

Simplify Home Audio Systems With the PCM9211 - A Versatile Audio Interface Transceiver



Large-screen HDTVs are selling in huge volumes over last few years, primarily driven by amazing improvements in picture quality & form factor (thinner screens). The form factor constraints from having skinny screens result in tiny built-in speakers that are undersized, under-powered and are typically aimed at wrong direction. Hence sound bars have exploded in popularity as complementary audio system by providing a sound experience that more closely matches the TV's life-like pictures. In addition, with release of HDMI 2.1 specification we finally have a no-compromise audio solution for HDMI as part of the eARC [enhanced Audio Return Channel]. This tech note reviews eARC and simplified Sound Bar design using PCM9211 and how to interface eARC signals with PCM9211.

What is eARC?

Audio Return Channel (ARC) is a feature that was introduced in HDMI 1.4a that enables digital audio (IEC 60958 / SPDIF) transmission and reception on existing but previously unused conductors in standard HDMI connectors and cables. eARC stands for enhanced Audio Return Channel, and is a new standard feature of HDMI 2.1 that aims to provide the best possible audio resolution. One of the most important functions the ARC enables is sending audio signal both “upstream” and “downstream” over a single connection. As a result, with eARC the full-resolution sound signals can be passed back and forth between your TV and audio systems with ease and without compromising sound quality.

A typical sound bar will have multiple digital and/or analog inputs to handle various sources that need to be brought in for audio processing, amplification and final output via the speakers as shown in [Figure 1](#).

Typical examples for digital sources are Blu-Ray DVD players, Cable set-top boxes, etc. Digital input sources utilize various protocols/ interfaces such as HDMI-ARC and S/PDIF, which typically require multiple chipsets for converting incoming audio stream into I2S format. In addition to handling various sources of audio inputs, a typical sound bar solution also incorporates multiple decoders and multiplexers resulting in increased device count, complex circuit board layout and concerns with clocking and control. For example synchronizing the clock for audio sampling between host processor and various audio interface blocks like DIR, ADC etc.

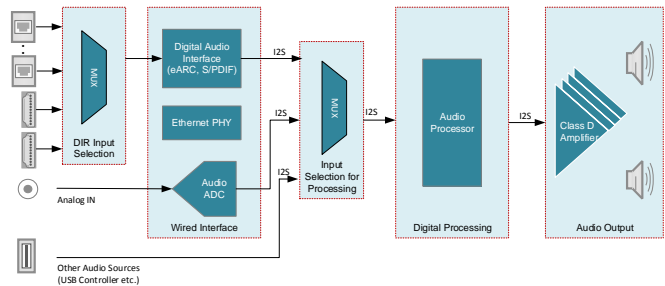


Figure 1. Block Diagram of a typical Sound Bar

Simplify Sound Bar Solution Using the PCM9211

The complexity challenges outlined in previous section related to board layout, clocking & control can be addressed by PCM9211 S/PDIF transceiver which can act as universal “front end” interface to the audio processor.

The PCM9211 is an analog and digital front-end device that integrates multiple functionalities needed in a sound bar system, as highlighted in [Figure 2](#). It consists primarily of integrated 216 kHz digital audio interface receiver (DIR), digital audio interface transmitter (DIT), and 96 kHz stereo analog-to-digital converter (ADC). As a result, the PCM9211 significantly simplifies implementation of end equipment like sound bars, AV receivers and other home audio systems.

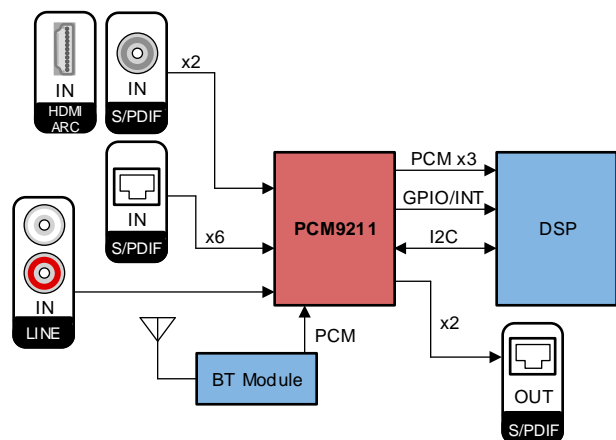


Figure 2. Block Diagram of a Simplified Sound Bar using PCM9211

Digital interface Receiver (DIR) supports TWO inputs w. integrated coaxial amplifiers. This allows direct connection to HDMI eARC source OR coaxial input S/PDIF source as highlighted in [Figure 2](#).

Interfacing ARC/eARC signals with PCM9211

The ARC digital audio signal is carried on a twisted pair of wires in an HDMI cable. These wires are designated HEAC+ (Pin 14) and HEAC-(pin 19). The ARC signal can be carried in two modes. In Single Mode, the digital audio signal is carried on the HEAC+, relative to the HDMI ground. In Common Mode, the ARC signal is carried commonly on the HEAC+ and HEAC- conductors, relative to ground. Figure 3 outlines the relevant pinouts on the HDMI connector.

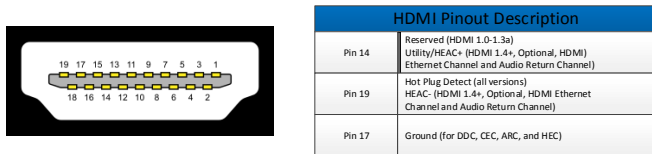


Figure 3. HDMI Connector Pinout

To interface the PCM9211 with ARC source (for example: eARC TX capable TV), please refer to following pin connection -

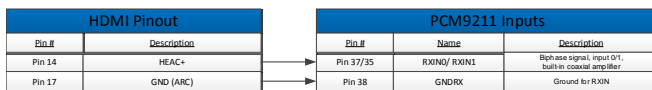


Figure 4. Connection between HDMI cable and PCM9211

Summary

PCM9211 Digital Interface Receiver is fully compatible with handling eARC frames, making the audio device to function seamlessly with newer HDMI 2.1 devices to be released in coming years. In addition to providing a cost-effective, easy to design Sound bars, PCM9211 can also provide additional system-level advantages for systems challenged by jitter on the HDMI inputs by cleaning the clock associated with the HDMI interface by internally looping the data through the S/PDIF transmitter, back through the S/PDIF receiver and its clock recovery mechanism. In addition, PCM9211 can be used as input monitoring device. Sub-modules in PCM9211 can be used to monitor any inputs to a device – like S/PDIF lock or analog line input level detect – and generate a system interrupt to wake up rest of the on-board blocks such as the audio processor and amplifier from standby – thereby resulting in lower power consumption for the overall end-equipment.

Related Documentation

1. [PCM9211 data sheet](#)
2. <http://www.hdmi.org>

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