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 subordinate node to node communication
Control and status information I²C to I²C
GPIO over distance
Bus power or local power subordinate nodes
Configurable with 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 reception of I²S data 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

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Figure 1. Functional Block Diagram
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

<table>
<thead>
<tr>
<th>Feature</th>
<th>AD2431W</th>
<th>AD2432W</th>
<th>AD2433W</th>
<th>AD2435W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main node capable</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Functional TRX blocks</td>
<td>A only</td>
<td>A + B</td>
<td>A + B</td>
<td>A + B</td>
</tr>
<tr>
<td>I²S/TDM support</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PDM microphone inputs</td>
<td>4 mics</td>
<td>4 mics</td>
<td>4 mics</td>
<td>4 mics</td>
</tr>
<tr>
<td>A²B bus power</td>
<td>High (≤ 50 W)</td>
<td>High (≤ 50 W)</td>
<td>Standard (≤ 2.7 W)</td>
<td>High (≤ 50 W)</td>
</tr>
<tr>
<td>Nominal bus bias voltage (VBUS)</td>
<td>7 V to 24 V</td>
<td>7 V to 24 V</td>
<td>4 V to 9 V</td>
<td>7 V to 24 V</td>
</tr>
<tr>
<td>SPI over distance</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Power configuration¹</td>
<td>N/A</td>
<td>CFG-4</td>
<td>CFG-0</td>
<td>CFG-4</td>
</tr>
</tbody>
</table>

¹ N/A means not applicable.

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

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