**Description**

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This **COTS tech-refresh** offers a compact size and low-cost I/O in a rugged form factor. Combine different AcroPack modules on one carrier for a simplified modular approach to system assembly.

The AP235 outputs analog voltage signals to drive up to 16 devices. When used with a carrier that holds two AcroPack AP modules, up to 32 voltage outputs can be obtained from a single card cage slot. The AP235 is ideal for waveform generation application that require high speed capabilities.

Each output channel has its own 16-bit D/A converter (DAC). Individual DACs are faster, and they eliminate glitches typically caused by the re-acquisition process of sample and holds found on multiplexed output boards. A 64K sample memory is provided for waveform storage on board. This memory is shared between the sixteen channels. Waveforms can be continuously output from onboard memory without host intervention. Additionally, a DMA controller is provided for streaming waveform data from host memory.

Designed for COTS applications these analog output modules deliver high-density, high-reliability, and high-performance at a low cost. AcroPack modules are RoHS compliant and ideal for military, defense, automation, aerospace, scientific, and development labs industries.

The AP235 modules are 70mm long, 19.05mm longer than the full length mini PCIe card. The board's width is the same as mPCIe board and use the same mPCIe standard board hold down standoff and screw keep out areas.

A down facing 100 pin Samtec connector will mate with the carrier card. Fifty of these signals are available as field I/O signals.

The AP235 supports 6 independent software selectable output ranges.

**Key Features & Benefits**

- PCI Express Generation 1 interface
- Independent 16-bit D/A converters per channel
- Waveforms can be continuously output from onboard memory without host intervention
- DMA controller provides for streaming waveform data from host memory
- Mix countless I/O combinations in a single slot
- Per channel configurability of bipolar and unipolar output ranges
- Sample software and diagnostics
- Configurable FIFO sizes up to 64K samples offer flexible waveform lengths
- Built-in calibration coefficients
- Flexible trigger, operating modes, and memory allocation
- Independent selectable output ranges
- Outputs reset to 0 volts
- Internally stored calibration coefficients ensure accuracy
- Synchronization of multiple modules using an external trigger
- Solid-down connector I/O interface
## Performance Specifications

**Analog Output**
- **Output configuration**: 16 non-isolated bipolar/unipolar.
- **D/A Resolution**: 16 bits.
- **Output ranges**
  - Unipolar: 0V to 5V, 0V to 10V.
  - BiPolar: -2.5V to 7.5V, ±3V, ±5V, ±10V.
- **Output rate**: 100kS/s.
- **Settling time**
  - 9μS - 20V step to 1 LSB at 16-bit resolution.
  - 7.5μS - 10V step to 1 LSB at 16-bit resolution.
- **Maximum throughput rate**: 7.5μS/conversion.
- **Calibrated system accuracy**
  - Linearity error: ±0.2 LSB.
  - Offset error: ±0.0625 LSB.
  - Gain error: ±0.0625 LSB.
  - Total error: ±0.0032% FSR maximum.
- **Data format (left-justified)**
  - Straight Binary or Two’s Complement.
- **Output at reset**: 0 volts.
- **Output current**
  - 10mA (maximum). This corresponds to a minimum load resistance of 1K ohms with a 10V output.
- **Short circuit protection**
  - Indefinite at 25°C.

**PCI Express Base Specification**
- **Conforms to PCIe base specification Revision 2.1**.
- **Lanes**: 1 lane in each direction.
- **Bus Speed**: 2.5 Gbps (Generation 1).
- **Memory**: 1MB space required. 1 base address register.

**Environmental**
- **Operating temperature**: -40 to 70°C.
- **Storage temperature**: -55 to 150°C.
- **Relative humidity**: 5 to 95% non-condensing.
- **MTBF**: Please contact factory.

**Power**
- **+3.3 VDC ±5% 0.5A typical, 1A maximum**.
- **+12 VDC ±5% 85mA typical, 275mA maximum**.
- **-12 VDC ±5% 50mA typical, 200mA maximum**.

**Physical**
- **Length**: 70mm.
- **Width**: 30mm.

## Ordering Information

**AcroPack® Modules**
- **AP235-16E-LF**: 16 voltage outputs, 16-bit DAC with waveform generation capabilities.

**Accessories**
- **AP-CC-01**: Conduction-cool kit.

**Carrier Cards**
- **APCe7010E-LF**: PCIe AcroPack carrier, holds one AcroPack module, air-cooled.
- **APCe7022E-LF**: PCIe AcroPack carrier, holds two AcroPack modules, air-cooled.
- **APCe7040E-LF**: PCIe AcroPack carrier, holds four AcroPack modules, air-cooled.
- **VPX4500E-LF**: 3U VPX AcroPack carrier, holds three AcroPack modules, air-cooled.
- **VPX4500-CC-LF**: 3U VPX AcroPack carrier, holds three AcroPack modules, conduction-cooled.
- **XMCAP2020-LF**: XMC AcroPack carrier; holds two AcroPack modules, 2-slots out front, air-cooled.
- **XMCAP2021-LF**: XMC AcroPack carrier; holds two AcroPack modules, 2-slots out rear, air-cooled.

**Software**
- (see software documentation for details)
- **APSW-API-VXW**: VxWorks® software support package.
- **APSW-API-WIN**: Windows® DLL driver software support package.
- **APSW-API-LNX**: Linux® support (website download only).

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**AP-CC-01 Conduction-Cool Kit**