

Raspberry Pi Expansion Card
Digital I/O Card with Opto-Isolation

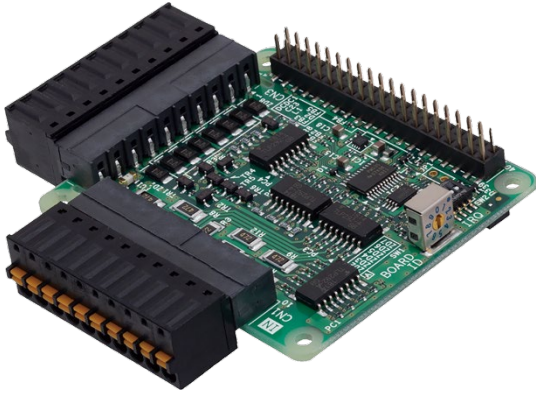
CPI-DIO-0808L

Digital Input Card with Opto-Isolation

CPI-DI-16L

Digital Output Card with Opto-Isolation

CPI-DO-16L



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

Features

Opto-coupler isolated input and opto-coupler isolated open-collector output

CPI-DIO-0808L has the opto-coupler isolated input 8ch (supporting current sink/source output) and opto-coupler isolated output 8ch (current sink type).

CPI-DI-16L has the opto-coupler isolated input 16ch (supporting current sink/source output).

CPI-DO-16L has the opto-coupler isolated output 16ch (current sink type).

Common terminal provided per 8ch, capable of supporting a different external power supply. Supporting driver voltages of 12 - 24 VDC for I/O.

Opto-coupler bus isolation

As the GPIO 40PIN connector on Raspberry Pi is isolated from the input and output interfaces by opto-couplers, this product has excellent noise performance.

Built-in interrupt notification signal (CPI-DIO-0808L, CPI-DI-16L only)

The CPI-DIO-0808L and CPI-DI-16L can output a signal to a Raspberry Pi's GPIO pins to notify of changes in the input signal (pin selection possible). This signal can be used as an interrupt notification signal for notifying of input signal changes without the need for I2C communication.

The output circuit, has a built-in Zener diode and the overcurrent protection circuit of the surge voltage protection. (CPI-DIO-0808L, CPI-DO-16L only)

To protect against surge voltage, Zener diodes are connected to the CPI-DIO-0808L and CPI-DO-16L output circuits. 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 ch.

Connectivity for up to 8 cards

Connect up to 8 expansion cards of the same series. Use the Board ID setting switch on the main body to identify connected expansion cards.

This product is an Expansion card to provide digital I/O interface to the Raspberry Pi.

Common terminal provided per 8ch, capable of supporting a different external power supply. Supporting driver voltages of 12 - 24 VDC for I/O.

CPI-DIO-0808L has the opto-coupler isolated input 8ch (supporting current sink/source output) and opto-coupler isolated output 8ch (current sink type).

CPI-DI-16L has the opto-coupler isolated input 16ch (supporting current sink/source output).

CPI-DO-16L has the opto-coupler isolated output 16ch (current sink type).

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* Visit the CONTEC website to check the latest details.

* Visit the CONTEC website to check the latest OS.

* The information in the data sheets is as of July, 2022.

Adaptable to a wide range of temperature between -20 and +60°C

The product is capable of operating in the temperature between -20 and +60°C. It can be installed in the various environments.

No electrolytic capacitor

Without an electrolytic capacitor, which has a limited life, we are creating the product with a longer life.

Linux compatible driver software

Using the digital I/O driver API-DIO(LNX) makes it possible to create applications of Linux.

Support Software

You can use CONTEC support software according to your purpose and development environment.

For more details on the supported OS, applicable languages, or to download the latest version of software, visit the CONTEC Web site.

Name	Contents	How to get
Driver software API-DIO(LNX)	This is the Linux version driver software provided in API function formats. The software includes various sample programs such as gcc (C, C++) and Python programs.	Download from the CONTEC website

List of Option

Product Name	Model type	Description
RAS card	CPI-RAS	RAS/RTC function, 8 to 28 VDC input function expansion
DIN RAIL ADAPTER	CPI-DIN01	

* Information about the option products, see the Contec's website.

Specification

Function specification < CPI-DIO-0808L >

Item	Description
Digital Input	
Input type	Opto-coupler isolated input (supports current sink output [negative logic] *1/current source output [positive logic] *2)
Number of input signal channels	8 (shared common)
Isolation	Opto-coupler Isolation
Voltage Resistance	AC1000Vrms
Input Resistance	4.7kΩ
Input ON current	2.0mA or more
Input OFF current	0.16mA or less
Response time	Within 200μsec
Digital Output	
Output type	Opto-coupler Isolation Open Collector Output (Current sink type) (negative logic) *1
Number of output signal channels	8 (shared common)
Isolation	Opto-coupler Isolation
Voltage Resistance	AC1000Vrms
Output rating	Output Voltage: 35VDC (Max.) Output Current: 100mA (Max.)
Residual Voltage with Output ON	0.5V or less (Output current ≤ 50mA), 1.0V or less (Output current ≤ 100mA)
Surge protector	Zener diode CMZB47 (TOSHIBA) or equivalent to it
Overcurrent protection	Fuse rating: 1 A (rush-resistant) (Connected to MCOM1 terminal)
Response time	Within 200μsec
Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
Digital I/O control IC	TCA9535(TI) or equivalent to it
Interrupt notification	Function *3: 8 interrupt input signals are arranged into a single output of interrupt signal INTA. An interrupt is generated at the rising edge (HIGH-to-LOW transition) or falling edge (LOW-to-HIGH transition). Output type: Open collector output (Pull-up: 15kΩ) Notification destination: Select from GPIO 4, 5, 6, or 22 (using DIP switch)
Bus specification	I2C bus (I2C1)
Max. module count for connection	Maximum of 8cards can be install in a same system. (Excluding RAS cards)
External circuit power supply	12 - 24VDC (±10%)
Connector	2 pieces 3.81mm pitch 10-pin terminal
Applicable wire	AWG28 - 16
Electricity consumption	5VDC 50mA 3.3V 1mA
Physical dimensions (mm)	65.0(W) x 56.5(D) (No protrusions) Spacer height : 12.5mm
Weight	50g

*1 Data "0" and "1" correspond to the High and Low levels, respectively.
*2 Data "0" and "1" correspond to the Low and High levels, respectively.
*3 For details on the interrupt notification function, see "Interrupt notification function" of reference manual.

Function specification < CPI-DI-16L >

Item	Description
Digital Input	
Input type	Opto-coupler isolated input output (supports current sink [negative logic] *1/current source output [positive logic] *2)
Number of input signal channels	16 (1 common for 8 channels)
Isolation	Opto-coupler Isolation
Voltage Resistance	AC1000Vrms
Input Resistance	4.7kΩ
Input ON current	2.0mA or more
Input OFF current	0.16mA or less
Response time	Within 200μsec
Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
Digital I/O control IC	TCA9535(TI) or equivalent to it
Interrupt notification	Function *3: 16 interrupt input signals are arranged into a single output of interrupt signal INTA. An interrupt is generated at the rising edge (HIGH-to-LOW transition) or falling edge (LOW-to-HIGH transition). Output type: Open collector output (Pull-up: 15kΩ) Notification destination: Select from GPIO 4, 5, 6, or 22 (using DIP switch)
Bus specification	I2C bus (I2C1)
Max. module count for connection	Maximum of 8cards can be install in a same system. (Excluding RAS cards)
External circuit power supply	12 - 24VDC (±10%)
Connector	2 pieces 3.81mm pitch 10-pin terminal
Applicable wire	AWG26 - 16
Electricity consumption	5VDC 20mA 3.3V 1mA
Physical dimensions (mm)	65.0(W) x 56.5(D) (No protrusions) Spacer height : 12.5mm
Weight	50g

*1 Data "0" and "1" correspond to the High and Low levels, respectively.
*2 Data "0" and "1" correspond to the Low and High levels, respectively.
*3 For details on the interrupt notification function, see "Interrupt notification function" of reference manual.

Function specification < CPI-DO-16L >

Item	Description
Digital Output	
Output type	Opto-coupler Isolation Open Collector Output (Current sink type) (negative logic) *1
Number of output signal channels	16 (1 common for 8 channels)
Isolation	Opto-coupler Isolation
Voltage Resistance	AC1000Vrms
Output rating	Output Voltage: 35VDC (Max.) Output Current: 100mA (Max.)
Residual Voltage with Output ON	0.5V or less (Output current ≤ 50mA), 1.0V or less (Output current ≤ 100mA)
Surge protector	Zener diode CMZB47 (TOSHIBA) or equivalent to it
Overcurrent protection	Fuse rating: 1 A (rush-resistant) (Connected to MCOM0, MCOM1 terminal)
Response time	Within 200μsec
Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
Digital I/O control IC	TCA9535(TI) or equivalent to it
Bus specification	I2C bus (I2C1)
Max. module count for connection	Maximum of 8cards can be install in a same system. (Excluding RAS cards)
External circuit power supply	12 - 24VDC (±10%)
Connector	2 pieces 3.81mm pitch 10-pin terminal
Applicable wire	AWG28 - 16
Electricity consumption	5VDC 80mA 3.3V 1mA
Physical dimensions (mm)	65.0(W) x 56.5(D) (No protrusions) Spacer height : 12.5mm
Weight	50g

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

Installation Environment Requirements

Item	Description	
Operating Temperature	-20 - +60°C	
Storage Temperature	-20 - +60°C	
Humidity	10 - 90%RH (No condensation)	
Floating dust particles	Not to be excessive	
Corrosive gases	None	
Line-noise resistance *4	Line noise	Signal Line /±1kV (IEC61000-4-4 Level 3, EN61000-4-4 Level 3)
	Static electricity resistance	Indirect discharge /±4kV (IEC61000-4-2 Level 2, EN61000-4-2 Level 2)
Vibration resistance	Sweep resistance	10 - 57Hz/semi-amplitude vibration 0.15mm, 57 - 150Hz/2.0G 40minutes each in X, Y, and Z directions (JIS C60068-2-6-compliant, IEC60068-2-6-compliant)
	Shock resistance	15G half-sine shock for 11ms in X, Y, and Z directions (JIS C 60068-2-27 -compliant, IEC 60068-2-27 -compliant)
Standard	VCCI Class A, FCC Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA	

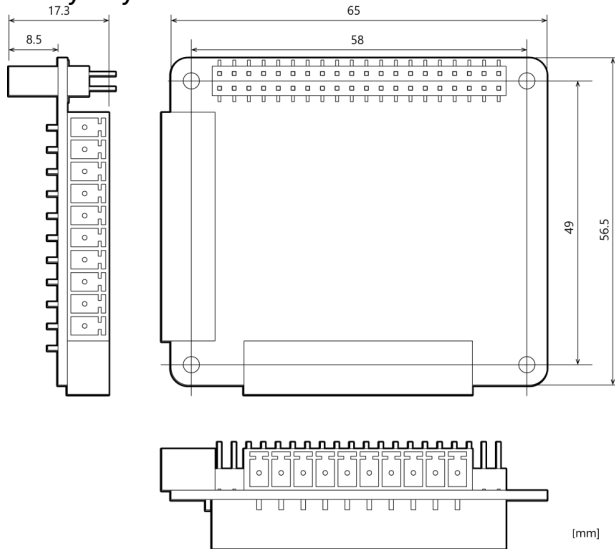
*4 When using the CPI-RAS.

Packing List

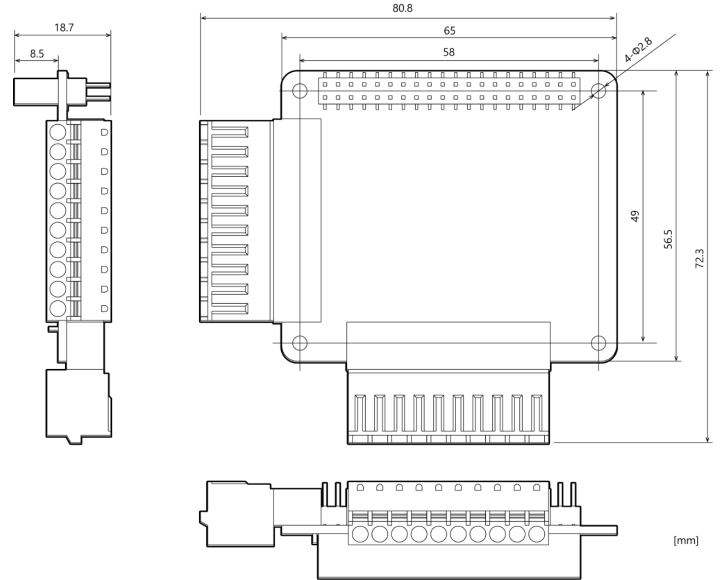
- Product [CPS-DIO-0808L, CPI-DI16L or CPI-DO-16L]...1
- 10-pin Connector...2 (Attached to the product)
- 40-pin Pin-header...1
- Plastic spacer for CPU card...1
- Hexagonal spacers...4 (Height 12.5mm)
- Three-point Sems Screw...4
- Nuts...4
- Product Guide & Warranty Certificate...1
- Serial Number Label ...1

External Dimensions

Main body only

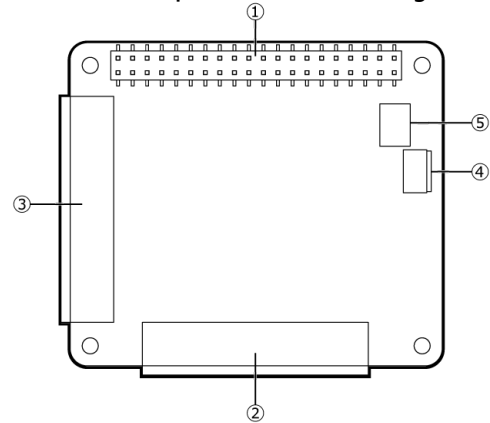


With connector attached



Component Name

Component name of the product is shown in Figure.

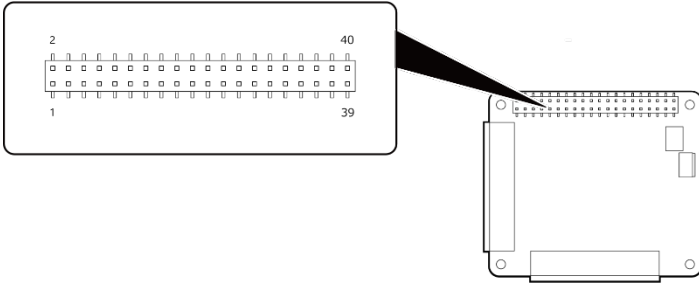


No.	Name	Function
1	GPIO 40 pin connector	This connector is used to connect to a Raspberry Pi or an expansion card.
2	Interface connector 1	This connector is used for digital input/output. It uses the included 10-pin connector.
3	Interface connector 2	This connector is used for digital input/output. It uses the included 10-pin connector.
4	Board ID setting switch	This setting switch is used to identify I2C communication expansion cards. The switch is used to change the I2C address.
5	DIP switch	This switch sets the GPIO pins to use for outputting the interrupt notification signal.

Description of Product Components

GPIO 40 pin connector

This connector is used to connect to a Raspberry Pi or an expansion card.



Pin Assignment

Pin No.	Signal Name	Description	Pin No.	Signal Name	Description
1	3.3V Power	3.3V power supply	2	5V Power	5V power supply
3	GPIO 2(I2C1 SDA)	I2C1 SDA	4	5V Power	5V power supply
5	GPIO 3(I2C1 SCL)	I2C1 SCL	6	Ground	GND
7	GPIO 4(GPCLK0)	INT_1 *1	8	GPIO 14(UART TX)	(Don't use)
9	Ground	GND	10	GPIO 15(UART RX)	(Don't use)
11	GPIO 17	(Don't use)	12	GPIO 18(PCM CLK)	(Don't use)
13	GPIO 27	(Don't use)	14	Ground	GND
15	GPIO 22	INT_2 *1	16	GPIO 23	(Don't use)
17	3.3V Power	3.3V power supply	18	GPIO 24	(Don't use)
19	GPIO 10(SPI0 MOSI)	(Don't use)	20	Ground	GND
21	GPIO 9(SPI0 MISO)	(Don't use)	22	GPIO 25	(Don't use)
23	GPIO 11(SPI0 SCLK)	(Don't use)	24	GPIO 8(SPI0 CE0)	(Don't use)
25	Ground	GND	26	GPIO 7(SPI0 CE1)	(Don't use)
27	GPIO 0(EEPROM SDA)	I2C0 SDA	28	GPIO 1(EEPROM SCL)	I2C0 SCL
29	GPIO 5	INT_3 *1	30	Ground	GND
31	GPIO 6	INT_4 *1	32	GPIO 12(PWM0)	(Don't use)
33	GPIO 13(PWM1)	(Don't use)	34	Ground	GND
35	GPIO 19(PCM FS)	(Don't use)	36	GPIO 16	(Don't use)
37	GPIO 26	(Don't use)	38	GPIO 20(PCM DIN)	(Don't use)
39	Ground	GND	40	GPIO 21(PCM DOUT)	(Don't use)

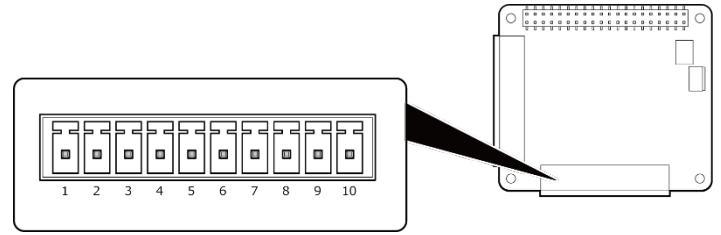
*1 Not used with the CPI-DO-16L.

Interface connector 1

This connector is used for digital input/output (Port 0). It uses the included 10-pin connector.

Connector type: DEGSON 15EDGKD-3.81-10P-13-00A(H)

PHOENIX CONTACT FK-MCP 1.5/10-ST-3.81 (or equivalent)



Pin Assignment <CPI-DIO-0808L>, <CPI-DI-16L>

Pin No.	Signal Name	Description
1	DI07	This indicates the input signals. It connects the output signals from the other devices.
2	DI06	This indicates the input signals. It connects the output signals from the other devices.
3	DI05	This indicates the input signals. It connects the output signals from the other devices.
4	DI04	This indicates the input signals. It connects the output signals from the other devices.
5	DI03	This indicates the input signals. It connects the output signals from the other devices.
6	DI02	This indicates the input signals. It connects the output signals from the other devices.
7	DI01	This indicates the input signals. It connects the output signals from the other devices.
8	DI00	This indicates the input signals. It connects the output signals from the other devices.
9	N.C.	This pin is not connected.
10	COM0	When connecting to sink output, connect this pin to the positive side of the external circuit power supply. When connecting to source output, connect this pin to the negative side of the external circuit power supply. There is one common for DI0 to DI7.

Pin Assignment <CPI-DO-16L>

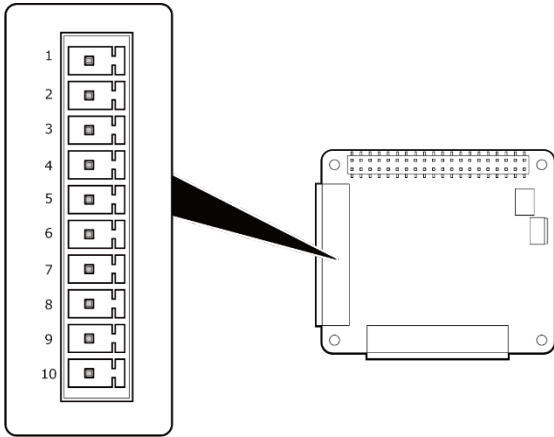
Pin No.	Signal Name	Description
1	DO07	This indicates the output signals. It connects the input signals from the other devices.
2	DO06	This indicates the output signals. It connects the input signals from the other devices.
3	DO05	This indicates the output signals. It connects the input signals from the other devices.
4	DO04	This indicates the output signals. It connects the input signals from the other devices.
5	DO03	This indicates the output signals. It connects the input signals from the other devices.
6	DO02	This indicates the output signals. It connects the input signals from the other devices.
7	DO01	This indicates the output signals. It connects the input signals from the other devices.
8	DO00	This indicates the output signals. It connects the input signals from the other devices.
9	MCOM0	Connect this pin to the negative side of the external circuit power supply. There is one common for DO00 to DO07.
10	PCOM0	Connect this pin to the positive side of the external circuit power supply. There is one common for DO00 to DO07.

Interface connector 2

This connector is used for digital input/output (Port 1). It uses the included 10-pin connector.

Connector type: DEGSON 15EDGKD-3.81-10P-13-00A(H)

PHOENIX CONTACT FK-MCP 1.5/10-ST-3.81 (or equivalent)



Pin Assignment <CPI-DIO-0808L>, <CPI-DO-16L>

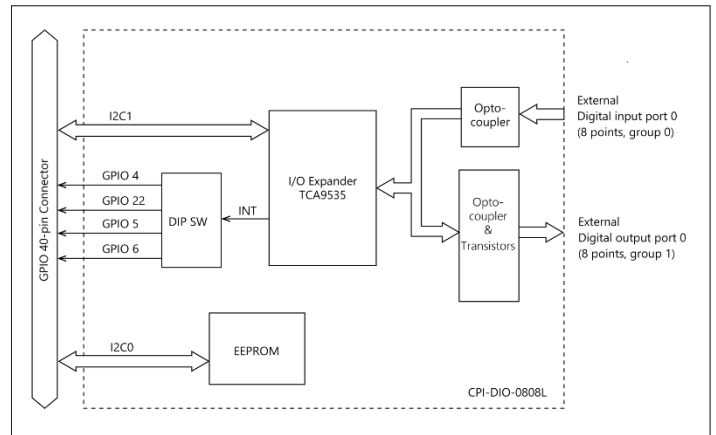
Pin No.	Signal Name	Description
1	DO17	This indicates the output signals. It connects the input signals from the other devices.
2	DO16	This indicates the output signals. It connects the input signals from the other devices.
3	DO15	This indicates the output signals. It connects the input signals from the other devices.
4	DO14	This indicates the output signals. It connects the input signals from the other devices.
5	DO13	This indicates the output signals. It connects the input signals from the other devices.
6	DO12	This indicates the output signals. It connects the input signals from the other devices.
7	DO11	This indicates the output signals. It connects the input signals from the other devices.
8	DO10	This indicates the output signals. It connects the input signals from the other devices.
9	MCOM1	Connect this pin to the negative side of the external circuit power supply. There is one common for DO10 to DO17.
10	PCOM1	Connect this pin to the positive side of the external circuit power supply. There is one common for DO10 to DO17.

Pin Assignment <CPI-DI-16L>

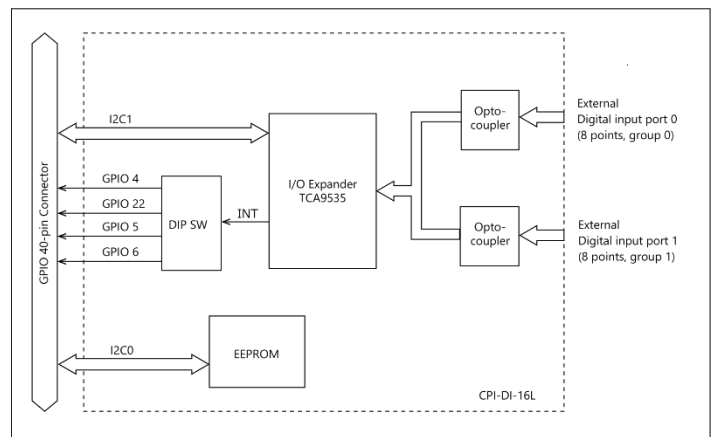
Pin No.	Signal Name	Description
1	DI17	This indicates the input signals. It connects the output signals from the other devices.
2	DI16	This indicates the input signals. It connects the output signals from the other devices.
3	DI15	This indicates the input signals. It connects the output signals from the other devices.
4	DI14	This indicates the input signals. It connects the output signals from the other devices.
5	DI13	This indicates the input signals. It connects the output signals from the other devices.
6	DI12	This indicates the input signals. It connects the output signals from the other devices.
7	DI11	This indicates the input signals. It connects the output signals from the other devices.
8	DI10	This indicates the input signals. It connects the output signals from the other devices.
9	N.C.	This pin is not connected.
10	PCOM1	When connecting to sink output, connect this pin to the positive side of the external circuit power supply. When connecting to source output, connect this pin to the negative side of the external circuit power supply. There is one common for DI10 to DI17.

Circuit Block Diagram

CPI-DIO-0808L



CPI-DI-16L



CPI-DO-16L

