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data sheet

APE1553-x

Single, Dual or Quad Stream MIL-STD-1553A/B Test & Simulation Module for PCI Express





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Avionics Databus Solutions

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APE1553-x

Single, Dual or Quad Stream MIL-STD-1553A/B Test & Simulation Modules for PCI Express

product guide

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General Features

The APE1553-x is a member of AIM's new family of PCI Express modules for analysing, simulating, monitoring and testing MIL-STD-1553A/B databuses. The APE1553-x concurrently acts as Bus Controller, Multiple Remote Terminals (31) and Chronological/ Mailbox Bus Monitor.

The APE1553-x-DS versions known as MILScope™, have an onboard A/D Converter on the first MIL-STD-1553 channel. The MILScope™ option provides a unique capability to test & verify the MIL-STD-1553 waveform and detect faulty bus conditions without the need of an external oscilloscope.

Versions with reduced functionality (Single Function or Simulator Only) are available as well as extended temperature range variants. All APE1553-x cards have the capability to handle eight General Purpose Discrete I/O (GPIO) signals and also offer Trigger I/O.

A full range of MIL-STD-1553 protocol errors can be injected/ detected. The APE1553-x modules can electrically reconstruct and replay previously recorded MIL-STD-1553A/B record files physically to the MIL-STD-1553A/B bus with excellent timing accuracy.

The APE1553-x offers an interface for 1, 2 or 4 dual redundant bus streams.

All versions are short length PCIe card formats.

The APE1553-x modules use AIM's 'Common Core' hardware design utilising multiple RISC processors with 128MB of Global RAM and 128MB of ASP RAM. The onboard ASP (Application Support Processor) which is based on a SOC (System On Chip) hardware device is running under LINUX OS. This offers a scalable and flexible platform for hosting various onboard applications.

ASP Application Software development is supported via the onboard Standard Ethernet Interface and an optional breakout panel.

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 one or more APE1553-x cards. The Physical Bus Interface (PBI) provides programmable bus coupling modes and variable output amplitude to the MIL-STD-1553A/B bus.

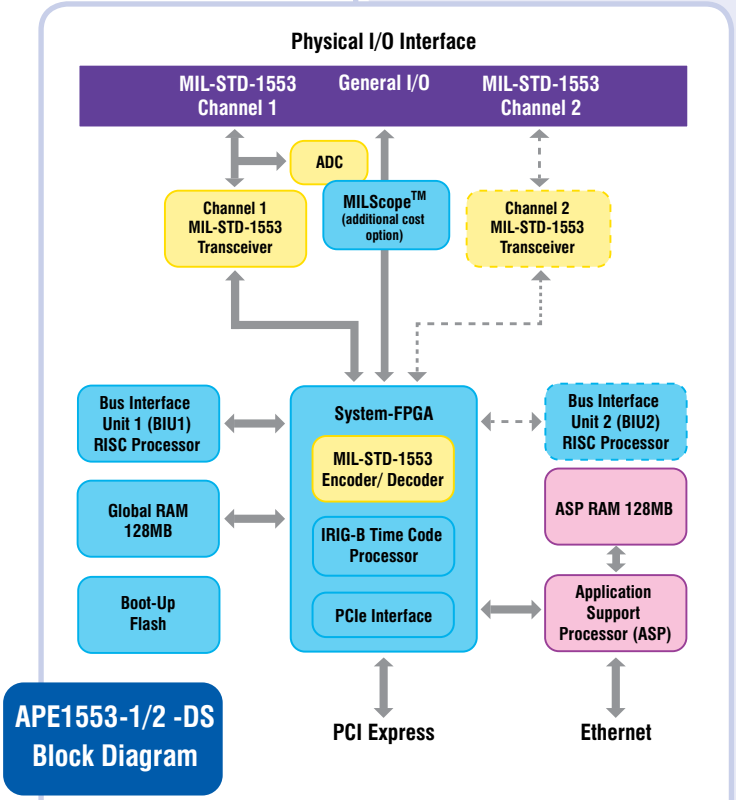




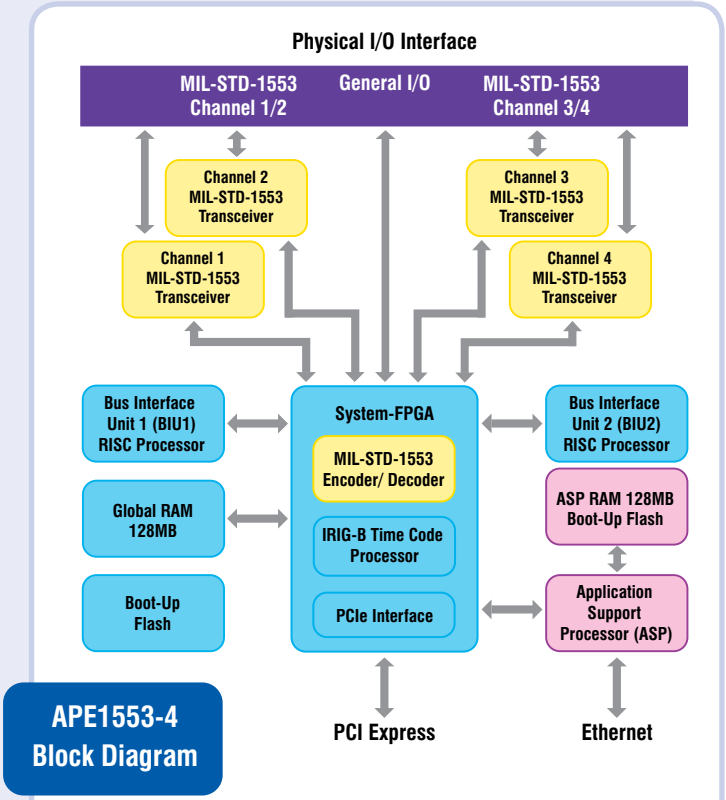
Full function driver software is delivered with the APE1553-x cards in comprehensive Board Software Packages (BSP's) for different Operating Systems. The optional PBA.pro™ Databus Test & Analysis Tool (for Windows & Linux) can also be purchased for use with APE1553-x modules.

PBA.pro™ software components are available to support the MILScope™ capability of APE1553-x-DS cards to view and verify the MIL-STD-1553 waveform.

Off the shelf test scripts are available to support the automatic execution of the 'AS4112 RT Production Test Plan' (Protocol and Electrical Tests) and the AS4111 RT Validation Test Plan (Protocol Tests).



APE1553-1/2 -DS Block Diagram



APE1553-4 Block Diagram

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Bus Controller

The APE1553-x modules provide real time Bus Controller functions on each independent, dual redundant MIL-STD-1553A/B Databus channel, concurrently with Multiple RT and Chronological Bus Monitor operation. Two 400MHz RISC processors, one for each Single or Dual Channel Bus Interface Unit, provide true simulation of BC operations without host computer interaction.

Key Features of the Bus Controller Mode include:

- *Autonomous Operation including Sequencing of Minor/ Major Frames*
- *Acyclic Message Insertion/ Deletion*
- *Programmable BC Retry without Host Interaction*
- *Full Error Injection down to Word and Bit Level*
- *Multi-Buffering with Real Time Data Buffer Updates*
- *Synchronisation of BC Operation to external Trigger Inputs*
- *4µs Intermessage Gaps*
- *Interrupt Generation on BC Transfer Events*
- *Start on external Trigger Input*

Multiple Remote Terminal

The APE1553-x modules simulate up to 31 Remote Terminals, including all sub addresses on each MIL-STD-1553 channel, concurrently with BC and Chronological Monitor operation. Alternatively each of the 31 RT's can operate in message oriented Mailbox Monitor Mode to monitor Non-Simulated RT's.

Key features of the Remote Terminal Simulation Mode include:

- *Programmable RT Response Time down to 4µs for each simulated RT*
- *Programmable & Intelligent Response to Mode Codes*
- *Full Error Injection down to Word and Bit Level (AS4112 compliant)*
- *Multi-Buffering with Real Time Data Buffer Updates*
- *Mailbox Monitor Mode*
- *Interrupt Generation on RT Events*

Physical Bus Replay

The APE1553-x cards can electrically reconstruct and replay previously recorded MIL-STD-1553A/B record files physically to the MIL-STD-1553A/B bus with excellent timing accuracy. Record files can be selected for Bus Replay. The additional capability to disable any or all RT responses from the MIL-STD-1553A/B replay enables smart systems integration and test to be performed.

Physical Bus Interface

A Physical Bus Interface (PBI) daughter board provides software programmable transformer or direct coupling with software programmable variable output transceivers and a terminated bus network to enable the direct connection of a single BC or RT device. The coupling to the external bus is software programmable.

Chronological Bus Monitor

The APE1553-x modules provide full bus monitoring and analysis with time tagging of all bus traffic with 1µs resolution including response time and gap time measurement down to 250ns concurrently with BC and Multi RT operation.

Key features of the Chronological Bus Monitor:

- *100% Data Capture on each Channel at full Bus Rates*
- *Single Shot, Continuous or Selective Capture Modes*
- *Autonomous Message Synchronisation and Full Error Detection*
- *Two Static/Dynamic Complex Triggers with Sequencing*
- *Message Filter and Selection Capture*
- *Bus Activity Recording independent from Trigger and Capture Mode*
- *Time Tagging:*
  - *All Bus Traffic to 1µs*
  - *Intermessage Gaps & Response Time to 250ns*
- *External Trigger Outputs*
- *Programmable Response Time-Out*

MILScope™ (available as a cost option)

The APE1553-x-DS versions integrate on one channel of the PBI a two channel differential Analogue to Digital Converter (ADC) providing 50Msamples for primary & secondary data acquisition or 100Msamples for either the primary or secondary bus. Accurate measurements of physical bus parameters such as rise/ fall time, overshoot, undershoot, pulse width & amplitude, can be triggered by the complex trigger of the Bus Monitor.

Trigger-/ General Purpose Discrete I/O Signals

The Front-I/O connectors provide one BC-, RT- and BM-trigger input and one BC-, RT- and BM-trigger output for each MIL-STD-1553A/B channel. Additionally up to five user programmable General Purpose Discrete I/O signals can be accessed via Front-I/O. All eight onboard General Purpose Discrete I/O signals, which are user programmable for input or output can be accessed via the board-to-board ribbon cable connector. Voltage levels of all trigger signals and General Purpose Discrete I/O's are TTL compatible whereas the General Purpose Discrete I/O's are designed to handle avionics level as well.

IRIG-B Time Encoder/ Decoder

APE1553-x modules include an onboard IRIG-B time encoder/ decoder with sinusoidal output and 'free wheeling' mode for time tag synchronisation. This allows synchronisation of multiple APE1553-x modules to one common IRIG-B time input source or to the onboard time code generator of one APE1553-x module as the reference for correlation of data across multiple MIL-STD-1553A/B streams.

Driver Software

The Driver Software is supplied with the APE1553-x module. A full function Application Programming Interface (API) is provided compatible with Windows XP/Vista/7 and Linux. Host applications can be written in C and C++. A LabView/VI application interface as well as LabViewRT drivers are provided.

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APE1553-x

Single, Dual or Quad Stream
MIL-STD-1553A/B
Test & Simulation Module
for PCI Express

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Technical Data

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

Processors: One or two 400MHz RISC Processors for BIU(s) and a 400MHz Application Support Processor (ASP)

Memory: 128MB Global RAM (DDR-RAM), 128MB ASP RAM (DDR-RAM), 2x 8MBit serial flash memory for BIUs, 64MBit serial flash memory for LCA

Encoder/ Decoder: Up to four MIL-STD-1553A/B Encoders/ Decoders with full error injection and detection

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

Trigger/ General Purpose Discretes: One BC-, RT- and BM-Trigger input and one BC-, RT- and BM-Trigger output for each channel available with up to five General Purpose Discrete I/O's (avionics level) on the front panel connector

Physical Bus Interface: One, two or four MIL-STD-1553A/B Transceivers with variable Output Amplitude, Programmable Bus Coupling modes with onboard terminated Bus Network

Connectors:
PCIe Bus standard edge connector
APE1553-1/2: 9-way D-Sub for Bus connections, 26-way High Density D-Sub for Trigger, General Purpose Discrete I/O and IRIG Time Code I/O

APE1553-4: Two 15-way High Density D-Sub for Bus connections, Trigger, General Purpose Discrete I/O and IRIG Time Code I/O

Dimensions: 167.65mm x 111.15mm

Power Consumption:

APE1553-1: Typical 2.8W @ 3.3VDC, 2.7W @ 12VDC

APE1553-2: Typical 2.9W @ 3.3VDC, 4.8W @ 12VDC

APE1553-4: Typical 4.5W @ 3.3VDC, 8.5W @ 12VDC

(@ 50% Busload)

Operating Temp. Range: Standard 0°C ...+45°C ambient

Extended temperature range -15°C...+65°C

Storage Temp: -40°C...+85°C

Humidity: 0 to 95% non-condensing

Ordering Information

APE1553-1 Single Stream, Dual Redundant PCIe bus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Time Encoder/ Decoder, 8 General Purpose Discrete I/O's (5 on Front I/O, 8 on board-to-board connector), 128MB Global RAM, 128MB ASP RAM

APE1553-1-DS Single Stream, Dual Redundant PCI-X bus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Encoder/ Decoder, 8 General Purpose Discrete I/O's (5 on Front I/O, 8 on B2B Connector); Digitising Scope for Waveform Analysis & Measurement; 1MB Global RAM, 128MB ASP RAM; Short Length Card

APE1553-2 Dual Stream, Dual Redundant PCIe bus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Time Encoder/ Decoder, 8 General Purpose Discrete I/O's (5 on Front I/O, 8 on board-to-board connector), 128MB Global RAM, 128MB ASP RAM

APE1553-2-DS Dual Stream, Dual Redundant PCI-X bus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Encoder/ Decoder; 8 General Purpose Discrete I/O's (5 on Front I/O, 8 on B2B Connector); Digitising Scope for Waveform Analysis & Measurement, 4MB Global RAM, 128MB ASP RAM; Short Length Card

APE1553-4 Quad Stream, Dual Redundant PCIe bus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Time Encoder/ Decoder, 8 General Purpose Discrete I/O's (2 on Front I/O, 8 on board-to-board connector), 128MB Global RAM, 128MB ASP RAM

Simulator Only versions available
BC, Multi RT Simulator with Mailbox Monitor

Single Function versions available
Chronological & Mailbox Monitor Or BC and Chronological & Mailbox Monitor Or Multi-RT and Chronological & Mailbox Monitor

ACB-PCI-1 Ready Made Adapter Cable (2.0m): From D-Sub to two Twinax Connectors PL-75 for all variants of APE1553-1 cards

ACB-PCI-2 Ready Made Adapter Cable (2.0m): From D-Sub to four Twinax Connectors PL-75 for all variants of APE1553-2 cards

ACB-HD15-2 Ready Made Adapter Cable (2.0m): From 15-pin HD-Sub to four Twinax Connectors PL-75 for all variants of APE1553-4 cards
Note: For all variants of APE1553-4 cards use two of ACB-HD15-2/ ACB-HD15-2-F Adapter Cables

ACB-HD15-2-F Ready Made Adapter Cable (2.0m): From 15-pin HD-Sub to four Twinax Connectors PL-75 and 9-pin D-Sub Connector for Trigger-I/O, IRIG-B and Discrete I/O's for all variants of APE1553-4 cards
Note: For all variants of APE1553-4 cards use two of ACB-HD15-2/ ACB-HD15-2-F Adapter Cables

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