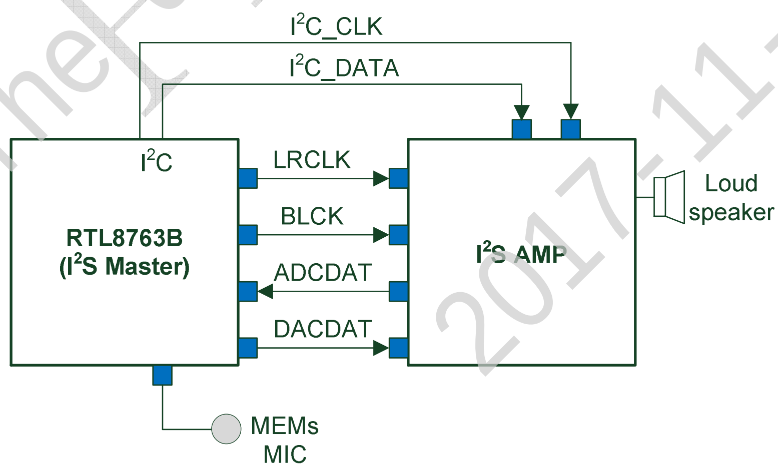


The MCU could be replaced by the following design





Even more, with RTK powerful Tensilica DSP core inside and SDK, the external DSP could be further be replaced by Tensilica core insde, the customer DSP algorithm could be programmed in DSP core, under this condition, only a I2S amplifier circuit is needed.



3 Key part selection guide & QVL

3.1 40MHz Crystal

Spec:

	Min.	Typ.	Max
Frequency (MHz)	-	40	-
Frequency tolerance (ppm)	-	-	±10
Frequency stability (ppm)	-	-	±10
Load capacitance (pF)	-	9 or 7	-
Drive Level (uW)	-	-	300
Equivalant Series Resitance (Ohm), C_L=7pF	-	-	50Ω
Equivalant Series Resitance (Ohm), C_L=9pF	-	-	40Ω
Insulation Resistance (MOhm)	500	-	-

QVL:

http://www.taisaw.com/en/index.php

http://www.siward.com.tw/en/

XTAL_40M	3225 type	40MHz/CL=7pF crystal, +/-5ppm, -40 °C ~85°C , +/- 15ppm	TZ0882D	TST
	2520 type		TZ1181B	
	1612 type		TZ3220A (-30~85)	
	2016type	40MHz/CL=7pF crystal, +/-20ppm over -40 °C ~85°C	EXS00A-CS10301	NDK
	1612type		EXS00A-CS10300	
	3225 type	40MHz/CL=9pF crystal, +/-5ppm, -40 °C ~85°C , +/- 15ppm	XTL571150-R53-026	Siward
			TZ0308D (-30~85)	TST
	2520 type		XTL581150-R53-027	Siward
			TZ0733E	TST
	2016 type		XTL501150-R53-028	Siward
			TZ1269D	TST
	1612 type		XTL901150-R53-029	Siward

XTAL 32768Hz	3215 type	32768Hz/CL=7pF crystal, +/-20ppm -40 oC ~85oC	XTL721-S349-005	Siward
	2012 type		XTL741-S999-426	
	3215 type	32768Hz/CL=7pF crystal, +/-20ppm -40 oC ~85oC	TZ1166B	TST

3.2 Switching regulator inductor

Spec:
2.2uH Power Inductor for DC-DC SWR

- 2.2uH Inductor Spec
- Inductor Type: Power inductor
- L=2.2uH +-20%
- Self-resonant frequency > 40MHz
- DCR<1ohm (better if 0.5ohm is available)
- Saturation current > 0.5A

QVL:
http://www.zeniththek.com.tw/
http://www.t-yuden.com/

	Footprint	Tolerance	Part Number	Vendor
2.2uH	L2520	±20%,Rdc 0.093Ω	ZADK-252012SB-2R2M	ZenithTek
	L0603	±10%,Rdc 0.56Ω	ZWP-0603-2R2K	ZenithTek
	L-L3W3	±20%,Rdc 0.17Ω	NRH3010T2R2MN	TAIYO YUDEN

3.3 RF inductor

QVL:
http://www.acxc.com.tw/
http://www.toko.co.jp/top/en/index.html

	Footprint	Tolerance	Part Number	Vendor
3.9nH 2.7nH	L0402	0.3nH,Y	HI1005-series	ACX
	L0201	0.3nH,Y	HI0603-series	ACX
	L0402	0.3nH,Y	LL1005-FH3N9S	TOKO

3.4 RF antenna

QVL:
https://www.unictron.com/index2016/
http://www.yageo.com/NewPortal/_en/index.jsp

Footprint	Part Number	Vendor
8010		UNICTRON, Yageo
5320		UNICTRON, Yageo
3216		UNICTRON, Yageo

3.5 Passive component

QVL:
http://www.passivecomponent.com/
http://www.yageo.com/NewPortal/_en/index.jsp
http://www.darfon.com.tw/English/

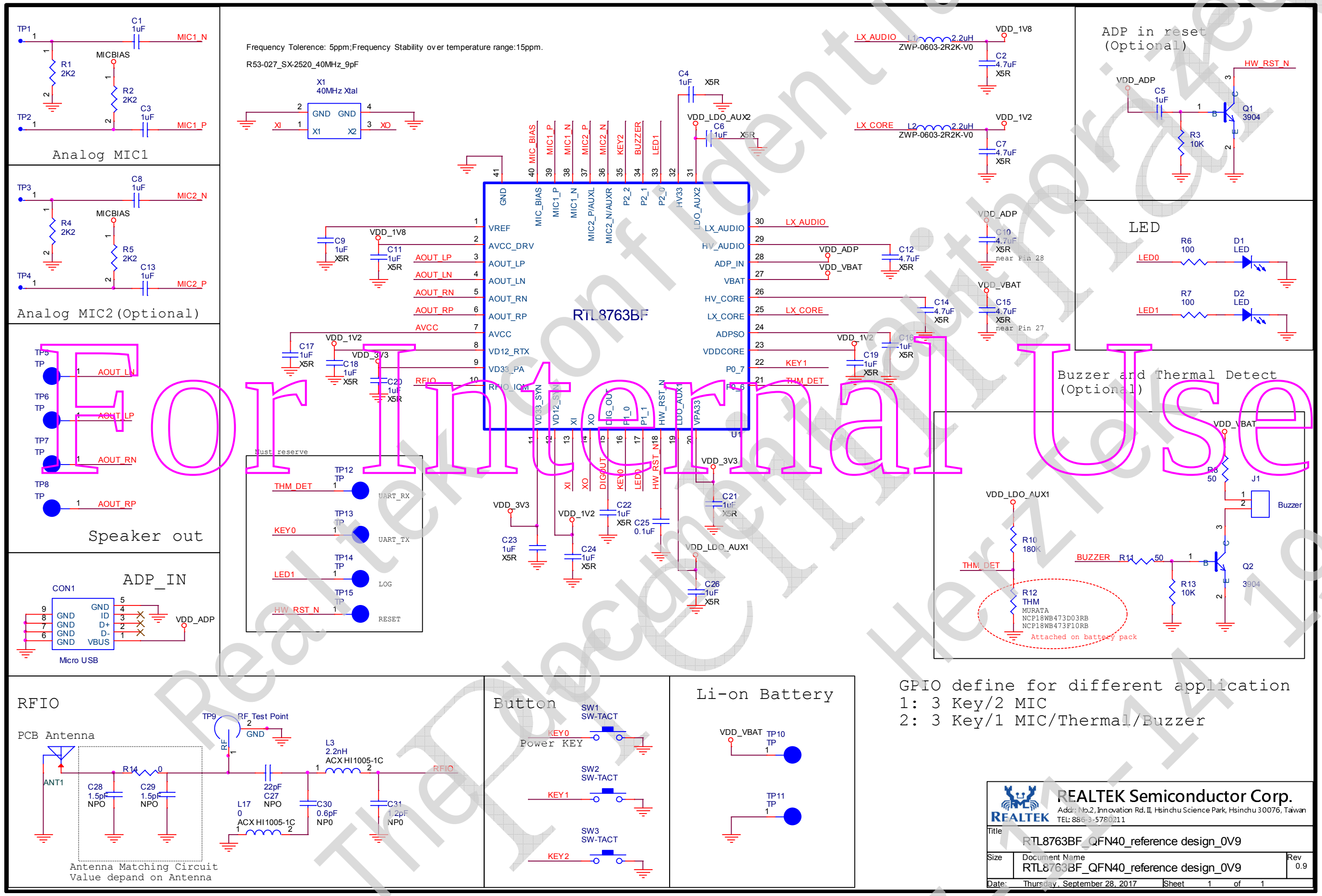
Value	Footprint	Spec	Vendor
4.7uF	0402	X5R, 6.3V	Walshin, Yageo, Darfon
4.7uF	0402	X5R, 10V	Walshin, Yageo, Darfon
4.7uF	0603	X5R, 6.3V	Walshin, Yageo, Darfon
4.7uF	0603	X5R, 10V	Walshin, Yageo, Darfon
1uF	0402	X5R, 6.3V	Walshin, Yageo, Darfon

3.6 SPI FLASH

QVL:
http://www.macronix.com/en-us/Pages/default.aspx

P/N	Footprint	Spec	Vendor
MX25R8035F		8M-bit [x1, x2, x4]	MXIC

3.7 RTL8763BF/BFR reference and rBOM



RTL8763BF_QFN40_reference design_0V9 Revised: Friday, September 29, 2017

Item	Q'ty	Reference	Description	footprint	Part	QVL
1	16	C1,C3,C4,C6,C9,C11,C16,C17,C18,C19,C20, C21,C22,C23,C24,C26	1uF/X5R/6.3V	0402	1uF	Walshin
2	4	C10,C12,C14,C15	4.7uF/X5R/10V	0402	4.7uF/10V	Darfon
3	2	C2,C7	C1005X5R475MCTS (4.7uF/X5R/6.3V)	0402	4.7uF/6.3V	Darfon
4	1	C25	0.1uF/X5R/6.3V	0402	0.1uF	Walshin
5	1	C30	NPO	0201	0.6pF	Walshin
6	1	C31	NPO	0201	1.2pF	Walshin
7	2	L1,L2	ZTFL-201610TB-2R2M_V0; ZWP-0603-2R2K-V0	0806, 0603	2.2uH	Zenithtek
8	1	L3	HI0603-1B2N2SHT	0201	2.2nH	ACX
9	1	L17	0201, 5%	0201	0	Walshin
10	2	R1,R2	0402, 5%	0402	2K2	Walshin
11	1	U1	RTL8763BF/QFN40/5x5	QFN40	RTL8763BF	REALTEK
12	1	X1	XTL581150-R53-027; TZ1181B _Rev1.0_	2520	40MHz Xtal	Siward, TST