Automotive Audio Bus (A^{2}B) Transceiver

AD2431/AD2432/AD2433/AD2435

A^{2}B BUS FEATURES

Line topology
  Single main node, up to 16 subordinate nodes
  Up to 15 m between nodes and up to 80 m overall cable
    length
Communication over distance
  Synchronous data
    Multichannel I^{2}S/TDM to I^{2}S/TDM
    Clock synchronous, phase aligned in all nodes
    Low latency node to node communication
  Control and status information I^{2}C to I^{2}C
  GPIO over distance
Bus power or local power subordinate nodes
**Configurable with SigmaStudio/SigmaStudio+ graphical
  software tool**
AEC-Q100 qualified for automotive applications

BASELINE A^{2}B TRANSCEIVER FEATURES

Configurable as A^{2}B bus main node or subordinate node
Programmable via I^{2}C and SPI interfaces
8-bit to 32-bit multichannel I^{2}S/TDM interface
  I^{2}S/TDM/PDM programmable data rate
  Up to 32 upstream and 32 downstream channels
**PDM inputs for 4 high dynamic range microphones on main
  or subordinate nodes**
**Simultaneous I^{2}S/TDM operations with up to 4 PDM
  microphones**

Unique ID register for each transceiver
Support for crossover or straight-through cabling
Programmable settings to optimize EMC performance

AD243x TRANSCEIVER ENHANCEMENTS

Mixed Signal
  Up to 50 W A^{2}B bus power
  Increased voltage regulator capacity (up to 100 mA)
  ADC monitoring of supply voltages
  Supports 3.3 V input at VIN in Low Voltage Input (LVI)
    mode
Digital
  High speed SPI (up to 10 Mbps) over distance
  A^{2}B bus self-discovery
  Dedicated hardware reset pin
  I^{2}S/TDM crossbar switch
    Flexible mapping of Tx/Rx TDM channel data to A^{2}B slot
  Support for I^{2}C fast mode plus (1 MHz)
  Support for in cabin LED control using 4 PWM outputs
  8 GPIO pins with configurable pin mapping

APPLICATIONS

Distributed audio systems
Personal audio zones
In car communications
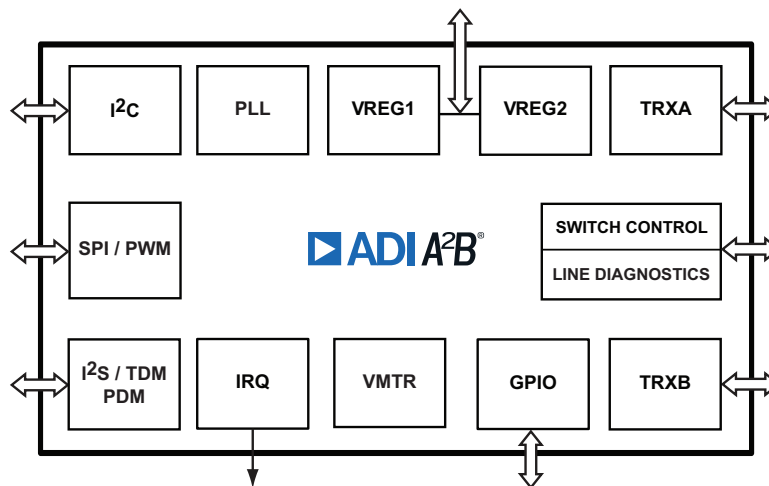**Smart/remote tuner modules**

Figure 1. Functional Block Diagram

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Rev. SpB   **Document Feedback**

Technical Support   **www.analog.com**

GENERAL DESCRIPTION

The Automotive Audio Bus (A^{2}B$^®$) provides a multichannel, I^{2}S/TDM link over distances of up to 15 m between nodes. It embeds bidirectional synchronous pulse-code modulation (PCM) data (for example, digital audio), clock, and synchronization signals onto a single unshielded twisted pair (UTP) differential cable. A^{2}B supports a direct point to point connection and allows multiple, daisy-chained nodes at different locations to contribute and/or consume time division multiplexed channel content.

A^{2}B is a single main node, multiple subordinate node system where the transceiver at the host controller is the main node. The main node generates clock, synchronization, and framing for all subordinate nodes. The main A^{2}B transceiver is programmable over a control port (I^{2}C/SPI) for configuration and read back. An extension of the control port protocol is embedded in the A^{2}B data stream. This allows direct access to registers and status information on subordinate transceivers, as well as I^{2}C to I^{2}C, SPI to I^{2}C, or SPI to SPI communication from the host to a peripheral in a subordinate node. SPI to SPI communication between subordinate nodes can be performed directly and does not need to involve the main node.

The transceiver can connect directly to general-purpose digital signal processors (DSPs), field-programmable gate arrays (FPGAs), application specific integrated circuits (ASICs), microphones, analog-to-digital converters (ADCs), digital-to-analog converters (DACs), and codecs through a multichannel I^{2}S/TDM interface. It also provides a pulse density modulation (PDM) interface for direct connection of up to four PDM digital microphones.

Finally, the transceiver also supports an A^{2}B bus powering feature, where the main node supplies voltage and current to the subordinate nodes over the same daisy-chained, twisted pair wire cable as used for the communication link.

Complete technical specifications are available for the A^{2}B transceiver. Contact a2b.support@analog.com to complete the nondisclosure agreement (NDA) required to receive additional product information.

Table 1. Product Comparison Guide

Feature	AD2431	AD2432	AD2433	AD2435
Main node capable	No	No	Yes	Yes
Functional TRX blocks	A only	A + B	A + B	A + B
I^{2}S/TDM support	No	No	Yes	Yes
PDM microphone inputs	4 mics	4 mics	4 mics	4 mics
A^{2}B bus power	N/A	High (≤ 50 W)	Standard (≤ 2.7 W)	High (≤ 50 W)
Nominal bus bias voltage (VBUS)	7 V to 24 V	7 V to 24 V	4 V to 9 V	7 V to 24 V
SPI	No	No	Yes	Yes
Power configuration[1]	N/A	CFG-4	CFG-0	CFG-4

[1] N/A means not applicable.

I^{2}C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

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