



Low Cost Integrated Voice/Audio Module

LIBRE SYNC

Product Data Sheet Module: LS5BV-N11S

Rev: 0.2

1. Introduction

Libre Wireless, LS5BV-N11S is a voice enabled network media module which includes a 580 MHz MIPS24K CPU core, 64MB of DDR2 DRAM memory and 16MB of Serial Flash, an 802.11n compliant 1T1R MAC/BBP/PA/RF, single port 10/100 Ethernet MDI interface, Voice processing DSP and a USB Host.

LS5BV-N11S provides a convenient and simple voice activated method for discovering and controlling devices, and cloud interfaces. LS5BV-N11S contains Integrated DSP for efficient voice trigger, speech recognition and high-speed audio processing. Provides Non-stationary and stationary noise reduction for both transmit and receive sides, and it supports Acoustic Echo Cancellation, Barge-in, Flexible Listening Enhancement, Voice equalizers.

The LS5BV-N11S, has very few external components required for 2.4GHz 11n wireless products. The LS5BV-N11S employs Libre Wireless's 2nd generation 11n technologies for longer range and better throughput. The embedded high performance CPU can process advanced applications effortlessly, such as Wi-Fi data processing without overloading the host processor. In addition, the LS5BV-N11S has rich hardware interfaces (SPI/ I2S/ I2C/ UART/ USB) to enable many possible applications.

LS5BV-N11S devices can be optimized for Smart Home control, Security/Surveillance, Voice Control Devices, Intercom/PA systems, Music Streaming, Outdoor/Recreational, Low Power Applications.

Libre solutions enables Brands/ODM's to take advantage of DDMS and unique Libre capabilities while delivering voice control, IoT device control, media streaming, communication and cloud connectivity features to the connected Consumer & Home.

2. Module Feature Summary

Network Media Features

- LS5BV-N11S is the small size and low power module for IEEE 802.11b/g/n wireless LAN.
- Embedded 1T1R 2.4G CMOS RF
- Embedded 802.11n 1T1R MAC/BBP w/MLD enhancement
- Support for both PCB connector and Notched SMT pad option
- 72.2 Mbps PHY data rate
- 20Mhz channel width
- Legacy and high throughput modes
- Compressed block ACK

- WEP64/128, WPA, WPA2, WAPI engines
- QOS - WMM, WMM Power Save
- Hardware frame aggregation
- Supports 802.11h TPC
- MIPS 24KEc 580 MHz with 64 KB I-cache/32 KB D-cache
- 16-bit DDR2 64Mbytes
- Serial Flash 16Mbytes
- 3x UART
- 1x USB 2.0 HOST
- Single port 10/100 Mbps Fast Ethernet MDI interface
- Slow speed I/O: GPIO, SPI, I2C, I2S, UART, and JTAG
- I2S interface supports 24-bit/192kHz (slave mode)
- I/O: 3.3 V

Voice Features

- Two Integrated DSP cores; that comprise: power-efficient voice trigger (VT) subsystem, high-speed audio processor (APR) subsystem.
- Noise Reduction
 - Supports Narrowband and wideband voice communications
 - Provides Non-stationary and stationary noise reduction for both transmit and receive sides.
 - Provides High voice quality in various handheld phone positions.
- Acoustic Echo Cancellation: Reduces the effects of echo in both single-talk (half-duplex) and double-talk (full-duplex) use cases.
- Automatic Gain Control: maintains the voice signal at desired level for both transmit and receive voice.

- Flexible Listening Enhancement: Improves the intelligibility of received voice in noisy environment.
- Voice equalizers: Enable frequency response modifications of voice and audio for better performance.
- Customized noise reduction for ASR: Maximizes ASR rates.

3. Block Diagram

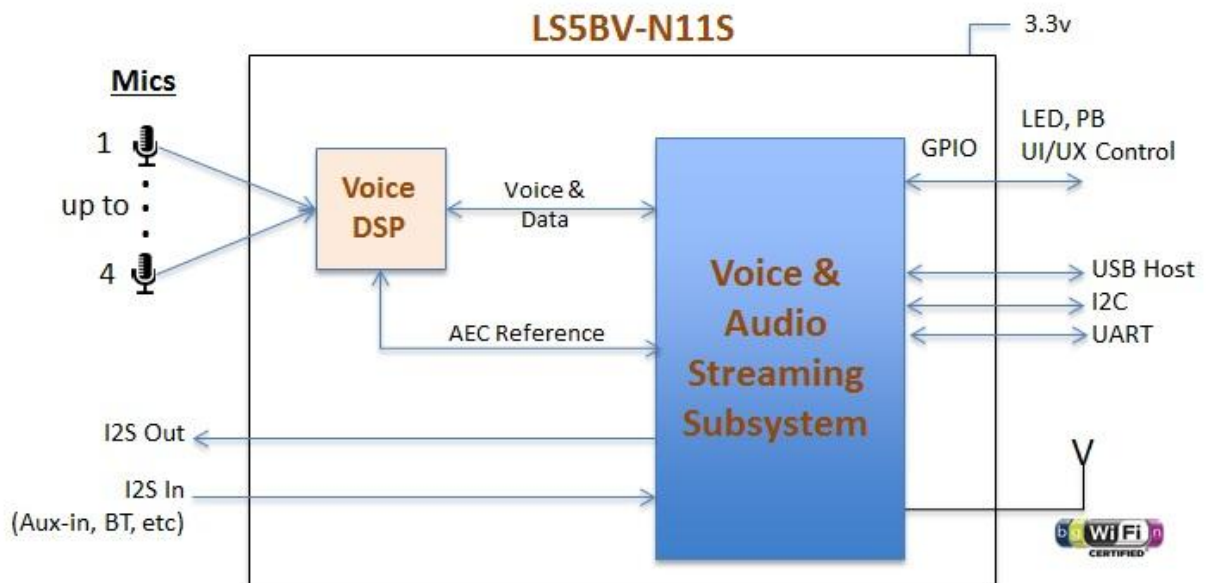



Figure 3-1: LS5BV Block Diagram

4. Specifications

4.1. Generic Specification Table

Type	Description for LS5BV-N11S
Model	LS5BV-N11S
Product Name	Voice Enabled Network Media Module
Major Chipset	MT7688A + DBMD5
Standard	IEEE802.11b / g /n
Data Transfer Rate	1, 2, 5.5, 6, 11, 12, 18, 22, 24, 30, 48, 54, 65 and maximum Physical Layer rate of 72.2 Mbps
Frequency Band	2.4 GHz
Control Bus Interface	UART
Data Bus Interface	USB / Ethernet / I2S
I2S Sampling Rate	Maximum of 192 KHz, 24 Bits
Operating Voltage	3.3 V +/- 5%
Ripple Requirement	20-30 mv peak-to-peak
Operating Temperature	-20°C to +60°C
Storage Temperature	TBG
Dimension (L x W x H)	52mm x 26mm x 5.8 mm (approx.) ± 0.2mm  Note: The dimension mentioned are subject to change. Please check with Libre team before finalising the design.

4.2. RF Characteristics

Items	IEEE802.11b (11 Mbps mode unless otherwise specified)	IEEE802.11g (54 Mbps mode unless otherwise specified)	IEEE802.11n (MCS7 mode unless otherwise specified)
Mode	DSSS / CCK 11 Mbps	OFDM 54 Mbps	OFDM 135 Mbps
Channel Frequency	2412 ~ 2462 MHz	2412 ~ 2462 MHz	2412 ~ 2462 MHz
RX	-83dbm	-70dbm	-65dbm
TX EVM	-27db	-30db	-31db
Normal Conditions	Temperature: 25°C VDD: 3.3 V	Temperature: 25°C VDD: 3.3 V	Temperature: 25°C VDD: 3.3 V

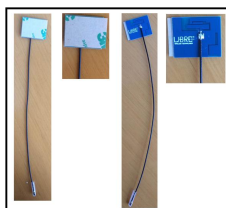
4.3. DC Characteristics

Module	Voltage	Ripple Requirement	Current Consumption (linking)
LS5BV-N11S	3.3 V	20-30 mv peak-to-peak	TBD

4.4. Antenna Specification

Antenna Module	LSANT-1A-180
Antenna Gain	≤ 1.5dBi
Manufacturer of Antenna	Golden Smart International Co., Ltd

Antenna Images



5. Mechanical, Connectors and Interfaces

5.1. Physical Module

Note: The dimension mentioned are subject to change. Please check with Libre team before finalising the design.

Module Dimension is 52mm x 26.0mm x 5.8mm (L x W x H)

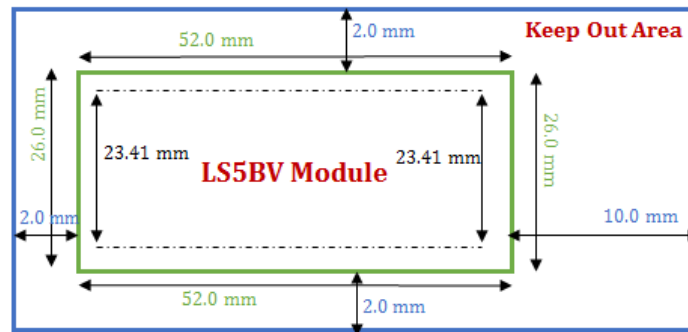


Figure 6-1: Keep Out Area Details

TBG

Figure 5-1: LS5BV-N11S Module Bottom

TBG

Figure 5-2: LS5BV-N11S Module Top

5.2. Connector Pin Out

Pin	Description	Function	Pin	Function	Description
1	3.3VD	3.3VD	31	3.3VD	3.3VD
2	Ground	GND	32	3.3VD	3.3VD
3	I2C_Clock	I2C_SCK	33	Ground	GND
4	I2C_Data	I2C_SDA	34	SPI_SPCK/GPIO4	SPCK
5	NC	NC	35	SPI_MOSI/GPIO5	MOSI

Pin	Description	Function	Pin	Function	Description
6	POWER ON RESET I/P	PORST_N	36	SPI_MISO/GPIO6	MISO
7	UART_TXD	UART_TXD1	37	SPI_CS1/GPIO37	SPI-CS1
8	UART_RXD	UART_RXD1	38	APR GPIO11	APR GPIO11
9	UART CTS	UART_CTS1	39	GND	Ground
10	UART RTS	UART_RTS1	40	EPHY_RXP_P4	Port4 RX+
11	DEBUG-UART Lite TXD	UART_TXD2	41	EPHY_RXN_P4	Port4 RX+-
12	DEBUG-UART Lite RXD	UART_RXD2	42	EPHY_TXP_P4	Port4 TX+
13	Ground	GND	43	EPHY_TXN_P4	Port4 TX-
14	MCLK_INPUT (12.288MHz)	MCLK_INPUT	44	GND	Grond
15	I2S_RXD	I2SDI	45	NC	NC
16	I2S_TXD	I2SWDO	46	NC	NC
17	I2S_LRCLK	I2SWS	47	NC	NC
18	I2S BIT CLOCK	I2SCLK	48	NC	NC
19	Ground	GND	49	NC	NC
20	APR GPIO8	APR GPIO8	50	NC	NC
21	NW Indication LED	NW Indication LED	51	MIC ON_LED	MIC ON_LED
22		MIC_ON_OFF	52	MIC_OFF_LED	MIC_OFF_LED
23	APR GPIO9	APR GPIO9	53	GND	Ground
24	Ground	GND	54	SETUP	WAC / factory default reset
25	USB_DM	USB_D-	55	DDMS LED	DDMS LED

Pin	Description	Function	Pin	Function	Description
26	USB_DP	USB_D+	56		
27	Ground	GND	57	APR GPIO10	APR GPIO10
28	RED LED	RED LED	58	APR GPIO12	APR GPIO12
29	BLUE LED	BLUE LED	59	GND	Ground
30	GREEN LED	GREEN LED	60	NC	NC

6. Ordering Guide

Product Number	Mic Configuration
LS5BV-N11S	TBD

7. Environmental

7.1. Operating

- Operating Temperature: TBG
- Relative Humidity: TBG

7.2. Storage

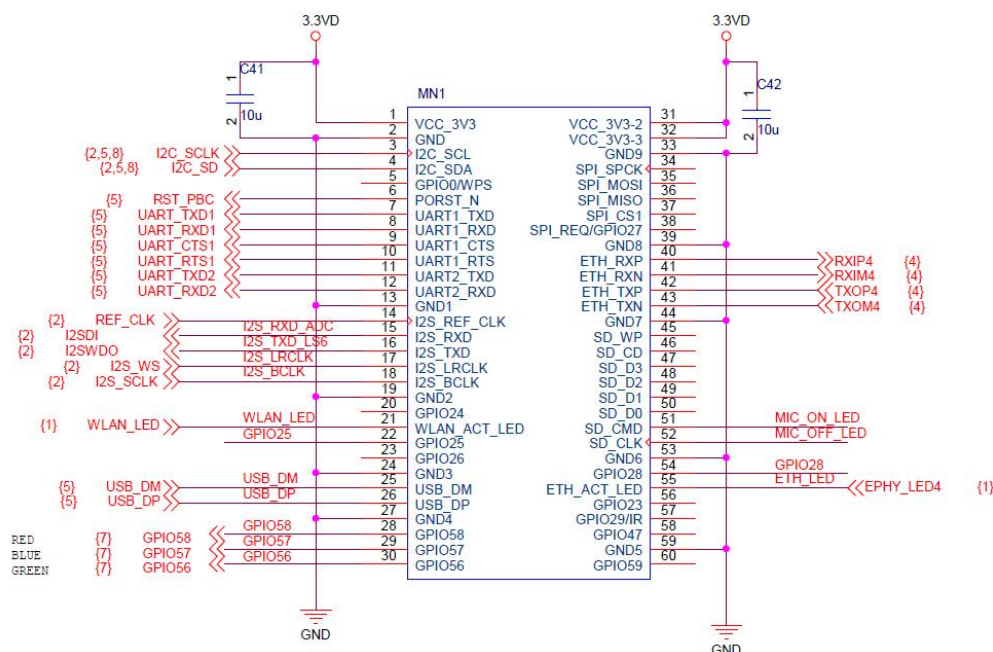
- Temperature: TBG
- Relevant Humidity: TBG

8. Reference Schematics

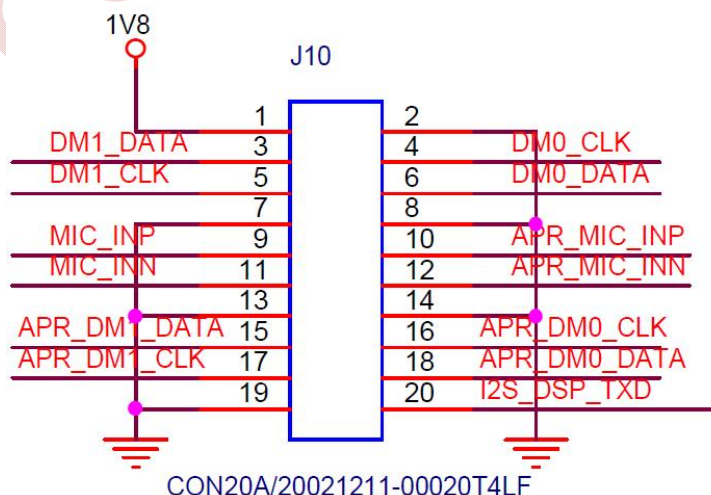


Note: For latest and detailed reference schematic, Contact Libre team.

8.1. LS5BV-N11S Connector

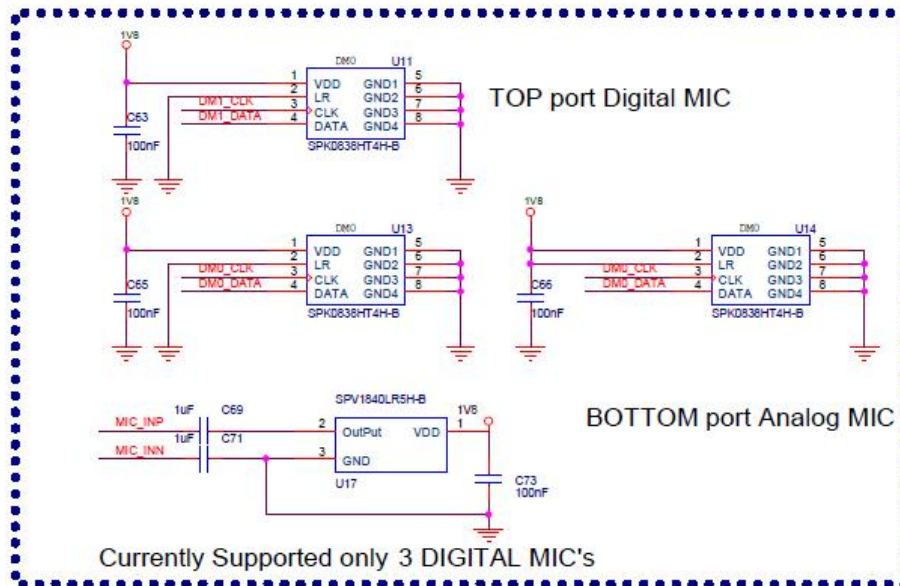


8.2. J10 Connector

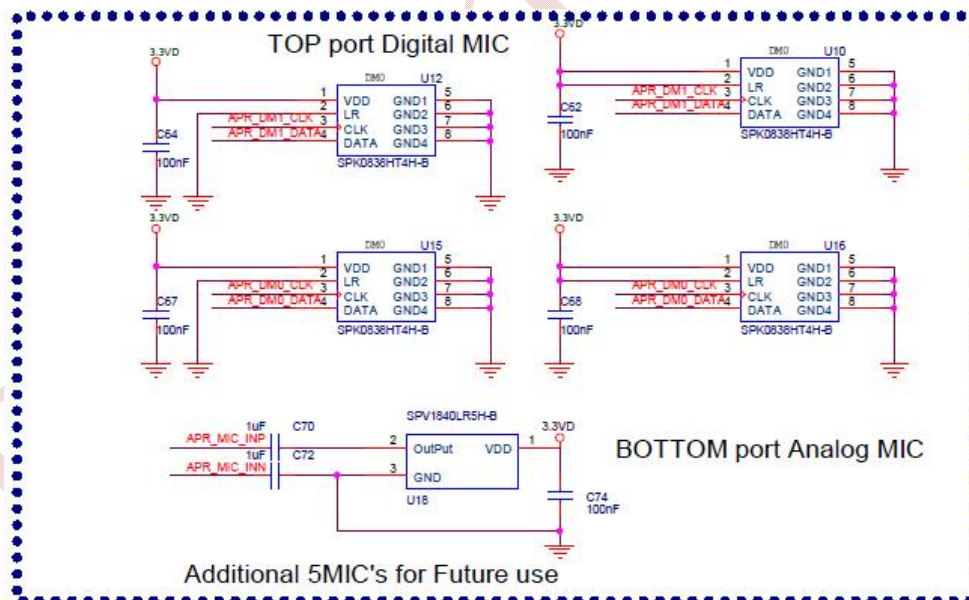


8.3. External MIC I/F

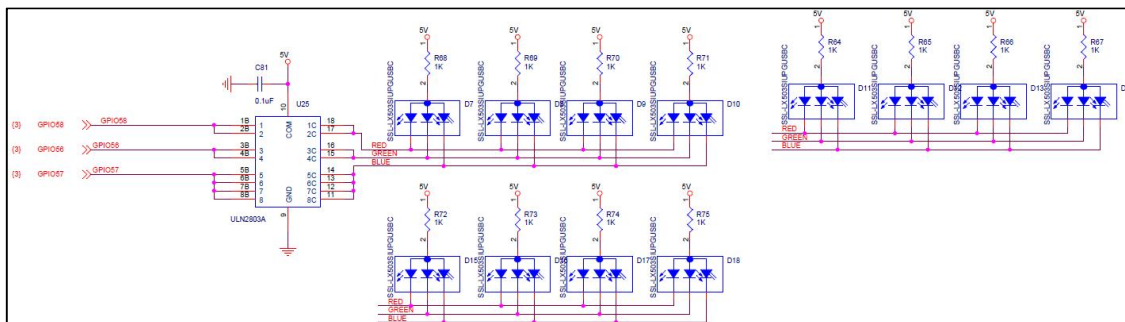
3 MIC Configuration – Currently Used



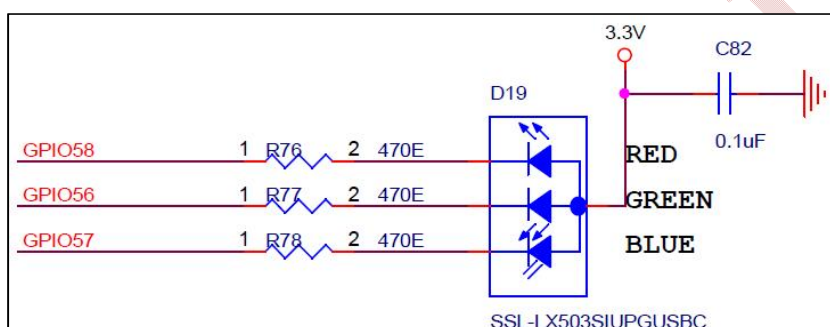
5 MIC Configuration – For Future Use



8.4. Alexa UI with Multiple RGB LED on the Ring



8.5. Alexa UI with Single RGB LED



For detailed specifications, refer to **LS5BV-N11S** schematic file available in Libre Portal.

9. Disclaimer

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10. Appendix

10.1. Revision History

Revision	Date	Description of change
0.1	February 21, 2017	Draft
0.2	February 22, 2017	Content restructure

Preliminary

FCC Statement

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.

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

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device .

FCC Radiation Exposure Statement

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

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

This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2ADBM-LS5BVD-N11S Or Contains FCC ID: 2ADBM-LS5BVD-N11S"

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. 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.
(2) This device must accept any interference received, including interference that may cause undesired operation.

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

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with limit modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C : 15.247 and 15.209 requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 requirement , then the host can be sold legally.