

Manual for Wireless Audio Module

December 15, 2011



REVISION HISTORY

| Version | Purpose \ Changes | Date |
|----------------|--------------------------|-------------------|
| 1.0 | Initial release | December 15, 2011 |
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1. Introduction

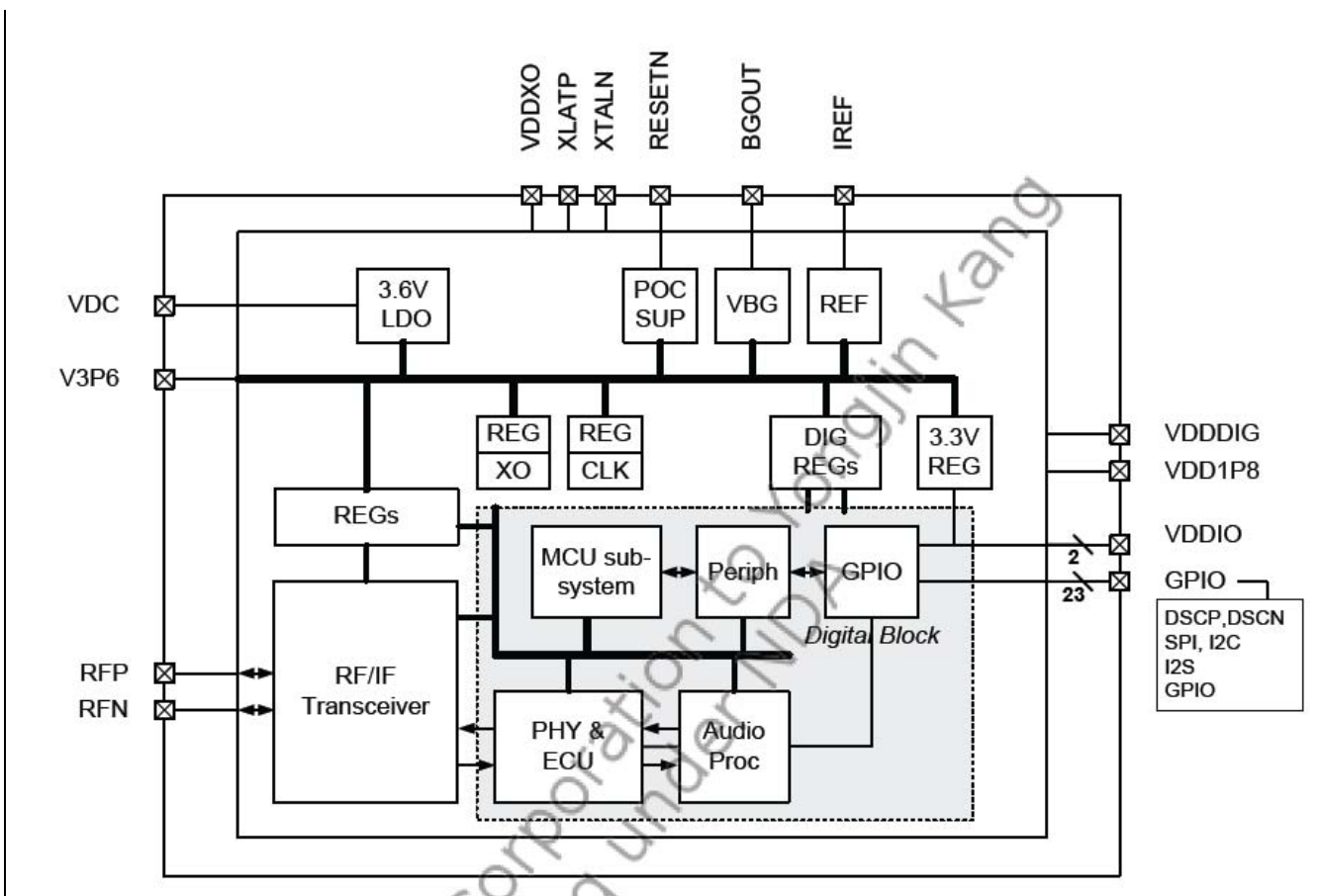
This features is a highly integrated, single-chip, wireless audio solution. This integrates the following: a complete 2.4 GHz RF transceiver, the VMI™ wireless communication system PHY & MAC, advanced power management, audio DSP, I2S interfaces and a full complement of programmable digital interfaces to support a wide range of end-product user communication requirements.

2. Hardware Architecture:

2.1 Main Chipset Information

| Item | Vendor | Part Number |
|-------------|--------|-------------|
| BBIC + RFIC | AVNERA | AV6200 |

2.2 Circuit Block Diagram



3. Operation Description

Samsung wireless audio module is the 2.4GHz band RF Module that provide users of a wireless audio system to connect to TV. This enables a wide range of digital wireless audio applications. This wireless audio technology has been known for its extreme wireless fidelity and audio quality. This module further extends this offering a high level of integration resulting in a very low-cost complete wireless system solution, without any sacrifice to the main technology drivers: Audio Quality and Wireless Fidelity.

- Time base of the RF frequency

For Zero IF and RF frequency, a crystal (16MHz) is a clock reference.

- Synthesizer

Synthesizer inside transceiver internal voltage controlled oscillator (VCO) provides the desired LO Signal base on the phase-locked loop (PLL) with a relatively wide tuning range for this application.

- Transmission

In transmit mode, the audio engine controlled I2S, transforms the audio data into packetized digital IQ signals. These are in turn pulse-shaped before conversion by a 10 bits 44MSPS DAC to match to the analog IQ inputs of the radio IC. The radio IC has programmable baseband filters to lower the RF spectrum side lobes and to suppress the DAC image and the DAC spurious. The output power is programmable. A power detector (PD_out) on the radio IC enables close-loop TX power control. The differential RF PA outputs are connected via a balun and low pass filter to a transmit/receive switch with TX diversity option to the antenna outputs.

- Receiver

In receive mode, antenna diversity is supported. The single ended output of the TR switch is connected to the RF LNA input through a matching network. Filtering and amplification is all performed by the radio transceiver. The gain setting is controlled by the BB. The analog IQ outputs are sampled by the BB by its integrated 22 MSPS dual channel 8bit ADC. This received data is demodulated and fed to the audio processing engine controlling the I2S connections.

- Power Control Level

The integrated PA for this device can transmit at a maximum power of +4dBm for class 2 operation.

- Transmit/Receive Switch

DUT has Transmit/Receive Switch. End user can't select any power setting.

4. Application for Wireless audio module

The application for the Tx and Rx modules is for the wireless link between a Samsung Sound Bar and a sub-woofer.

5. Pin description

WISP-40ST CONNECTOR PIN TABLE (TX-Module)

TX 모듈 Connector Pin Table (Connector : 3708-002175, 24p, 0.5mm)

| No | Pin Name | I/O | AV6200 | Pin description |
|----|-----------|-----|---------------|---|
| 1 | VDD | - | | 5V (±10%) AV6200 |
| 2 | VDD | - | | |
| 3 | Reserved | O | | Not use (open) |
| 4 | Reserved | O | | Not use (open) |
| 5 | IRQ# | O | GPIO17 Pin 48 | Internal Pull-Up |
| 6 | RESET# | I | Pin 24 | Module reset from Host MCU, Internal Pull-Up |
| 7 | I2C_SCL_S | I | GPIO5 Pin 44 | I2C Clock Input from Host MCU , Internal Pull-Up (S_MISO) |
| 8 | I2C_SDA_S | IO | GPIO4 Pin 45 | I2C Data In/Output, Internal Pull-Up (S_MOSI) |
| 9 | MISO_M | O | GPIO9 Pin 33 | SPI MISO of flash memory (Must be opened) |
| 10 | MOSI_M | IO | GPIO8 Pin 34 | SPI MOSI of flash memory (Must be opened) |
| 11 | Reserved | I | | |
| 12 | GND | - | | Ground |
| 13 | BCK | I | GPIO15 Pin 26 | I2S bit clock input from Host System |
| 14 | LRCK | I | GPIO16 Pin 25 | I2S Data window clock input from Host system |
| 15 | SSB_M | I | GPIO6 Pin 36 | SSB of Flash memory |
| 16 | DAT_X | I | GPIO14 Pin 27 | I2S DATA input from Host system (Subwoofer) |
| 17 | SCK_M | I | GPIO7 Pin 35 | SPI Clock of Flash memory |
| 18 | Reserved | | | |
| 19 | Reserved | | | |
| 20 | Reserved | | | |
| 21 | S_SCK | I | GPIO3 Pin 46 | |
| 22 | S_SSB | I | GPIO2 Pin 47 | |
| 23 | HWWR_MUTE | I | GPIO11 Pin 30 | Audio stream mute input, Active Low = Mute |
| 24 | GND | - | | Ground |

WISP-40AR CONNECTOR PIN TABLE (RX-Module)

RX 모듈 Connector Pin Table (Connector : 3708-002175, 24p, 0.5mm)

| No | Pin Name | I/O | AV6200 | Pin description |
|----|-----------|-----|---------------|--|
| 1 | VDD | - | | 5V (±10%) AV6200 |
| 2 | VDD | - | | |
| 3 | PWM_RST# | O | GPIO17 Pin 48 | PWM IC(PS9831) Reset Output |
| 4 | MUTE | O | GPIO18 Pin 43 | Mute audio output (Active High) |
| 5 | PWR_CTL | O | GPIO15 Pin 26 | SMPS stand-by mode (Active High) |
| 6 | RESET# | I | Pin 24 | Module reset from SWA-XXXX |
| 7 | I2C_SCL_S | I | GPIO 5 Pin 44 | Not use (Open) |
| 8 | I2C_SDA_S | IO | GPIO4 Pin 45 | Not use (Open) |
| 9 | I2C_SCL_M | O | GPIO22 Pin 41 | I2C Clock Output for PS9831 control (option resistor : MISO_M GPIO9) |
| 10 | I2C_SDA_M | IO | GPIO21 Pin 42 | I2C Data for PS9831 control (option resistor : MOSI_M GPIO8) |
| 11 | MCLK | I | GPIO10 Pin 31 | This port must be used for I2S output |
| 12 | GND | - | | Ground |
| 13 | BCK | O | GPIO11 Pin 30 | I2S bit clock output to SWA-5XXXX |
| 14 | LRCK | O | GPIO12 Pin 29 | I2S Data window clock output to SWA-5XXXX |
| 15 | SSB_M | I | GPIO6 Pin 36 | SSB of Flash memory (Must be opened) |
| 16 | DAT_X | O | GPIO13 Pin 28 | I2S DATA_X Output to SWA-5XXXX (Sub-woofer) |
| 17 | SCK_M | I | GPIO7 Pin 35 | SPI Clock of Flash memory (Must be opened) |
| 18 | FW_SEL | I | | FW Selection (Sub Woofer : Low, Rear : High) |
| 19 | IR_RST# | O | GPIO19 Pin 37 | Amplifier Reset |
| 20 | ID_SET# | I | GPIO14 Pin 27 | Input from push button (Active Low) |
| 21 | RED_LED | O | GPIO3 Pin 46 | RED LED Control |
| 22 | BLUE_LED | O | GPIO2 Pin 47 | BLUE LED Control |
| 23 | IR_SD# | I | GPIO16 Pin 25 | Detect IR Amp Shutdown |
| 24 | GND | - | | Ground |

6. Pairing Algorithm

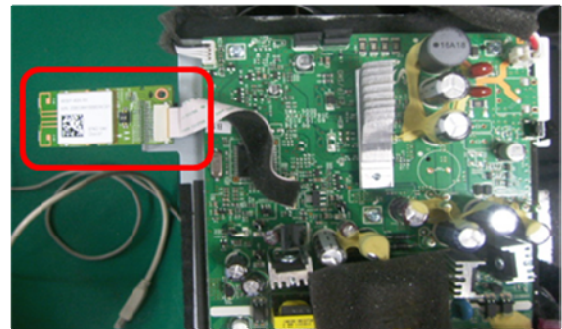
The system has both “auto-pairing” and manual pairing capabilities. Auto-pairing can be used at the factory for testing purposes but all units are shipped from the factory with “auto-pairing” enabled. This means the user can unpack the sound bar and sub woofer and they will link immediately without user interaction. It does present an issue if there is another unit close by as erroneous operation can result if a sound bar connects to the wrong sub woofer. Auto-pairing persists for up to 30 seconds after units are powered up.

There is also the capability to manually pair the sub woofer to the sound bar. This is accomplished by turning on the sound bar and setting it to pair mode via the IR remote (push the mute button for > 5 seconds). The sub woofer can be put into manual pairing mode by pushing the button on the back panel for > 5 seconds when it is not in a link. If the sub woofer is already linked it is not possible to enter pairing mode.

The Tx command set with the sound bar module includes a method to return the system back to auto pairing mode but this is not a user feature – only for factory use.

7. Installation

This module must be installed in a device and not allow the user to replace nor modify it. And the location is as follows Figure.



8. Brief system block diagram

This radios system block diagram is ad follows figure.



Notice

FCC Statement

Federal Communication Commission Interference Statement

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 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.

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

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.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC 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 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 radiation exposure limits set forth for a 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 user 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 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 part 15.19 statement is required to be available in the user manual: 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains [FCC ID: A3LWISP40A](#) ". 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 interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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 conjunction with any other antenna or transmitter.

IC Radiation Exposure Statement

This device is in compliance with SAR for general population/uncontrolled exposure limits in IC RSS-102 and has been tested in accordance with the measurement methods and procedures specified in IEEE 1528. This equipment should be installed and operated with a minimum separation distance of 20 cm between the device and your body. The device and its antenna must not be co-located or operated in conjunction with any other antenna or transmitter.

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 a 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 user 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 user 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-WISP40A](#)".