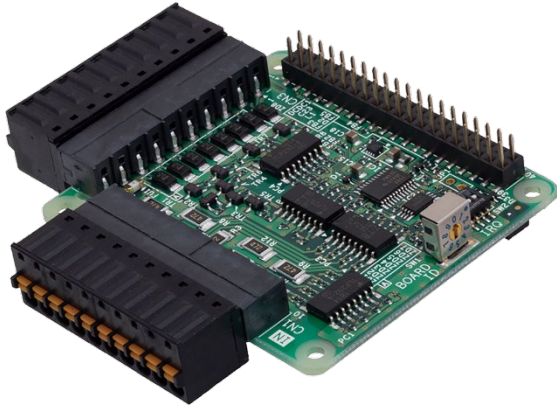## Raspberry Pi Expansion Card
Digital I/O Card with Opto-Isolation
CPI-DIO-0808RL
Digital Output Card with Opto-Isolation
CPI-DO-16RL

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

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

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

* The contents in this document are subject to change without notice.
* 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.

Features

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

CPI-DO-16RL has the opto-coupler isolated output 16ch (current source 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-0808RL only)
The CPS-DIO-0808RL can output a signal to a Raspberry Pi's GPIO pins to notify of changes in the input signal. 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.
To protect against surge voltage, Zener diodes are connected to the CPI-DIO-0808RL and CPI-DO-16RL output circuits.
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.

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.

Specification

Function specification < CPI-DIO-0808RL >

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	8 (1 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 source type) (negative logic) *2
	Number of output signal channels	8 (1 common)
	Isolation	Opto-coupler Isolation
	Voltage Resistance	AC1000Vrms
Output rating	Output Voltage	35VDC (Max.)
	Output Current	100mA (Max.)
	Residual Voltage with Output ON	1.5V 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 PCOM1 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		AWG26 - 16

Item	Description
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-DO-16RL >

Item		Description
Digital Output		
	Output type	Opto-coupler Isolation Open Collector Output (Current source 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	1.5V 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 PCOM0, PCOM1 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		AWG26 - 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-0808RL or CPI-DO-16RL]...1
10-pi 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

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

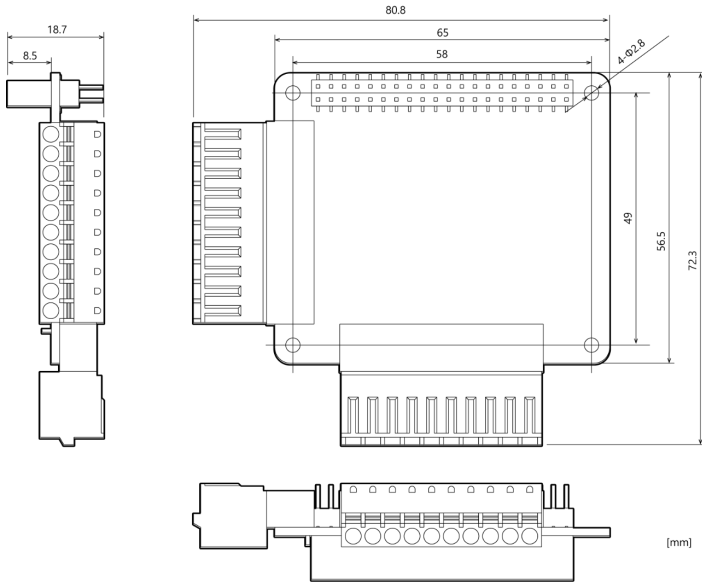| Product Name	Model type	Description
RAS card	CPI-RAS	RAS/RTC function, 8 to 28 VDC input function expansion
DIN RAIL ADAPTER	CPI-DIN01	

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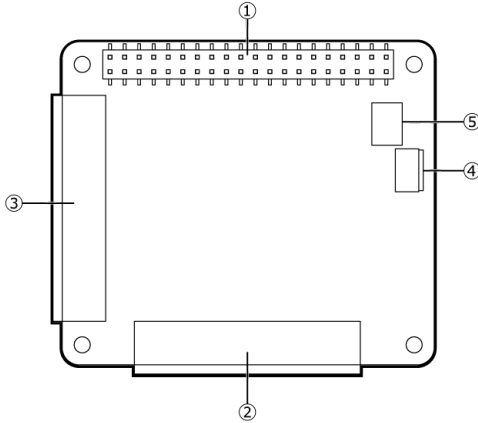
External Dimensions

Main body only

[mm]
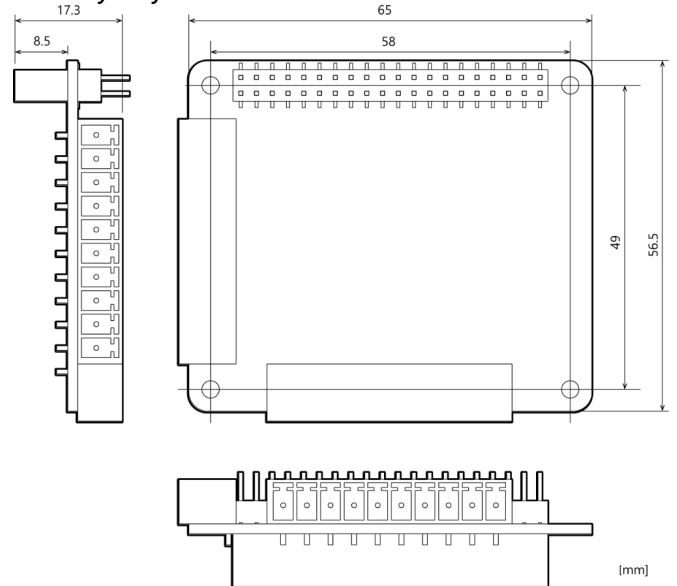
With connector attached

[mm]

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.
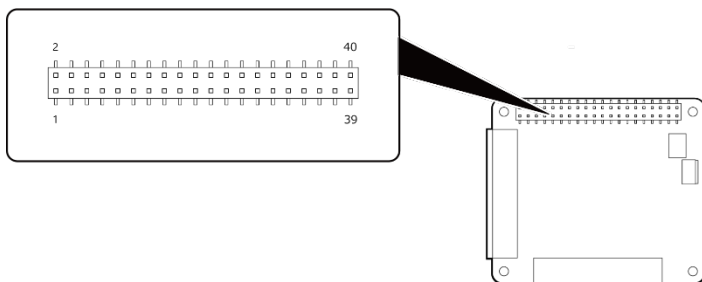
Pin Assignment

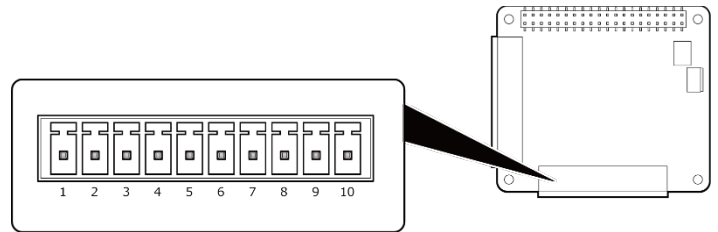| Pin No.	Signal Name	Description	Pin No.	Signal Name	Description
1	3.3V Power	3.3V power supply	2	5V Power	5V power supply
3	GPIO 2(I2C1 SDA)	I2C1 SDA	4	5V Power	5V power supply
5	GPIO 3(I2C1 SCL)	I2C1 SCL	6	Ground	GND
7	GPIO 4(GPCLK0)	INT_1 *1	8	GPIO 14(UART TX)	(Don't use)
9	Ground	GND	10	GPIO 15(UART 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-16RL.

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)

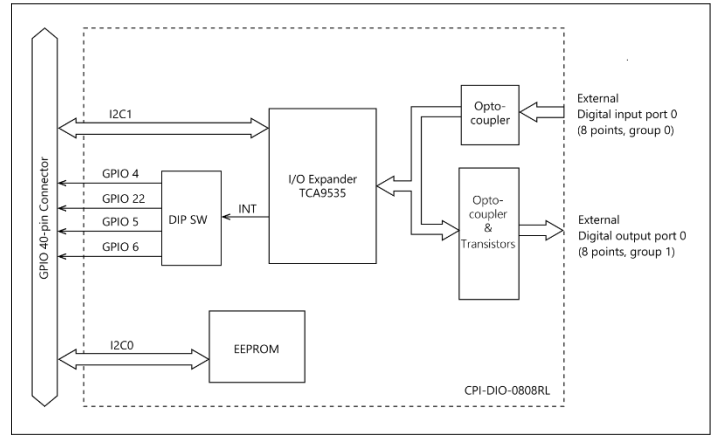PHOENIX CONTACT FK-MCP 1.5/10-ST-3.81 (or equivalent)

Pin Assignment <CPI-DIO-0808RL>

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	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.
10	N.C.	This pin is not connected.

Pin Assignment <CPI-DO-16RL>

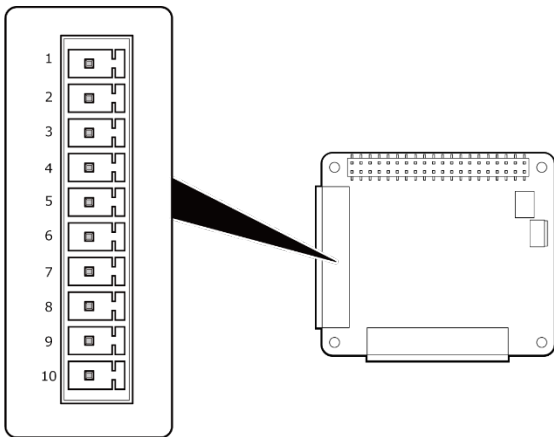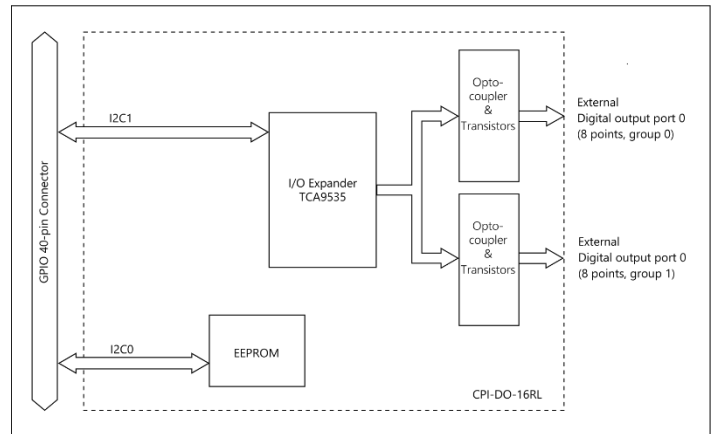| Pin No.	Signal Name	Description
1	DO07	This indicates the output signals. It connects the input signals from the other devices.
2	DO06	This indicates the output signals. It connects the input signals from the other devices.
3	DO05	This indicates the output signals. It connects the input signals from 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	N.C.	This pin is not connected.
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

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	N.C.	This pin is not connected.
10	PCOM1	Connect this pin to the positive side of the external circuit power supply. There is one common for DO10 to DO17.

Circuit Block Diagram

CPI-DIO-0808RL

CPI-DO-16RL