文件編號： Ver.: 1.0

承 認 書
SPECIFICATION FOR APPROVAL

CUSTOMER ______________________

PRODUCT 2.4GHz Wireless Digital Audio

MODEL NO. DIO-S003B

DATE ______________________

APPROVED
Date：__________

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TABLE OF CONTENTS

1. Features

1. Non-compression for high sound quality with delay time 0.5ms.
2. Digital audio with 44.1K sampling rate and 16-bit resolution.
3. FSK digital modulation/demodulation.
4. 20Hz ~ 20 KHz (-1dB) audio frequency response
5. 92dB audio dynamic range
6. Power-on function to prevent pop noise
7. Improving performance in fading environment by antenna diversity
8. Embedded antenna for cost-effect and quick development
9. Avoiding reception errors by employing forward error correction (FEC)
10. Muting function when suffering interference or at poor receiving conditions
11. Operating at 2.4GHz ISM band with 8 selectable channels
12. Low power consumption for portable application
13. Proper RF output power 10dBm to reduce interfering to other devices operating at the same frequency band
14. -87dBm receiving sensitivity, 45dB channel rejection and 25dB image rejection
15. Application distance up to 30 meters (L.O.S.) with perfect reception

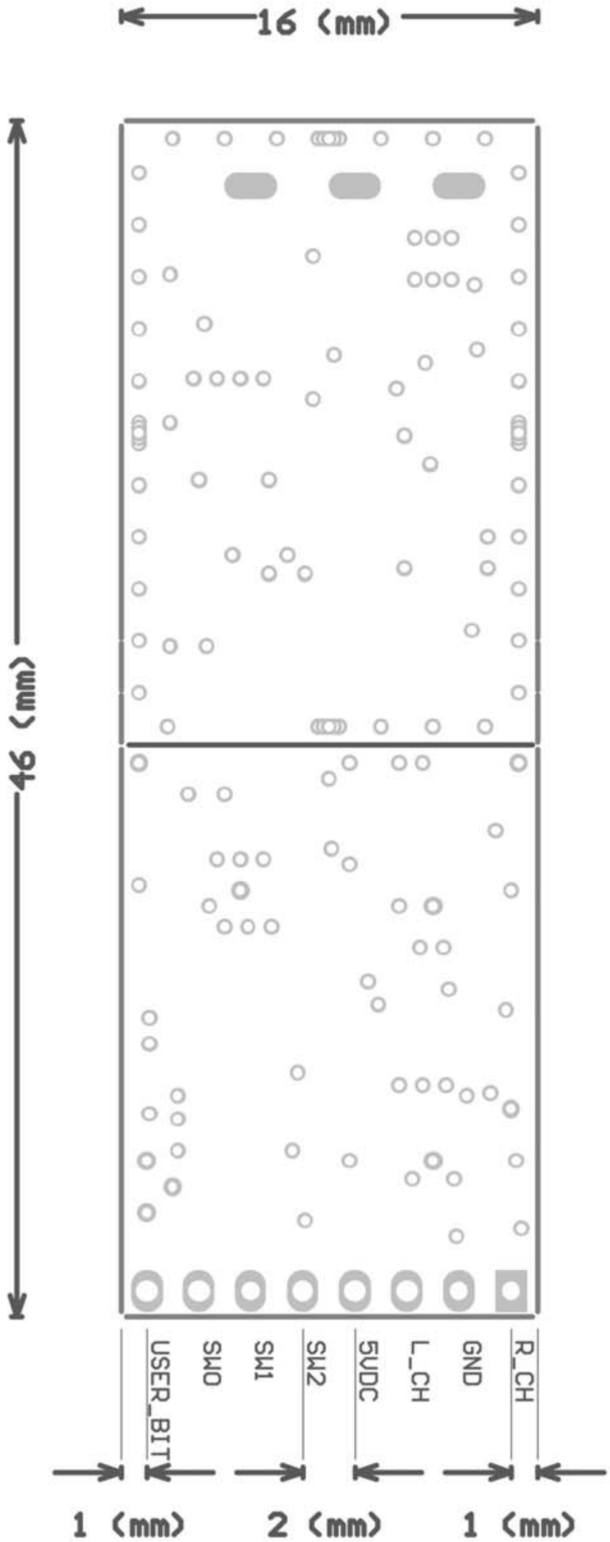
2. Applications

- Home theater rear speakers
- Wireless speakers
- Sound Card, MP3, CD player and DVD player
- Headphone

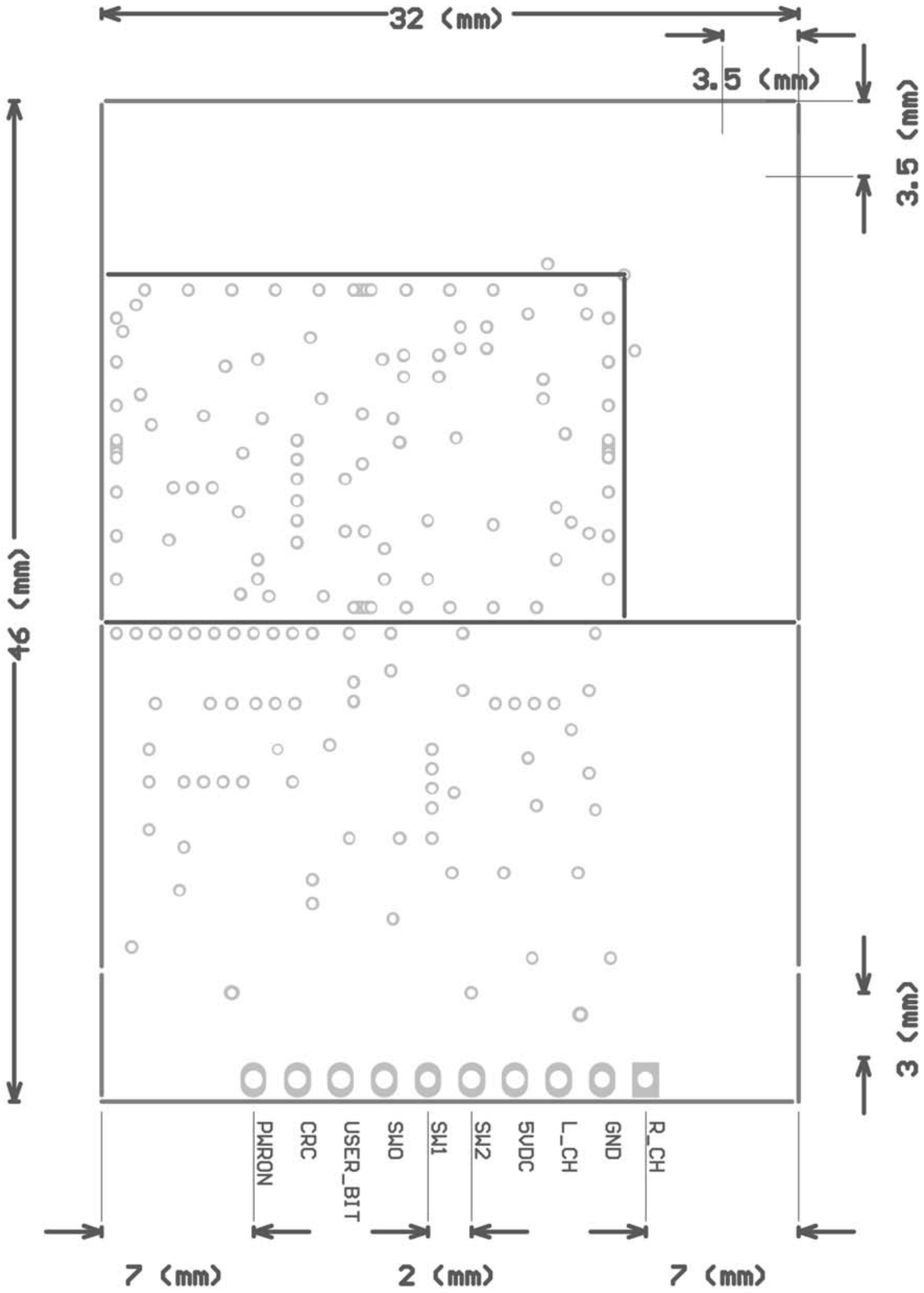
3. Specification

Model NO.	DIO-T003B	DIO-R003B
Description	Transmitter Module	Receiver Module
Supply voltage	3.6 ~ 5VDC	3.9 ~ 5VDC
Current consumption	100 mA (Typical)	130 mA (Typical)
Operating temperature	-10 ~ +60 (degrees Celsius)	-10 ~ +60 (degrees Celsius)
Frequency range	2400 ~ 2483.5 MHz	2400 ~ 2483.5 MHz
Modulation	FSK (Modulation Index 0.5)	
Channel number	8	8
Channel spacing	9 MHz	9 MHz
Channel frequency	2410, 2419 ~ 2473 MHz	2410, 2419~ 2473 MHz
Frequency stability	±100 KHz	±100 KHz
TX Power	+10 dBm for CE (Typical), 0 dBm for FCC (Typical)	
Input impedance	>10K Ohm	
Input level	4Vp-p (Max)	
RX Sensitivity		-85 dBm (Min.)
Adjacent channel rejection		>45dB @ +/-5MHz offset the central frequency
Image rejection		>25dB @ the image frequency
Output impedance		< 1KOhm
Output level		3.4Vp-p (Max)
Response	20 ~ 20 KHz, -1dB	
Dynamic range	92dB (Typical)	
Separation	80dB (Typical)	
SN ratio	87dB (Typical)	
THD	0.1% (Typical)	

4. Pin configuration and board dimension of Tx module



5. Pin configuration and board dimension of Rx module



6. Pin assignment of Tx module

Pin No.	Pin name	Pin description
1	R_CH	Audio R channel
2	GND	Ground
3	L_CH	Audio L channel
4	5VDC	3.6 ~ 5DC input
5	SW2	Tact Switch
6	SW1	Not connected
7	SW0	Not connected
8	USER_BIT	Maximum data rate is 5Kbps (input)

7. Pin assignment of Rx module

Pin No.	Pin name	Pin description
1	R_CH	Audio R channel
2	GND	Ground
3	L_CH	Audio L channel
4	5VDC	3.9~5VDC input
5	SW2	Tact Switch
6	SW1	See below attached table
7	SW0	See below attached table
8	USER_BIT	Maximum data rate is 5Kbps (output)
9	CRC	The level will be logical high during poor receiving condition. With simple circuits, a few functions can be presented, such as indicator for extra noise reduction or reducing pop-noise when Tx is turn on and off.
10	PWN	The level will be logical high with 1-second delay after the DC power supply is supplied to module. This 1-second delay signal can then be used to turn on the audio power amplifier to prevent pop-noise when Rx module is turn on.

7.1 The Table of Rx TACT Switch Mode

SW1	SW0	Mode
1	1	Auto scan channel
1	0	TACT to scan channel
0	1	TACT to select channel step by step
0	0	-

8. Application of Tx module

Application circuit for TX module

8.1. C1 and C2 are both DC blocking capacitors for audio R and audio L inputs respectively. 1uF capacitance for C1 and C2 will be sufficient for general applications because the input impedance of the A/D converter is greater than10KOH. If further audio low frequency response wanted, C1 and C2 can be increase to get more extension in low frequency response.

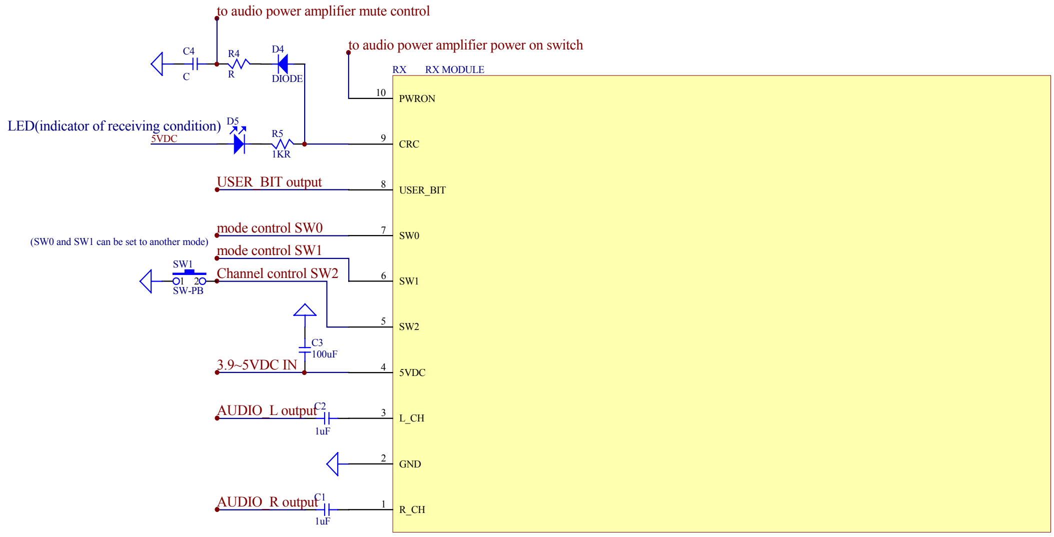
8.2. C3 is the DC power supply decoupling capacitor to ensure the DC stability. In general, a 100uF capacitor can work well.

8.3. D1, D2, D3, R1, R2 and R3 can be used as channel status indicator when SW0, SW1, or SW2 are switched to ground.

8.4. As to the user_bit, one can provide a data sequence defined by users to this pin and this data sequence will be delivery and received at the RX module. One can use the user_bit function for extra control form TX module. For example, one can turns on/off the audio power amplifier, adjusts volume, muting function, and so on.

9. Application of Rx module

Application circuit for RX module



9.1. C1 and C2 are both DC blocking capacitors for audio R and audio L outputs respectively. 1uF capacitance for C1 and C2 will be sufficient for general applications because the input impedance of the audio power amplifier is usually bigger than 10KOH. If further audio low frequency response wanted or the input impedance of the audio power amplifier is less than 10KOH, C1 and C2 can be increase to get more extension in low frequency response.

9.2. C3 is the DC power supply decoupling capacitor to ensure the DC stability. In general, a 100uF capacitor can work well.

9.3. D1, D2, D3, R1, R2 and R3 can be used as channel status indicator when SW0, SW1, or SW2 are switched to ground.

9.4. As to the user_bit, one can receive the data sequence, which is provided at the TX module. The data sequence defined by used can then be used as various controls. For example, one can turns on/off the audio power amplifier, adjusts volume, muting function, and so on.

9.5. CRC output is an indicator for poor receiving condition. The output will be a series of positive pulse when the receiving condition is not good. One can know what the receiving condition is by pin 9 and use the characteristic to achieve a few functions. For example, indicator of receiving condition and noise reduction when TX is turned off or suffering unwanted RF interference.

9.6. D4, R4 and C4 are relative to external muting control for extra noise reduction when TX module is turned off or suffering unwanted RF interference. In addition, TX power on pop noise can also be eliminated by this function. Feeding this signal to mute control input of audio power amplifier to achieve this function. In principle, proper time constant can be easily determined by only R4 and C4. As to providing the sufficient sinking current to the mute control input for proper mute operation, R4 cannot be too large, that means C4 must be sufficiently large to obtain proper time constant.

9.7. D5 (LED) and R5 can be connected as receiving condition indicator. When the LED is lighted, it means in proper receiving condition.

9.8. The PWRON (level H) is provided with 1-second delay after DC power is applied to the RX module, which can then be used to turn on the audio power amplifier. By adding this function, one can avoid RX power on pop noise.

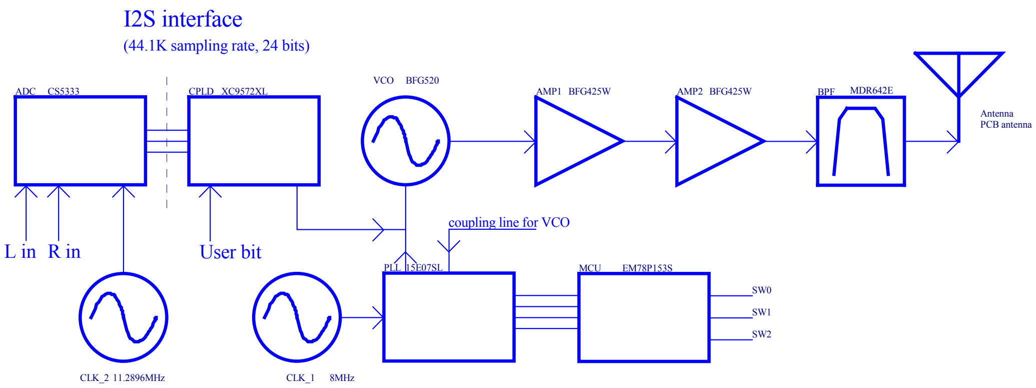
10. PCB layout guideline

Any metal (including PCB track and holding screw) around the antenna will result in changing input impedance and radiation pattern of antenna. These two parameters are the most important for antenna performance. Keep in mind that reserve as much as space around the antenna if possible.

Connect all parts as close as possible to the pins of module and reduce the length of routing traces, to help on good audio performance, proper antenna pattern and EMC certification.

11. Theory of Tx module

Block diagram of TX module

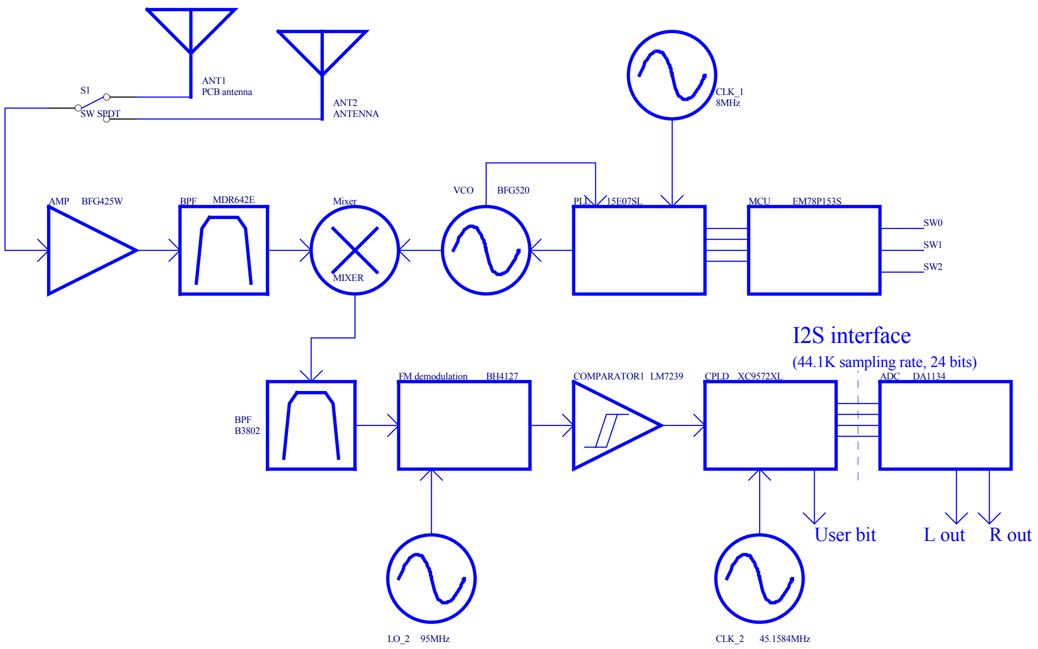


11.1 Audio L and R are sampling at 44.1K rate and are represented with 16-bits respectively by A/D converter, which produces the I^2S data. The I^2S data then is encoded by CLPD to a bit sequence with data rate approximately 2.8Mbps.

11.2 The encoded data stream (passing a LPF) modulates the 2.4GHz carrier frequency directly with a 700KHz frequency deviation. The modulated carrier is amplified twice and filtered by a LTCC BPF, then emitted via the inverted-F antenna.

12. Theory of Rx module

Block diagram of RX module



12.1 2.4GHz RF signal is received by the antenna and past to the LNA, BPF then down-converted by mixer to 110MHz BPF (bandwidth 4MHz). The 110MHz SAW filter will provide about 45dB adjacent channel rejection. The IF signal is then down-converted again to 15MHz to perform the FSK demodulation.

12.2 The demodulated data is sliced by a comparator and decoded to I^2S data by CPLD, which provides D/A converter with the right format for audio reconstruction. To overcome the fading environment, the CPLD has the FEC function to perform error correction. Antenna diversity will overcome most of the fading with good arrangement of antenna position and excellent decision of selecting a suitable antenna.