

# DIAMOND-MM-16-AT

## 16-channel, 16-bit Analog I/O with Autocalibration



- 16 16-bit A/D with 100KHz sample rate, programmable input ranges and a 512 sample FIFO
- Autocalibration of A/D and D/A for high accuracy
- 4 12-bit D/A
- 8 digital inputs and 8 digital outputs
- Counter / timers for A/D control and general use

#### DESCRIPTION

The Diamond-MM-16-AT features top performance and flexibility for a mid-range price. It has 16 single-ended / 8 differential analog inputs with both unipolar and bipolar input ranges and programmable gain. It has a maximum sampling rate of 100KHz, supported by a 512-sample FIFO with a 256-sample threshold for gap-free A/D sampling. Both single-channel and multi-channel scan sampling modes are supported. The A/D can be triggered with a software command, the on-board programmable timer, or an external signal. These feature give you maximum flexibility to configure the board to your application.

#### **ANALOG INPUTS**

The 16 16-bit analog input channels on Diamond-MM-16-AT feature programmable gains of 1, 2, 4, and 8, as well as programmable unipolar/bipolar range, for a total of 7 different input ranges. Maximum sampling rate is 100KHz (total for all channels), and a new 512-sample FIFO enables the board to operate at full speed in Windows operating systems using interrupts. DMA is no longer required to attain full speed.

#### **SPECIFICATIONS**

Analog InputsNumber of Inputs16 16-bit resolutionInput ModesSingle-ended, DifferentialInput Ranges±10V, ±5V, ±2.5V, ±1.25V, ±0625V, 0-10V, 0-5V, 0-2.5V, 0-1.25VMax Sample Rate100KHzNonlinearity±3LSB with no missing codesOn-board FIFO512 samples with programmable thresholdCalibrationSoftware initiated autocalibrationAnalog Outputs4 12-bit resolutionOutput Ranges±5V, 0-5VOutput Current±5mA max per channelSettling Time6μS max to 0.01%Relative Accuracy±1 LSBDigital I/ONumber of I/O Lines8 In, 8 OutDIO Input VoltageLogic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V maxDIO Output VoltageLogic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V max		
Input ModesSingle-ended, DifferentialInput Ranges±10V, ±5V, ±2.5V, ±1.25V, ±0625V, 0-10V, 0-5V, 0-2.5V, 0-1.25VMax Sample Rate100KHzNonlinearity±3LSB with no missing codesOn-board FIFO512 samples with programmable thresholdCalibrationSoftware initiated autocalibrationAnalog Outputs4 12-bit resolutionNumber of Outputs4 12-bit resolutionOutput Ranges±5V, 0-5VOutput Current±5mA max per channelSettling Time6μS max to 0.01%Relative Accuracy±1 LSBDigital I/O8 In, 8 OutNumber of I/O Lines8 In, 8 OutDIO Input VoltageLogic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V maxDIO Output VoltageLogic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V maxGeneral	Analog Inputs	
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O-10V, 0-5V, 0-2.5V, 0-1.25V     Max Sample Rate   100KHz     Nonlinearity   ±3LSB with no missing codes     On-board FIFO   512 samples with programmable threshold     Calibration   Software initiated autocalibration     Analog Outputs   4 12-bit resolution     Output Ranges   ±5V, 0-5V     Output Current   ±5mA max per channel     Settling Time   6µS max to 0.01%     Relative Accuracy   ±1 LSB     Digital I/O     Number of I/O Lines   B In, 8 Out     DIO Input Voltage   Logic 0: 0.0V min, 0.8V max     Logic 1: 2.0V min, 5.0V max     Logic 0: 0.0V min, 0.33V max     Logic 1: 3.8V min, 5.0V max     Ceneral   Logic 1: 3.8V min, 5.0V max     Ceneral	Input Modes	Single-ended, Differential
Max Sample Rate100KHzNonlinearity±3LSB with no missing codesOn-board FIFO512 samples with programmable thresholdCalibrationSoftware initiated autocalibrationAnalog Outputs4 12-bit resolutionNumber of Outputs4 12-bit resolutionOutput Ranges±5V, 0-5VOutput Current±5mA max per channelSettling Time6μS max to 0.01%Relative Accuracy±1 LSBDigital I/O8 In, 8 OutNumber of I/O Lines8 In, 8 OutDIO Input VoltageLogic 0: 0.0V min, 0.8V maxLogic 1: 2.0V min, 5.0V maxLogic 0: 0.0V min, 0.33V maxLogic 1: 3.8V min, 5.0V max	Input Ranges	±10V, ±5V, ±2.5V, ±1.25V, ±0625V,
Nonlinearity±3LSB with no missing codesOn-board FIFO512 samples with programmable thresholdCalibrationSoftware initiated autocalibrationAnalog Outputs4 12-bit resolutionNumber of Outputs4 12-bit resolutionOutput Ranges±5V, 0-5VOutput Current±5mA max per channelSettling Time6μS max to 0.01%Relative Accuracy±1 LSBDigital I/O8 In, 8 OutNumber of I/O Lines8 In, 8 OutDIO Input VoltageLogic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V maxDIO Output VoltageLogic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V max		0-10V, 0-5V, 0-2.5V, 0-1.25V
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threshold  Calibration  Analog Outputs  Number of Outputs  Output Ranges  Output Current  Settling Time  Relative Accuracy  Digital I/O  Number of I/O Lines  DIO Input Voltage  DIO Output Voltage  Logic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V max Logic 1: 3.8V min, 5.0V max  Ceneral	Nonlinearity	±3LSB with no missing codes
Analog OutputsNumber of Outputs4 12-bit resolutionOutput Ranges±5V, 0-5VOutput Current±5mA max per channelSettling Time6μS max to 0.01%Relative Accuracy±1 LSBDigital I/O8 In, 8 OutNumber of I/O Lines8 In, 8 OutDIO Input VoltageLogic 0: 0.0V min, 0.8V maxLogic 1: 2.0V min, 5.0V maxLogic 0: 0.0V min, 0.33V maxLogic 1: 3.8V min, 5.0V max	On-board FIFO	1 1 3
Number of Outputs4 12-bit resolutionOutput Ranges±5V, 0-5VOutput Current±5mA max per channelSettling Time6μS max to 0.01%Relative Accuracy±1 LSBDigital I/O8 In, 8 OutNumber of I/O LinesLogic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V maxDIO Output VoltageLogic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V maxGeneral	Calibration	Software initiated autocalibration
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Output Current±5mA max per channelSettling Time6μS max to 0.01%Relative Accuracy±1 LSBDigital I/O8 In, 8 OutNumber of I/O Lines8 In, 8 OutDIO Input VoltageLogic 0: 0.0V min, 0.8V maxDIO Output VoltageLogic 1: 2.0V min, 5.0V maxLogic 0: 0.0V min, 0.33V maxLogic 1: 3.8V min, 5.0V max	Number of Outputs	4 12-bit resolution
Settling Time6μS max to 0.01%Relative Accuracy±1 LSBDigital I/O8 In, 8 OutNumber of I/O LinesLogic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V maxDIO Output VoltageLogic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V maxGeneralGeneral	Output Ranges	±5V, 0-5V
Relative Accuracy Digital I/O Number of I/O Lines DIO Input Voltage Logic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V max Logic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V max General	Output Current	±5mA max per channel
Digital I/O Number of I/O Lines DIO Input Voltage  DIO Output Voltage Logic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V max Logic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V max	Settling Time	6μS max to 0.01%
Number of I/O Lines DIO Input Voltage Logic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V max Logic 0: 0.0V min, 0.33V max Logic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V max	Relative Accuracy	±1 LSB
DIO Input Voltage Logic 0: 0.0V min, 0.8V max Logic 1: 2.0V min, 5.0V max  DIO Output Voltage Logic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V max  General	Digital I/O	
Logic 1: 2.0V min, 5.0V max  Logic 0: 0.0V min, 0.33V max  Logic 1: 3.8V min, 5.0V max  General	Number of I/O Lines	8 In, 8 Out
DIO Output Voltage Logic 0: 0.0V min, 0.33V max Logic 1: 3.8V min, 5.0V max General	DIO Input Voltage	Logic 0: 0.0V min, 0.8V max
Logic 1: 3.8V min, 5.0V max  General		Logic 1: 2.0V min, 5.0V max
General	DIO Output Voltage	,
		Logic 1: 3.8V min, 5.0V max
Country / Timers 1 22 bit 0 1 16 bit		
Counter / Timers 1 - 32-DIL & 1 - 10-DIL	Counter / Timers	1 - 32-bit & 1 - 16-bit
Clock Source 10MHz clock or external signal	Clock Source	3
Power Supply +5VDC±10% at 350mA		+5VDC±10% at 350mA
Operating Temp -40°C to +85°C		-40°C to +85°C
<b>Weight</b> 3.3oz / 93g	Weight	3.3oz / 93g



#### **ANALOG OUTPUTS**

The board also has 4 12-bit D/A channels with multiple unipolar and bipolar output ranges. The DACs feature simultaneous update capability. A new programmable output range feature lets you set the output range via software anywhere between 0V and 10V with 1mV precision in both unipolar and bipolar modes.

### **COUNTERS AND DIGITAL I/O**

Diamond-MM-16-AT has an on-board counter/timer to control A/D sampling or rate generator functions, 8 digital inputs, and 8 digital outputs. New features enable you to generate hardware interrupts from the counter/timer as well as an external digital signal. And in keeping with our real-world-friendly design, Diamond-MM-16-AT requires only +5V power supply and operates over the full industrial temperature range of -40°C to +85°C.

#### ORDERING INFORMATION

Part No. DMM-16-AT	Description Diamond-MM Autocalibrating 16-ch 16-bit A/D + 4-ch 12-bit D/A Extended
	Temperature
DMM-16-NA-AT	Diamond-MM Autocalibrating 16-ch 16-bit A/D only Extended Temperature

#### FOR MORE INFORMATION

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