Automotive Audio Bus (A²B) Transceiver

AD2431/AD2432/AD2433/AD2435

A²B 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 I²S/TDM to I²S/TDM
    - Clock synchronous, phase aligned in all nodes
    - Low latency node to node communication
  - Control and status information I²C to I²C
  - GPIO over distance
- Bus power or local power subordinate nodes
- Configurable with SIgmaStudio/SigmaStudio+ graphical software tool
- AEC-Q100 qualified for automotive applications

BASELINE A²B TRANSCEIVER FEATURES

- Configurable as A²B bus main node or subordinate node
- Programmable via I²C and SPI interfaces
- 8-bit to 32-bit multichannel I²S/TDM interface
  - I²S/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 I²S/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 A²B 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
  - A²B bus self-discovery
  - Dedicated hardware reset pin
  - I²S/TDM crossbar switch
    - Flexible mapping of Tx/Rx TDM channel data to A²B slot
  - Support for I²C 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

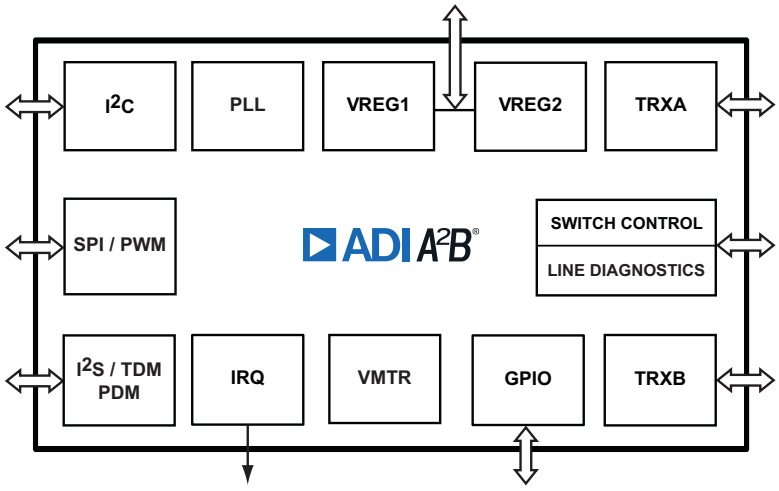


Figure 1. Functional Block Diagram

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One Analog Way, Wilmington, MA 01887 U.S.A.
Tel: 781.935.5565
Technical Support

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GENERAL DESCRIPTION

The Automotive Audio Bus (A²B®) provides a multichannel, I²S/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. A²B 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.

A²B 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 A²B transceiver is programmable over a control port (I²C/SPI) for configuration and read back. An extension of the control port protocol is embedded in the A²B data stream. This allows direct access to registers and status information on subordinate transceivers, as well as I²C to I²C, SPI to I²C, 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 I²S/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 A²B 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 A²B transceiver. Contact your nearest Analog Devices sales office 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
I²S/TDM support	No	No	Yes	Yes
PDM microphone inputs	4 mics	4 mics	4 mics	4 mics
A²B 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.

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

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