MOMENTUM DATA SYSTEMS

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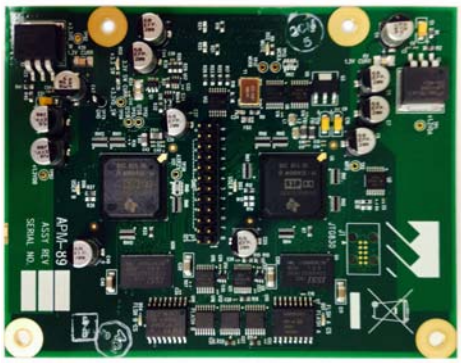
Texas Instruments' DA830 + DA810 DSP-based OEM Audio Module for Object Audio Systems



APM - 89L™

Dual-DSP module with integrated Linux Host Controller

Momentum Data Systems APM modules are a superset of MDS' DAE modules, adding an integral ARM-based processor running Linux to create a stand-alone subsystem compared to the DSP-only DAE modules.

The APM-89L offers a transition between DSP-only modules such as the DAE-82 or DAE-77 and new modules to be based on multi-core SoCs offering twice the performance of current parts.

The APM-89L offers up to 20 I^2S ports, allowing the mixed signal portions to be selected to meet the exact system requirements. The hardware design is based on Texas Instruments' (TI) DA830 and DA810, which are functionally similar to TI's OMAP L137 and C674x floating point DSP devices.

The module can also be used with MDS HDMI switcher/ repeater products, which range from a 1:1 repeater through a 8: 2 switch.

By using MDS' audio and HDMI modules, system designers can quickly implement the common functions needed of all AV Receivers and focus on the unique, differentiating aspects of their products.

For OEMs and integrators needing assistance with analog, system or software design, MDS Engineering can provide design services ranging from consulting through complete product design.

AVR decoder firmware

The modules includes DSP firmware that enables certain specific processing features common to AV Receivers (AVRs, which for these products also includes Pre-Processor or Pre-Pro applications).

When an APM-89L is ordered, it is assigned a 4 digit order code which both defines the hardware and the firmware configuration (i.e. the decoder, ASPs and their topology) that go with it. Unless noted otherwise, the descriptions in this datasheet refer to the firmware in a generic sense and not a specific combination of features.

Linux host interface

The APM-89L includes an integrated ARM processor running Linux. An example console application is included that illustrates the major features of an AVR system. Customers can replace this example with a Linux-based control application of their own design that interfaces to their system host processor over I2C or serial communications.

APM-89L module details

Common Features - connector

All APM series modules use the same 140 pin connector for digital signals and power, a Hirose FX8C-140S-SV5 receptacle. This allows mating heights of 10 to 16mm to allow circuitry to be placed under the board if desired; however, do not place any analog circuitry under the APM module.

The APM-89L uses 3.3 and 5V power from the digital connector. Peak 3.3V power is 3A. About 100 mA is used on the 5V supply.

Booting

The modules boots from a local SPI serial flash. While the host can write to this flash directly for field updates it is generally suggested to implement field updates in the Linux system, as less overall storage is typically needed that way.

Development

To support application development, your system board will need to provide access to the UART and USB ports from the DA830. The UART is used for a console connection and the USB is used for a USB Ethernet adapter to support NFS during development.

JTAG is available for use with CCS-compatible emulators, but a Tag-Connect adapter is needed. Please contact MDS for more information.

The standard development environment is TI CCS running in Windows and Ubuntu running as a VM in Windows.

Common Features - control

The board is controlled through an I2C port on the DA830 device. The serial console UART could also be used but isn't recommended due to the complications of sharing the port during development.

Common Features - I2S ports

With the exception of a few I2S data lines, the three McASP ports on the DA8xx devices are brought out to the connector. From the raw hardware perspective this provides up to 20 I2S data lines in three clock domains.

However, the AVR firmware makes specific use of certain ports. 4 data lines of McASP0 are used for audio input. McASP 1 is always used for the primary output. McASP2 is always used for secondary (downmix) output and an optional stereo input mix.

APM-89L Linux-based audio module for Object Audio Systems

HDMI Input/Output

MDS offers a number of different HDMI repeater/switching solutions to provide access to the audio carried by HDMI interconnects.

Typically the downstream HDMI device will be a TV or similar display device which does not decode audio. In that case the APM-89L is configured to provide the stereo downmix as 2-channel PCM for the HDMI output of the AVR.

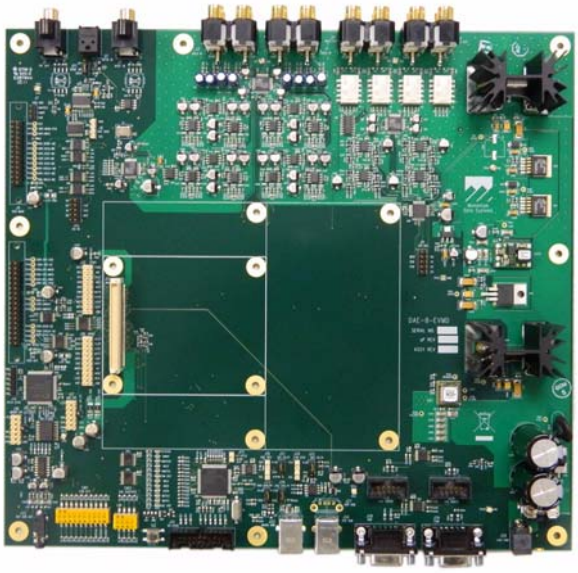
Evaluation Systems

For those wishing to better understand how to use the APM-89L module, MDS offers an evaluation system for purchase.

Customers combining MDS' APM-89L with one of MDS' HDMI repeater/switcher/audio extractor systems should contact MDS for guidance on the evaluation system choices.

Included with the system is a host-side API source code library on the ARM 9 of the DA30 that is used to control the DSP functions.

MDS provides a layer on top of the lower-level driver to deliver a simple and robust interface for the common functions of an AVR. Access to the lower-level interface is available to allow complete customization of the system's functions.

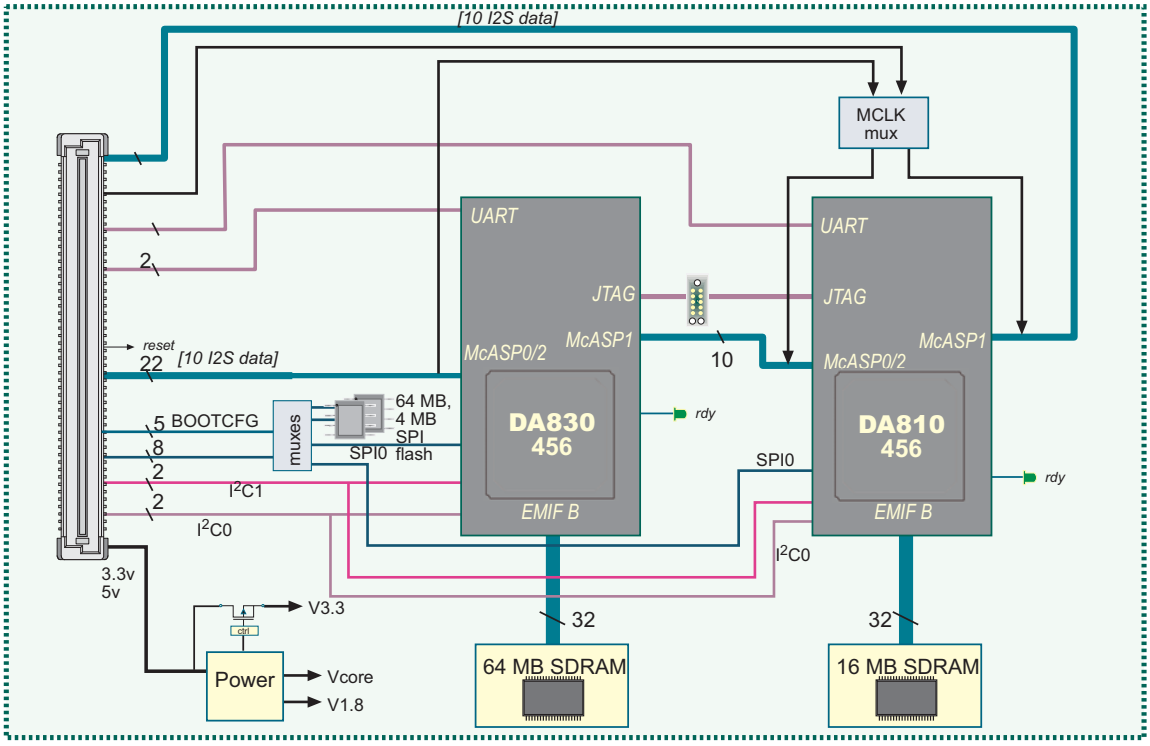


EVM Board

The EVM board provides volume control on input and output since these are features of a typical AVR, while the EVM software provides an example of how to integrate that with the APM-89L.

EVM-APM-89xx Development System:

- EVM Mother Board (includes 13.3 analog out) for APM-89L;
- APM-89xx module;
- Power supply;
- HSR-41 HDMI repeater module;
- Documentation
- Engineering Support



APM-89L block diagram

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Ordering Information

Sales and shipments of APM-89L products with decoder capability require appropriate licensing from Dolby Labs, Xperi-DTS and Auro Technologies NV where included.

Module orders are subject to minimum quantities and pricing is based upon quantity per delivery. Please contact MDS sales department for quotation.

Ordering codes consist of the hardware model followed by 2 or more alpha-numeric digits that indicate a specific combination of firmware products (standard and optional).

Some options require MDS to create a customer-specific firmware release and may incur a porting charge. These charges do not include the license fees from the algorithm vendor. Adding additional processing options may reduce CPU availability for other features.

Available Decoders

- Dolby Atmos®, Dolby TrueHD® and Dolby Digital Plus®
- DTS:X®, including DTS-HD MA®, DTS-ES 96/24®, DTS 5.1®
- Auro-Codec®
- AAC decode (ISO/IEC 13818-7:19975.1.0.0)

Upmixers

- Dolby Surround®
- DTS Neural-X®
- Auro-Matic®
- MDS MST Multi-speaker mono or stereo

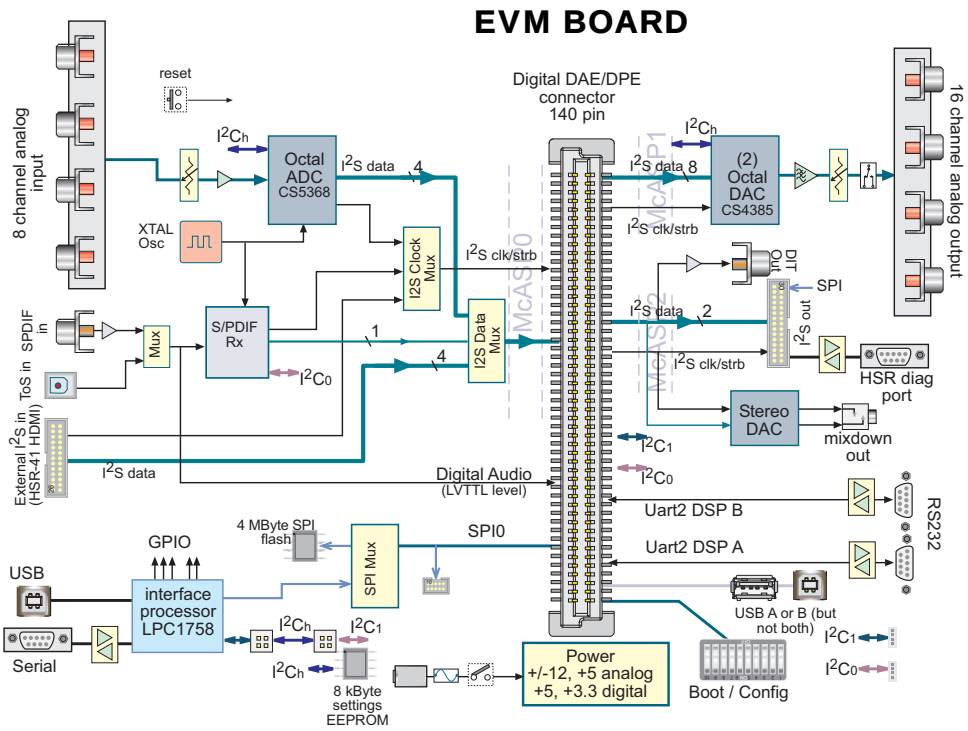
Room Correction

MDS currently offers optional inclusion and support of Dirac Live® speaker/room EQ.

Supported DACs/ADCs/ Volume Controls

Different parts have different control requirements. While in most cases the host processor can take responsibility, there are some direct hardware-level interactions that the APM board needs to be involved with (for example the MUTE signals). Please contact MDS to discuss hardware choices and to determine if specific devices might require modification to the APM module's drivers.

Please visit ***http://www.mds.com*** for more information on these and other products to speed your designs to market.



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