

CDM4140

Technical Datasheet

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Conversdigital Co., Ltd.
B-2007 Woolim Lions Valley 2nd, 45-14 Sagimakgol-ro,
Jungwon-gu, Seongnam-si, Gyeonggi-do,
Republic of Korea 13209
www.conversdigital.com

Tel: +82-31-759-5088 / Fax: +82-31-759-5089

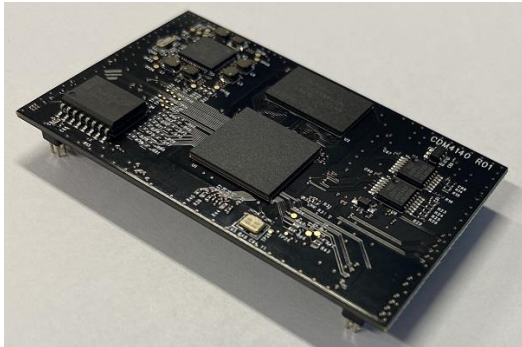
Revision History

| Version | Date | Description |
|---------|-------------|--|
| 1.0 | 24 JUN 2020 | Initial release version. |
| 1.1 | 23 JUL 2020 | Additional explanation about EEPROM for LAN, and UART2 in FAQ. |
| 1.2 | 18 AUG 2020 | Add AX88772C in supported USB-LAN. |

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1. Introduction



[mconnect CDM4140]

mconnect CDM4140 is high performance network audio module for HiFi audio products. CDM4140 has required functionalities for high-end streaming audio, such as supporting up to PCM 384kHz and DSD256, Gigabit Ethernet & WiFi, UART with Host, and supporting various streaming protocols.

CDM4140 supports connectivity protocols of DLNA/UPnP, Apple's AirPlay2, Spotify Connect, and Roon. MQA (Master Quality Authenticated) full decoding up to 384kHz is also supported. Gigabit Ethernet and WiFi via USB interface removes complexity of customer's board design.

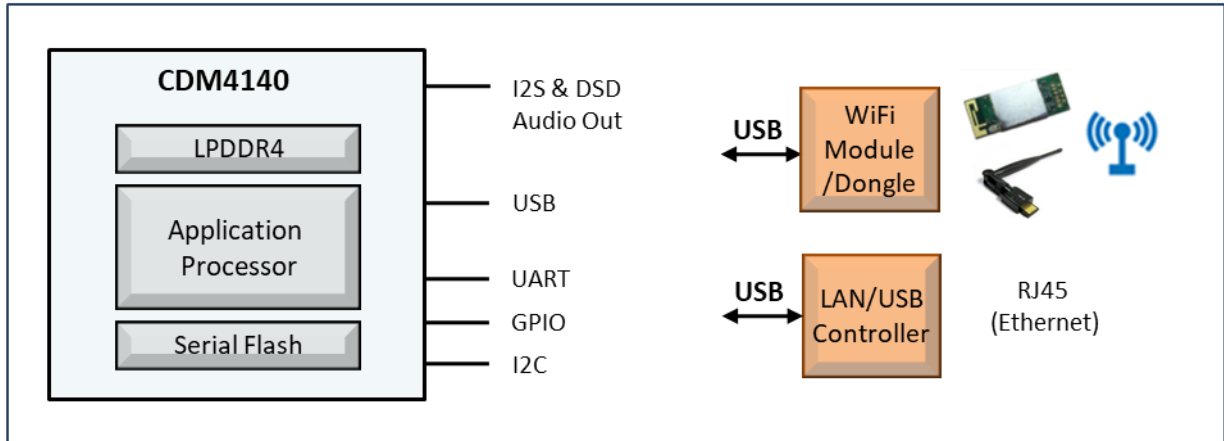
Powered by Conversdigital's **mconnect Firmware**, **CDM4140** has comprehensive features of network audio, such as Gapless playback, various audio codec, Multi-room synchronous audio, and integrated internet music streaming services, such as Spotify, Deezer, TIDAL, Qobuz, and vTuner Internet Radio. The features are continuously evolving by upgrading the firmware.

mconnect Software also includes customizable control app for iOS and Android to provide device specific functions that cannot be covered by market standard technology. **mconnect Control app** has full features as a music player and DLNA/UPnP controller app, as well as device dedicated functions such as multi-room control and device setting.

[CDM4140 Applications]

Network enabled audio products: DAC, DDC, Streaming Player, Amplifier, Stereo Speaker, Sound Bar and Component Audio.

CDM4140 System Architecture



2. Features

Audio Interface

- I2S digital audio out – Master and Slave mode.
- DSD audio out
- 2 channel (stereo)
- PCM: Resolution up to 32bit, Sample rate up to 384KHz
- Native DSD up to DSD256 (11.2MHz), Supports DSD to PCM and DSD to DoP conversion

Network Support

- Via USB interface, flexible selection of USB-WiFi & USB-LAN
- WiFi: IEEE 802.11 b/g/n/ac (2.4&5GHz dual band)
- 10/100/1000 Ethernet

WiFi Mode and Setting

- Station Mode & Soft AP Mode
- Setting by Control App & PC setup program

Connectivity

- DLNA 1.5 & UPnP AV 1.0 Digital Media Renderer
- Apple's official AirPlay2
**Apple's Authentication Coprocessor is required. Mconnect product does not include it.*
- Spotify Connect
- Roon Ready

MQA (Master Quality Authenticated) Support

- MQA Full decoding up to 32bit/384kHz
- Supports Core decoding only.

Audio Format Support

- AAC, AIFF, MP3, FLAC, WAV, WMA, Apple Lossless, OGG, Monkey's
* License and/or cost for codecs is not included in mconnect product.

Internet Streaming Music Service Integration

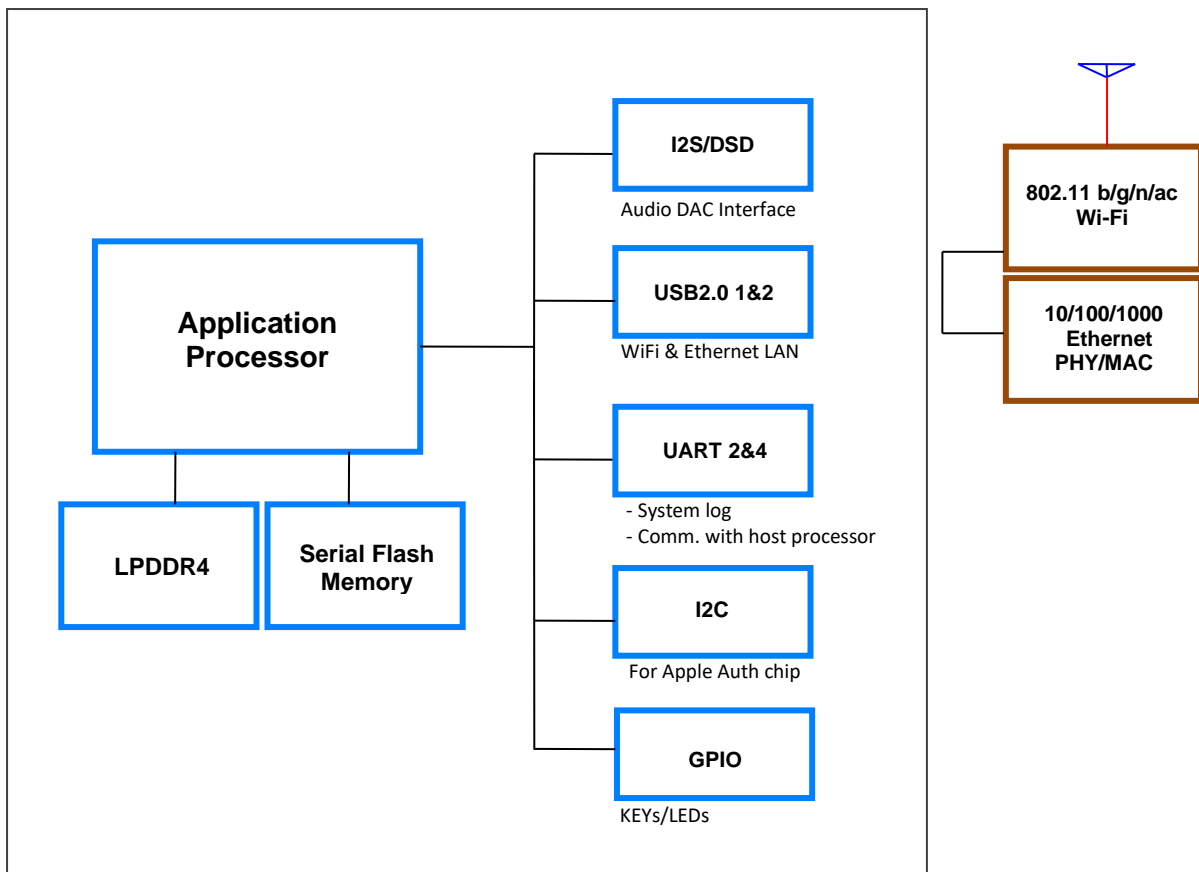
- Spotify, Deezer, TIDAL, Qobuz, vTuner Internet Radio
* New internet music services can be added when they are available to integrate.
* Integrated internet music services can be removed depending on the service provider's policy.

Multi-room synchronous audio technology

Control App

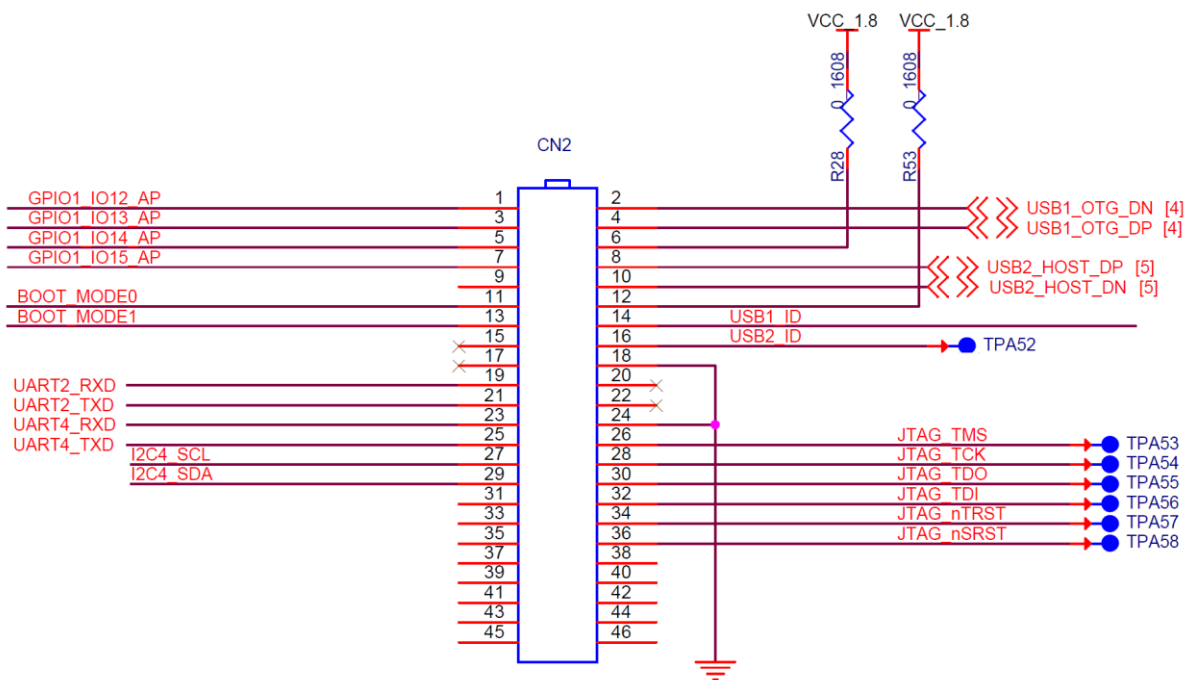
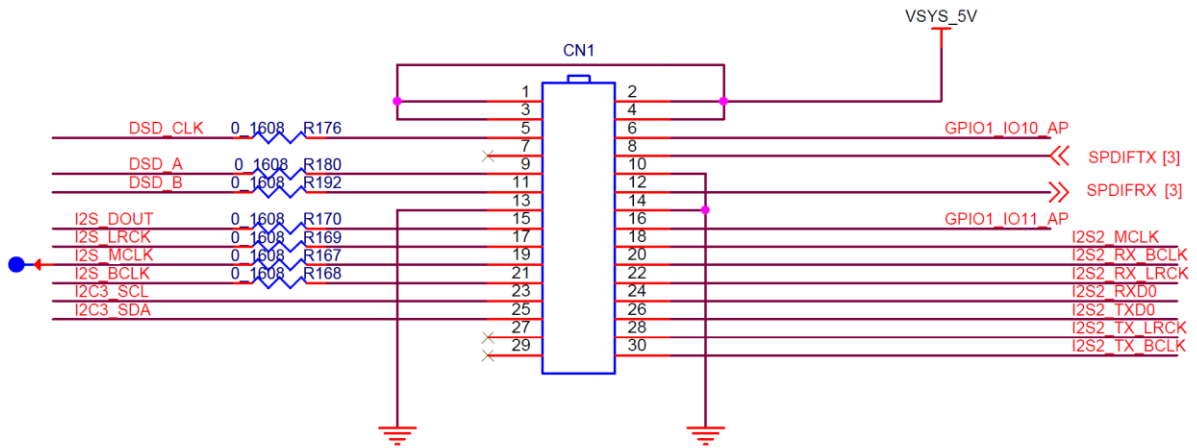
- Music Player & DLNA/UPnP Controller, Integrated Internet Streaming Music
- Gapless Play ON/OFF, Multi-room control / Device setup
- Can be licensed with own Brand.

3. Block Diagram



4. Pin Description

4-1. Pin Assignment



4-2. Interface PIN Configuration (CN1)

| CN1 | | | |
|-----|--------------|-----------|--|
| No | PIN | I/O Level | Functional Description |
| 1 | 5V_PWR_IN | | 5.0V Power Supply |
| 2 | 5V_PWR_IN | | 5.0V Power Supply |
| 3 | 5V_PWR_IN | | 5.0V Power Supply |
| 4 | 5V_PWR_IN | | 5.0V Power Supply |
| 5 | DSD_CLK | 3.3V | DSD Clock |
| 6 | GPIO1_IO10 | 1.8V | For WiFi power control. |
| 7 | NC | - | |
| 8 | SPDIF_TX | 3.3V | SPDIF Audio Output. Not implemented in firmware. |
| 9 | DSD_A | 3.3V | DSD Data A |
| 10 | GND | - | GND |
| 11 | DSD_B | 3.3V | DSD Data B |
| 12 | SPDIF_RX | 3.3V | SPDIF Audio Input. Not implemented in firmware. |
| 13 | GND | - | Ground |
| 14 | GND | - | Ground |
| 15 | I2S DOUT | 3.3V | I2S Data Out |
| 16 | GPIO1_IO11 | 1.8V | GPIO reserved. |
| 17 | I2S_LRCK | 3.3V | I2S Left/Right (Word) Clock |
| 18 | I2S2_MCLK | 3.3V | I2S2 interface. Not implemented in firmware. |
| 19 | I2S_MCLK | 3.3V | Not used. |
| 20 | I2S2_RX_BCLK | 3.3V | I2S2 interface. Not implemented in firmware. |
| 21 | I2S_BCLK | 3.3V | I2S Bit Clock. |
| 22 | I2S2_RX_LRCK | 3.3V | I2S2 interface. Not implemented in firmware. |
| 23 | I2C3_SCL | 3.3V | I2C3 Clock. Used only for EVB. |
| 24 | I2S2_RXD0 | 3.3V | I2S2 interface. Not implemented in firmware. |
| 25 | I2C3_SDA | 3.3V | I2C3 Data. Used only for EVB. |
| 26 | I2S2_TXD0 | 3.3V | I2S2 interface. Not implemented in firmware. |
| 27 | NC | - | |
| 28 | I2S2_TX_LRCK | 3.3V | I2S2 interface. Not implemented in firmware. |
| 29 | NC | - | |
| 30 | I2S2_TX_BCLK | 3.3V | I2S2 interface. Not implemented in firmware. |

4-3. Interface PIN Configuration (CN2)

| CN2 | | | |
|-----|--------------|-----------|--|
| No | PIN | I/O Level | Functional Description |
| 1 | GPIO1_IO12 | 1.8V | Key Input GPIO for WiFi mode selection |
| 2 | USB1_OTG_DN | | USB1 Data Pin - (port 1) |
| 3 | GPIO1_IO13 | 1.8V | Key Input GPIO for Factory Reset |
| 4 | USB1_OTG_DP | | USB2 Data Pin + (port 1) |
| 5 | GPIO1_IO14 | 1.8V | For Ready LED |
| 6 | USB1_VBUS | | USB1 VBUS |
| 7 | GPIO1_IO15 | 1.8V | For WIFI Status LED |
| 8 | USB2_HOST_DP | | USB2 Data Pin + (port 2) |
| 9 | NC | | |
| 10 | USB2_HOST_DN | | USB Data Pin - (port 2) |
| 11 | BOOT_MODE0 | 1.8V | Boot mode selection 0 |
| 12 | USB2_VBUS | | USB2 VBUS |
| 13 | BOOT_MODE1 | 1.8V | Boot mode selection 1 |
| 14 | USB1_ID | | USB1 ID |
| 15 | NC | | |
| 16 | USB2_ID | | USB2 ID |
| 17 | NC | | |
| 18 | GND | | Ground |
| 19 | UART2_RXD | 3.3V | UART2 Data Receive |
| 20 | NC | | |
| 21 | UART2_TXD | 3.3V | UART2 Data Transmit |
| 22 | NC | | |
| 23 | UART4_RXD | 3.3V | UART4 Data Receive |
| 24 | GND | | Ground |
| 25 | UART4_TXD | 3.3V | UART4 Data Transmit |
| 26 | JTAG_TMS | | Not used. |
| 27 | I2C4_SCL | 3.3V | I2C4 Clock (For Apple Auth Chip) |
| 28 | JTAG_TCK | | Not used. |
| 29 | I2C4_SDA | 3.3V | I2C4 Data (For Apple Auth Chip) |
| 30 | JTAG_TDO | | Not used. |
| 31 | NC | | |
| 32 | JTAG_TDI | | Not used. |
| 33 | NC | | |
| 34 | JTAG_nTRST | | Not used. |
| 35 | NC | | |
| 36 | JTAG_nSRST | | Not used. |
| 37 | NC | | |
| 38 | NC | | |
| 39 | NC | | |
| 40 | NC | | |
| 41 | NC | | |
| 42 | NC | | |
| 43 | NC | | |
| 44 | NC | | |
| 45 | NC | | |
| 46 | NC | | |

5. General Specifications

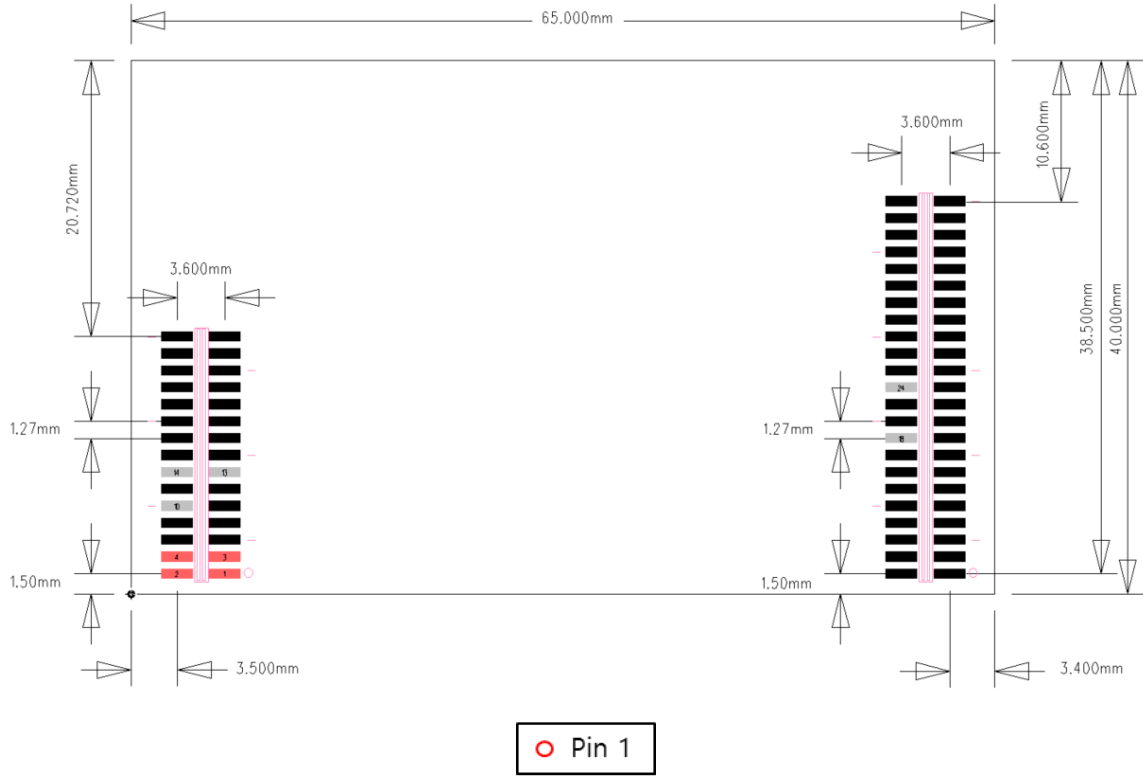
| Item | Specifications |
|-----------------------|---|
| Interface | I2S & DSD, I2C, UART, USB2.0 x 2, GPIOs |
| Memory | LPDDR4 RAM 512MBytes |
| Dimension | 65mm X 40mm |
| Operating Temperature | 0°C ~ +60°C |
| Relative Humidity | 10% ~ 90%, non condensing |

6. Electrical Characteristics

| Item | Min | Typ | Max | Unit | Remark |
|----------------------|------|-----|------|------|--------|
| Power Supply Voltage | 4.75 | 5.0 | 5.25 | V | |
| Current Consumption | 480 | 520 | 600 | mA | |

7. Physical Dimensions

[Top View]



8. Firmware Options

1) Communication Interfaces

| Interfaces | Options | Description |
|----------------|--------------|---|
| I2S Clock Mode | Master/Slave | In Master mode, CDM4140 sends I2S L/R & Bit clock and DSD clock to your system. In Slave mode, your system needs to send I2S L/R & Bit clock and DSD clock to CDM4140. |

2) Connectivity Protocol and Internet Streaming Music

| Items | Options | Description |
|-----------------|--------------------|---------------------------------------|
| MQA | Enable/Disable | Master Quality Authenticated support. |
| Apple AirPlay2 | Enable/Disable | Apple's AirPlay2 support. |
| Spotify Connect | Enable/Disable | Spotify Streaming music support. |
| Roon | Enable/Disable | Roon Ready support. |
| vTuner | Enable/Disable | vTuner Internet Radio support. |
| TIDAL | Enabled by default | TIDAL Streaming music support. |
| Deezer | Enabled by default | Deezer Streaming music support. |
| Qobuz | Enabled by default | Qobuz Streaming music support |

** Integrated Internet Music Services could be removed from mconnect solution depending on the service provider's policy.*

9. Frequently Asked Questions

1) Do we need customized firmware for our brand?

Yes. The firmware in CDM4140 should be customized for each brand. There are optional features in the firmware, and so the features may vary among brands according to the selection of optional features.

The Demo firmware in CDM4140 Evaluation Board is for demonstration/test use only, and it should not be used in your products distributed in the market.

2) Which pinouts are available for audio output from CDM4140?

CDM4140 has two sets of audio output pins:

- PCM: I2S_DOUT, I2S_LRCK, I2S_BCLK (CN1 15, 17, 21)
- DSD: DSD_CLK, DSD_A, DSD_B (CN1 5, 9, 11)

3) I2S & DSD Clock master and slave.

CDM4140 supports both clock slave and master.

The clock mode will be set in the customized firmware by your request.

4) I will use CDM4140 as I2S slave. How does my system get a track's sample rate to feed right clock to CDM4140?

CDM4140 provides UART(4) interface to communicate with your host processor. CDM4140 sends each track's sample rate via UART(4) interface.

5) How does my processor/DSP communicate with CDM4140 to exchange information?

Required information, such as track information, network status, playing status and many others will be delivered from CDM4140 to your processor via UART(4). Your system also can send user inputs, such as from remote/front panel, and control/setting commands to CDM4140 via UART(4).

The document "UART Communication Protocol" is provided by Conversdigital separately from this datasheet.

FYI, UART(2) interface is for debugging console of CDM4140.

It is recommended to make pinout of UART(2) on your board, which will be helpful for debugging even after your products will be in the field.

6) Which USB-LAN chipset will my system use?

CDM4140 supports USB-LAN chipsets of AX88179(10/100/1000 Gigabit Ethernet) and AX88772C(10/100 Fast Ethernet) from ASIX for the Ethernet LAN.

7) Does my system need the EEPROM for ASIX chipset to write LAN MAC address?

No. The EEPROM for LAN MAC Address is not needed for your system. The LAN MAC address will be written in CDM4140 before shipment.

8) Which WiFi module/dongle can my system use?

Currently, CDM4140 supports Realtek's RTL8811AU and RTL8812BU chipset. Any WiFi module/dongle with these

chipsets can be used for your product.

9) Does my product need to use USB HUB as in the EVB?

CDM4140 provides 2 USB interfaces. WiFi and LAN need USB connection.

If your product only needs WiFi and LAN for USB interface, USB HUB is not required.

10) What is required to support AirPlay2 in my product?

CDM4140 supports Apple's official AirPlay2. Which means Apple's Authentication Coprocessor is required on your product. The Auth chipset should be connected with CDM4140 via I2C.

11) Can we have own branded Control App?

Yes. Conversdigital provides mconnect Control & mconnect Control HD with customization.

These apps support iOS and Android for phone and tablet UI.

- mconnect Control (for phone) and mconnect Control HD (only for iPad and tablets) are on the Apple App Store and Google Play Store.

*** End users can use these apps as it is on the App Stores, to control mconnect module embedded products including Device Setting & Firmware update.**

FYI, Conversdigital's "mconnect Player" and "mconnect Player HD" are standard DLNA/UPnP apps for iOS and Android. These apps work with any DLNA/UPnP compatible devices.