

## **Hi-Fi Wireless Digital Audio Module User's Manual**

**Names:** **2.4GHz Wireless Digital Audio Transceiver Modules**

**Model:** **SOYO-WM24G02**

**Date:** **May, 2008**

**Version No.:** **Version 1.5**

**Soyo Technology Development Co. Ltd.**

**2008--2009**

**All rights reserved**

# CONTENTS

<b>I. INTRODUCTION.....</b>	<b>3</b>
1.1 APPLICATIONS.....	4
1.2 FEATURES .....	4
1.3 ELECTRICAL SPECIFICATION .....	5
<b>II GUIDE OF DESIGN.....</b>	<b>7</b>
2.1 GUIDE OF TRANSMITTER DESIGN.....	7
2.1.1 Figure of Transmitter Interface and Dimension.....	7
2.1.2 Transmitter Module Pin Assignment.....	7
2.1.3 Transmitter Module Using Methods .....	7
2.1.4 Channel Transform Methods of Transmitter.....	7
2.2 GUIDE OF RECEIVER MODULE DESIGN .....	9
2.2.1 Figure of Receiver Module interface and dimensions .....	9
2.2.2 Receiver Module Pin Assignment.....	10
2.2.3 Receiver Module Using Methods .....	10
2.2.4 Changing of Receiver Module Frequency Channel.....	11
2.3. RECEIVER MODULE AND TRANSMITTER MODULE PAIRING ARRANGEMENT .....	12
2.3.1 Approaches of Pairing Point to Point.....	12
2.3.2 Approaches of Pairing Point to Mass: .....	12
<b>III. GUIDE OF PLACING AN ORDER .....</b>	<b>13</b>

# I. Introduction

SOYO-WM24G02X, is the latest version of the wireless digital audio transmission module is developed by SOYO TECHNOLOGY CO. LTD. It is Hi-Fi and very good in resistance against various RF interferences, not only with the quality of the previous version, but with a I/O interface, which allows users to have more different functions. It is characterized by a lot advantages, such as highly integrated small form, high quality sound (with HDCD sound effect), powerful ability to work against different RF interferences, etc. It has the highest sampling ratio in the field and best sound effect of all our modules. The range of its input power can be as broad as 3.6—6 Volts and its audio output as high as 60mw. Its input interface is compatible with microphones and stereo frequency

It's our second generation of its kind produced as a result of a lot of research work and efforts based on a great number of our customers' letters after our first one was successfully marketed. It is not only characterized by a lot advantages, such as highly integrated small form, high quality sound (with HDCD sound effect, and the highest sampling ratio in the field and best sound effect of all our modules so far), powerful ability to work against different RF interferences( Its [input voltage](#) as broad as 3.6v to 6v and audio frequency output as high as 50mw), and its input interface is compatible with microphones and stereo frequency, like the first one; but also added with the following features.

- Channel up-and- down adjustment
- Digital volume adjustment to 32 grades.
- The main switch can get rid of the switching noise with its own noise elimination circuit
- Supporting the real-time-online cut of audio frequency, common microphone and audio input.

There are 20 channels available, the number of which is the largest in the field up till now. Simultaneous interpretation, Multi-channel player as well as some other applications can also be available by selecting channels manually.

This module supports fixed ID working mode, both point to point and point to mass. It can also receive high-end modules and acts as an auto channel scan. So it is quite easy and convenient to use. Once ID is paired, the receiver, placed at random, will receive signals from the Transmitter Module automatically. If there is interference in the current channel, just change the channel. It features audio muting function in case there should be no or weak signals

SOYO-WM24G02X is the best choice for the manufacturers of speakers, head-phones and microphones to

develop high-quality wireless digital products. To our old customers who have used SOYO-WM24G01X, SOYO-WM24G02X can be a better cost effective product.

## 1.1 Applications

- Wireless speakers
- Wireless headphones
- Surround speakers
- Wireless microphones (or loudspeakers)
- Supporting facility of wireless audio transmission in sound system.
- Supporting facility of wireless audio transmission in monitoring project.
- Channel-surround sound boxes being wireless.
- Wireless microphones or loudspeakers
- Wireless Guide Speaker
- CD/DVD players or other musical facilities.
- wireless eavesdropping
- Wireless Simultaneous interpretation System
- Wireless megaphone
- Wireless Loud-speaker

## 1.2 Features

- Frequency: 2.402—2.478GHz
- Channels: 20
- Two types of input supporting microphones and stereo and UPS On-line real-time switch as well.
- Digital transmission
- Additional 20dB selection can be available with microphone input (for the high-sensitivity microphone, eavesdropping applications)
- Sampling ratios: We have the highest sampling ratios in the field: 64k@16bitx2
- Frequency response: 20—20KHz; HDCD Sound effect
- Two digital number display on the Digital Volume and the channel change
- Channel up-and- down adjustment

- Digital volume adjustment to 127 grades.
- The main switch can get rid of the switching noise with its own noise elimination circuit
- Small size and highly integrated.
- We have the lowest latency (<0.5ms), and good quality of surrounding
- Low power consumption for a wide range of input voltage.
- Audio muting function when receiving weak signals or no signals.
- Function of auto channel scanning.
- For the application of head-phones, the receiver particularly provides no signal standby dormancy function. And the standby current is less than 0.5mA.
- Interface of Channel display
- Flexible design supporting custom functions
- Indeed convenient to use and easy to handle.
- As far as the headphone users are concerned, they are offered an option of a low-voltage module with the 2-2.2Volts as its minimum operating voltage
- Digital transmission

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

### 1.3 Electrical Specification

No	Description	Transmitter	Receiver
1	Work Voltage	3.6—6V DC	2.5—3.6V DC
2	Work Current	Max 120mA	Max 40mA
3	Operation Temperature	-15—65℃	-15—65℃
4	RF IC Frequency	2400—2524MHz	2400—2524MHz
5	MODULATION	GFSK	
6	Data Rate	2Mbps	2Mbps
7	Channel Space	4MHz	4MHz
8	Frequency Stability	±156KHz	±156KHz
9	Practical Module Frequency Range	2402—2478MHz	2402—2478MHz
10	Practical Module Working Channel	20CH (Mode B)	20CH (Mode B)
11	Module Channel Space	4MHz	4MHz

12	TX Power	10dBm	
13	RX Sensitivity		-90dBm
14	Input Level	Max.1.0Vrms	
15	Input Impedance	10k Ohm	
16	Input interface	Selection of inputs of microphones and stereo frequency	
17	Stereo Output Level 1		30mW RL=32Ω
18	Stereo Output Level 2		50mW RL=16Ω
19	Mic input gain adjustment	0dB (for ordinary Mic)	1kOhm
		20dB (for high sensitivity or monitoring)	
20	Output Impedance	1k Ohm	
21	Gain ratio of output and input	1:1	
22	Frequency Response	20—20000Hz (+/-1dB)	
23	Latency	<0.5ms	
24	Sampling Ratio	44.1khz (Mode A) 64kHz ( Mode B) 16 bit	
25	S/N Ratio	95dB	
26	THD	0.8%@1kHz	
27	Dynamic Range	90dB	
28	Channel Separation	70dB	

**Table I** Technical parameter

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

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.

## II Guide of Design

### 2.1 Guide of Transmitter Design

#### 2.1.1 Figure of Transmitter Interface and Dimension

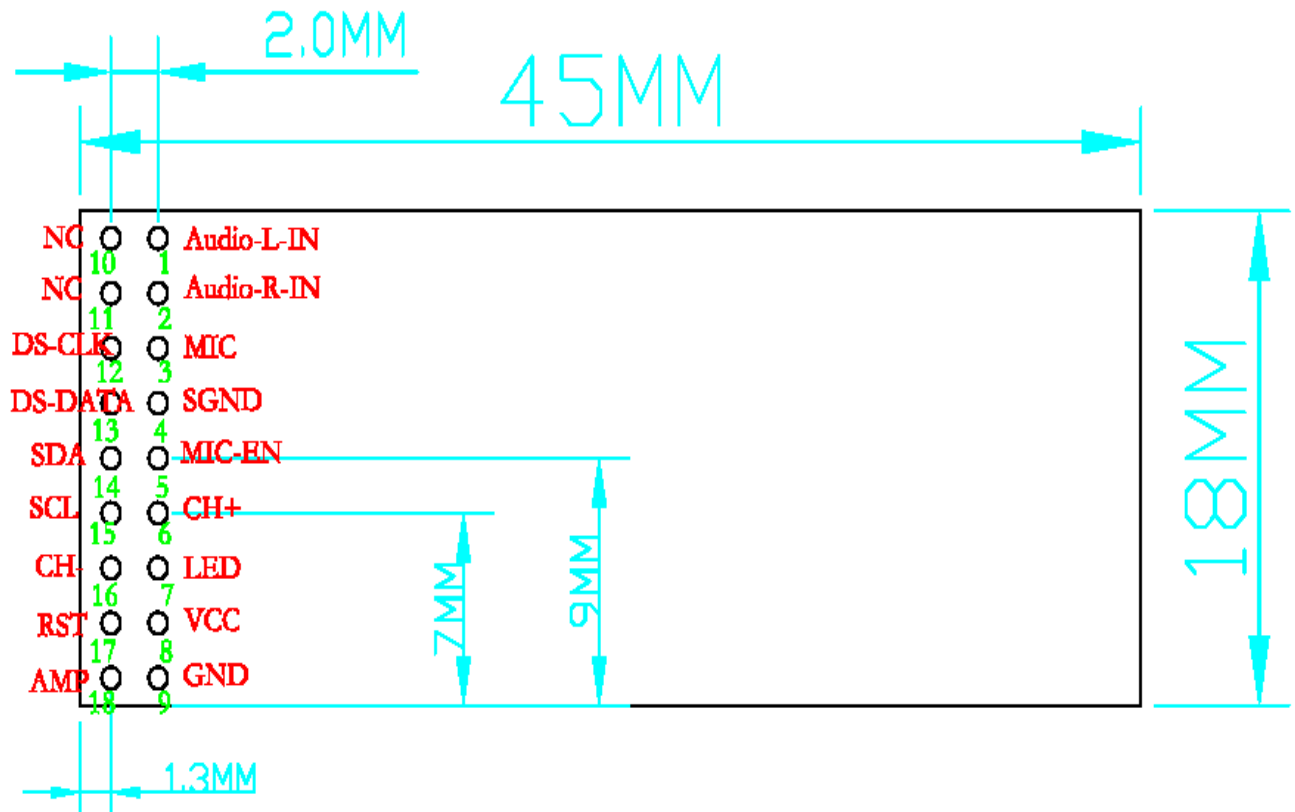


Figure 1 Transmitter Module Figure (SOYO-WM24G02T)

#### 2.1.2 Transmitter Module Pin Assignment

No	Pin	Description
1	Audio-L-IN	Audio Left Channel Line Input
2	Audio-R-IN	Audio Right Channel Line Input
3	MIC-IN	Microphone (Loudspeaker) Input
4	SG	Simulating Signal Ground
5	MIC-EN	Selection of Microphone or Sound Input. Open for Line input, connected with 10k resistance; grounding the drop-down for Mic input
6	CH+	Channel up. It is also used for pairing ID (Press the channel button continuously for 3s, during

		which the LED is out, until the LED remains on. Stop pressing, and it will get into the 5-second-point-to-point ID pairing status where the LED flickers. If you keep on pressing the button while the LED is flickering, it will keep on pairing, which is the function of pairing point to mass, a function of one transmitter pairing a mass of several receivers.
7	LED	Indicating Module Working Status: It remains on while normally working.
8	VCC	Voltage DC 3.6—6V
9	GND	Power
10	NC	Non-connected
11	NC	Non-connected
12	DS_CLK_	Displaying serial clock
13	DS_DATA	Displaying serial data
14	SDA	Signal data Adjustment, controlling input volume.
15	SCL	Signal data clock, controlling input volume
16	CH-	Channel down
17	REST	Module reset ,also used as Mute function
18	AMP	Selection of MIC input gain amplification: 0dB 、 20dB

### 2.1.3 Transmitter Module Using Methods

With unified channel and ID when produced, the Transmitter Module is ready to work as soon as it is interfaced in accordance with Figure 1 and switched on.

- For Mode A, switch is chosen through channel selection and 8 channels are available to avoid interference .Receiver has to be adapted synchronously as transmitting channel is done when channel is selected.
- For Mode B, by adding function of ID pairing to it, interference can be resisted automatically. And it has 20 channels for you to choose. So to avoid getting sounds mixed up, having the function of ID pairing is suggested. Paired ID is the real random address, whose coincidence rate is only 1/20,000,000, therefore it is nearly impossible to have the coincidence

### 2.1.4 Channel Transform Methods of Transmitter

The module has an extremely good resistance to interference as a result of the 2.4G digital wireless technology. It can be very effectively shielding the interference from cordless phones, cellular phones, walkie-talkies and other wireless devices and ensures a hi-fi wireless audio. However, the characteristics of the wireless products determine that the module can not avoid the interference with



the frequencies. Therefore, when encountering this source of interference, the easiest way is to change the channel, selecting a different frequency channel.

Our company provides, in the industry, the most optional channels (20channels) the most convenient channel tracking and switching (RF channel changing and the receiving end automatically sweep-tracking-and switching transformation) to facilitate the customer.

In the case of being interfered, say receiving intermittent sound or no sound (in an effective distance), replacement of the channel can avoid interference.

The specific method is as follows. Press the button and then release it, (Note: The pressing period can not be more than 3 seconds, otherwise it will get into the state of pairing) the channel is replaced once. Altogether 20 channels are available.

## 2.2 Guide of Receiver Module design

### 2.2.1 Figure of Receiver Module interface and dimensions

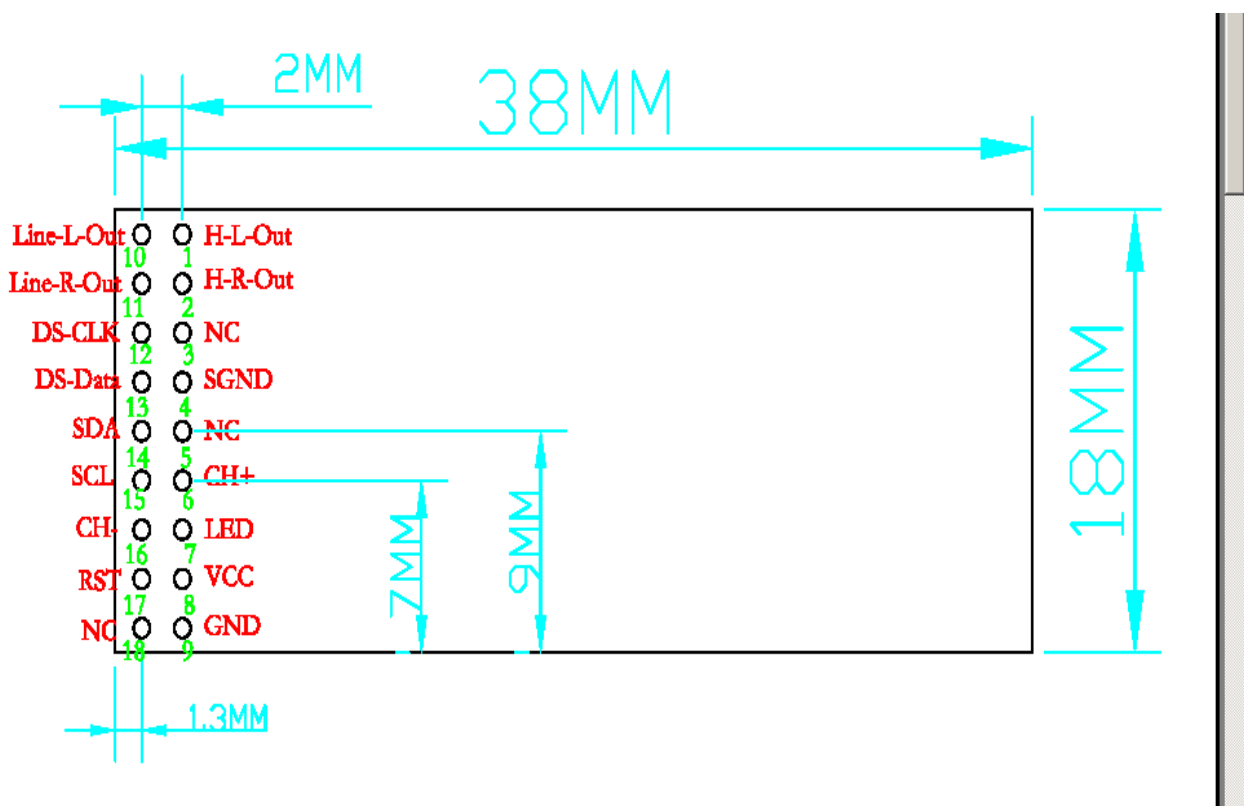


Figure 4 Receiver Module view (SOYO-WM24G02R)

## 2.2.2 Receiver Module Pin Assignment

No.	Pin	Description
1	H-L-Out	Audio Left Channel Output connected with the head-phone(amplifying and actuating the headphone directly)
2	H-R-Out	Audio Right Channel Output connected with the head-phone(amplifying and actuating the headphone directly)
3	NC	Non-connected
4	SG	Signal ground
5	NC	Non-connected
6	CH+	Channel up It is also used for pairing ID Press the channel button continuously for 3s, (The LED is originally out) until the LED is on. Stop pressing, and it will get into the 5-second-point-to-point ID pairing state where the LED flickers. When the ID paired signals have been received, LED flickers three times and the module gets into the receiving mode , waiting for the signals from the transmitter. Then pairing is fulfilled.
7	LED	Indicating its working condition. It remains on when scanning or not receiving. It is out when signals from the transmitter. are available.
8	VCC	Voltage DC 3.6—6V
9	GND	Power
10	Line-L-out	Audio Left Channel Line output
11	Line-R-out	Audio Right Channel Line output
12	DS_CLK	Displaying partial serial clock output
13	DS_DATA	Displaying partial serial data output
14	SDA	Serial signal data adjustment, controlling output volume.
15	SCL	Serial signal data clock, controlling output volume
16	CH-	Channel down
17	RST	Module reset
18	NC	Non-connected

## 2.2.3 Receiver Module Using Methods

With unified channel and ID when produced, the Receiver Module is ready to work as soon as it is interfaced in accordance with the figure related to it and switched on.

- For Mode A, switch is chosen through channel selection and 8 channels are available to avoid interference .Receiver has to be adapted synchronously as transmitter channel is done when channel is selected.

- For Mode B, by adding function of ID pairing to it, interference can be avoided automatically.

When the receiver is working and receiving signals properly, LED is out; otherwise it is on for 1s, and then begins to search for the channel automatically until signals are received.

## 2.2.4 Changing of Receiver Module Frequency Channel

The module has an extremely good resistance to interference as a result of the 2.4G digital wireless technology. It can be very effectively shielding the interference from cordless phones, cellular phones, walkie-talkies and other wireless devices and ensures a high-fidelity wireless audio. However, the characteristics of the wireless products determine that the module can not avoid the interference with the frequencies. Therefore, when encountering this source of interference, the easiest way is to change the channel, selecting a different frequency channel.

Our company provides, in the industry, the most optional channels (20channels) the most convenient channel tracking and switching (RF channel changing and the receiving end automatically sweep-tracking-and switching transformation) to facilitate the customer.

In the case of being interfered, say receiving intermittent sound or no sound (in an effective distance), replacement of the channel can avoid interference.

The specific method is as follows.

- Mode A: When Transmitter Modulechannel has been changed, LED will remains on, which means that no signals can be received. In this case, it is necessary to press the button and then release it (Note: the pressing period can not be more than 3 seconds, otherwise it will get into the state of pairing)until LED becomes out, which indicates that the channel has been replaced once and the receiver has correctly been changed into the same channel as the transmitter.
- Mode B: With the function of Transmitter Modulechannel tracking automatically, the receiver is able to change automatically into the same channel as the transmitter a second after the transmitter channel has been changed by scanning. The whole process is automatic, and no manual operation is needed.

## 2.3. Receiver Module and Transmitter Module Pairing Arrangement

### 2.3.1 Approaches of Pairing Point to Point

Pairing point to point:

- Simultaneously press the CH+ buttons of both Receiver Module module and Transmitter module for more than 3s( during which LED is continuously out for 3s) till LED is on. The moment you release it, it gets into the 5-second-point-to point-ID-pairing state(during which LED is flickering).

- **Receiver Module Paring Arrangement**

When Receiver Module receives paired signals, the LED of the receiver flickers three times, indicating that it gets into the receiving state, waiting for signals from the transmitter. Normally, the LED will be out when paring is fulfilled.

- **Transmitter Module Paring Arrangement**

When the CH button of the transmitter module is released, its LED flickers five times. When pairing is fulfilled, the LED of the receiver module is out.

### 2.3.2 Approaches of Pairing Point to Mass:

- **Transmitter Module using methods**

Press the CH button of the receiver for more than 3s (during which the LED is continuously out for 3s) till the LED is on. The moment you release it, it gets into the 5s-point-to-point-ID-pairing state (during which the LED flickers). If you again press the button while it is flickering, its continuous flickering indicates that the module gets into the state of pairing point to mass. The button should not to be released until the pairing work is done.

- **Receiver Module using methods**

When the transmitter module has got into the state of pairing point to mass, press the CH button of the

receiver module for more than 3s (during which the LED is continuously out for 3s) till the LED is on. The moment you release it, it gets into the 5s-point-to-point-ID-pairing state. (during which the LED flickers). When the receiver has received the ID paired signals, its LED will flicker three 3 times and the module gets into the receiving state, waiting for the signals from the transmitter. Normally, when pairing is accomplished, the LED will be out. Use the methods repeatedly till the .point-to-mass pairing work is completed After that, if you release the CH button of the transmitter, the pairing point to mass comes to an end.

### III. Guide of Placing an Order

SOYO-WM24G02A      SOYO-WM24G02B

We can offer two modes for you to choose: SOYO-WM24G02A and SOYO-WM24G02B

Differences:

Mode to be ordered	SOYO-WM24G02A	SOYO-WM24G02B
Channel selection method	Manual	auto
ID feature	No.	Only one ID number for each transmitter and receiver. Additional ID distinguishing interference resistance to keep interferences away.
Sampling frequency	44.1khz@16bit*2	64khz@16bit*2