# Model 420128RM Wireless Link Module External Interface Specification

2016/6/13

## Introduction

Model 420128RM Wireless Link Module is for the low latency wireless link between console and bass box or rear surround speaker or both.
This document shows how to connect the wireless module.

## Features and Functions

- 2.4GHz, 5.2GHz, 5.8GHz, 5.2/5.8GHz dual band, 2.4/5.2/5.8GHz tri band
    - **All band usage is under active software control according to each regional and country band plan assignments. Where the use of any band conflicts with local regulations, the radio will be locked out of that band.**
- 22Mbps data rate (15 MHz nominal channel bandwidth).
- Modulation - QPSK
- Antenna types –Inverted F with following gains:

| | **2.4 GHz** | **5.2GHz** | **5.8GHz** |
|---|---|---|---|
| **Antenna-A** | 1.98 dBi | 4.18 dBi | 4.98 dBi |
| **Antenna-B** | 2.2 dBi | 5.02 dBi | 5.56 dBi |

- Target Power –

| **Band (GHz)** | **Target Power** |
|---|---|
| 2.4 | 3.08 dBm + 2dB |
| 5.2 | 8.83 dBm + 2dB |
| 5.8 | 9.31 dBm + 2dB |

- One module design can be used for both source and sink
    - Source : Central Unit (CU)
    - Sink : Mobile Unit (MU)
- Bi-directional audio and data
- Up to four uncompressed stereo audio channels (max 7.1ch configuration)
- I2S for audio
    - Input (Source) : 44.1kHz, 48kHz
    - Output (Sink) : 48kHz
- I2C for control

## Connection

Wireless (Module to Module)

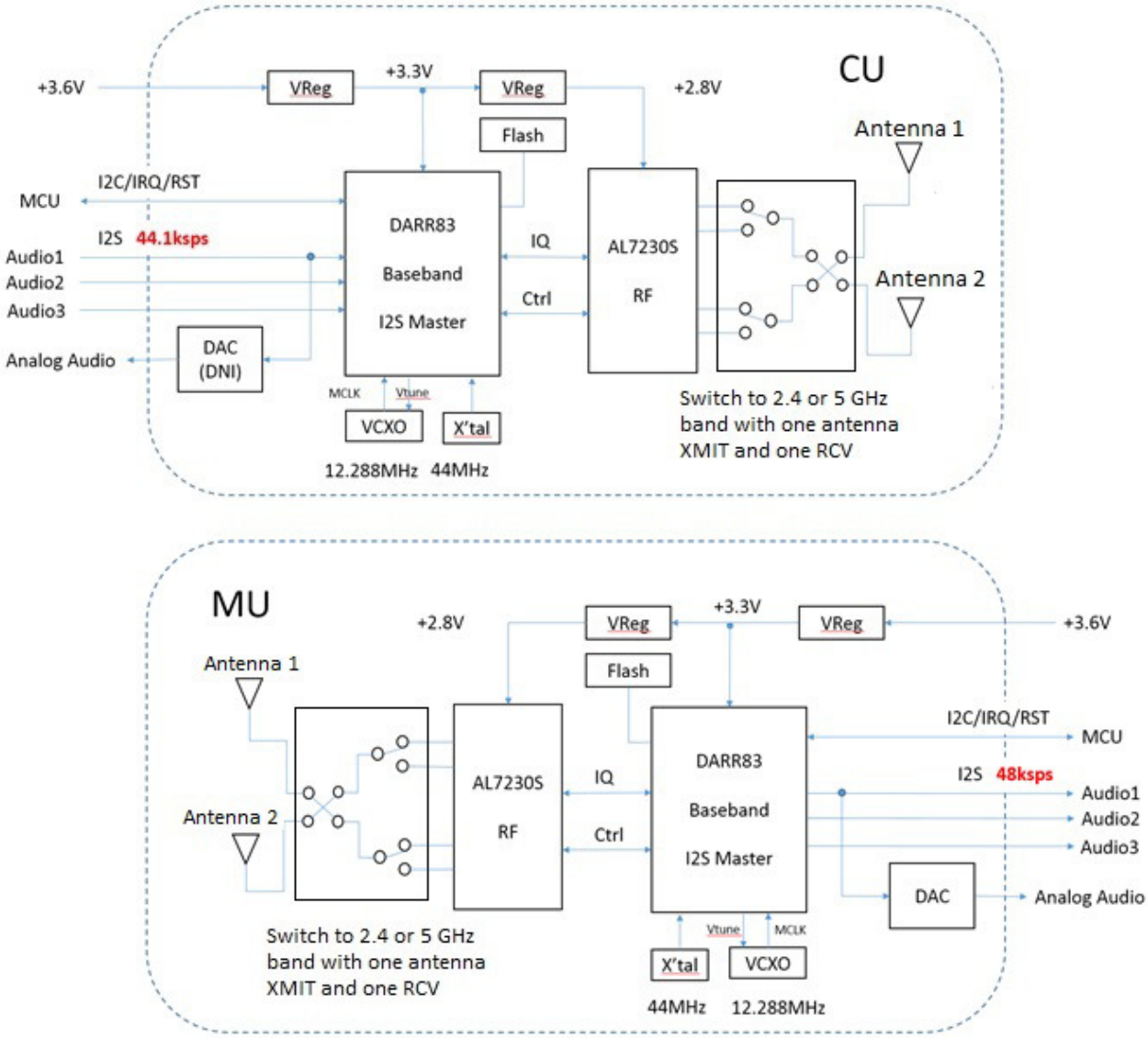
- Point to point
- Point to multi point

Module to PCB

- 26 pin FFC

## Block diagram

Bose module




| Radio Output (MHz) |
|---|
| 2412.0 |
| 2438.0 |
| 2464.0 |
| 5180.0 |
| 5210.0 |
| 5240.0 |
| 5736.0 |
| 5762.0 |
| 5814.0 |

## FFC Connector pin assignment

Bose module

| Pin# | Wireless Module | Console Main | Bassbox | Rear Right | Rear Left | Header |
|---|---|---|---|---|---|---|
| 1 | +3.6V to +5V | +3.6V | +3.6V | +3.6V | +3.6V | 1 |
| 2 | GND | GND | GND | GND | GND | 2 |
| 3 | MCLK 12.288MHz | AUDIO_MCLK | MCLK 12.288MHz | MCLK 12.288MHz | MCLK 12.288MHz | 3 |
| 4 | nc | nc | nc | nc | nc | |
| 5 | DAC_LEFT_P | nc | Analog_In_P | Analog_In_P | Analog_In_P | 4 |
| 6 | DAC_LEFT_N | nc | Analog_In_N | Analog_In_N | Analog_In_N | 5 |
| 7 | nc | nc | nc | nc | nc | |
| 8 | nc | nc | nc | nc | nc | |
| 9 | DARR83_GPIO_3 | SYNC_LED | SYNC_LED | SYNC_LED | SYNC_LED | 6 |
| 10 | GND | GND | GND | GND | GND | |
| 11 | GND | GND | GND | GND | GND | 7 |
| 12 | GND | GND | GND | GND | GND | |
| 13 | DARR83_GPIO_24 | MON_TXD | MON_TXD | MON_TXD | MON_TXD | 8 |
| 14 | DARR83_GPIO_14 | RADIO_IRQ | RADIO_IRQ | RADIO_IRQ | RADIO_IRQ | 9 |
| 15 | GND | nc | nc | nc | nc | |
| 16 | DAC_RST_L | nc | DAC_RST_L | DAC_RST_L | DAC_RST_L | 10 |
| 17 | DARR_RST_L | RADIO_RST_L | RADIO_RST_L | RADIO_RST_L | RADIO_RST_L | 11 |
| 18 | I2C_SCL_Slave | RADIO_SCL | RADIO_SCL | RADIO_SCL | RADIO_SCL | 12 |
| 19 | I2C_SDA_Slave | RADIO_SDA | RADIO_SDA | RADIO_SDA | RADIO_SDA | 13 |
| 20 | DARR83_GPIO_12 | nc | nc | nc | nc | 14 |
| 21 | DARR83_GPIO_11 | RADIO_DATA1 | nc | RADIO_DATA1 | RADIO_DATA1 | 15 |
| 22 | DARR83_GPIO_10 | AUDIO_LRCLK | AUDIO_LRCLK | AUDIO_LRCLK | AUDIO_LRCLK | 16 |
| 23 | GND | GND | GND | GND | GND | 17 |
| 24 | DARR83_GPIO_8 | AUDIO_BCLK | AUDIO_BCLK | AUDIO_BCLK | AUDIO_BCLK | 18 |
| 25 | DARR83_GPIO_6 | RADIO_DATA2 | nc | nc | nc | 19 |
| 26 | DARR83_GPIO_5 | RADIO_DATA3 | RADIO_DATA3 | nc | nc | 20 |

- Pin# is for Flat Flex Cable connector
  - Bose part # : 715435-26S2
  - Hirose FH12-26S-0.5SH
  - Side entry
  - Bottom contact
- Console/BB/Rear board must use same connector and FFC must be opposite side contact.
- Header is dual row

# Specification

System specification

| Parameter | Value | Unit | Remarks |
|---|---|---|---|
| **RF Characteristics** | | | |
| RF Frequency Range | 2400 – 2483.5<br>5150 – 5250<br>5725 – 5875 | MHz<br>MHz<br>MHz | 2412, 2438, 2464 MHz<br>5180, 5210(5200 in Japan), 5240 MHz<br>5736, 5762, 5814 MHz |
| RF Bandwidth | 22 | MHz | |
| RF TX power | 3<br>9<br>9 | dBm<br>dBm<br>dBm | 2.4GHz<br>5.2GHz<br>5.8GHz |
| RF RX sensitivity | -83<br>-81<br>-81 | dBm<br>dBm<br>dBm | 2.4GHz<br>5.2GHz<br>5.8GHz |
| RF Antenna | 2 Dual Band Etched F | | 2.4G/5G dual band etched antenna and jumper and RF connector for external antenna option |
| RF Connector | u.FL | | |
| **Air Framing** | | | |
| Addressing | 24 | Bit | |
| Data message size | 32 | Byte | Application dependent |
| CRC | 16, 24 and 32 | Bit | |
| **Control** | | | |
| Control interface | $I^2C$ | | |
| **Data** | | | |
| Data Bandwidth | 100 | Kbps | Bi-directional wireless data channel |
| Data latency | 5 | ms | |
| **Audio** | | | |
| Audio interface | $I^2S$ | | Standard, left, right justified selectable |
| Master clock | 12.288 | MHz | 48kHz x 256 |
| Number of stereo audio output channels on Mobile Unit | 1, 2, 3 or 4 | | Max 4, only use 1 in MU(Receiver)<br>SW configure appropriate wireless burst to single channel output |
| Number of stereo audio output channels on Central Unit | 1, 2, 3 or 4 | | Max 4, only use 2 in CU(Console)<br>Rear L/R and Bass |
| Input Sample rate | 44.1, 48 or 96 | ksps | DARR83 must be slave mode to use SRC |
| Output Sample rate | 48 | ksps | |
| Sample width | 16 or 24 | Bit | |
| Latency | 20 | ms | Configurable from 10 to 23.6ms, depending on the application. |
| Dynamic range | 98<br>146 | dB<br>dB | 16bit 48ksps, A-weighted<br>24bit 48ksps, A-weighted |
| THD+N | -96<br>-143 | dB<br>dB | 16bit 48ksps<br>24bit 48ksps |

Absolute Maximum Rating

| Symbol | Parameter | Min | Max | Unit | Remarks |
|---|---|---|---|---|---|
| Vcc | Supply Voltage | | 3.8 | V | DP0.1 |
| | | 3.5 | 5.2 | V | DP1 or later |

Recommended Operating Conditions

| Symbol | Parameter | Min | Typ | Max | Unit | Remarks |
|---|---|---|---|---|---|---|
| Vcc | Supply Voltage | 3.1 | 3.3 | 3.5 | V | DP0.1 |
| | | | 3.6 | | V | DP1 or later |
| Vcc ripple | Peak to Peak ripple | | 0 | 100 | mV | DP0.1 |
| Tamb | Operating Temp | -10 | 25 | 60 | °C | |

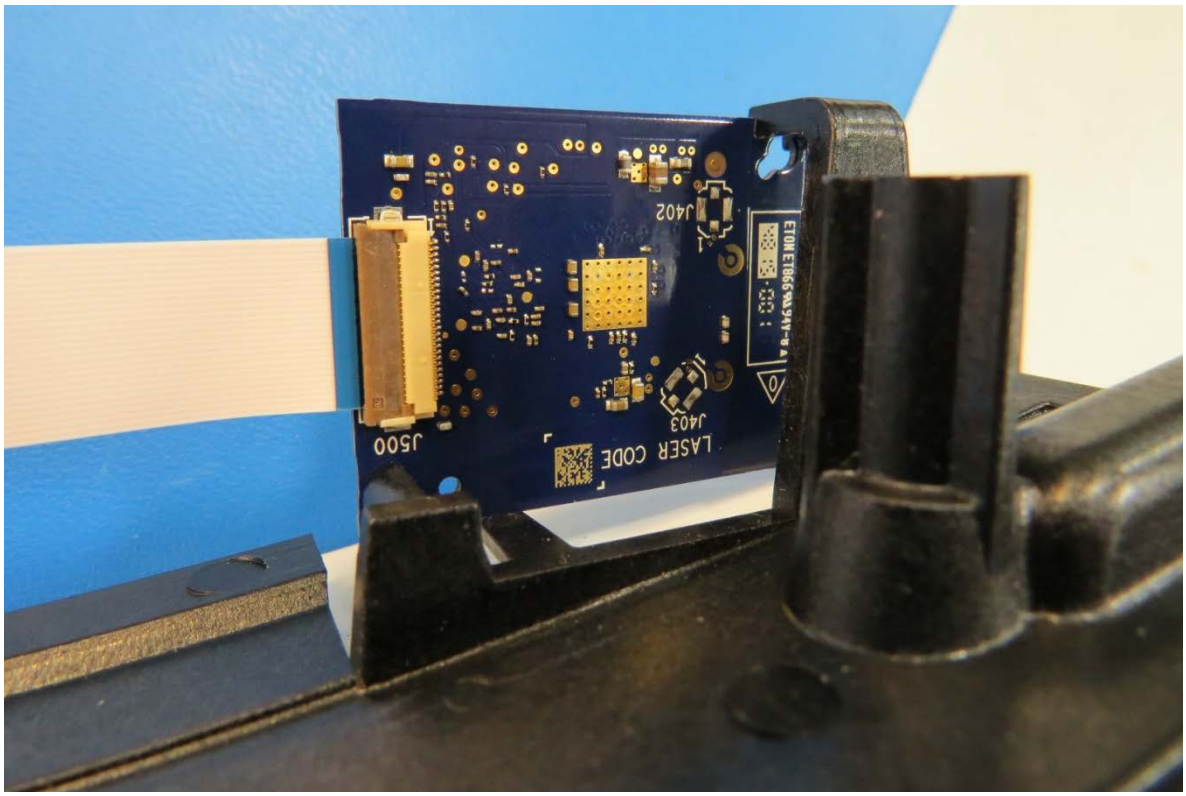
Reset timing characteristics

| Symbol | Parameter | Min | Typ | Max | Unit | Remarks |
|---|---|---|---|---|---|---|
| Tr | Rise time of Vcc | | | 10 | ms | |
| Tf | Fall time of Vcc | | | 10 | ms | |
| Treset | Reset signal pulse width | 1 | | | ms | |

Power consumption (Vcc=3.3V, 25°C)

| Application | 2.4GHz | | 5.2GHz | | 5.8GHz | | Unit |
|---|---|---|---|---|---|---|---|
| | MU | CU | MU | CU | MU | CU | |
| Standby mode | 21 | 21 | 21 | 21 | 21 | 21 | mA |
| 2 Stereo NACK | 81 | 140 | 82 | 124 | 82 | 127 | mA |
| TX continuous (Test) | | 390 | | 300 | | 300 | mA |

## Module Photo



For 2.4G Device

NCC 警語
低功率電波輻射性電機管理辦法
第十二條經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
第十四條低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信規定作業之無線電信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾

For 2.4G Device

# NCC Warning Statement

Article 12

Without permission, any company, firm or user shall not alter the frequency, increase the power, or change the characteristics and functions of the original design of the certified lower power frequency electric machinery.

Article 14

The application of low power frequency electric machineries shall not affect the navigation safety nor interfere a legal communication, if an interference is found, the service will be suspended until improvement is made and the interference no longer exists

To reduce any potential for harmful interference to co-channel MSS operations

For 5G Device
NCC 警語
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在 5.25-5.35 秭赫頻帶內操作之無線資訊傳輸設備，限於室內使用。

前項合法通信，指依電信規定作業之無線電信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾

For 5G Device

# NCC Warning Statement

Article 12

Without permission, any company, firm or user shall not alter the frequency, increase the power, or change the characteristics and functions of the original design of the certified lower power frequency electric machinery.

Article 14

The application of low power frequency electric machineries shall not affect the navigation safety nor interfere a legal communication, if an interference is found, the service will be suspended until improvement is made and the interference no longer exists

Within the 5.25-5.35GHz band, U-NII devices will be restricted to indoor operations to reduce any potential for harmful interference to co-channel MSS operations

CAUTION: Changes or modifications not expressly approved could void your authority to use this equipment

**FCC STATEMENT**

This device complies with Part 15 of the FCC Rules. Operation 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

**INDUSTRY CANADA STATEMENT**

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Exposure - Min. 20 cm separation distance required for this module.

2.4 GHz statement – The radio module only supports Channels 2412, 2438, 2464 MHz and does not support Channel frequencies 2467 MHz or 2472 MHz.

5 GHz UNII statement – This module supports automatic discontinue transmission as described in 15.407(c):

“The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals.”

When the module is configured as a “Master” device, it will transmit digitally encoded audio data as fed from the host system via an I2C data bus. If this data is malformed as indicated by an incorrect data checksum. Transmission ceases. When configured as a “Slave” device, the only transmissions occur after the reception of a data packet from the Master. Lack proper data reception, a single transmission of “Not Acknowldge” to inform the master of the failure. Lacking pairing with a Master device, the module is in receive only mode.

Frequency stability 15.407(g).

“Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.”

> This is accomplished by through the use of a crystal controlled oscillator having a frequency tolerance of 20 parts per million in accuracy. This frequency is verified at manufacture to be within these tolerances.

Labeling - For a host manufacture’s using this certified modular, an additional permanent label referring to the enclosed module: “Contains Transmitter Module FCC ID: A94410128RM and IC: 3232A-420128RM” or “Contains FCC ID: A94410128RM and IC: 3232A-420128RM” must be used. The host OEM user manual must also contain clear instructions on how end users can find and/or access the module and the FCC ID.