Digital I/O Board with Opto-Isolation for PCI Express Low Profile
DIO-1616L-LPE

* Specifications, color and design of the products are subject to change without notice.

Features

Opto-coupler isolated input (supporting current sink output) and opto-coupler isolated open-collector output (current sink type)
This product has the 16ch of opto-coupler isolated input (supporting current sink output) and 16ch of opto-coupler isolated open-collector output (current sink type) whose response time is 200μsec.   Common terminal provided per 16channels, capable of supporting a different external power supply.   Supporting driver voltages of 12 - 24 VDC for I/O.

Opto-coupler bus isolation
As the PCI Express bus (PC) is isolated from the input and output interfaces by opto-couplers, this product has excellent noise performance.

All input signals can be used as interrupt request signals
You can use all input signals as interrupt request signals and also disable or enable the interrupt in bit units and select the edge of the input signals, at which to generate an interrupt.

Windows/Linux support device driver
Using the device driver API-TOOL makes it possible to create applications of Windows/Linux. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

Equipped with digital filter to prevent wrong recognition of input signals from carrying noise or a chattering
This product has a digital filter to prevent wrong recognition of input signals from carrying noise or a chattering. All input terminals can be added a digital filter, and the setting can be performed by software.

Zener diode for surge voltage protection and the circuit for overcurrent protection
Zener diodes are connected to the output circuits to protect against surge voltages.   In addition, the output circuit, it attaches the overcurrent protection circuit at the output 8-channel unit.   The output rating is max. 35VDC, 100mA per channel.

Support for both of Low Profile and standard size slots
Support for both of Low Profile and standard size slots (interchangeable with a bundled bracket).

This product is a Low Profile size PCI Express bus-compliant interface board for input/output of digital signals.   This product can input and output digital signals at 12 - 24VDC.

This product features 16 opto-coupler isolated inputs (supporting current sink output) and 16 opto-coupler isolated open-collector outputs (current sink type).   You can use all of input signals as interrupt inputs. In addition, the digital filter function to prevent wrong recognition of input signals is provided and output transistor protection circuit (surge voltage protection and overcurrent protection).

This product supports a Low Profile size slot and, if replaced with the supplied bracket, supports a standard size slot, too.

Windows/Linux device driver is supported with this product.

*The contents in this document are subject to change without notice.
*Visit the CONTEC website to check the latest details in the document.
*The information in the data sheets is as of March 2024.

Functions are compatible with PCI Express compatible board DIO-1616L-PE and PCI compatible board PIO-16/16L(PCI)H
The functions same with PCI Express compatible board DIO-1616L-PE and PCI compatible board PIO-16/16L(PCI)H are provided.

Functions and connectors are compatible with PCI compatible board PIO-16/16L(LPCI)H series
The functions same with PCI compatible board PIO-16/16L(LPCI)H are provided.   In addition, as there is compatibility in terms of connector shape and pin assignments, it is easy to migrate from the existing system.

Packing List

Product ...1
Standard-sized bracket ...1
Please read the following ... 1

Support Software

Name	Contents	How to get
Windows Version Digital I/O Driver software API-DIO(WDM)	The Windows device driver is provided as a form of Windows API functions. Various sample programs such as C# and Visual Basic .NET , Visual C++, Python etc. and diagnostic program useful for checking operation is provided.	Download from the CONTEC website *1
Linux Version Digital I/O Driver software API-DIO(LNX)	The Linux device driver is provided as a shared library. The software includes various sample programs such as gcc (C, C++) and Python programs, as well as a configuration tool to configure the device settings.	Download from the CONTEC website *1
Software Development Tool Kits (SDK) and Support Software	In addition to the device drivers, we offer many software programs for using CONTEC devices in an easier manner.	Download from the CONTEC website *2

*1 Download the files from the following URL.
   https://www.contec.com/download/

*2 For supported software, search the CONTEC website for this product and view the product page.
   https://www.contec.com/

Specification

### Function Specifications

Item		Specifications
Input	Type	Opto-Isolated Input (for current sinking output) (Negative logic *1)
	Number of Channels	16ch (all available for interrupts) (One common power supply per 16 channels)
	Input resistance	4.7kΩ
	Current required to turn ON	2.0mA or more
	Current required to turn OFF	0.16mA or less
	Interrupts	Combine 16 interrupt signals to one interrupt request signal as the INTA. Either rising edge or falling edge of input signal can generate interrupt.
	Response time	200μsec within
Output	Type	Opto-Isolated Open Collector Output (current sinking type) (Negative logic *1)
	Number of Channels	16ch (1 common)
	Output rated voltage	35VDC (Max.)
	Output rated current	100mA/channel (Max.)
	Residual voltage with output on	0.5V or less (Output current ≤ 50mA), 1.0V or less (Output current ≤ 100mA)
	Surge protector	Zener diode RD47FM(Renesas) or equivalent
	Response time	200μsec within
Common	Internal power	None
	Connecting distance	50m(Typ.)(depending on wiring environment)
	I/O address	Any 32-byte boundary
	Interruption level	1 level use
	Boards in one system	Maximum of 16 boards can be install in a same system.
	Isolated voltage	1000Vrms
	External circuit power supply	12 - 24VDC(±10%)
	Power consumption	3.3VDC 350mA (Max.)
	Bus specification	PCI Express Base Specification Rev. 1.0a x1
	Dimension (mm)	121.69(L)×67.90(H)
	Weight	50g

*1   Data "0" and "1" correspond to the High and Low levels, respectively.

Installation Environment Requirements

Item	Specifications
Operating ambient temperature	0 - +50℃
Operating ambient humidity	10 - 90%RH (No condensation)
Floating dust particles	Not to be excessive
Corrosive gases	None
Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA

Physical Dimensions
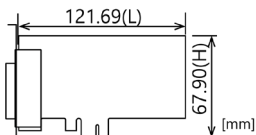
The standard outside dimension (L) is the distance from the end of the card to the outer surface of the slot cover.

Optional Products

| Product Name	Model type	Description
Shield Cable with Two 50-pin Mini-Ribbon Connector	PCB50PS-0.5P	0.5m
	PCB50PS-1.5P	1.5m
	PCB50PS-3P	3m
Shield Cable with One 50-pin Mini-Ribbon Connector	PCA50PS-0.5P	0.5m
	PCA50PS-1.5P	1.5m
	PCA50PS-3P	3m
Connection Conversion 0.5m Shield Cable (50p Ribbon to 37p D-SUB)	PCE50/37PS-0.5P	0.5m
Screw Terminal (M3 * 50P)	EPD-50A	*1 *2
Screw Terminal (M3 * 37P)	EPD-37A	*1 *3
Screw Terminal (M3.5 * 37)	EPD-37	*3
General Purpose Terminal	DTP-3C	*3
Screw Terminal	DTP-4C	*3
Signal monitor Accessory for Digital I/O (32bits)	CM-32L	*3

*1   "Spring-up" type terminal is used to prevent terminal screws from falling off.
*2   PCB50PS-*P optional cable is required separately.
*3   PCE50/37PS-0.5P and PCB37P or PCB37PS optional cable is required separately.

Visit the CONTEC website for the latest optional products.
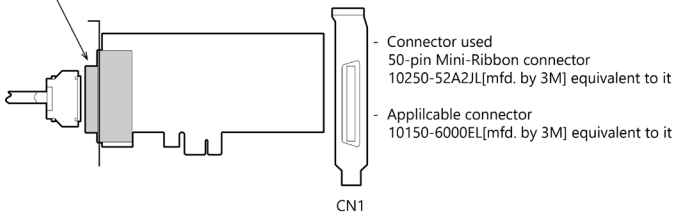
Nomenclature of Product Components

Built-in power setting function
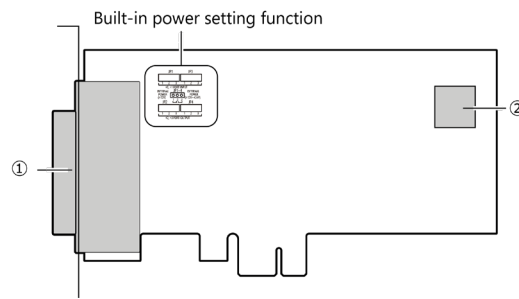
No.	Name
1	Interface Connector
2	Board ID Setting Switch

⚠ CAUTION

The product doesn't have the built-in power setting function.

Connecting an Interface Connector

Interface connector (CN1)

- Connector used
  50-pin Mini-Ribbon connector
  10250-52A2JL[mfd. by 3M] equivalent to it

- Applilcable connector
  10150-6000EL[mfd. by 3M] equivalent to it

CN1

Layout on the Interface Connector(CN1)

Common minus pin for +2/+3 output ports	ON-2/3	50			25	ON-2/3	Common minus pin for +2/+3 output ports
	ON-2/3	49			24	ON-2/3	
+2 port (Output)	O-20	48			23	O-30	+3 port (Output)
	O-21	47			22	O-31	
	O-22	46			21	O-32	
	O-23	45			20	O-33	
	O-24	44			19	O-34	
	O-25	43			18	O-35	
	O-26	42			17	O-36	
	O-27	41			16	O-37	
Common plus pin for +2/+3 output ports	OP-2/3	40			15	OP-2/3	Common plus pin for +2/+3 output ports
	OP-2/3	39			14	OP-2/3	
	N.C.	38			13	N.C.	
	N.C.	37			12	N.C.	
	N.C.	36			11	N.C.	
+0 port (Input)	I-00	35			10	I-10	+1 port (Input)
	I-01	34			9	I-11	
	I-02	33			8	I-12	
	I-03	32			7	I-13	
	I-04	31			6	I-14	
	I-05	30			5	I-15	
	I-06	29			4	I-16	
	I-07	28			3	I-17	
Common plus pin for +0/+1 input ports	IP-0/1	27			2	IP-0/1	Common plus pin for +0/+1 input ports
	IP-0/1	26			1	IP-0/1	

50　25

26　1

* I-00 - I-17 can be used as interrupt signal.

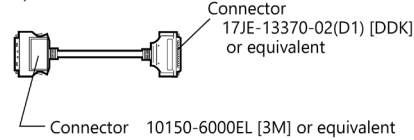| Signal name	Description
I-00 - I-17	16 input signal pins. Connect output signals from the external device to these pins.
O-20 - O-37	16 output signal pins. Connect these pins to the input signal pins of the external device.
IP-0/1	Connect the positive side of the external power supply. These pins are common to 16 input signal pins.
OP-2/3	Connect the positive side of the external power supply. These pins are common to 16 output signal pins.
ON-2/3	Connect the negative side of the external power supply. These pins are common to 16 output signal pins. One pin permissible current of the connector is 1A. Please connect necessary number of pins for the corresponding total current of the output 16 channels. When 16 channels are used by the output full ratings (100mA per 1 channel), it is necessary to connect all.
N.C.	This pin is left unconnected.

⚠ CAUTION

　To perform input/output using this product with the CONTEC device driver, specify logical ports and logical bits when calling each function.　For details, refer to the "Relationships between API-TOOL Logical Ports/Bits and Connector Signal Pins" of Reference Manual.

Pin Assignments of Optional Connector PCE50/37PS-0.5P
- Option cable　PCE50/37PS-0.5P

Connector
17JE-13370-02(D1) [DDK]
or equivalent

Connector　10150-6000EL [3M] or equivalent

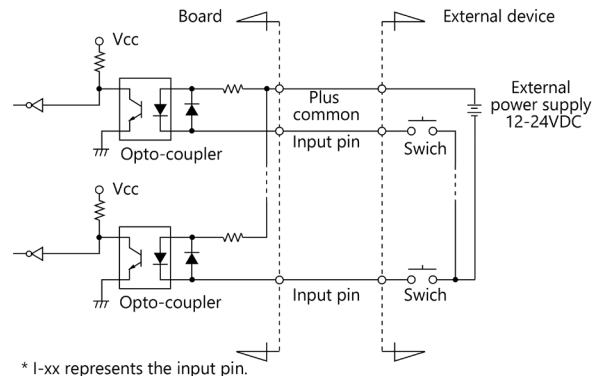|	N.C.	1		20	ON-2/3	Common minus pin for +2/+3 output ports
+0 port (Input)	I-00	2		21	O-20	+2 port (Output)
	I-01	3		22	O-21	
	I-02	4		23	O-22	
	I-03	5		24	O-23	
	I-04	6		25	O-24	
	I-05	7		26	O-25	
	I-06	8		27	O-26	
	I-07	9		28	O-27	
+1 port (Input)	I-10	10		29	O-30	+3 port (Output)
	I-11	11		30	O-31	
	I-12	12		31	O-32	
	I-13	13		32	O-33	
	I-14	14		33	O-34	
	I-15	15		34	O-35	
	I-16	16		35	O-36	
	I-17	17		36	O-37	
Common plus pin for +0/+1 input ports	IP-0/1	18		37	OP-2/3	Common plus pin for +2/+3 output ports
	N.C.	19				

1　20

19　37

Connecting Input and Output Signals

Input Circuit
Connect the input signals to a device which can be current-driven, such as a switch or transistor output device.
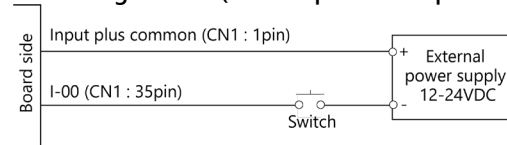The connection requires an external power supply to feed currents.
The product inputs the ON/OFF state of the current-driven device as a digital value.

Board　External device
Vcc
Plus common
External power supply 12-24VDC
Opto-coupler　Input pin　Swich
Vcc
Opto-coupler　Input pin　Swich

* I-xx represents the input pin.

The signal inputs are isolated by opto-couplers (ready to accept current sinking output signals).　The product therefore requires an external power supply to drive the inputs. The power requirement for each input pin is about 5.1 mA at 24 VDC (about 2.6 mA at 12 VDC).

Connecting a Switch (An Example to use Input I-00)

Board side
Input plus common (CN1 : 1pin)
I-00 (CN1 : 35pin)
Switch
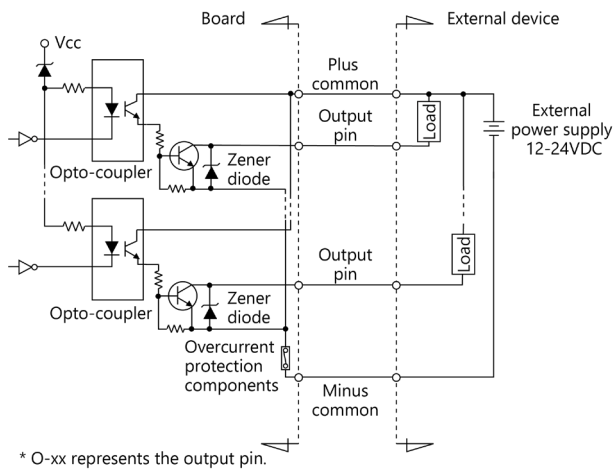+ External power supply 12-24VDC -

When the switch is ON, the corresponding bit contains 1.
When the switch is OFF, by contrast, the bit contains 0.

Output Circuit

Connect the output signals to a current-driven controlled device such as a relay or LED.

The connection requires an external power supply to feed currents.

The product controls turning on/off the current-driven controlled device using a digital value.


* O-xx represents the output pin.

The signal output section is an opto-coupler isolated, open-collector output (current sink type). Driving the output section requires an external power supply.

The rated output current per channel is 100mA at maximum. The output section can also be connected to a TTL level input as it uses a low-saturated transistor for output.

The residual voltage (low-level voltage) between the collector and emitter with the output on is 0.5V or less at an output current within 50mA or at most 1.0V at an output current within 100mA.

A zener diode is connected to the output transistor for protection from surge voltages.

A overcurrent protection components is provided for every 8 output transistors.
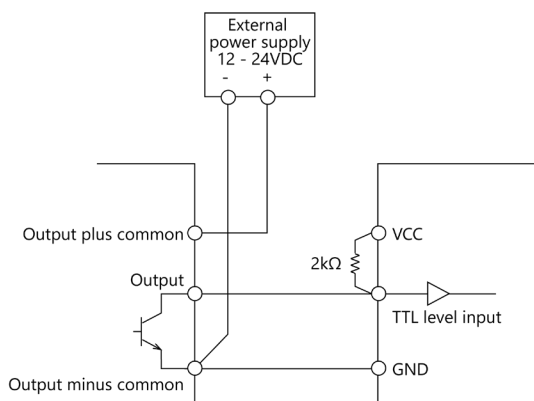
⚠ CAUTION

When the PC is turned on, all output are reset to OFF.

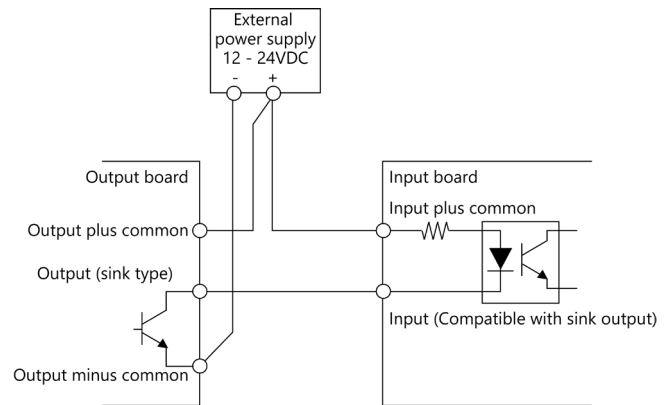### Connection to the LED (An Example to use Output O-20)
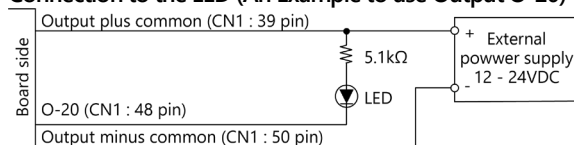
When "1" is output to a relevant bit, the corresponding LED comes on.
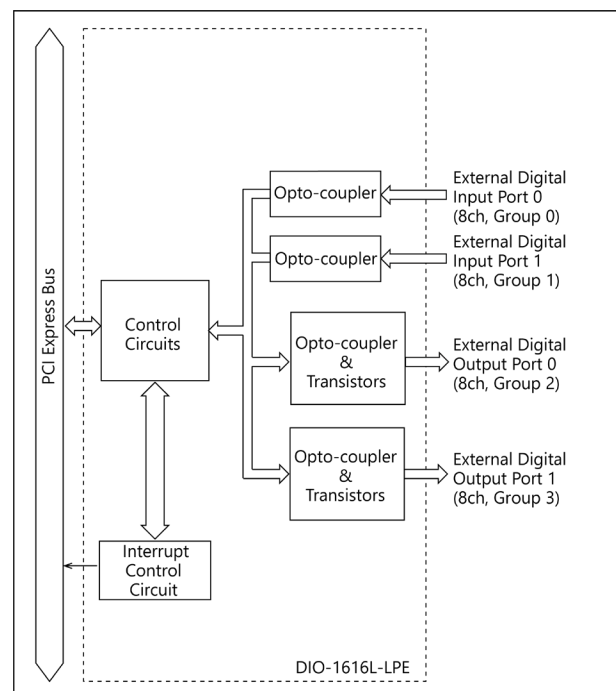When "0" is output to the bit, in contrast, the LED goes out.

Example of Connection to TTL Level Input (Connection Example of Output and TTL level Input Signal)

Connecting the Sink Type Output and Sink Output Support Input

Block Diagram

DIO-1616L-LPE

Differences between DIO-1616L-LPE and PIO-16/16L(PCI)H, PIO-16/16L(LPCI)H, DIO-1616L-PE

	DIO-1616L-LPE	PIO-16/16L(PCI)H	PIO-16L(LPCI)H	DIO-1616L-PE
Power consumption	3.3VDC 350mA	5VDC 200mA	5VDC 100mA	3.3VDC 350mA
Bus specification	PCI Express Base Specification Rev. 1.0a x1	PCI(32bit, 33MHz, Universal key shapes supported)	PCI(32bit, 33MHz, Universal key shapes supported)	PCI Express Base Specification Rev. 1.0a x1
Dimension (mm)	121.69(L)×67.90(H)	121.69(L)×105.68(H)	121.69(L)×63.41(H)	121.69(L)×110.18(H)
Connector	50-Pin Mini-Ribbon connector10250-52A2JL[mfd.by 3M] or equivalent to it	37 pin D-SUB connector [F (female) type] DCLC-J37SAF-20L9E [mfd by JAE] or equivalent to it	50-Pin Mini-Ribbon connector 10250-52A2JL[mfd.by 3M] or equivalent to it	37 pin D-SUB connector [F (female) type] DCLC-J37SAF-20L9E [mfd by JAE] or equivalent to it
Weight	50g	130g	60g	130g