General Standards Corporation

High Performance Bus Interface Solutions

12AISS8AO4

12-Channel, 12-Bit PMC Analog Input/Output Board

With Eight Simultaneously-Sampled Wide-Range Inputs at 2.0 MSPS per Channel, Four Analog Outputs, and 16-Bit Digital I/O Port

Available in PMC, PCI, cPCI and PC104-*Plus* and PCI Express form factors as:

PMC-12AISS8AO4:	**PMC**, Single-width
PCI-12AISS8AO4:	**PCI**, short length
cPCI-12AISS8AO4:	**cPCI,** 3U
PC104P-12AISS8AO4:	**PC104-*Plus***
PCIe-12AISS8AO4:	**PCI Express**
PCIe104-12AISS8AO4:	**PCIe, one-lane on PC/104 form factor**

See Ordering Information for details.

Call for availability of other form factors, such as XMC, CCPMC, etc.

Features Include:

- **8 Differential Analog Inputs with Dedicated 12-Bit, 2.0 MSPS ADC per Channel**
- **True Simultaneous Sampling of all Inputs; Minimum Data Skew**
- **Sampling Rates to 2.0 MSPS per Channel. (Input bandwidth is reduced on the lower input ranges. See 'Small Signal Bandwidth'.)**
- **Software-Selectable Input Ranges: ±10V, ±1V, ±100mV**
- 64-Ksample Analog Input FIFO Data Buffer
- Supports DMA Transfers in Two Channels in Block-Mode or Demand-Mode
- **4 Analog Output Channels with Direct Register Access**
- **16-Bit Bidirectional Digital I/O Port**
- Sampling Controlled by Internal Rate Generator, by Software Trigger, or Externally
- Input Frequency response to 900kHz on ±10V Range, 10kHz on ±100mV Range. (Refer to the PMC-12AISS44AO4 product specification for a wideband version of this product).
- On-Demand Internal Autocalibration
- Hardware Sync I/O for Multiboard Operation
- Integral Dual-Conversion Precision Analog Power Supplies
- Completely Software-Configurable; No Field Jumpers
- Conforms to PCI Local Bus Specification, Revision 2.3, with Universal Signaling
- Single-width PMC Form Factor, with Integral EMI Shield

APPLICATIONS

➢ **Simultaneous Sampling**	➢ **Low-Level Inputs**	➢ **Instrumentation**
➢ **Transducer Inputs**	➢ **Event Capture**	➢ **Acoustic Sensor Inputs**
➢ **Dynamic Test Systems**	➢ **Voltage Control**	➢ **Closed-Loop Systems**

FUNCTIONAL DESCRIPTION

The 12-Bit PMC-12AISS8AO4 analog I/O board samples and digitizes eight input channels simultaneously at rates up to 2.0 million samples per second for each channel. The resulting 12-bit sampled data is available to the PCI bus through a 64K-Sample FIFO buffer. All data is channel-tagged. (Input bandwidth is reduced on the lower input ranges. See 'Small Signal Bandwidth'.)

The analog inputs can be sampled in groups of 1 through 8 channels, and the sample clock can be generated either from an internal rate generator, through software, or by external hardware. Both burst and continuous sampling modes are supported. Input ranges are software-selectable as ±10V, ±1V, or ±100mV. The inputs can be divided into two channel groups that can be assigned input ranges independently.

Four analog output channels provide software-selected output ranges of ±2.5V, ±5V or ±10V, and are accessed directly through dedicated control registers. A 16-Bit bidirectional digital port can be configured as two independent byte-wide ports.

An on-demand autocalibration feature determines offset and gain correction values for each input and output channel, and the corrections are applied subsequently during normal operation. A selftest switching network routes output channels or calibration reference signals to the analog inputs, and permits board integrity to be verified by the host..

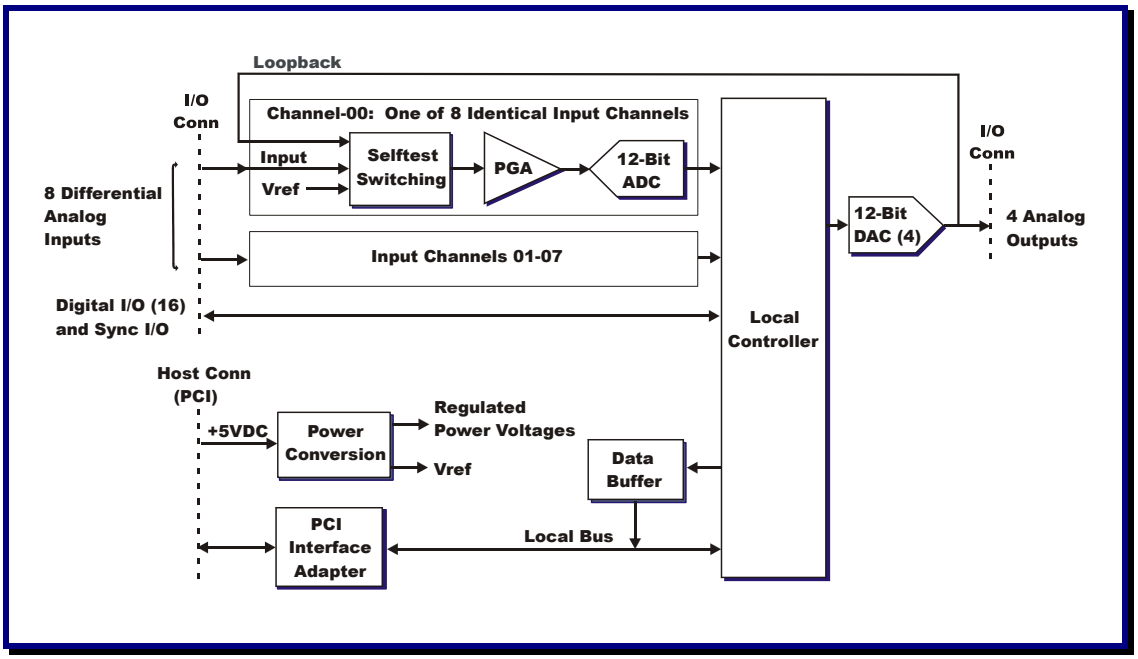

Figure 1. PMC-12AISS8AO4; Functional Organization

This product is functionally compatible with the IEEE PCI local bus specification Revision 2.3, and supports the "plug-n-play" initialization concept. System connections are made at the front panel through a high-density dual-ribbon 80-pin connector. Power requirements consist of +5 VDC in compliance with the PCI specification, and analog power voltages are generated internally. All operational parameters are software configurable. Operation over the specified temperature range is achieved with conventional convection cooling.

PERFORMANCE SPECIFICATIONS

At +25 ^{O}C, with specified operating voltages

Analog Input Characteristics:

Configuration:	Eight differential analog input channels; Dedicated 12-Bit ADC per channel. Optional 4-Channel version available.
Voltage Ranges:	Independently assignable between two groups of input channels as: ±10V, ±1V or ±100mV full scale.
Input Impedance:	20 Megohms Line-Line in parallel with 40pF, typical.
Bias Current:	50 nanoamps maximum, all ranges
Crosstalk Rejection:	70dB typical, DC-500kHz
Signal/Noise Ratio (SNR):	±10V Range: 75dB, ±1V: 70dB, ±100mV: 65dB. Inputs shorted. (10 Hz to small-signal bandwidth. Signal = Fullscale-0.3dB)
Common Mode Rejection:	±10V Range: 90dB, ±1V Range: 100dB, ±100mV Range: 105dB. Typical, DC-100Hz, CMV = ±11V, Vin = Zero.
Overvoltage Protection:	±40 Volts with power removed; ±25V with power applied.

Analog Input Transfer Characteristics:

Resolution:	12 Bits (0.0244 percent of FSR)
Maximum Sample Rate:	◆ 2.0 MSPS per channel. (Input bandwidth is reduced on the lower input ranges. See 'Small Signal Bandwidth'.)
Sampling Mode::	Simultaneous; 1 through 8 channels
DC Accuracy: (Maximum composite error after autocalibration)	Range / Midscale Accuracy * / Fullscale Accuracy * ±5-10V ± 6mV ± 12mV ±1-2.5V ± 2mV ± 3mV ±100mV ± 0.4mV ± 0.9mV * Differential input mode. Add ±1.2mV for single-ended input mode.
Small Signal Bandwidth, -3dB, Typical: *	±10V Range: 900kHz, ±1V: 80kHz, ±100mV: 10kHz
Settling Time; 0.01%, Typical: *	±10V Range: 24us, ±1V: 30us, ±100mV: 150us
Power Bandwidth, Vpp*Hz, -3dB, Typical: *	28,000 * Range, Typical. E.g.: 2.8VP-P at 100kHz,.±10V range.
Integral Nonlinearity:	±0.035 percent FSR (FSR = fullscale range; e.g.: 20Von ±10Vrange).
Differential Nonlinearity:	±0.030 percent FSR.

*** Refer to the PMC-12AISS44AO4 product specification for a fixed-range, wideband version of this product.**

Analog Input Operating Modes and Controls

Input Data Buffer:	64K-sample FIFO; Optional 16K-sample buffer available
Sample Clock Sources:	Internal rate generator; External Hardware Sync I/O, Software clock.
Sampling Modes:	Continuous sampling, and triggered burst.
Internal Rate Generator:	Programmable from 488-2,000,000 sample clocks per second. Divides 32MHz master clock to sample rate.
External Clock I/O:	TTL, bidirectional. Zero to 2,000,000 sample clocks per second.
Input Data Format:	Selectable as offset binary or as two's complement. All channels tagged.

Analog Output Characteristics:

Configuration:	Four single-ended output channels. (Ordering option)
Voltage Ranges:	±10, ±5 or ±2.5 Volts; Independent of analog input ranges.
Output Resistance:	1.0 Ohm maximum
Output protection:	Withstands sustained short-circuiting to ground
Load Current:	Zero to ±5ma per channel
Load Capacitance:	Stable with any load capacitance
Noise:	2.0mV-RMS, 10Hz-100KHz typical
Glitch Impulse:	5 LSB-nSec typical, all ranges

Analog Output Transfer Characteristics:

Resolution:	12 Bits (0.0244 percent of FSR)		
Output Clocking:	Direct register access. Outputs can update immediately upon receiving each new value from the bus, or can update synchronously from an internal or external clock. Maximum practical clocking rate is 400KSPS per channel.		
DC Accuracy:	Range	Midscale Accuracy	±Fullscale Accuracy
(Max error, no-load)	±10V	±15mV	±30mV
	±5V	±12mV	±18mV
	±2.5V	±10mV	±12mV
Settling Time:	4us to 1-LSB, typical with 50-percent fullscale step, no-load.		
Crosstalk Rejection:	65 dB minimum, DC-10 kHz		
Integral Nonlinearity:	±0.04 percent of FSR, maximum		
Differential Nonlinearity:	±0.03 percent of FSR, maximum		

Digital I/O Port:

16-Bit bidirectional I/O port. Standard TTL levels. Direct register Access. Byte or word configuration.
20 mA loading when configured as an output port. 0.1 mA source when configured as inputs.

PCI Compatibility:

Conforms to PCI Specification 2.3, D32 read/write, 33MHz, universal (5V/3.3V) signaling,
Supports "plug-n-play" initialization,
Provides one multifunction interrupt,
Supports DMA data transfers in two channels as bus master in block mode or demand mode.

Power Requirements

+5VDC ±0.25 VDC at 1.5 Amp maximum, 1.1 Amp typical.

Maximum Power Dissipation: Side-1: 6.5 Watts. Side 2: 1.0 Watt.

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PHYSICAL PARAMETERS

Mechanical Characteristics (PMC Form Factor)

Height: 13.5 mm (0.53 in)
Depth: 149.0 mm (5.87 in)
Width: 74.0 mm (2.91 in)
Shield: Side-1 is protected by an EMI shield.

* Mechanical dimensions are shown for the native PMC form factor. See Ordering Information.

Environmental Specifications

Ambient Temperature Range:	Operating 0 to +65 Degrees Celsius inlet air: Storage: -40 to +85 Degrees Celsius
Relative Humidity:	Operating: 0 to 80%, non-condensing Storage: 0 to 95%, non-condensing
Altitude:	Operation to 10,000 ft.
Cooling:	Conventional convection cooling; 150 LFPM

ORDERING INFORMATION

Specify the basic product model number followed by an option suffix "-A-B-C-D", as indicated below. For example, model number PMC-12AISS8AO4-8-64K-4 describes a PMC module with eight input channels, four output channels, and a 64 Ksample data buffer.

Basic Model Number	Form Factor
PMC-12AISS8AO4	PMC (Native)
PCI-12AISS8AO4	PCI, short length
cPCI-12AISS8AO4	cPCI, 3U
PCIe-12AISS8AO4	cPCI, 3U
PC104P-12AISS8AO4	PC104-*Plus*
PCIe104-12AISS8AO4[2]	PCIe, one-lane on PC/104 form factor

[1] Module installed and tested on an adapter, with mechanical and functional equivalency. Contact factory for availability in native form factors.

[2] PCIe104 supports only the PCIe bus.

Optional Parameter	Value	Specify Option As:
Number of Input Channels	**8 Input Channels**	**A = 8**
	4 Input Channels	**A = 4**
Buffer Size	**64 Ksamples**	**B = 64K**
	16 Ksamples	**B = 16K**
Analog Outputs	**Four Analog Outputs**	**C = 4**
	No Analog Outputs	**C = 0**
Custom Feature	---	**D ***

* Numeric code, determined by specific feature. Blank or zero (0) if no custom feature applies.

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SYSTEM INTERFACE CONNECTOR

Table 1. System I/O Connector

ROW-A		ROW-B	
PIN	SIGNAL	PIN	SIGNAL
1	OUTPUT RTN	1	DIGITAL RTN
2	ANA OUT 00	2	DIO 00
3	OUTPUT RTN	3	DIGITAL RTN
4	ANA OUT 01	4	DIO 01
5	OUTPUT RTN	5	DIGITAL RTN
6	ANA OUT 02	6	DIO 02
7	OUTPUT RTN	7	DIGITAL RTN
8	ANA OUT 03	8	DIO 03
9	INPUT RTN	9	DIGITAL RTN
10	INPUT RTN	10	DIO 04
11	INP00 LO	11	DIGITAL RTN
12	INP00 HI	12	DIO 05
13	INPUT RTN	13	DIGITAL RTN
14	INPUT RTN	14	DIO 06
15	INP01 LO	15	DIGITAL RTN
16	INP01 HI	16	DIO 07
17	INPUT RTN	17	DIGITAL RTN
18	INPUT RTN	18	DIO 08
19	INP02 LO	19	DIGITAL RTN
20	INP02 HI	20	DIO 09
21	INPUT RTN	21	DIGITAL RTN
22	INPUT RTN	22	DIO 10
23	INP03 LO	23	DIGITAL RTN
24	INP03 HI	24	DIO 11
25	INPUT RTN	25	DIGITAL RTN
26	INPUT RTN	26	DIO 12
27	INP04 LO	27	DIGITAL RTN
28	INP04 HI	28	DIO 13
29	INPUT RTN	29	DIGITAL RTN
30	INPUT RTN	30	DIO 14
31	INP05 LO	31	DIGITAL RTN
32	INP05 HI	32	DIO 15
33	INPUT RTN	33	VTEST RTN
34	INPUT RTN	34	VTEST
35	INP06 LO	35	DIGITAL RTN
36	INP06 HI	36	OUTPUT CLK I/O
37	INPUT RTN	37	DIGITAL RTN
38	INPUT RTN	38	INPUT TRIG I/O
39	INP07 LO	39	DIGITAL RTN
40	INP07 HI	40	INPUT CLK I/O

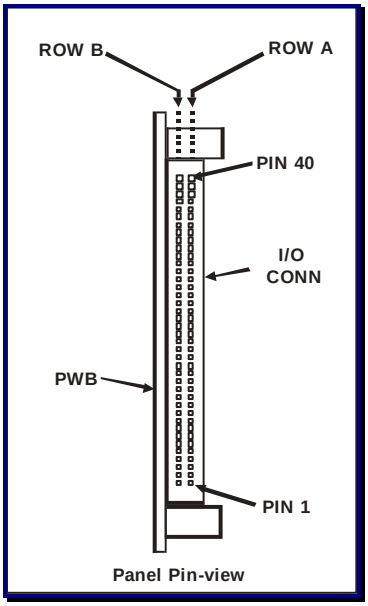

Figure 2. System Input Connector

System Mating Connector:

Standard 80-pin 0.050" dual-ribbon socket connector:

Robinson Nugent **P50E-080-S-TG,** or equivalent.