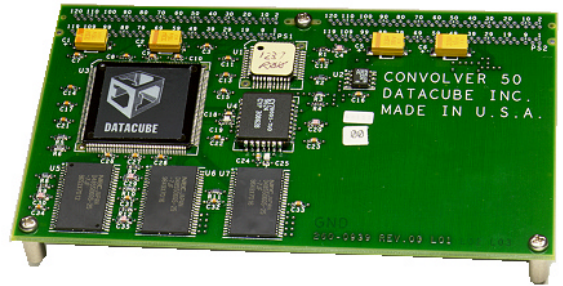
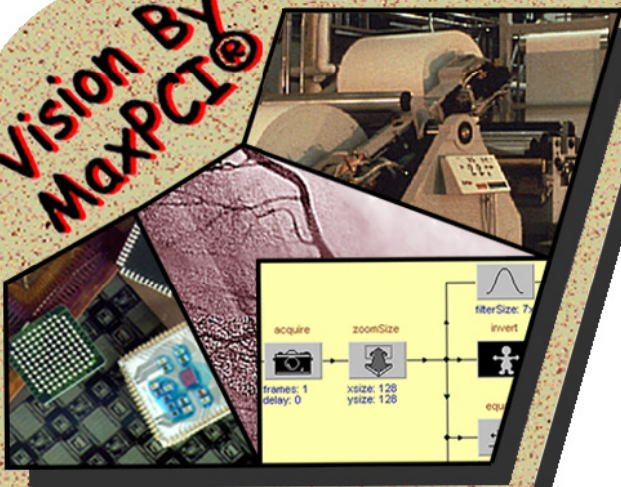




Convolver 50/100/200 Family

Vision By
MaxPCI®



Scalable Neighborhood Multiply and Accumulate Capabilities

- Cost-effective selection of models with 50, 100, or 200 NMAC elements to fit specific application needs operating at 40 MHz
- Flexible configuration allows wide variety of user-defined kernel sizes and combinations
- Cascading feature allows even greater pixel depth or larger kernel sizes

The Convolver 50/100/200 family of PSMODs (processing and storage modules) provides neighborhood multiply and accumulate (NMAC) capabilities that are fundamental to a wide variety of popular image processing and machine vision tasks. The models in the Convolver PSMOD family are designed to provide different levels of performance, and are priced to allow fine-tuning to meet price/performance needs. The numbers in each of the product names refers to the number of available NMAC elements.

The lowest-priced model in this PSMOD family, the Convolver 50, provides basic 8-bit convolution capability necessary for a wide variety of applications. The Convolver 100 and 200 provide solid mid- and high-performance convolution allowing 16-bit convolution capability. They also include banked sets of coefficients that can be loaded quickly from an ImageFlow PipeOp Altering Thread (PAT).

In addition to the Convolver PSMOD family's flexible, programmable kernel configurations, users can take advantage of the Convolvers' ability to cascade data. Image data may be passed through the same

Convolver PSMOD multiple times or through multiple Convolver PSMODs to increase its aperture and/or its bit-depth.

The Convolver PSMODs can be installed on the motherboard using any available PSMOD connector. The PSMOD connections provide power as well as four input, four output, and four bidirectional connections to the motherboard's crosspoint switch, allowing the Convolver PSMODs to be easily integrated into even the most complex image processing pipelines.

Features

- Models available in a variety of sizes to meet application needs cost-effectively
 - Convolver 50 PSMOD
 - Convolver 100 PSMOD
 - Convolver 200 PSMOD
- Extremely fast processing of 8-bit data:

Model	Operations/Second
Convolver 50	4,000 MOPS
Convolver 100	8,000 MOPS
Convolver 200	16,000 MOPS

Kernel configurations supported by each of the Convolver Family PSMODs in a single pass

Kernel Size ^a Operating at 40 MHz	Data Bits	Coefficient Bits	Convolver Models		
			50	100	200
7x7, 8x6, 10x5, 12x4, 16x3, 25x2, 50x1	8	8	x1	x2 ^b	x4 ^c
	16	8		x1	x2
	16	16			x1
7x14, 8x12, 10x10, 12x8, 14x7, 16x6, 20x5, 25x4, 32x3, 50x2, 100x1	8	8		x1	x2
	16	8			x1
7x28, 8x24, 10x20, 12x16, 14x14, 16x12, 20x10, 24x8, 28x7, 25x8, 32x6, 40x5, 50x4, 100x2, 200x1	8	8			x1

a. All kernel sizes are listed as HxV. b. "x2" indicates two simultaneous convolutions of this size can be performed on this model. c. "x4" indicates four simultaneous convolutions of this size can be performed on this model.

- Convolution and correlation of 8-bit data at 40 MHz
- In some configurations, Convolver 100 PSMOD supports up to two simultaneous kernels with independent inputs and outputs (see table above)
- In some configurations, Convolver 200 PSMOD supports up to four simultaneous kernels with independent inputs and outputs (see table above)
- All coefficients of the kernel are independently programmable
- Supports cascading for larger aperture or greater bit-depth
 - Multiple passes through a single Convolver PSMOD or through multiple Convolver PSMODs
- Squaring mode calculates the sum of the squares for all the pixels in the kernel
- 24-bit output path can be formatted to 8- or 16-bit or kept as 24-bit for cascading (partial result)
- Factory programmed EEPROM for storage of hardware configuration information (including, serial number, revision level, module ID, etc.)

Specifications

- Maximum line length: 5048 total (active + blanking)
- Signed or unsigned data and coefficients

Convolver 50 PSMOD

- 24-bit output
- 24-bit cascade input
- Formatting logic includes shifting, rounding, offset adding, and limiting

Convolver 100/200 PSMOD

- 32 coefficient banks for rapid changes controlled by PipeOp Altering Threads (PATs)
- Single convolver mode with 24-bit output
- Single convolver mode with 24-bit cascade input

Physical Specifications

Height: 0.31 inches (8 mm)

Length: 4.50 inches (114 mm)

Width: 2.69 inches (68 mm)

Weight:

Convolver 50: 1.30 ounces (36.8 g)

Convolver 100: 1.58 ounces (44.8 g)

Convolver 200: 1.91 ounces (54.1 g)

Power Requirements (all voltages $\pm 5\%$, all amperages are typical values)

Convolver:	50	100	200
+ 3.3 Volts	150 mA	250 mA	500 mA
+ 5.0 Volts	750 mA	1.25 A	1.75 A
TOTAL	4.25 W	7.08 W	10.37 W

Environmental Specifications

Operating Temp: 0° to 55° C (32° to 131° F)

Maximum Chip Case Temp: 85° C (185° F)

Storage Temp: -40° to 100° C (-40° to 212° F)

Relative Humidity: 10% to 90% (non-condensing)

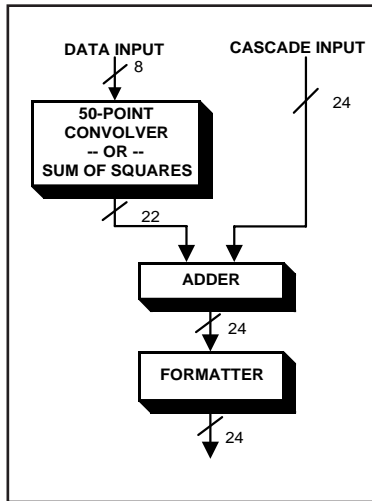
Air Flow Requirement: 50 LFPM

Additional Information

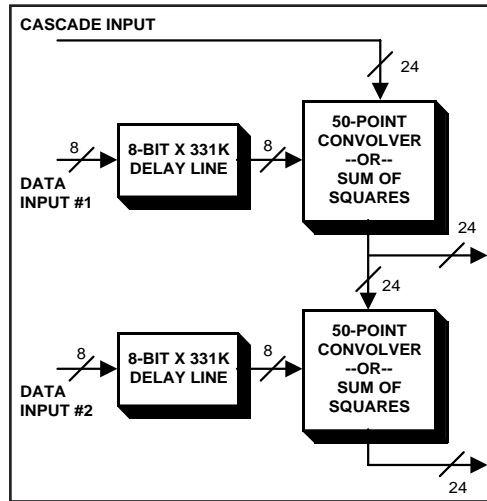
For related product information, refer to the following Datacube literature:

[MaxPCI Data Sheet](#)
[PC ImageFlow Data Sheet](#)
[DQWIT Data Sheet](#)

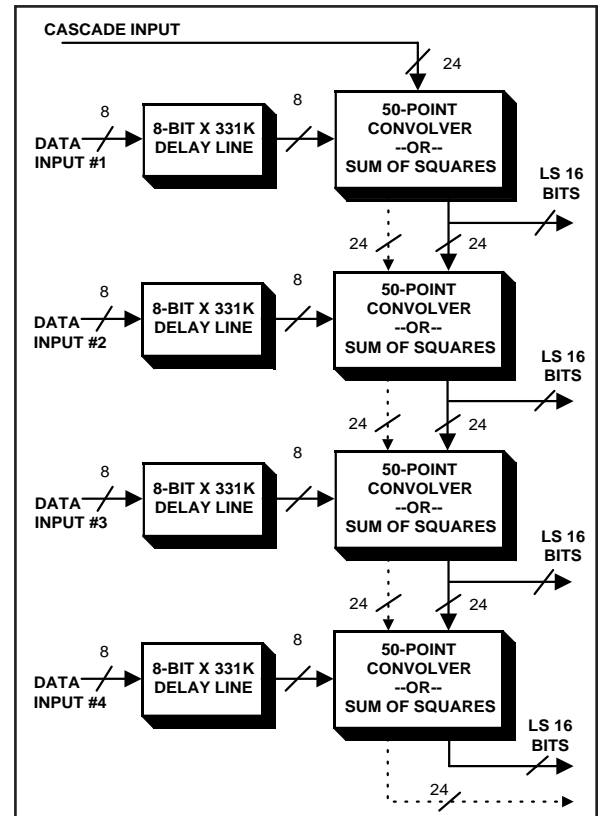
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Block Diagram for Convolver 50



Block Diagram for Convolver 100



Block Diagram for Convolver 200

(Dotted line shows cascaded datapath through a single Convolver 200)

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