User Manual

1. Product Description

The WSN720S module is a wireless audio module based on the Microchip DARR83. This module can used to build an uncompressed wireless digital audio transceiver operating in the 2.4GHz, 5.2GHz and 5.8GHz bands. The wireless audio link supports up to two stereo audio streams and comes together with additional features such as: data encryption, pairing functionality, bi-directional control data messages, low power audio snooze mode, WLAN detection and Automatic Frequency Allocation. The DARR83 chip itself provides the basic functions of Audio Processing and buffering, Data Link Layer and Physical Layer. The WSN720S module integrates all functionality for a wireless digital and analog audio connection, comprising the below features:

- DARR83 Wireless Audio Processor
- 2.4GHz/ 5.2GHz/ 5.8 GHz RF Transceiver
- Embedded Antennas – dual antenna
- One TX transmitter and antenna diversity receiver (not simultaneous TX transmission)
- Digital audio interfaces (I2S)
- Integrated 24 bit stereo Audio DAC + Headphone AMP
- Integrated 16 bit Audio ADC + Microphone AMP
- Built-in SPI interface Flash
- 24 pins interface connector for power, audio output, control interface and GPIOs
- Regulated 5V supply

2. Functions & Features

High Quality Audio

- Up to four stereo audio channels, fully bidirectional, up to 24-bit/96 kbps uncompressed audio
- Low latency<20ms for real-time audio and lip sync
- Low latency compression algorithm – optimized for voice applications, headphones
- Inter-speaker synchronization; Low-jitter audio clock sync
- Programmable digital audio gain

Networking and Connectivity

- 22Mbps Bandwidth in 2.4G, 5.2GHz and 5.8 GHz Bands
- In-room or multi-room network topology
- Point-to-Point and Point-to-Multipoint
- Bidirectional data channel (100 kbps)
- Simple Pairing and Association Function
- 4 I2S Data pins, each provided with their own pair of BCK/LRCK signals or stereo S/PDIF

input/output

- Master and Slave I2C bus for external control functions

Coexistence and Robustness

- Enhanced robustness against both in and out of band interferers like: WiFi and cordless phones
- Coexistence with 802.11a, b, g and n
- Automatic receiver antenna diversity minimizes fading and multi-path effects
- Link quality monitoring
- Soft audio muting under poor link circumstances

Power Management

- Low power consumption
- Automatic RF output power control
- Power down Duty Cycle mode: If no link established, modules (both TX and RX) will enter power down mode

Integrated 8052 MCU

The DARR83 integrates an 8052 MCU. This includes the following features:

- 45 KByte Code RAM
- 8 KByte Data RAM
- 4 Timer/Counters
- UART

Digital Audio Clock Synchronization

The digital audio clock synchronization is an additional more cost effective method for synchronization of audio sample on the receiving side with respect to the transmitted audio samples. The digital clock synchronization feature works for output audio sample rates of 96 and 48kbps.

Sample Rate Converter (SRC) + Sample Rate Detector

The SRC can handle the following input sample rates [Ksps]:

- 44.1
- 48
- 96
- 192(using I2S in slave mode)

3. Product Specification

Product Form Factor

- Module Size (mm): 26.0 (W) X 60.0 (L) X 3.3 (H)
- PCB size (mm): 26.0 (W) X 60.0 (L) X 1.1 (H)
- Shield can (mm): 23.3 (W) X 23.0 (L) X 1.7(H)
- Antenna Type : Dual- PCB Printed Antenna

Operating Contions

Symbol	Parameter	Min	Typ.	Max	Unit
V dc	Supply Voltage	4.5	5.0	5.5	V
I dc	Supply current	-	-	450	mA
Temp	Operating Temperature	-20	25	50	℃

RF & Audio Characteristics

Parameter		Min	Typ.	Max	Unit
Modulation	QPSK				
TX/RX operating	1 TX transmit / RX antenna diversity				
Bandwidth			22		MHz
RF Band (channel)	2.4GHz (low/mid/high)	2412 (1)	2438 (2)	2464 (3)	MHz
	5.2GHz (low/mid/high)	5180 (4)	5210 (5)	5240 (6)	
	5.8GHz (low/mid/high)	5736 (7)	5762 (8)	5814 (9)	
TX Average RF Output Power (Typical: avg. /peak, *TA = 25 ℃*)	2.4GHz	13.0	15.0	17.0	dBm
	5.2GHz	12.0	14.0	16.0	
	5.8GHz	6.0	8.0	10.0	
RX Sensitivity			-82		dBm
Audio Latency			20		ms

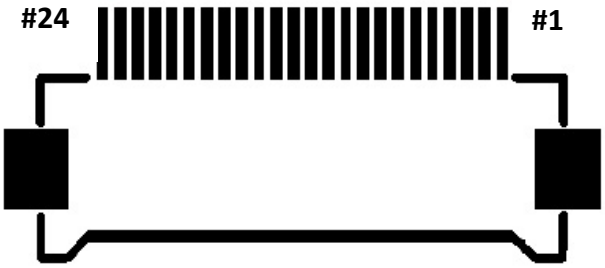
Audio Bit Resolution			24		bit
Audio Sampling Rate			48		Kbps

Antenna Characteristics

PARAMETER	ANTENNA	BAND	MIN	TYP	MAX	UNIT
Frequency Range		2.4GHz	2400		2480	MHz
		5.2GHz	5150		5250	
		5.8GHz	5725		5850	
Return Loss	ANT-A	2.4GHz			-13	dB
		5.2GHz			-8	
		5.8GHz			-13	
	ANT-B	2.4GHz			-13	
		5.2GHz			-8	
		5.8GHz			-15	
Peak Gain	ANT-A	2.4GHz			0.8	dBi
		5.2GHz			3.7	
		5.8GHz			4.4	
	ANT-B	2.4GHz			2.5	
		5.2GHz			4.3	
		5.8GHz			4.2	
Average Gain	ANT-A	2.4GHz			-2.6	dBi
		5.2GHz			-0.8	
		5.8GHz			-1.0	
	ANT-B	2.4GHz			-1.7	
		5.2GHz			-0.8	
		5.8GHz			-1.2	
Efficiency	ANT-A	2.4GHz			55	%
		5.2GHz			83	
		5.8GHz			80	
	ANT-B	2.4GHz			67	
		5.2GHz			84	
		5.8GHz			76	
Impedance				50		Ω

4. I/O Pin Descriptions

Pin #	Pin Name	TX Module		RX Module	
		I/O	Function Description	I/O	Function Description
1	VDD	PWR	Regulated 4.5V to 5.5V input	PWR	Regulated 4.5V to 5.5V input
2	VDD	PWR	Regulated 4.5V to 5.5V input	PWR	Regulated 4.5V to 5.5V input
3	PWM RST#			O	
4	MUTE			O	Mute audio output
5	IRQ / PWR_CTRL	O	Host MCU Interrupt	O	SMPS stand-by mode (Active High)
6	RESET#	I	Module reset from Host MCU, Internal Pull-Up	I	Module reset from Host MCU, Internal Pull-Up
7	I2C_SCL_S	I	I2C Clock Input from Host MCU, (S_MISO)	I	Not use (Open)
8	I2C_SDA_S	I/O	I2C Data In/Output to Host MCU ,(S_MOSI)	I/O	Not use (Open)
9	I2C_SCL_M		Not use (Open)	O	I2C Clock Output for AMP IC
10	I2C_SDA_M		Not use (Open)	I/O	I2C DATA for AMP IC
11	MCLK			O	This port must be used for I2S output
12	GND	GND	Ground	-	Ground
13	BCK	I	I2S bit clock input from Host system	O	I2S bit clock input from Host System
14	LRCK	I	I2S Data window clock input from Host system	O	I2S Data window clock input from Host system
15	DAT_W	I	I2S DATA – Rear L/R	O	I2S DATA
16	DAT_X	I	I2S DATA input from host system (Subwoofer)	O	I2S DATA input from Host system (Subwoofer)
17	MON_TXD (UART_TXD)	O	UART Debug monitor	O	UART Debug monitor
18	DAT_Y / FW_SEL	I	I2S DATA – Rear Top L/R	I	FW Select (Woofer or Rear)
19	IR_RST#			O	AMP Reset
20	ID SET#			I	ID Set Button
21	RED LED			I/O	RED LED Control & Rear L/R detect option
22	BLUE LED (UART_RXD)			O	Blue LED Control
23	IR_SD# (HW_MUTE)			I	Detect IR Amp Shutdown
24	GND	GND	Ground	GND	Ground



5. Label

TX Module Label

Size: 22 X 21.5 [mm]
color : Yellow

RX Module Label

Size: 22 X 21.5 [mm]
color : White

6. Notice

FCC Statement

This device complies with Part 15 of FCC Rules, Operation is Subject to following two conditions:

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received including interference that cause undesired operation.

Caution: Any changes or modifications to the equipment not expressly approved by the party responsible for compliance could void user s authority to operate the equipment.

This equipment has been tested and found to comply within 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 different circuit from that to which the receiver is connected
• Consult the dealer or an experienced radio/TV technician for help.

This device and its antenna(s) must not be co-located or operation in conjuction with any other antenna or transmitter.
This device is going to be operated in 5.15~5.25GHz frequency range, it is restricted in indoor environment only

IMPORTANT NOTE:

FCC Radiation Exposure Statement;

This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter.
A minimum separation distance of 20 ㎝ must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC Part 2.1091 radiation exposure limits set forth for an population/ uncontrolled environment can be satisfied.
Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

That separate approval is required for all other operating configurations, including portable configurations with respect to part 2.1093 and different antenna configurations.

USER MANUAL OF THE END PRODUCT:

In the users manual of the end of product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated.

The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.
If the size of the end product is smaller than 8x10cm, then additional FCC part15.19statement is required to be available in the users manual; This device complies with Part15 of FCC rules.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains **FCC ID: A3LWSN720S** ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.

IC Statement

This Class B digital apparatus complies with Canadian ICES-003.

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.

Cet appareil numérique de la classe B est conforme á la norme NMB-003 du Canada.

This device and its antenna(s) must not be co-located or operation in conjuction with any other antenna or transmitter. The device could automatically discontinue transmission in case of absence of information to transmit, or operational failure.Note that this is not intended to prohibit transmission of control or signaling information or the use of repetitive codes where required by the technology.

The device for the band 5150-5250 MHz is only for indoor usage to reduce potential for harmful interference to co-channel mobile satellite systems.

IMPORTANT NOTE:

IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 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

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is still responsible for the IC compliance requirement of the end product, which integrates this module.
20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the IC RSS-102 radiation exposure limits set forth for an population/ uncontrolled environment can be satisfied.
Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. IC statement is required to be available in the users manual: This Class B digital apparatus complies with Canadian ICES-003.
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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains **IC : 649E-WSN720S** ".