ADVANTECH

PCIE-1813 – 38.4 kS/s, 26-Bit, 4-Ch, Simultaneous Sampling, Universal Bridge Input, Multifunction PCI Express Card
Startup Manual

Packing List

Before card installation, please ensure that the following items are included in your shipment:

1. 1 x PCIE-1813 card
2. 1 x Startup manual

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

User Manual

For more detailed information about this product, refer to the PCIE-1813 user manual provided on the DVD ROM (PDF format). DVD:\Documents\Hardware Manuals\PCIE

Declaration of Conformity

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference. In such cases, users are required to correct interference at their own expense.

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend using shielded cables. Such cables are available from Advantech. Please contact your local supplier for ordering information.

For more information about this or other Advantech products, please visit our website at

http://www.advantech.com

For technical support services, please visit our support website at

http://support.advantech.com

This manual is for PCIE-1813.

Part No. 2001181301

Edition 2
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Specifications

Analog Input

Channels		4 x differentials, can be enabled/disabled for each channel					
Resolution		26 bit					
Built-In Memory		1K samples					
Sampling Rate		38.4 KS/s per channel					
Voltage Input							
Input Range		Bipolar	±10	±5	±2.5	±1.25	±0.625	±0.3125
Absolute Accuracy	Offset Error	±0.1 mV					
	Gain Error	±0.01% of full-scale range					
Temperature Drift	Offset	25 ppm/°C					
	Gain	15 ppm/°C					
Input Impedance		1GΩ/350 pF					
Bridge Input							
Input Range (V)		±1 V/V	±500 mV/V	±250 mV/V	±125 mV/V	±62.5 mV/V	±31.25 mV/V
Bridge Completion		Full, half, quarter					
Half-Bridge	Tolerance	±500 μV/V max.					
	Stability	2.5 μV/V per °C max.					
Quarter-Bridge Completion	Values	120Ω, 350Ω, 1 kΩ					
	Tolerance	±0.1% max.					
	Stability	10 ppm/°C max.					
Shunt Calibration	Values	33.333 kΩ, 50 kΩ, 100 kΩ					
	Tolerance	±0.1% max.					
	Stability	10 ppm/°C max.					
Excitation Characteristics	Values	120 Ω bridge: 0 ~ +3 V					
		350 Ω bridge: 0 ~ +10 V					
		1 kΩ bridge: 0 ~ +10 V					
	Tolerance	±2% max.					
Accuracy	Offset Error	±0.1 mV					
	Gain Error	±0.15% of full-scale range					
Drift	Offset Drift	25 ppm/°C					
	Gain Drift	15 ppm/°C					

Specifications (Cont.)

Analog Output

Channels	2		
Resolution	16 bit		
Memory Size	8K samples		
Update Rate	3 MS/s		
Output Range	Internal Reference	0 ~ 5 V, 0 ~ 10 V, ±5 V, ±10 V	
	External Reference	Reference Input	Maximum Range
	Unipolar Bipolar	-10 V ≤ x ≤ 10 V	0 ~ x V -x ~ x V
Accuracy	Relative	±1 LSB	
	Differential Non-Linearity	±1 LSB (monotonic)	
Slew Rate	20 V/us		
Gain Error	Adjustable to zero		
Drift	30 ppm/°C		
Driving Capability	5 mA		
Update Mode	Static update, waveform		
Output Impedance	max. 0.1 Ω		

Non-Isolated Digital Input/Output

Channels	32 (shared)	
Input Voltage	Low	1.5 V max.
	High	3.5 V min.
Output Voltage	Low	0.5 V max.@ +20mA (sink)
	High	4.5 V min.@ -20mA (source)
Input Load	50 KΩ pull-up resistor connected to 5 V	

Specifications (Cont.)

Counter

Channels	4 channels (independent)	
Resolution	32 bit	
Base Clock	Internal 20 MHz or external clock (10 MHz max.). Configurable via software	
Input Frequency	10 MHz max.	
Clock Input	Low	1.5 V max.
	High	3.5 V min.
Gate Input	Low	1.5 V max.
	High	3.5 V min.
Counter Output	Low	0.5 V max. @+20 mA
	High	4.5 V min. @-20 mA
Error in Advanced Functions	Frequency Measurement	0.1% when input signal frequency ≤ 20 KHz
	Pulse Width Measurement	0.1% when input signal frequency ≤ 20 KHz
	Pulse Output	0.1% when output signal frequency ≤ 20 KHz
	PWM Output	0.1% when output signal frequency ≤ 20 KHz

General

I/O Connector Type	100-pin SCSI female	
Dimensions	167.7 x 100 mm (6.6 x 3.9 in)	
Power Consumption	Typical	+3.3 V @ 200 mA +12 V @ 300 mA
	Max	+3.3V @ 400mA +12V @ 500mA
Temperature	Operating	0 ~ 60 °C (32 ~ 158 °F)
	Storage	-20 ~ 70 °C (-4 ~ 185 °F)
Relative Humidity	Operating	5 ~ 85% RH non-condensing
	Storage	5 ~ 95% RH non-condensing
Certifications	CE	

Board ID Switch

PCIE-1813 is equipped with a built-in DIP switch (SW1) for defining the board ID of each module. When multiple cards are located on the same chassis, the board ID switch can be used to identify the device number of each card.

SW1	Position 1	Position 2	Position 3	Position 4
Board ID	ID3	ID2	ID1	ID0
15	OFF	OFF	OFF	OFF
14	OFF	OFF	OFF	ON
13	OFF	OFF	ON	OFF
:	:	:	:	:
1	ON	ON	ON	OFF
0*	ON	ON	ON	ON

* The default setting is 0.

Installation

Software Installation

PCIE-1813 is a bridge input multifunction card. The product's user manual, drivers, and programming SDK are available on the Advantech website, and can be accessed using the link below. Simply search the product name "PCIE-1813".

http://support.advantech.com.tw

Hardware Installation

After the device driver is installed, you can now install the PCIE-1813 card in your computer.

Please follow the steps below to install the PCIE-1813 card:

1. Touch any metal part of your computer to neutralize the static electricity that may be in your body.
2. Plug the card into a PCI Express slot. Do not use excessive force to avoid damaging the card.

Pin Assignments

AI 0 +	100	50	AI 0 -
RS 0 +	99	49	RS 0 -
EX 0 +	98	48	EX 0 -
QTR/SC 0	97	47	QTR/SC 1
AI 1 +	96	46	AI 1 -
RS 1 +	95	45	RS 1 -
EX 1 +	94	44	EX 1 -
AI 2 +	93	43	AI 2 -
RS 2 +	92	42	RS 2 -
EX 2 +	91	41	EX 2 -
QTR/SC 2	90	40	QTR/SC 3
AI 3 +	89	39	AI 3 -
RS 3 +	88	38	RS 3 -
EX 3 +	87	37	EX 3 -
AO 0 REF	86	36	AO 1 REF
AO 0 OUT	85	35	AO 1 OUT
AGND	84	34	AGND
ATRG 0	83	33	ATRG 1
DTRG0	82	32	DTRG1
RSV	81	31	AI_CONV
RSV	80	30	AO_CONV
DGND	79	29	DGND
DI/O 0	78	28	DI/O 1
DI/O 2	77	27	DI/O 3
DI/O 4	76	26	DI/O 5
DI/O 6	75	25	DI/O 7
DI/O 8	74	24	DI/O 9
DI/O 10	73	23	DI/O 11
DI/O 12	72	22	DI/O 13
DI/O 14	71	21	DI/O 15
DI/O 16	70	20	DI/O 17
DI/O 18	69	19	DI/O 19
DI/O 20	68	18	DI/O 21
DI/O 22	67	17	DI/O 23
DI/O 24	66	16	DI/O 25
DI/O 26	65	15	DI/O 27
DI/O 28	64	14	DI/O 29
DI/O 30	63	13	DI/O 31
DGND	62	12	DGND
CNT0_CLK/A	61	11	CNT1_CLK/A
CNT0_B	60	10	CNT1_B
CNT0_GATE/Z	59	9	CNT1_GATE/Z
CNT0_SCLK/L	58	8	CNT1_SCLK/L
CNT0_OUT	57	7	CNT1_OUT
CNT2_CLK/A	56	6	CNT3_CLK/A
CNT2_B	55	5	CNT3_B
CNT2_GATE/Z	54	4	CNT3_GATE/Z
CNT2_SCLK/L	53	3	CNT3_SCLK/L
CNT2_OUT	52	2	CNT3_OUT
+12V	51	1	+5V

Pin Assignments (Cont.)

Pin Name	Type	Pin#	Description
Table: I/O Connector Signal Descriptions			
Analog Input			
AI0+	I	100	Positive terminal of analog input channel 0
AI0-	I	50	Negative terminal of analog input channel 0
RS0+	I	99	Positive remote sensing terminal of AI 0
RS0-	I	49	Negative remote sensing terminal of AI 0
EX0+	O	98	Positive excitation voltage terminal of AI 0
EX0-	O	48	Negative excitation voltage terminal of AI 0
QTR/SC0	-	97	Quarter bridge completion/shunt calibration terminal of AI 0
QTR/SC1	-	47	Quarter bridge completion/shunt calibration terminal of AI 1
AI1+	I	96	Positive terminal of analog input channel 1
AI1-	I	46	Negative terminal of analog input channel 1
RS1+	I	95	Positive remote sensing terminal of AI 1
RS1-	I	45	Negative remote sensing terminal of AI 1
EX1+	O	94	Positive excitation voltage terminal of AI 1
EX1-	O	44	Negative excitation voltage terminal of AI 1
AI2+	I	93	Positive terminal of analog input channel 2
AI2-	I	43	Negative terminal of analog input channel 2
RS2+	I	92	Positive remote sensing terminal of AI 2
RS2-	I	42	Negative remote sensing terminal of AI 2
EX2+	O	91	Positive excitation voltage terminal of AI 2
EX2-	O	41	Negative excitation voltage terminal of AI 2
QTR/SC2	-	90	Quarter bridge completion/shunt calibration terminal of AI 2
QTR/SC3	-	40	Quarter bridge completion/shunt calibration terminal of AI 3
AI3+	I	89	Positive terminal of analog input channel 3
AI3-	I	39	Negative terminal of analog input channel 3
RS3+	I	88	Positive remote sensing terminal of AI 3
RS3-	I	38	Negative remote sensing terminal of AI 3
EX3+	O	87	Positive excitation voltage terminal of AI 3
EX3-	O	37	Negative excitation voltage terminal of AI 3
Analog Output			
AO0_REF	I	86	External reference voltage input for analog output channel 0
AO0_OUT	O	85	Voltage output of analog output channel 0
AO1_REF	I	36	External reference voltage input for analog output channel 1
AO1_OUT	O	35	Voltage output of analog output channel 1
Timing Signals			
ATRG0	I	83	Analog threshold trigger input channel 0
ATRG1	I	33	Analog threshold trigger input channel 1
DTRG0	I	82	Digital trigger input channel 0
DTRG1	I	32	Digital trigger input channel 1
AI_CONV	I	31	External analog input conversion clock
AO_CONV	I	30	External analog output conversion clock
Digital Input/Output			
DIO0	I/O	78	Digital input/output channel 0
DIO1	I/O	28	Digital input/output channel 1
DIO2	I/O	77	Digital input/output channel 2
DIO3	I/O	27	Digital input/output channel 3
DIO4	I/O	76	Digital input/output channel 4
DIO5	I/O	26	Digital input/output channel 5
DIO6	I/O	75	Digital input/output channel 6
DIO7	I/O	25	Digital input/output channel 7
DIO8	I/O	74	Digital input/output channel 8
DIO9	I/O	24	Digital input/output channel 9
DIO10	I/O	73	Digital input/output channel 10
DIO11	I/O	23	Digital input/output channel 11
DIO12	I/O	72	Digital input/output channel 12
DIO13	I/O	22	Digital input/output channel 13
DIO14	I/O	71	Digital input/output channel 14

Pin Assignments (Cont.)

DIO15	I/O	21	Digital input/output channel 15
DIO16	I/O	70	Digital input/output channel 16
DIO17	I/O	20	Digital input/output channel 17
DIO18	I/O	69	Digital input/output channel 18
DIO19	I/O	19	Digital input/output channel 19
DIO20	I/O	68	Digital input/output channel 20
DIO21	I/O	18	Digital input/output channel 21
DIO22	I/O	67	Digital input/output channel 22
DIO23	I/O	17	Digital input/output channel 23
DIO24	I/O	66	Digital input/output channel 24
DIO25	I/O	16	Digital input/output channel 25
DIO26	I/O	65	Digital input/output channel 26
DIO27	I/O	15	Digital input/output channel 27
DIO28	I/O	64	Digital input/output channel 28
DIO29	I/O	14	Digital input/output channel 29
DIO30	I/O	63	Digital input/output channel 30
DIO31	I/O	13	Digital input/output channel 31
Counter			
CNT0_CLK/A	I	61	Clock input (general purpose counter) or signal A input (encoder counter) of counter channel 0
CNT0_ B	I	60	Signal B input (encoder counter) of counter channel 0
CNT0_GATE/Z	I	59	Gate input (general purpose counter) or signal Z input (encoder counter) of counter channel 0
CNT0_SCLK/L	I	58	Sample clock input (general purpose counter) or latch input (encoder counter) of counter channel 0
CNT0_OUT	O	57	Output of counter channel 0
CNT1_CLK/A	I	11	Clock input (general purpose counter) or signal A input (encoder counter) of counter channel 1
CNT1_B	I	10	Signal B input (encoder counter) of counter channel 1
CNT1_GATE/Z	I	9	Gate input (general purpose counter) or signal Z input (encoder counter) of counter channel 1
CNT1_SCLK/L	I	8	Sample clock input (general purpose counter) or latch input (encoder counter) of counter channel 1
CNT1_OUT	O	7	Output of counter channel 1
CNT2_CLK/A	I	56	Clock input (general purpose counter) or signal A input (encoder counter) of counter channel 2
CNT2_ B	I	55	Signal B input (encoder counter) of counter channel 2
CNT2_GATE/Z	I	54	Gate input (general purpose counter) or signal Z input (encoder counter) of counter channel 2
CNT2_SCLK/L	I	53	Sample clock input (general purpose counter) or latch input (encoder counter) of counter channel 2
CNT2_OUT	O	52	Output of counter channel 2
CNT3_CLK/A	I	6	Clock input (general purpose counter) or signal A input (encoder counter) of counter channel 3
CNT3_B	I	5	Signal B input (encoder counter) of counter channel 3
CNT3_GATE/Z	I	4	Gate input (general purpose counter) or signal Z input (encoder counter) of counter channel 3
CNT3_SCLK/L	I	3	Sample clock input (general purpose counter) or latch input (encoder counter) of counter channel 3
CNT3_OUT	O	2	Output of counter channel 3
Power and Ground			
AGND	-	34, 38, 40, 42, 45, 47, 49, 84	Analog ground. Reference for all analog signals.
DGND	-	12, 29, 62, 79	Digital ground. Reference for all digital signals.
+12V	-	51	+12 V power supply for external use
+5V	-	1	+5 V power supply for external use
Others			
RSV	-	80, 81	Reserved. Do not connect.

Signal Connections

Analog Input
Differential Channel Connections

The differential input channels operate with two signal wires for each channel, and the voltage difference between both signal wires is measured. When all PCIE-1813 channels are configured to differential input, up to 4 analog channels are available.
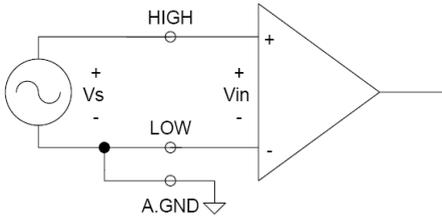
Bridge Input Connections

Each of the four PCIE-1813 AI channels support full-, half-, and quarter-bridge input. Signal connections are as shown below.
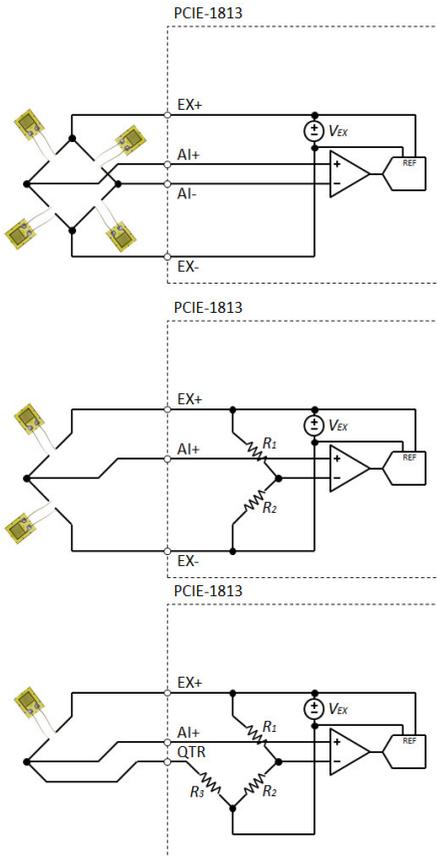
Signal Connections (Cont.)

Analog Output Connections

PCIE-1813 provides two analog output channels, AO0 and AO1. The image below shows how to make analog output connections on PCIE-1813.
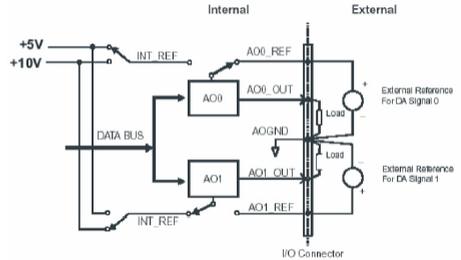
External Conversion Source Connection

PCIE-1813 not only supports external triggering, but also allows external triggering for AO and AI conversions. A low-to-high edge coming from CONV will trigger an AO and AI conversion on the PCIE-1813 card.
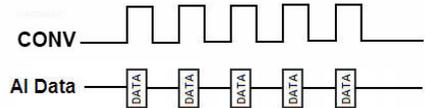
Note!   Do not connect signals to the CONV pin when the external trigger function is not in use.

Note!   When using external triggering for AO and AI conversions, we recommend choosing differential mode for all analog input signals to reduce the cross-talk noise caused by the external trigger source.