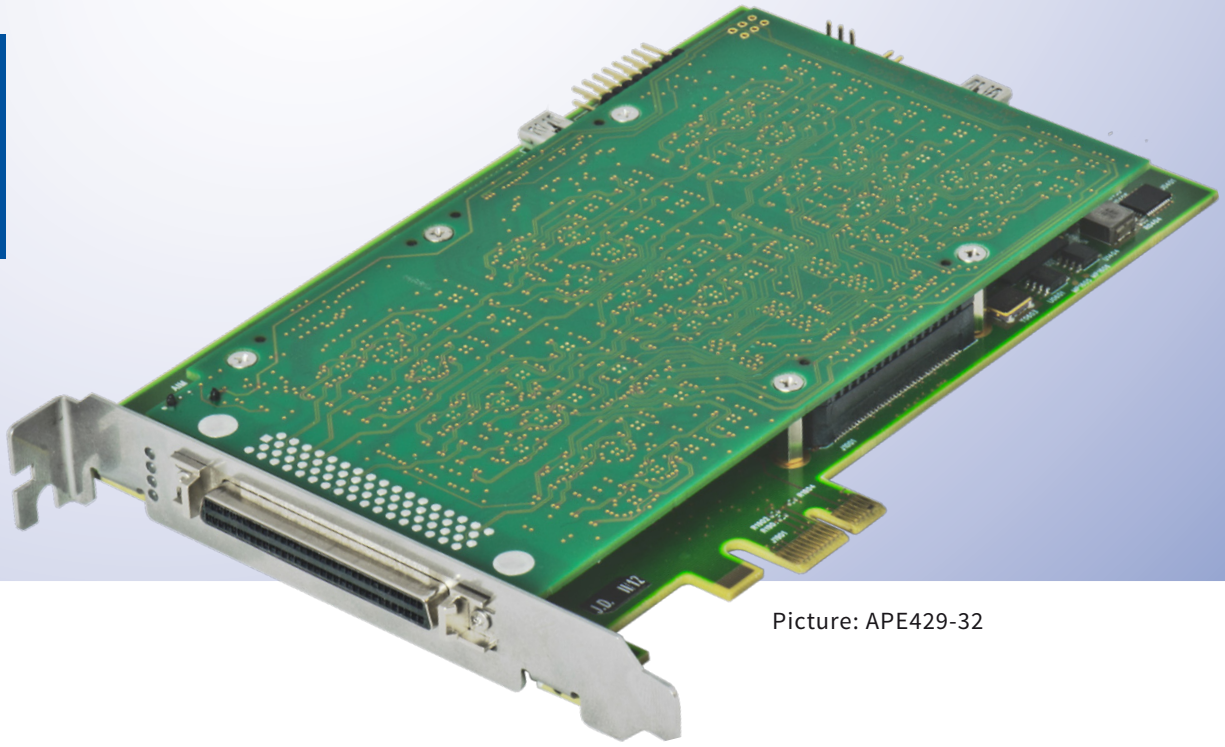
APE429-x

Avionics Databus Solutions

4, 8, 16 and 32 Channel ARINC429 Test & Simulation Module for PCI Express

Data Sheet



Picture: APE429-32

www.aim-online.com

APE429-x

4, 8, 16 and 32 Channel ARINC429 Test & Simulation Module for PCI Express

General Features

The APE429-x is a member of AIM's new family of PCI Express modules for analysing, simulating, monitoring and testing ARINC429 channels providing up to 32 channels on a 'Short Length PCIe' standard module format.

4 channels are available on the APE429-4, 8 channels on the APE429-8, 16 channels on the APE429-16 module and 32 channels on the APE429-32 module. All channels are software programmable for Receive (Rx) or Transmit (Tx) mode. The lower 8 transmit channels provide variable output amplitudes, whereas upper 8 transmit channels are of fixed amplitude for the APE429-16. All transmit channels are of fixed output amplitude for the APE429-32 version. APE429-4 and APE429-8 versions provide separate Transmit (Tx) and Receive (Rx) pins on all channels and are pin compatible to previous generation API/APX429-4 and API/APX429-8 modules.

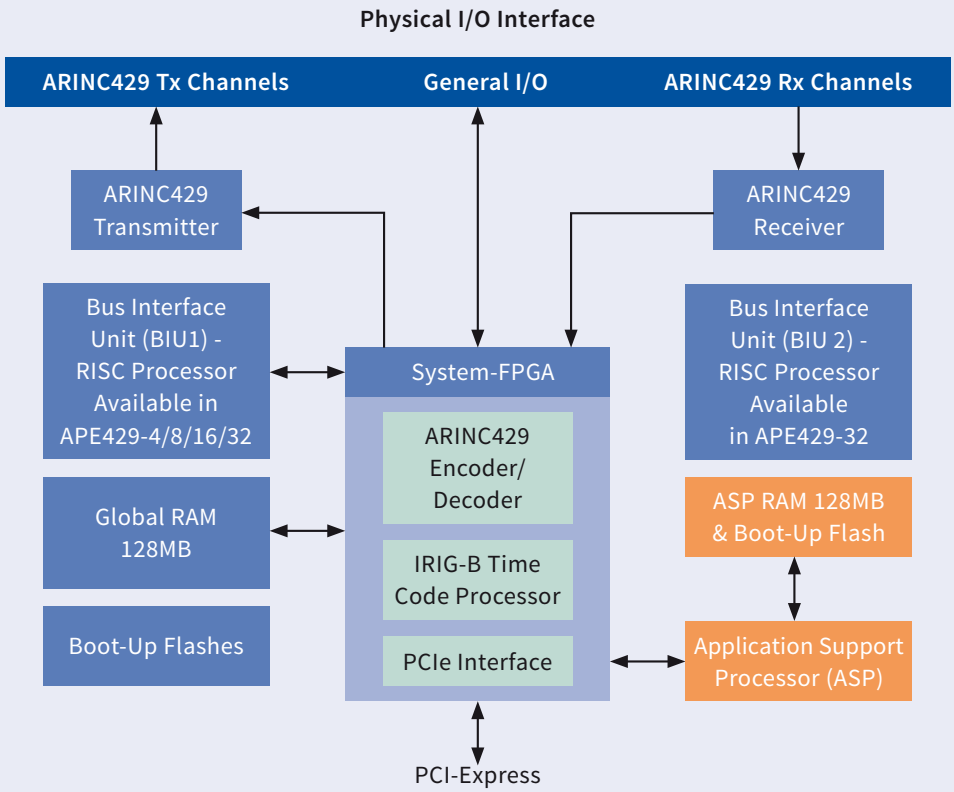
All APE429-x cards have the capability to handle 8 General Purpose Discrete I/O (GPIO) signals which can be monitored or generated. For access of Discrete I/O's an optional breakout cable can be supplied occupying a slot bracket position of the PC.

The APE429-x modules use AIM's 'Common Core' hardware design utilising multiple RISC processors with 128MB of Global RAM and 128MB of ASP RAM. An onboard ASP (Application Support Processor) based on a SOC (System on Chip) hardware device is prepared to be running under LINUX OS. This offers a scalable and flexible platform for hosting various on-board applications.

The use of onboard processing and large memory enables autonomous operation with minimal interaction with the host PC for real time applications.

An onboard IRIG-B time encoder/decoder is included with sinusoidal output and 'free wheeling' mode for time tag synchronisation on system level using 1 or more APE429-x cards.

Full function driver software is delivered with the APE429-x cards in comprehensive Board Software Packages (BSP's) for different Operating Systems. The optional PBA.pro™ Databus Test & Analysis Tool (for Windows & Linux) can also be purchased for use with APE429-x modules.



APE429-x
Block Diagram

Receive Channel Operation

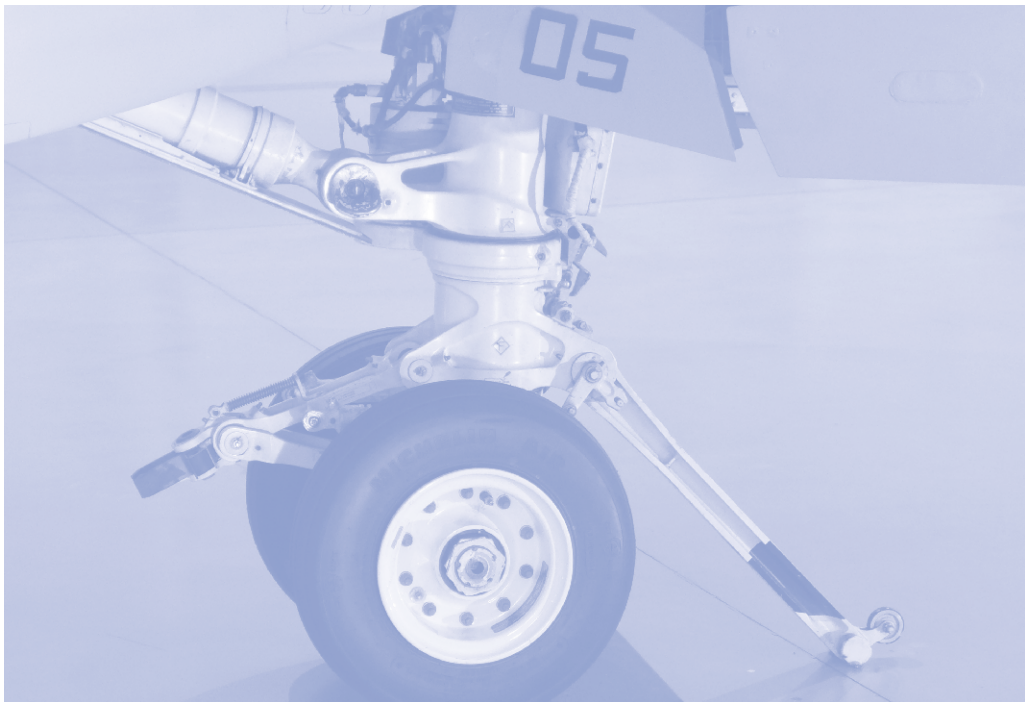
APE429-x modules provide real time monitoring of up to 32 ARINC429 receiver channels concurrently controlled by an onboard RISC processor.

- Label Oriented Receive Mode (individual Buffers for each Label with Multi-Buffering and Real Time Updates)
- Chronological Receive Mode per Channel with 1µs Resolution Time Stamping
- Chronological Mode concurrent to label oriented Receive Mode
- Local (1 Buffer per Channel) or Global Monitoring (1 Buffer all Channels)
- Continuous or Single Shot Capturing Modes
- Support of SDI Handling
- Interrupt Generation on Label Reception (configurable per Label/SDI)
- Complex Triggering and Filtering Functions
- Loop of received Data to configurable Transmit Channel with Label Data Modification Capability
- High Accuracy FPGA based Label Time Stamping

Transmit Channel Operation

APE429-x modules provide real time simulation of up to 32 ARINC429 transmitter channels concurrently controlled by the onboard RISC processors via instruction lists. Transmission rates are selectable for each channel at 12.5kbit/s or 100kbit/s with the associated rise/fall time in accordance with the ARINC429 electrical specification.

- Cyclic/Acyclic Label Transmission and Channel Loop Mode
- Error Injection for each Label Transfer: Short Gap, Parity, Bit Count, Coding
- Programmable Gap between Labels: 4 to 255-bit
- Simulate Zero-Jitter Scenarios using Virtual Label Transfers
- Multi-Buffering with Real Time Update supported per individual Label Transfer
- Reconstruction of previously recorded ARINC429 Traffic physically to the Bus with excellent
  Timing Accuracy (Physical Replay)
- Interrupt Generation on Label Transmit (configurable per Label Transfer)



Loop-back & Pollution Mode

Receive and transmit channels can be paired to form a 'Loop-back' couple. Data received from the receiver channel are automatically transmitted on the selected transmitter channel with minimum delay. A special receiver function block mode can be used to modify (pollute) the received label prior to its re-transmission.

Discretes

APE429-x modules provide 8 General Purpose Discrete I/O's (GPIO's). GPIO's can be used as simple digital inputs/outputs for a board-to-board connection inside the PC or to sample a digital output of an external system or to generate strobes to an external system. For external use access to GPIO's can be provided through a Breakout Cable (BOC).

IRIG-B Time Encoder/Decoder

APE429-x cards include an onboard IRIG-B time encoder/decoder with sinusoidal output and 'free-wheeling' mode for time tag synchronisation. This allows synchronisation of multiple APE429-x cards or any IRIG-B compatible modules to 1 common external IRIG-B time input source or to the onboard time code generator of 1 APE429-x card as the reference for the correlation of data across multiple ARINC429 channels.

Physical Bus Replay

The APE429-x cards can electrically reconstruct and replay previously recorded ARINC429 channels physically to the ARINC429 bus with excellent timing accuracy. Record files can be selected for bus replay. The additional capability to disable any or all ARINC429 labels from the replay enables smart systems integration and test to be performed.

Driver Software

The driver software is supplied with the APE429-x module. A full function Application Programming Interface (API) is provided compatible with Windows and Linux. Host applications can be written in C and C++. A LabView/VI application interface as well as LabViewRT drivers are provided.

Technical Data

System Interface
Single Lane (PCIe x1), 2.5Gb/s PCI Express V1.1 compliant; compatible to higher Versions

Processors
2x 400MHz RISC Processors for BIUs and 1x 400MHz RISC Processor for ASP

Memory
128MB Global RAM (DDR2-RAM)
128MB ASP RAM (DDR2-RAM)
2x (3x) 8MB serial flash memories for processors
1x 64MB serial flash memory for LCA
1x 256MB NAND-Flash for ASP

Encoder/Decoder
Up to 32 ARINC429 Encoder/Decoder with Error Injection and Detection

Time Tagging
Sinusoidal 46-bit absolute IRIG-B Time stamping with 1µs resolution

Trigger/General Purpose Discretes
1 Trigger input and 1 Trigger output on the front panel connector and 8 General Purpose Discrete I/O's (avionics level) on board-to-board connector

Physical Bus Interface
Up to 32 ARINC429 Line Transmitter and 32 ARINC429 Line Receiver for a total of 32 Channels; Channels are user programmable for Rx or Tx;
Transmitter Channels 1-8 with variable output amplitude, Transmitter Channels 9-16 with fixed output amplitude (APE429-4/8/16), all Transmitter Channels with fixed output amplitude (APE429-32)

Connectors
PCIe Bus standard edge connector, 37-pin (female) D-Sub connector (APE429-4/8/16) or 68-pin (female) SCSI-3 HD-Sub connector (APE429-32) for ARINC429 signals, Trigger & IRIG-B; board-to-board connector for 16-pin ribbon cable

Ordering Information

APE429-4
4 Channel PCIe bus to ARINC429 Interface:
Software programmable Receiver/ Transmitter Channels with Variable Output Amplitude,
IRIG-B Time Encoder/Decoder,
8 General Purpose Discrete I/O's (on board-to-board connector only),
128MB Global RAM, 128MB ASP RAM
37-pin D-Sub connector with separate Tx and Rx pins
(fully compatible to API/APX429-4)

APE429-8
8 Channel PCIe bus to ARINC429 Interface:
Software programmable Receiver/ Transmitter Channels with Variable Output Amplitude,
IRIG-B Time Encoder/Decoder,
8 General Purpose Discrete I/O's (on board-to-board connector only),
128MB Global RAM, 128MB ASP RAM
37-pin D-Sub connector with separate Tx and Rx pins
(fully compatible to API/APX429-8)

APE429-16
16 Channel PCIe bus to ARINC429 Interface:
8 Software programmable Receiver/ Transmitter Channels with Variable Output Amplitude plus
8 Software programmable Receiver/ Transmitter Channels with fixed Output Amplitude,
IRIG-B Time Encoder/Decoder,
8 General Purpose Discrete I/O's (on board-to-board connector only),
128MB Global RAM, 128MB ASP RAM
37-pin D-Sub connector with shared Tx and Rx pins

APE429-32
32 Channel PCIe bus to ARINC429 Interface:
32 Software programmable Receiver/ Transmitter Channels with Fixed Output Amplitude,
IRIG-B Time Encoder/Decoder,
8 General Purpose Discrete I/O's (on board-to-board connector only),
128MB Global RAM, 128MB ASP RAM
68-pin (female) SCSI-3 HD-Sub connector with shared Tx and Rx pins

Dimensions
167.65mm x 111.15mm

Power Consumption
APE429-4: 3.0W (idle)/3.0W (LS-Operational with No Load)
APE429-8: 3.0W (idle)/3.0W (LS-Operational with No Load)
APE429-16: 3.3W (idle)/3.4W (LS-Operational with No Load)
APE429-32: 4.4W (idle)/5.9W (LS-Operational with No Load)

Operating Temp. Range
Standard 0°C ...+45°C ambient
Extended temperature range -15°C to +65°C

Storage Temp. Range
-40°C to +85°C

Humidity
0 to 95% non-condensing

AIM Office Contacts:

AIM GmbH
Sasbacher Str. 2
D-79111 Freiburg / Germany
Phone +49 (0)761 4 52 29-0
Fax +49 (0)761 4 52 29-33
sales@aim-online.com

AIM GmbH – Munich Sales Office
Terofalstr. 23a
D-80689 München / Germany
Phone +49 (0)89 70 92 92-92
Fax +49 (0)89 70 92 92-94
salesgermany@aim-online.com

AIM UK Office
Cressex Enterprise Centre, Lincoln Rd.
High Wycombe, Bucks. HP12 3RB / UK
Phone +44 (0)1494-446844
Fax +44 (0)1494-449324
salesuk@aim-online.com

AIM USA LLC
Seven Neshaminy Interplex
Suite 211 Trevose, PA 19053
Phone 267-982-2600
Fax 215-645-1580
salesusa@aim-online.com

© AIM 2016
APE429-x_15Nov2016
Specifications are subject to change without notice.