

# General Standards Corporation

High Performance Bus Interface Solutions

## 66-24DSI6C500K

### 24-Bit, 6-Channel, 500KSPS, PMC Analog Input Module

#### *With 6 Delta-Sigma Input Channels*

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

<b>PMC66-24DSI6C500K:</b>	<b>PMC</b> , Single-width
<b>PCI66-24DSI6C500K:</b>	<b>PCI</b> , short length
<b>cPCI66-24DSI6C500K:</b>	<b>cPCI</b> , 3U
<b>PC104P66-24DSI6C500K:</b>	<b>PC104 Plus</b>
<b>PCIe-24DSI6C500K:</b>	<b>PCI Express</b>
<b>PCIe104-24DSI6C500K:</b>	<b>PCIe, one-lane on PC/104 form factor</b>

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

*(The description in this document applies primarily to the PMC form-factor.)*

#### **Features Include:**

- 6 Multirange differential 24-Bit simultaneously-sampled analog input channels.
- Input sample rates from 10 to 500 Kilosamples per second per channel, software-selectable; including 327.680 KSPS.
- Fixed  $\pm 6V$  input range. Contact factory for availability of optional input ranges of  $\pm 10V$ ,  $\pm 5V$  or  $\pm 2.5V$ .
- Delta-Sigma input conversion minimizes or eliminates the need for antialias filtering.
- 256K-sample analog input FIFO buffer.
- Continuous and Burst (One-shot) sampling modes.
- Sample clock source selected as internal or external.
- Supports multiboard synchronization of analog inputs.
- On-demand internal offset and gain autocalibration of all analog inputs.
- Software-controlled Front-Panel LED indicator.
- 8-Bit bi-directional digital TTL port.
- Front-Panel system I/O connections,
- 66MHz 32-bit PCI support where applicable, with universal 5V/3.3V signaling and DMA support.

#### **Applications:**

- |                 |                       |                           |
|-----------------|-----------------------|---------------------------|
| ✓ Sonar Arrays  | ✓ Voltage Acquisition | ✓ Phase Comparison        |
| ✓ Analog Inputs | ✓ Acoustic Research   | ✓ Audio Waveform Analysis |

REV: 012120

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## Overview:

The six-channel 66-24DSI6C500K analog input module provides high-density 24-bit analog input resources on an industry-standard module. Optimized for flexibility and performance, the board is ideal for a wide variety of applications, ranging from simple precision voltage measurements, to the analysis of complex audio signals and waveforms.

## Functional Description:

Each of six analog input channels contains a lowpass analog image filter and a delta-sigma A/D converter that provides inherent antialias suppression and sharp cutoff lowpass filtering. An internal voltage reference can be applied to all channels to support self-test operations and autocalibration. Gain and offset trimming is performed by applying correction values that are determined during on-demand autocalibration. A linear-phase digital antialiasing filter rejects out-of-band signals, and a lowpass analog filter rejects those interference signals that fall within harmonic images of the digital filter.

An internal sample-rate generator is adjustable over a 2:1 frequency range, and is divided down within the local controller to provide individual channel sample rates from 10KSPS to 500KSPS. Conversion data from all active channels is transferred to the PCI bus through a 256K-sample data buffer that is supported by two DMA channels. Multiple channels can be synchronized to perform sampling in "lockstep", either by a software command or by external hardware sync and clock input signals.

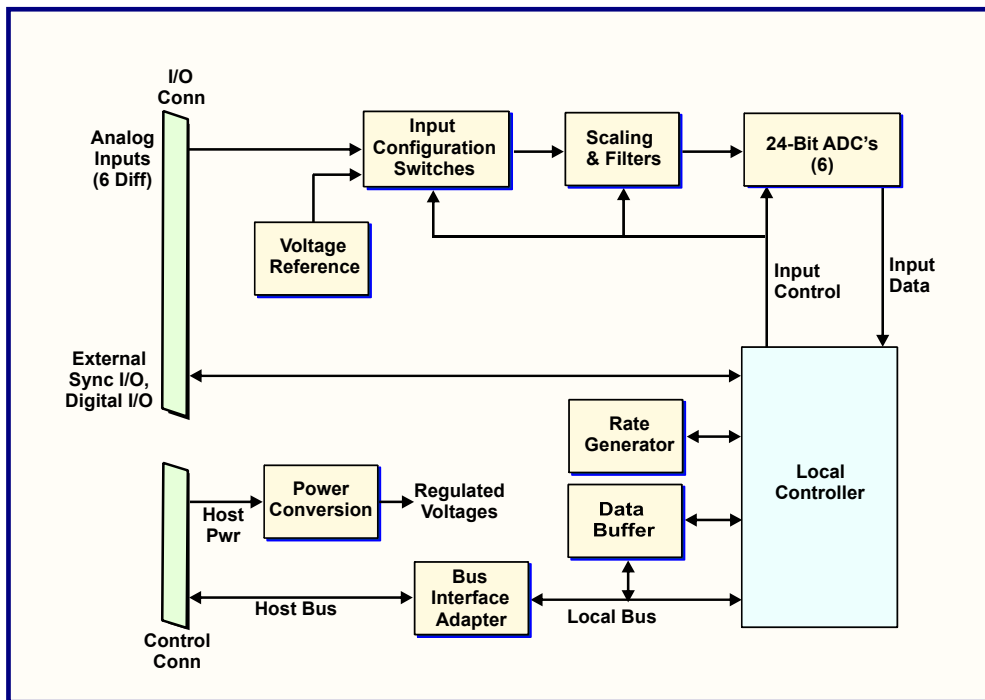


Figure 1. 66-24DSI20C500K; Functional Organization

This product is functionally compatible with the IEEE PCI local bus specification Revision 2.3 for PMC, PC104 *Plus*, or PCI products, or with the PCIe Specification revision 2.0 for PCI Express products. System input/output connections are made at the front panel through a single high-density connector. Operation over the specified temperature range is achieved with conventional convection cooling.

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## ***ELECTRICAL SPECIFICATIONS***

At +25 °C, with specified operating conditions.

### ***Input Characteristics:***

Configuration:	Six two-wire differential input channels. 4-Channel and 2-channel configurations also available.
Voltage Range:	Fixed $\pm 6V$ input range. Contact factory for availability of optional input range of $\pm 10V$ , $\pm 5V$ or $\pm 2.5V$ .
Input Impedance:	1.0 Megohm typical, in parallel with 20 pF. 2.0 Megohms line-line.
Common Mode Rejection:	62dB to 15kHz on $\pm 6V$ range; typical
Common Mode Range:	$\pm 10$ Volts with zero normal-mode input
Overvoltage Protection:	$\pm 35$ -Volt transients with power applied; $\pm 30$ Volts with power removed

### ***Transfer Characteristics:***

Conversion Architecture:	24-Bit Delta-Sigma						
Sample Rate:	10-500 kilosamples per second per channel, software-selectable, including 327.680KSPS						
Oversampling Factor:	x256 (10-78KSPS), x128 (78-156KSPS), x64 (156-312KSPS), x32 (312-500KSPS),						
DC Accuracy: (Mean composite error after autocalibration)	<table><thead><tr><th>Input Range</th><th>Midrange (Zero) Accuracy</th><th><math>\pm</math>Fullscale Accuracy</th></tr></thead><tbody><tr><td><math>\pm 6V</math></td><td><math>\pm 1.2mv</math></td><td><math>\pm 4.0mv</math></td></tr></tbody></table>	Input Range	Midrange (Zero) Accuracy	$\pm$ Fullscale Accuracy	$\pm 6V$	$\pm 1.2mv$	$\pm 4.0mv$
Input Range	Midrange (Zero) Accuracy	$\pm$ Fullscale Accuracy					
$\pm 6V$	$\pm 1.2mv$	$\pm 4.0mv$					
Passband:	DC to 40% of the sample rate at -0.1dB, or 41% at -3dB; Typical.						
Passband Ripple:	$\pm 0.05dB$ maximum						
Stopband threshold:	Typically 50 percent of the selected sample rate.						
Stopband Attenuation:	110dB Typical						
Integral Nonlinearity (INL)	0.001 percent of fullscale range; typical.						
No Missing Codes	24 Bits.						
Dynamic Range:	Typical with DC-50kHz bandwidth: 107dB with oversampling at x256; 102dB at x32. $\pm 6V$ range; typical with DC-50kHz bandwidth						
SINAD:	102dB with oversampling at x256; 99dB at x32. $\pm 6V$ range; Typical with DC-50kHz bandwidth						
Interchannel Crosstalk:	-96dB typical to 40kHz						
Phase Skew:	Typically less than 100ns (0.1-Degree for $F_{sig} = 5kHz$ ), with $F_{sig}/F_{samp} < 0.35$ ; channel-channel (board-board for multiboard configurations), excluding noise.						
Antialias Filtering:	Each ADC provides linear-phase digital lowpass filtering as indicated for "passband" and "stopband". In addition to the digital filter, a single-pole lowpass analog image filter in each channel provides a -3dB cutoff frequency of approximately 2MHz to suppress images from the digital filter. Optional alternative filter frequencies are available, and should be selected to be well above the expected passband.						
Input Data Buffer:	256 K-Sample FIFO buffer.						

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## ***Operating Modes and Controls:***

Organization:	All input channels operate at the same sample rate, controlled by division of an internal or external rate generator frequency.
Sampling Clock I/O:	The sampling clock can be derived either from an internal rate generator, or from a TTL or LVDS external hardware input. Multiple boards can be locked to a common clock by daisy-chaining the output clock from each board to the input clock of the next board in the chain. Any number of boards can be daisy-chained together, with a typical propagation delay of 10ns introduced per board. The 'star-configuration' also is supported.
Internal Rate Generator:	An internal PLL rate generator provides sample rates from 10 KSPS to 500 KSPS. The frequency of the generator is controlled by an internal reference oscillator, the ratio of two 10-Bit integers, and an integer divisor, with an accuracy of 25 PPM.
Synchronization:	Daisy-chained or 'star-configuration' hardware sync inputs and outputs can be used to synchronize sampling among multiple boards.
Burst Timing:	Triggered burst sampling can be timed either internally or externally.
Data Format:	Software-selectable as either offset binary or two's complement. Width of the data field is selectable as 16, 18, 20 or 24 bits.
Channel Tags:	A 3-bit channel tag is appended to each input data value.
Buffer Access:	The input buffer FIFO is accessed through either of two DMA channels, with both block-mode and demand-mode transfers supported.
Digital I/O	Eight TTL I/O lines in two groups of four bits, group-configurable as inputs or outputs. 0.2ma maximum input loading as current source, 8ma output loading as either source or sink. Direct register control.

## ***Host Control Interface Compatibility:***

### **PCI, PMC, cPCI and PC104 Plus:**

Conforms to PCI Specification 2.3, with D32 read/write transactions and universal 5V/3.3V signaling..

Supports block-mode DMA transfers as bus master. Provides a multifunction interrupt.

### **PCI Express:**

PCIe Specification revision 2.0; single-lane.

Supports block-mode DMA transfers as bus master.

## ***Power Requirements:***

### **PCI, PMC, cPCI and PC104 Plus form factors:**

+5.0 VDC  $\pm$ 0.25 VDC at:

6-Channel Configuration: 1.9 Amps typical, 2.0 Amps, maximum

2-Channel Configuration: 1.1 Amps typical, 1.3 Amps, maximum

### **PCI Express Form Factor**

6-Channel Configuration:

+3.3 $\pm$ 0.3VDC at 1.4 Amps typ; 1.7 Amps max. +12.0 $\pm$ 0.8VDC at 0.4 Amp typ; 0.5 Amp max.

2-Channel Configuration:

+3.3 $\pm$ 0.3VDC at 1.2 Amps typ; 1.6 Amps max. +12.0 $\pm$ 0.8VDC at 0.2 Amp typ; 0.3 Amp max.

## ***Physical Dimensions:***

### **PMC Form Factor**

Height: 13.5 mm (0.53 in),

Depth: 143.75 mm (5.66 in)

Width: 74.0 mm (2.91 in)

### **PCI Express Form Factor**

Height: 12.4 mm (0.49 in)

Depth: 167.6 mm (6.60 in)

Width: 110.1 mm (4.37 in)

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## Environmental Specifications:

Ambient Temperature Range:

Standard Temperature:	Operating: 0 to +70 Degrees Celsius *
	Storage: -40 to +85 Degrees Celsius
Extended Temperature:	Operating: -40 to +85 Degrees Celsius *
	Storage: -40 to +85 Degrees Celsius
	* Air temperature at board surface.

Relative Humidity: 0 to 95%, non-condensing

Altitude: Operation to 10,000 ft.

Cooling: Conventional air cooling; 150 LFPM

## ORDERING INFORMATION

Specify the basic product model number followed by an option suffix "-A-B-C", as indicated below. For example, model number **PCle-24DSI6C500K-6-SF-6V-0** describes a PMC module installed on a PCI Express adapter, with six input channels, standard image filter frequency, a fixed  $\pm 6V$  input range, and no custom features. For industrial (extended) temperature operation, add "-I" at the end of the model number.

**Table 1. Available Form Factors**

Basic Model Number	Form Factor
PMC66-24DSI6C500K	PMC (Native)
PCI66-24DSI6C500K <sup>1</sup>	PCI, short length
PC104P66-24DSI6C500K <sup>1</sup>	PC104-Plus
cPCI66-24DSI6C500K <sup>1</sup>	cPCI, 3U
PCle-24DSI6C500K <sup>1</sup>	PCI Express
PCle104-24DSI6C500K <sup>2</sup>	PCI Express, one-lane on PC/104 form factor

<sup>1</sup> Module installed and tested on an adapter, with mechanical and functional equivalency. Contact factory for availability in native form factors.

<sup>2</sup> PCle104 supports only the PCle bus.

**Table 2. Ordering Options**

Optional Parameter	Value	Specify Option As:
Number of Input Channels	2 Channels	A = 2
	4 Channels	A = 4
	6 Channels	A = 6
Image Filter -3dB Frequency	Standard 2MHz (-0.1dB at 300kHz)	B = SF
	Custom Frequencies:	B = CFx <sup>1</sup>
Input Range	$\pm 6V$ input range	C = 6V
	$\pm 2.5V$ input range	C = 2.5V
Custom Features <sup>2</sup>	---	D = 0

<sup>1</sup> "x" = Filter frequency.  $\pm 15\%$  frequency accuracy. Contact factory for availability of specific frequencies.

<sup>2</sup> Contact factory for availability.

Note: Using the internal rate generator, the range of sample rates is software-selectable from 10-500KSPS, including an exact value of 327.680KSPS (within the reference oscillator frequency tolerance of  $\pm 25\text{PPM}$ ).

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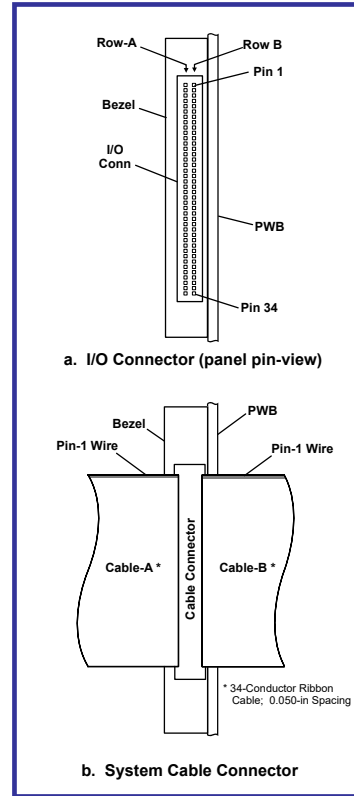
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# SYSTEM INTERFACE CONNECTORS

**Table 3. System Connector Pin Functions**

ROW-A		ROW-B	
PIN	SIGNAL	PIN	SIGNAL
1	INP RETURN	1	DIGITAL GND
2	INP RETURN	2	DIO 00
3	INP CH 00 LO	3	DIGITAL GND
4	INP CH 00 HI	4	DIO 01
5	INP RETURN	5	DIGITAL GND
6	INP RETURN	6	DIO 02
7	INP CH 01 LO	7	DIGITAL GND
8	INP CH 01 HI	8	DIO 03
9	INP RETURN	9	DIGITAL GND
10	INP RETURN	10	DIO 04
11	INP CH 02 LO	11	DIGITAL GND
12	INP CH 02 HI	12	DIO 05
13	INP RETURN	13	DIGITAL GND
14	INP RETURN	14	DIO 06
15	INP CH 03 LO	15	DIGITAL GND
16	INP CH 03 HI	16	DIO 07
17	INP RETURN	17	DIGITAL GND
18	INP RETURN	18	DIGITAL GND
19	INP CH 04 LO	19	DIGITAL GND
20	INP CH 04 HI	20	EXT SYNC INPUT HI
21	INP RETURN	21	EXT SYNC INPUT LO
22	INP RETURN	22	DIGITAL GND
23	INP CH 05 LO	23	DIGITAL GND
24	INP CH 05 HI	24	EXT CLK INPUT HI
25	INP RETURN	25	EXT CLK INPUT LO
26	INP RETURN	26	DIGITAL GND
27	(Spare) <sup>1</sup>	27	DIGITAL GND
28	(Spare) <sup>1</sup>	28	EXT SYNC OUT HI
29	(Spare) <sup>1</sup>	29	EXT SYNC OUT LO
30	(Spare) <sup>1</sup>	30	DIGITAL GND
31	(Spare) <sup>1</sup>	31	DIGITAL GND
32	(Spare) <sup>1</sup>	32	EXT CLK OUT HI
33	(Spare) <sup>1</sup>	33	EXT CLK OUT LO
34	(Spare) <sup>1</sup>	34	DIGITAL GND

<sup>1</sup> Connect to INP RETURN or leave disconnected.



**Figure 2. System I/O Connector**

**System Mating Connector:**

68-pin 0.050" Subminiature connector with metal shield:  
AMP #749621-7 or equivalent

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