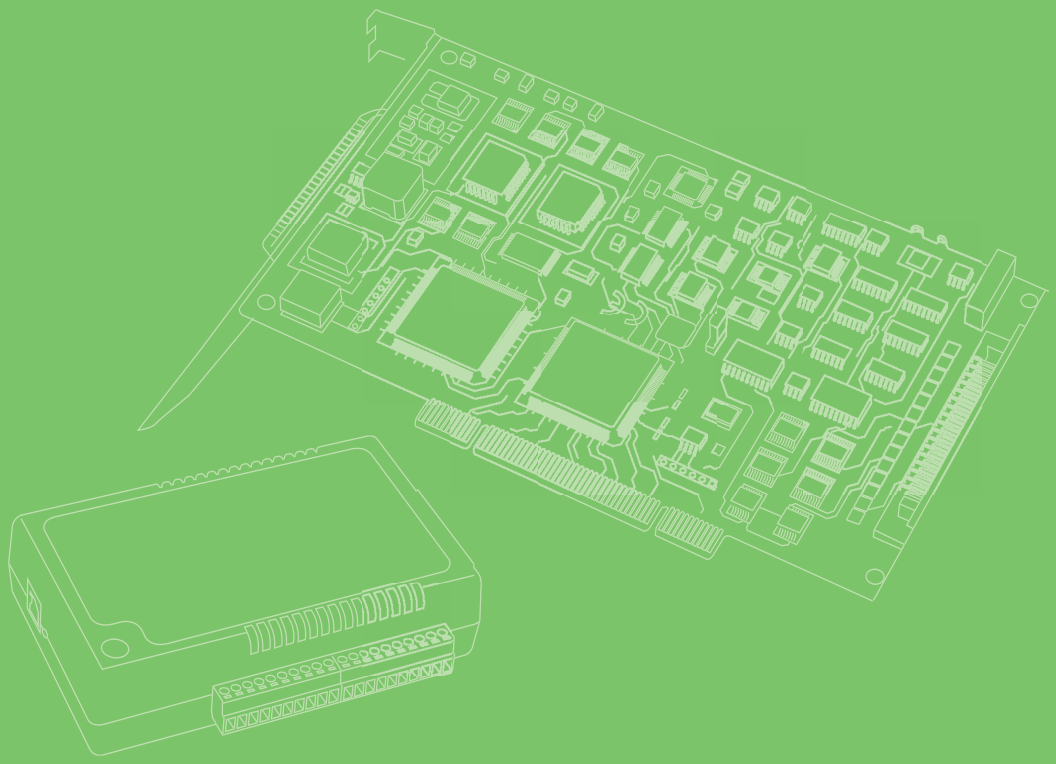

User Manual

PCIE-1751

48-Ch Digital I/O and 3-Ch Counter PCI Express Card

ADVANTECH

Enabling an Intelligent Planet

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Acknowledgments

Product Warranty (2 years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product to be defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Part No. 2003E75111 Edition 2

Printed in Taiwan April 2023

Declaration of Conformity

CE

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

Test conditions for passing also include the equipment being operated within an industrial enclosure. In order to protect the product from damage caused by electrostatic discharge (ESD) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

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 user manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In this event, users are required to correct the interference at their own expense.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Have the following information ready before you call:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Warnings, Cautions, and Notes

Warning! *Warnings indicate conditions that if not observed can cause personal injury!*

Caution! *Cautions are included to help prevent hardware damage and data losses. For example,*

"Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions."

Document Feedback

To assist us with improving this manual, we welcome all comments and constructive criticism. Please send all feedback in writing to support@advantech.com.

Safety Precautions - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

1. To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
2. Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following occurs, have the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture.
    - The equipment is malfunctioning, or does not operate according to the user manual.
    - The equipment has been dropped and damaged.
    - The equipment shows obvious signs of breakage.
15. Do not leave the equipment in an environment with a storage temperature of below -20 °C (-4 °F) or above 60 °C (140 °F) as this may damage the components. The equipment should be kept in a controlled environment.
16. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
17. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position should not exceed 70 dB (A).

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Contents

Chapter 1

Overview

1.1 Introduction

The PCIE-1751 is a 48-ch DI/O and 3-ch counter card with a Universal PCI Express bus. It provides 48 channels of parallel digital input/output compatible with 5V/TTL as well as 3 counters. It emulates mode 0 of the 8255 PPI chip, but the buffered circuits offer a higher driving capability than the 8255.

The card emulates two 8255 PPI chips to provide 48 DI/O channels. The I/O channels are divided into six 8-bit ports. Each port can be divided into two nibbles (bits 0 ~ 3 belong to the low nibble, while bits 4 ~ 7 belong to the high nibble). You can configure each nibble as either input or output via software. The dual interrupt handling capability provides users the flexibility to generate interrupts to a PC. A pin on the connector can output a digital signal simultaneously as the card generates an interrupt. This card uses a high-density SCSI 68-pin connector for easy and reliable connection to field devices.

Two other features give the PCIE-1751 practical advantages in an industrial setting. When the system is hot reset (the power is not turned off) PCIE-1751 retains the last I/O port settings and output values if the user has set the JP1 jumper to enable this feature. Otherwise, port settings and output values reset to their safe default state, or to the state determined by other jumper settings. The PCIE-1751's other useful feature is it supports both wet and dry contacts, allowing it to interface with other devices more easily.

The following sections of this chapter will provide further information about features and the installation guide, together with some brief information on software and accessories for the PCIE-1751 card.

1.2 Features

- 48 TTL digital I/O lines
- Emulates mode 0 of 8255 PPI (every port with a nibble)
- Buffered circuits for higher driving capacity than the 8255
- Interrupt handling capability
- Timer/Counter interrupt capability
- Supports both dry and wet contacts
- Keeps the I/O port setting and DO state after system reset
- Board ID switch
- Pattern match interrupt function for DI
- "Change of state" interrupt function for DI
- Programmable digital filter function for DI (available for bit 0 of every port)

The Advantech PCIE-1751 offers the following main features:

Plug-and-Play Function

The PCIE-1751 is a Plug-and-Play device, which fully complies with PCI Express specifications. During card installation, there is no need to set jumpers or DIP switches. Instead, all bus-related configurations such as base I/O address and interrupt are automatically done by the Plug-and-Play function.

Board ID

The PCIE-1751 has a built-in DIP switch that helps define each card's ID when multiple PCIE-1751 cards have been installed on the same PC chassis. The Board ID setting function is very useful when users build their systems with multiple PCIE-1751 cards. With correct Board ID settings, you can easily identify and access each card during hardware configuration and software programming.

Counter function:

1. Event Counting:
   In event counting mode, the counter counts the number of edges the counter clock signal generates. It can be configured as rising edge active or falling edge active, as shown in Figure 1.1 and Figure 1.2, respectively.

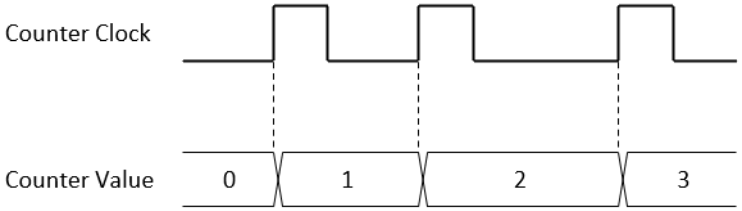


Figure 1.1 Rising edge event counting

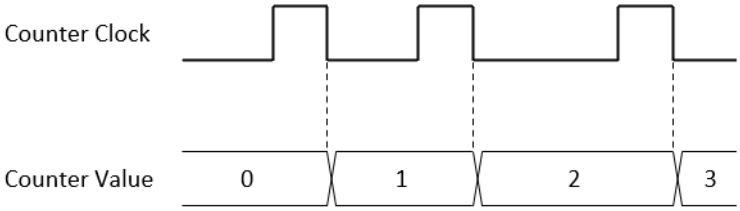


Figure 1.2 Falling edge event counting

Counting may be temporarily paused by the counter gate signal as shown in Figure 1.3.

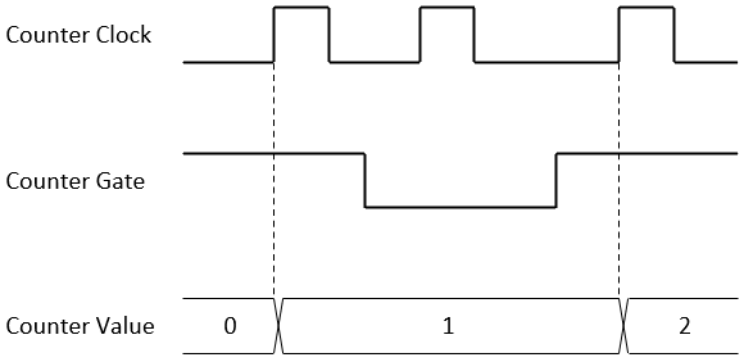


Figure 1.3 Event counting with pause gate

2. Two ways of frequency measurement:
   – Period Inversion:
     In this method, the period of the counter clock signal is first measured by an internal high frequency clock. The frequency of the signal is then calculated by inverting the period value. This is shown in Figure 1.4 and by the following equation.

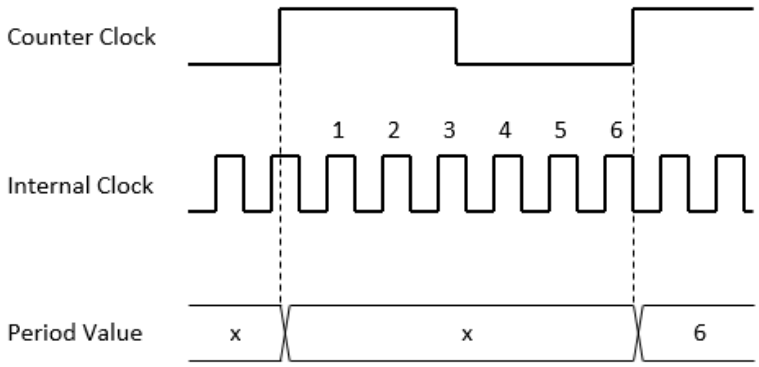


Figure 1.4 Frequency measurement by period inversion

$$Frequency = \frac{1}{Period} = \frac{1}{InternalClockCount \quad InternalClockPeriod}$$

This method is suitable if the counter clock signal frequency is much smaller (< 0.1%) than the internal clock frequency. Measuring accuracy degrades as the counter clock signal frequency increases.

   – Counting Number of Pulses in a Fixed Duration:
     The pulse number of the counter clock signal is measured in a fixed time duration. The frequency of the signal is then calculated by dividing this number by the time duration. This is shown in Figure 1.5 and by the following equation.

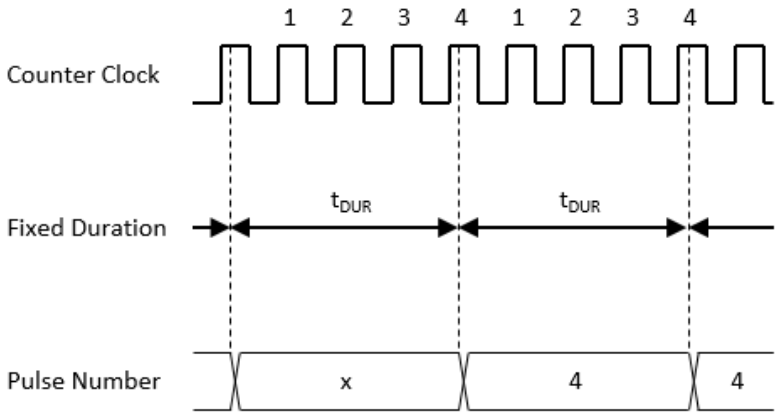


Figure 1.5 Frequency measurement by counting number of pulses in a fixed duration

$$Frequency = \frac{PulseNumber}{t_{DUR}}$$

For counter clock signal frequency higher than that specified in the previous section, this method gives a more accurate result.

3. Pulse Width Measurement:
In pulse width measurement mode, both the high period and the low period of the counter clock signal are measured. The measured values are updated when a pulse is completed. This is shown in Figure 1.6.

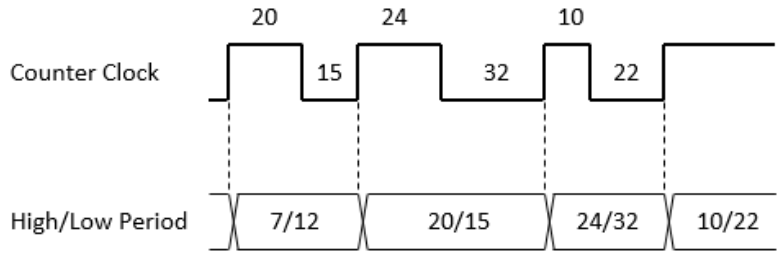


Figure 1.6 Pulse width measurement

4. Timer/Pulse with Interrupt:
In timer/pulse mode, continuous pulses with specified frequency are generated at the counter output terminal, and an interrupt is also generated with each pulse as shown in Figure 1.7.

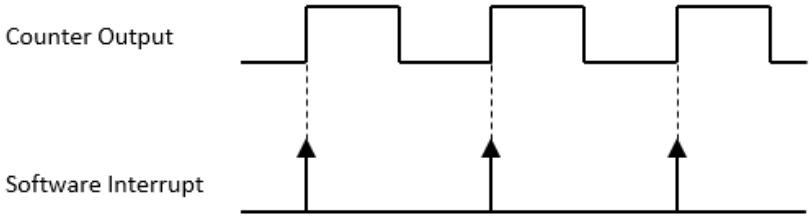


Figure 1.7 Pulse output and timer interrupt

The output can be gated. If the counter gate is at an active level, pulses are output normally. On the other hand, if the counter gate is at an inactive level, output is disabled. Figure 1.8 shows an example of an active high gate.

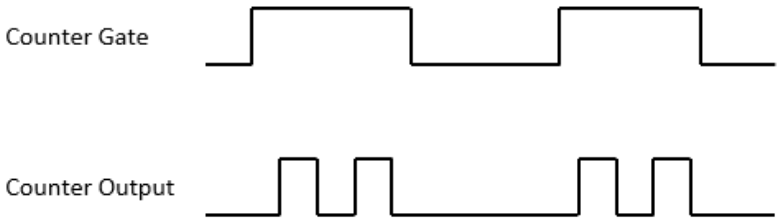


Figure 1.8 Gated timer/pulse output

5. One-Shot (Delayed Pulse Generation):
In one-shot mode, when an active edge of gate signal is detected, a pulse will be generated after the specified number of source clock counts. The pulse width is one period of the source clock. Figure 1.9 shows an example of high-pulse, 5-clock delay one-shot output.

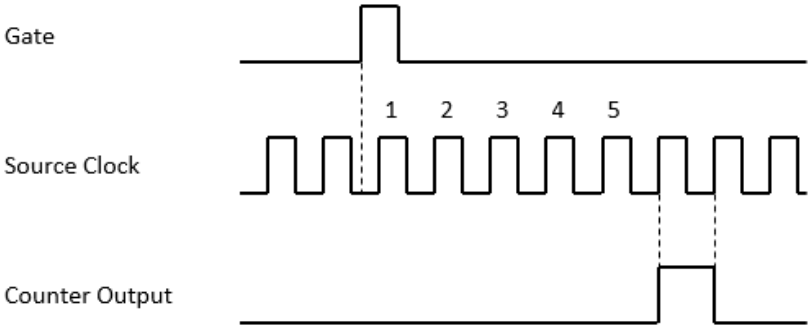


Figure 1.9 One-shot operation

6. Pulse Width Modulation Output (Finite/Infinite):
In pulse width modulation (PWM) output mode, a pulse waveform with specified high period (tHIGH) and low period (tLOW) is output at the counter output terminal as shown in Figure 1.10.

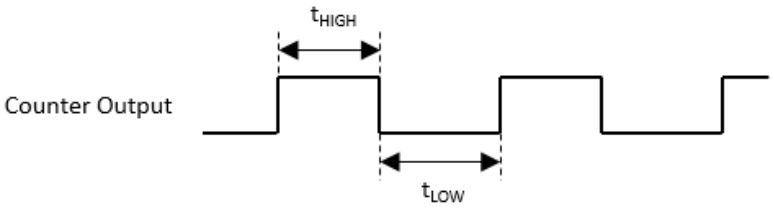


Figure 1.10 Pulse width modulation output

The number of pulses generated can be finite or infinite. For finite pulse generation, the counter output starts generating pulses when armed, and automatically stops after the specified number of pulses has completed. The counter can be re-armed after the previous generation is completed. This is shown in Figure 1.11.

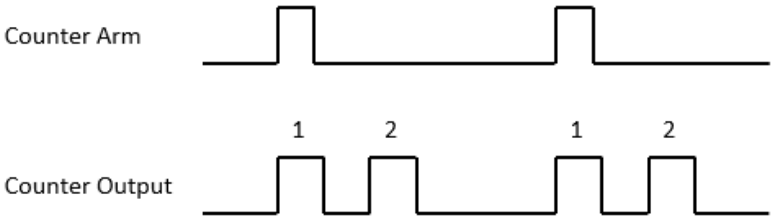


Figure 1.11 Finite pulse generation

For infinite pulse generation, the counter output starts generating pulses when armed and continues until stopped by software. This is shown in Figure 1.12.

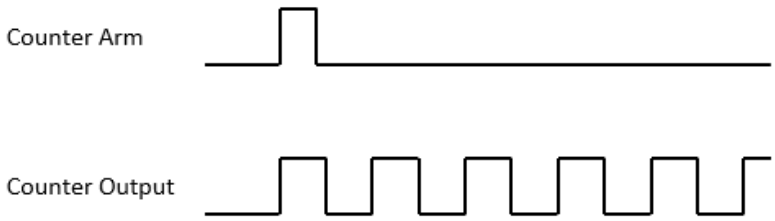


Figure 1.12 Infinite pulse generation

The output can be gated. If the counter gate is high, pulses are output normally. On the other hand, if the counter gate is low, output is disabled. This is shown in Figure 1.13.

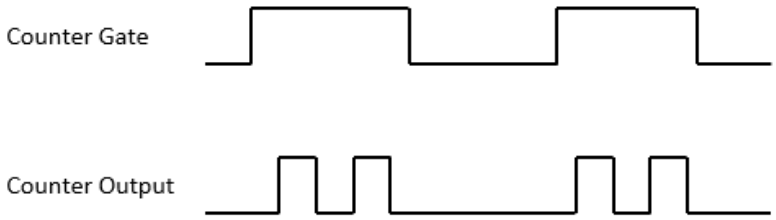


Figure 1.13 Gated pulse width modulation output

1.3 Driver Installation

The driver package can be found on the Advantech Support Portal (https://www.advantech.com/support). Search for COM card on the support portal to find the corresponding driver/SDK package. You'll have the XNavi installer after the download session finishes.

Execute the installer, then it will guide you through the session. You can choose the device and software components you'd like to install in the system (figure 1.4). After the selection, click "start" to begin the installation.

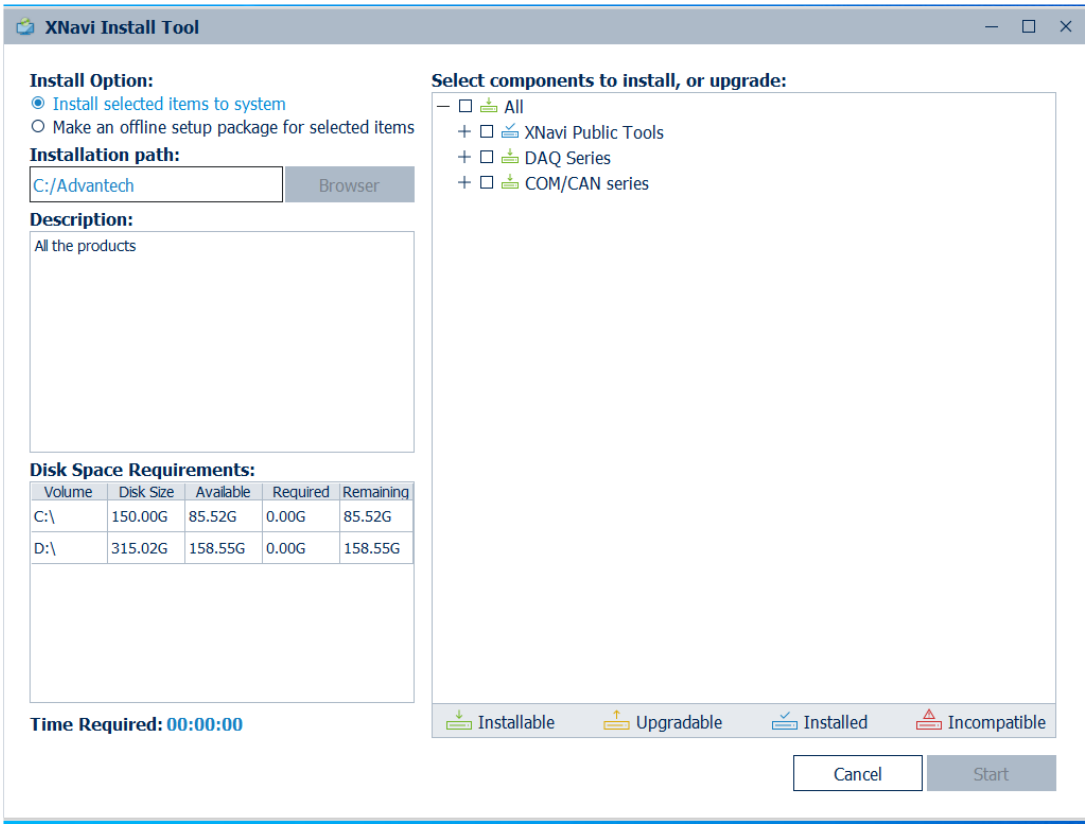


Figure 1.14 XNavi installer

1.4 Software Utility

Advantech offers device drivers, SDKs, third-party driver support and application software to help fully utilize the functions of your PCIE system. All these software packages are available on the Advantech website: http://www.advantech.com/.

The Advantech Navigator is a utility that allows you to set up, configure and test your device, and later store your settings in a proprietary database.

1. To set up the I/O device for your card, you can first run the Advantech Navigator program (by accessing Start/Programs/Advantech Automation/XNavi/Advantech Navigator). The settings can also be saved.
2. You can then view the device(s) already installed on your system (if any) in the Installed Device tree view. If the software and hardware installation are complete, you will see PCIE modules in the Installed Devices list.

1.5 Software Development Using DAQNavi SDK

DAQNavi SDK is the software development kit for programming applications with Advantech PCIE products. The necessary runtime DLL, header files, software manual and tutorial videos can be installed via the XNavi installer. They can be found under C:\Advantech\XNavi (default directory) after finishing the installation.

1.6 Accessories

Advantech offers a complete set of accessory products to support the PCIE-1751 card. These accessories include:

- PCL-10168-1E: 68-pin SCSI shielded cable, 1 m
- PCL-10168-2E: 68-pin SCSI shielded cable, 2 m
- ADAM-3968-AE: 68-pin SCSI DIN-rail wiring board

Chapter 2

Hardware Installation

2.1 Installation

This chapter gives users a package item checklist, proper instructions about unpacking, and step-by-step procedures for both driver and card installation.

2.2 Unpacking

After receiving your PCIE-1751 package, please inspect its contents first. The package should contain the following items:

- PCIE-1751 card
- Startup Manual

The PCIE-1751 card harbors certain electronic components vulnerable to electrostatic discharge (ESD). ESD can easily damage the integrated circuits and certain components if preventive measures are not carefully paid attention to.

Before removing the card from the antistatic plastic bag, you should take the following precautions to ward off possible ESD damage:

- Touch the metal part of your computer chassis with your hand to discharge static electricity accumulated on your body. One can also use a grounding strap.
- Touch the anti-static bag to a metal part of your computer chassis before opening the bag.
- Take hold of the card only by the metal bracket when removing it out of the bag.

After taking out the card, first you should:

Inspect the card for any possible signs of external damage (loose or damaged components, etc.). If the card is visibly damaged, please notify our service department or our local sales representative immediately. Avoid installing a damaged card into your system.

Also pay extra attention to the following aspects to ensure proper installation:

- Avoid physical contact with materials that could hold static electricity such as plastic, vinyl, and styrofoam.
- Whenever you handle the card, grasp it only by its edges. DO NOT TOUCH the exposed metal pins of the connector or the electronic components.

Note! *Keep the anti-static bag for future use. You might need the original bag to store the card if you have to remove the card from the PC or transport it elsewhere.*

2.3 Hardware Installation

Note! *Make sure you have installed the driver before you install the card.*

After the device driver installation is complete, you can install the PCIE-1751 card in any PCI Express slot on your computer. Follow the steps below to install the card on your system.

1. Turn off your computer and unplug the power cord and cables. TURN OFF your computer before installing or removing any components on the computer.
2. Remove the cover of your computer.
3. Remove the slot cover on the back panel of your computer.
4. Touch the metal part on the surface of your computer to neutralize the static electricity that might be on your body.
5. Insert the PCIE-1751 card into a PCI Express slot. Hold the card only by its edges and carefully align it with the slot. Insert the card firmly into place. Use of excessive force must be avoided, otherwise the card might be damaged.
6. Fasten the bracket of the PCI Express card on the back panel of the computer.
7. Connect appropriate accessories to the PCI Express card.
8. Replace the cover of your computer chassis. Re-connect the cables you removed in step 1.
9. Plug in the power cord and turn on the computer.

Note! *In case you installed the card without installing the Device Drivers first, the OS will recognize your card as an "unknown device" after rebooting, and will prompt you to provide the necessary driver. Ignore the prompts (just click the Cancel button) and set up the driver according to the steps described in 2.3 Driver Installation.*

After the PCIE-1751 card is installed, you can verify whether it is properly installed on your system through the Device Manager:

1. Access the Device Manager through the Control Panel/System/Device Manager.
2. The device name of the PCIE-1751 should be listed on the Device Manager tab as follows.

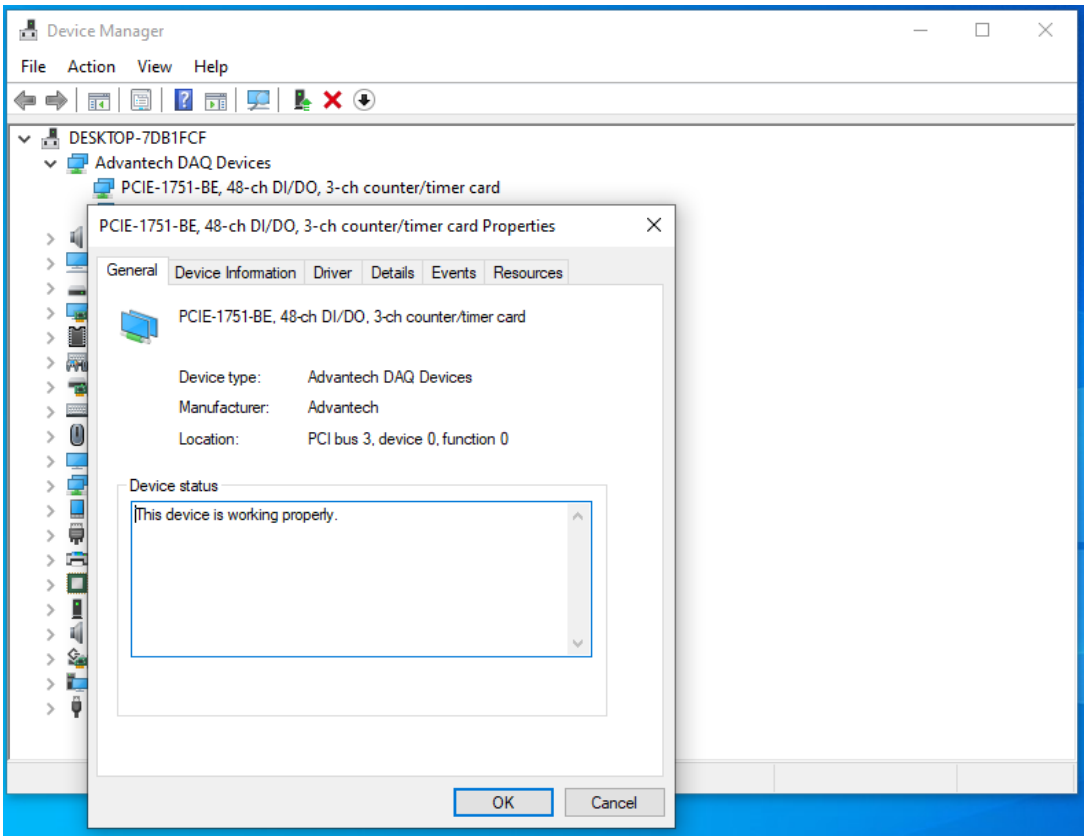


Figure 2.1 Device Manager

Note! *If your card is properly installed, you should see the device name of your card listed on the Device Manager tab. If you do see your device name listed on it but marked with an exclamation sign "!", it means your card has not been correctly installed. In this case, remove the card device from the Device Manager by selecting its device name and press the Remove button. Then go through the driver installation process again.*

After your card is properly installed on your system, you can configure your device using the Advantech Navigator after you install XNavi on your computer.

Chapter 3

Signal Connections

3.1 Overview

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly. A good signal connection can avoid unnecessary and costly damage to your PC and other hardware devices. This chapter provides useful information about how to connect input and output signals to the PCIE-1751 via the I/O connector.

3.2 Switch and Jumper Settings

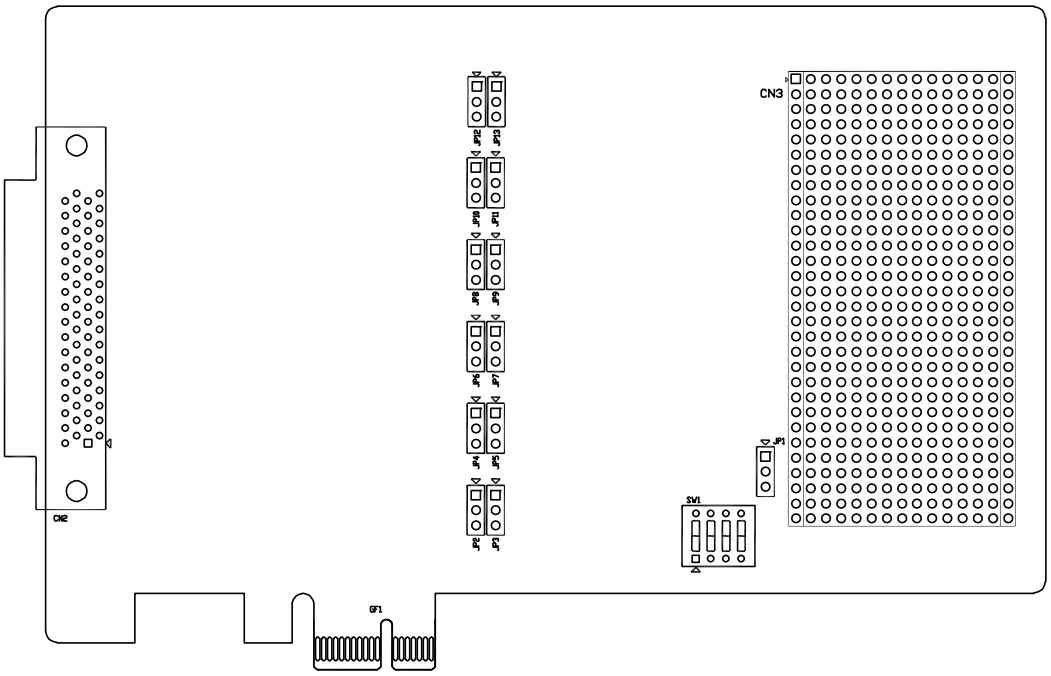


Figure 3.1 Card connector, jumpers and switches

3.2.1 Jumper JP1 Restores Ports to Their Condition Prior to Reset

Jumper JP1 gives the PCIE-1751 a new and valuable capability. With JP1 enabled, the PCIE-1751 “memorizes” all port I/O settings and output values, and, in the event of a “hot” reset, the settings and output values present at the port just prior to reset are restored to each port following the reset. This feature applies to both ports set by software, and to ports configured as output ports via jumpers. Depending on the application, this capability may allow a card to be reset without requiring a complete shut- down of processes controlled by the card (since port values are left unchanged and are interrupted only momentarily). Complete loss of power to the chip clears the chip memory. Thus, even if JP1 is enabled, if the power to the card is disconnected, the card’s initial power-on state will be the default state (for software-set ports) or the state of an output port with low voltage output (for jumper-set ports). When jumper JP1 is not enabled, power-off or reset results in ports returning to their default state (for software-set ports) or returning to the state of the output port with low voltage output (for jumper-set ports).

Power-On Configuration (JP1)

Table 3.1: Jumper Settings (JP1)

Jumper Setting	Description
	Keep last status after a hot reset.
	Reset to default status after a hot reset*.

* Default setting

DI/O Channel Direction Configuration (JP2 ~ JP13)

Table 3.2: Jumper Channels

Jumper	Controlled DI/O Channels
JP2, JP3	Port 0 DI/O 0 ~ DI/O 7
JP6, JP7	Port 1 DI/O 0 ~ DI/O 7
JP10, JP11	Port 2 DI/O 0 ~ DI/O 7
JP4, JP5	Port 3 DI/O 0 ~ DI/O 7
JP8, JP9	Port 4 DI/O 0 ~ DI/O 7
JP12, JP13	Port 5 DI/O 0 ~ DI/O 7

Table 3.3: Jumper Settings (JP2 ~ JP13)

Jumper Setting	Description
	DI/O channels are fixed at output.
	DI/O channel direction is software-configurable*.

* Default setting

3.3 Signal Connections

PCIE-1751 Pin Assignments

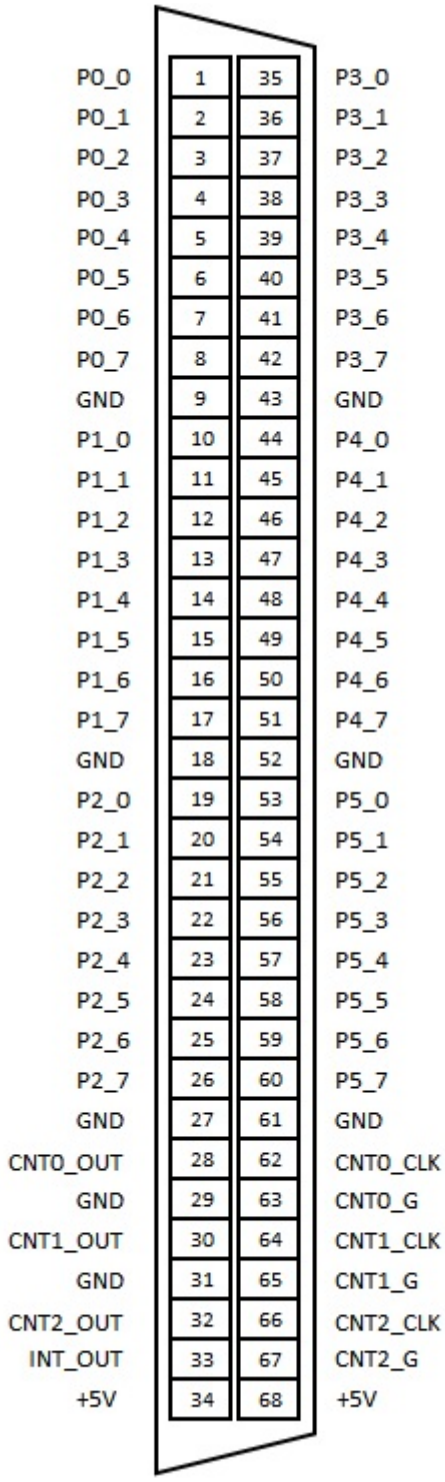


Table 3.4: PCIE-1751 Pin Assignments

Pin Name	Direction	Description	Pin Number
DI/O Port 0<0..7>	I/O	Bi-directional digital input/output port 0 terminals.	1 ~ 8
DI/O Port 1<0..7>	I/O	Bi-directional digital input/output port 1 terminals.	10 ~ 17
DI/O Port 2<0..7>	I/O	Bi-directional digital input/output port 2 terminals.	19 ~ 26
DI/O Port 3<0..7>	I/O	Bi-directional digital input/output port 3 terminals.	35 ~ 42
DI/O Port 4<0..7>	I/O	Bi-directional digital input/output port 4 terminals.	44 ~ 51
DI/O Port5<0..7>	I/O	Bi-directional digital input/output port 5 terminals.	53 ~ 60
INT_OUT	O	Interrupt Out	33
CNT<0..2>_CLK	I	Counter 0 clock input terminal.	62, 64, 66
CNT<0..2>_OUT	O	Counter 0 output terminal.	28, 30, 32
CNT<0..2>_GATE	I	Counter 0 gate input terminal.	63, 65, 67
GND	-	Ground terminals for digital signals.	9, 18, 27, 29, 31, 43, 52, 61
+5V	O	+5 V supply output.	34, 68

Digital Input (TTL DI/O, Pull-Up/Down)

A digital input/output (DI/O) channel can be configured by software to perform digital input measurement, which is the power-on default configuration, or digital output generation. When performing digital input measurement, the voltage logic level between the digital input (DI) terminal and the digital ground (DGND) terminal is measured. To prevent undetermined or fluctuating results when input is floating, the digital input channel can be configured as internally pulled-up or pulled-down by software. This is shown in Figure 3.2.

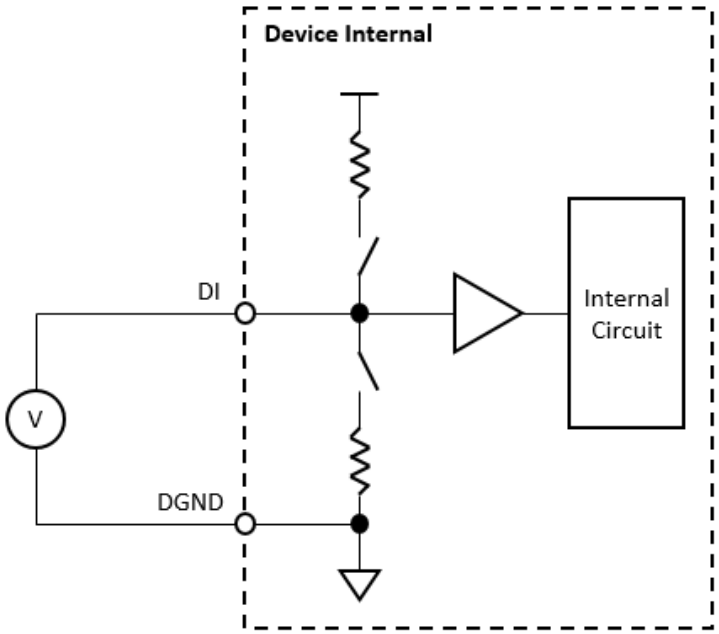


Figure 3.2 Digital input signal connection

Digital Output

A digital input/output (DI/O) channel can be configured by software to perform digital input measurement, which is the power-on default configuration, or digital output generation. When performing digital output generation, a voltage logic level is generated between the digital output (DO) terminal and the digital ground (DGND) terminal. This is shown in Figure 3.3.

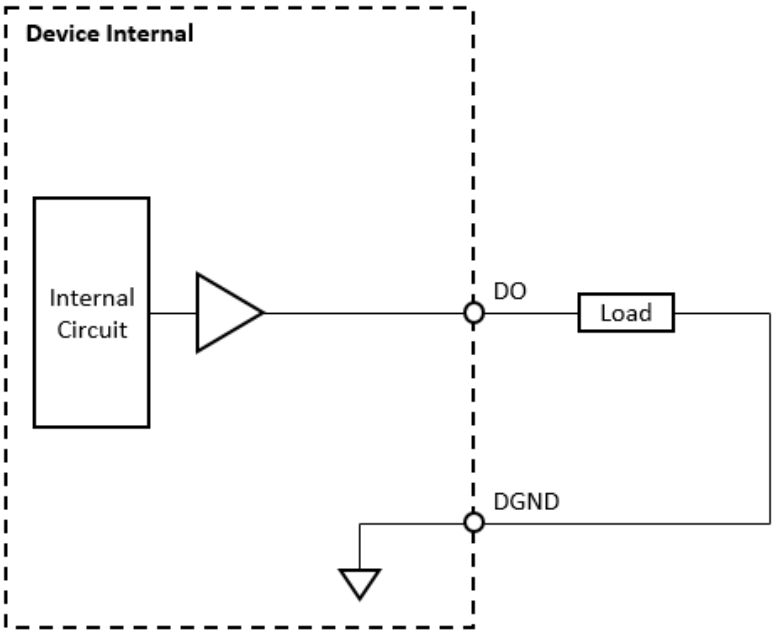


Figure 3.3 Digital output signal connection

Each digital output channel can source or sink only a finite amount of current. If this limit is exceeded, the output voltage will not stay at the specified voltage logic level. Refer to the device specifications for the maximum source and skin current values.

Counter Input

The voltage logic level between the counter input (counter clock, counter gate, counter arm, and sample clock) terminals and the digital ground (DGND) terminal is measured. To prevent undetermined or fluctuating results when input is floating, the counter input signals are internally pulled-up. This is shown in Figure 3.4

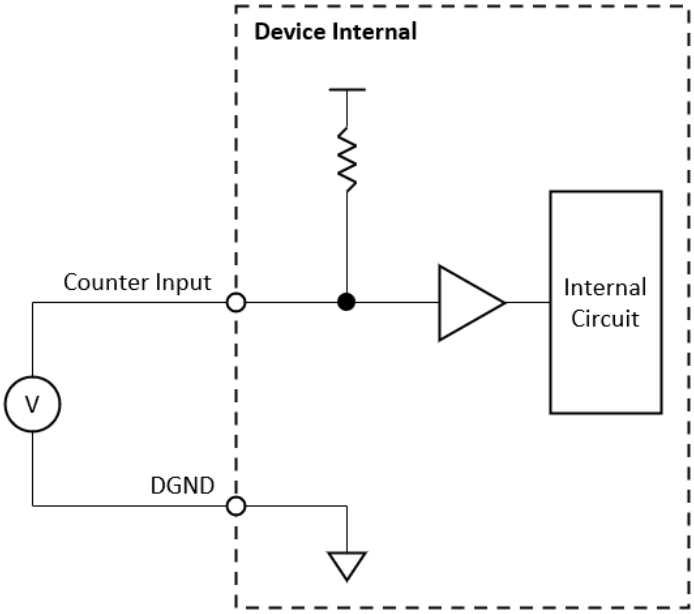


Figure 3.4 Counter input signal connection

Counter Output

A voltage logic level is generated between the counter output terminal and the digital ground (DGND) terminal. This is shown in Figure 3.5.

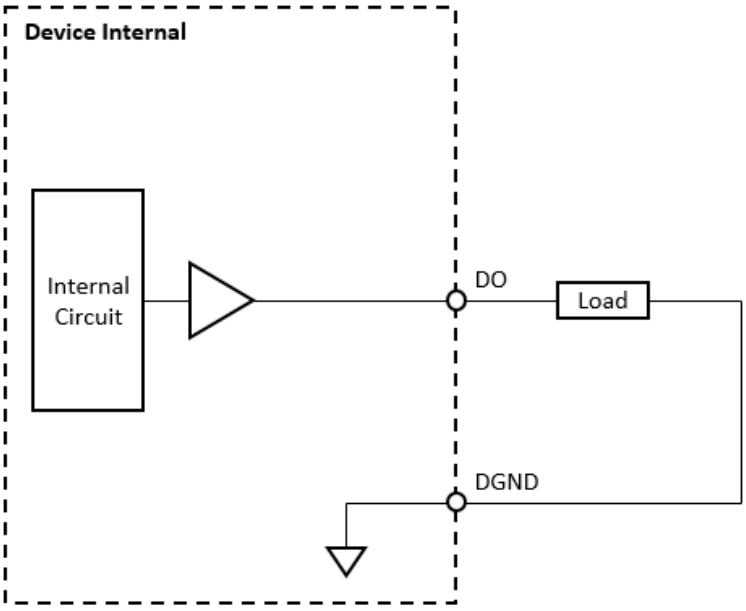


Figure 3.5 Counter output signal connection

Each counter output channel can source or sink only a finite amount of current. If this limit is exceeded, the output voltage will not stay at the specified voltage logic level. Refer to the device specifications for the maximum source and skin current values.

Appendix A

Specifications

A.1 Digital Input

Table A.1: Digital Input		
Input type	5 V TTL	
Input logic level	Logic high	2.0 V min.
	Logic low	0.8 V max.
	Working voltage	-0.25 V ~ 5.25 V
Input protection voltage	-0.5 V ~ 6.5 V	
Pull-up resistor	10 kΩ	
Response time	25 ns max.	
Debounce filter	32 ns ~ 67 ms, software-configurable	
Acquisition type	Instant, software-configurable	
Interrupt	Edge detection	Rising edge, falling edge, or both edges, software-configurable per channel
	Pattern match detection	By port detection, each channel can be enabled or disabled by software independently
	State latch	Latch port state when interrupt occurs

A.2 Digital Output

Table A.2: Digital Output		
Output type	5 V TTL	
Power-on state	Logic low	
Output logic level	Logic high	4.0 V min. @ 2 mA source / 5.2 V max.
	Logic low	0.4 V max. @ 2 mA sink
Load current	One channel	8 mA max.
	Per port summed	20 mA max.
Response time	25 ns max.	
Update type	Static software-configurable	
Initial output value	Software-configurable	

A.3 Counter

Table A.3: Counter		
Channels	3	
Resolution	16 bits	
Input type	5 V TTL	
Input logic level	Logic high	2.0 V min.
	Logic low	0.8 V max.
	Working voltage	-0.25 V ~ 5.25 V
Input protection voltage	-0.5 V ~ 6.5 V	
Pull-up resistor	10 kΩ	
Debounce filter	32 ns ~ 67 ms, software-configurable	
Output type	5 V TTL	
Output logic level	Logic high	4.0 V min. @ 2 mA source/5.2 V max.
	Logic low	0.4 V max. @ 2 mA sink
Load current	8 mA max.	
Counter measurement function		
Event counting	Input frequency	10 MHz max.
	Clock polarity	Rising edge or falling edge, software-configurable
	Gate function	Enabled or disabled, software-configurable
	Gate polarity	High active or low active, software-configurable
	Measuring type	Instant
Frequency measurement	Measuring method	Counting pulse by system time, period inverse, or auto-adaptive, software-configurable
	Input frequency	0.1 Hz ~ 10 MHz
	Accuracy	f_{IN}/40 MHz or 50 ppm, whichever is larger
	Measuring type	Instant
Pulse width measurement	Pulse width range	100 ns ~ 1 s
	Pulse width resolution	25 ns
	Accuracy	50 ppm
	Measuring type	Instant
Counter output function		

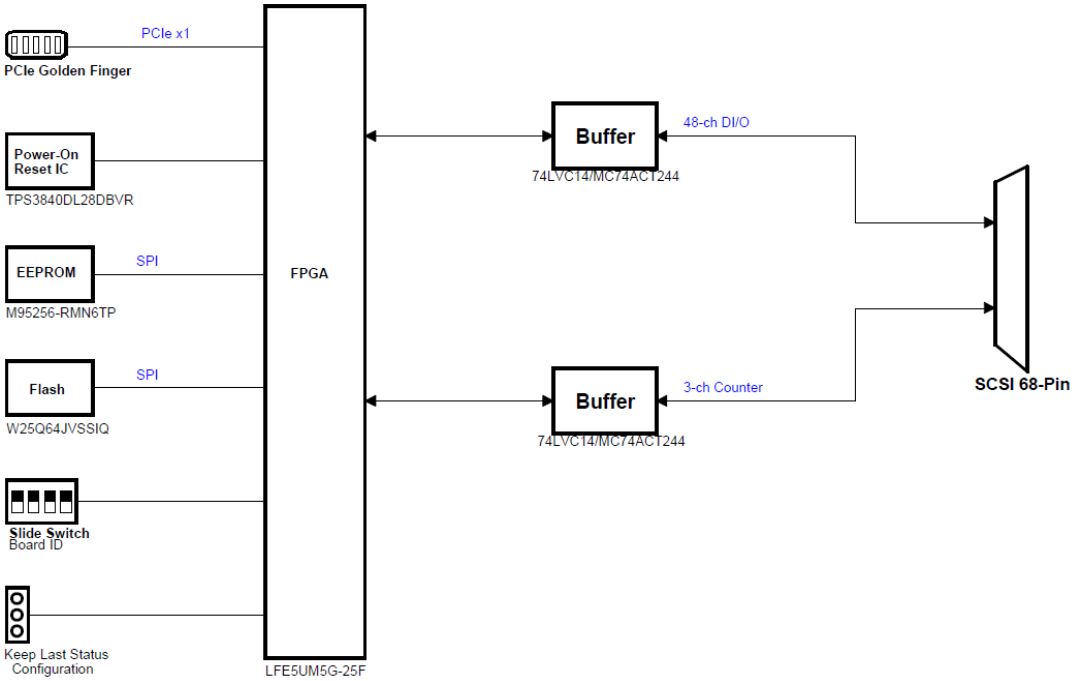
One shot	Internal clock source frequency	10 MHz, 1 MHz, 100 kHz, or 10 kHz, software-configurable
	Internal clock accuracy	50 ppm
	External clock source frequency	10 MHz max.
	Delay count	1 ~ 4,294,967,295
	Gate source	External
	Gate polarity	Rising edge or falling edge, software-configurable
	Generation type	Static
Timer/pulse	Timebase clock frequency	40 MHz
	Timebase clock accuracy	50 ppm
	Output frequency	0.1 Hz ~ 10 MHz
	Gate function	Enabled or disabled, software-configurable
	Gate polarity	High active or low active, software-configurable
	Interrupt generation	Enabled or disabled, software-configurable
Pulse width modulation	Timebase clock frequency	40 MHz
	Timebase clock accuracy	50 ppm
	Pulse width	100 ns ~ 1 s
	Pulse width resolution	25 ns
	Number of pulses	1 ~ 4,294,967,295 or infinite, software-configurable
	Gate function	Enabled or disabled, software-configurable
	Gate polarity	High active or low active, software-configurable
	Generation type	Static

A.4 General

Table A.4: General		
Power consumption	+3.3 V	330 mA typ. 400 mA max.
Power Supply output	+5 V (±5%)	200 mA max.
Physical	Form factor	PCI Express
	Dimensions	175 x 100 x 18 mm^3 (6.9 x 3.9 x 0.7 $in.^3$)
	Weight	113 g
	I/O connector	68-pin SCSI (pin type)
Environmental	Operating temperature	0 °C to 60 °C (32 °F to 140 °F)
	Storage temperature	-20 °C to 70 °C (-4 °F to 158 °F)
	Operating humidity	10% to 90% RH, non-condensing
	Storage humidity	5% to 95% RH, non-condensing

Appendix B

Function Block Diagram


PCIe x1
PCIe Golden Finger
Power-On Reset IC
TPS3840DL28DBVR
EEPROM
SPI
M95256-RMN6TP
Flash
SPI
W25Q64JVSSIQ
Slide Switch
Board ID
Keep Last Status Configuration
FPGA
LFE5UM5G-25F
Buffer
74LVC14/MC74ACT244
48-ch DI/O
Buffer
74LVC14/MC74ACT244
3-ch Counter
SCSI 68-Pin

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Please verify specifications before quoting. This guide is intended for reference purposes only.

All product specifications are subject to change without notice.