THSB-FMC-02CL
User Manual

GENERAL DESCRIPTION

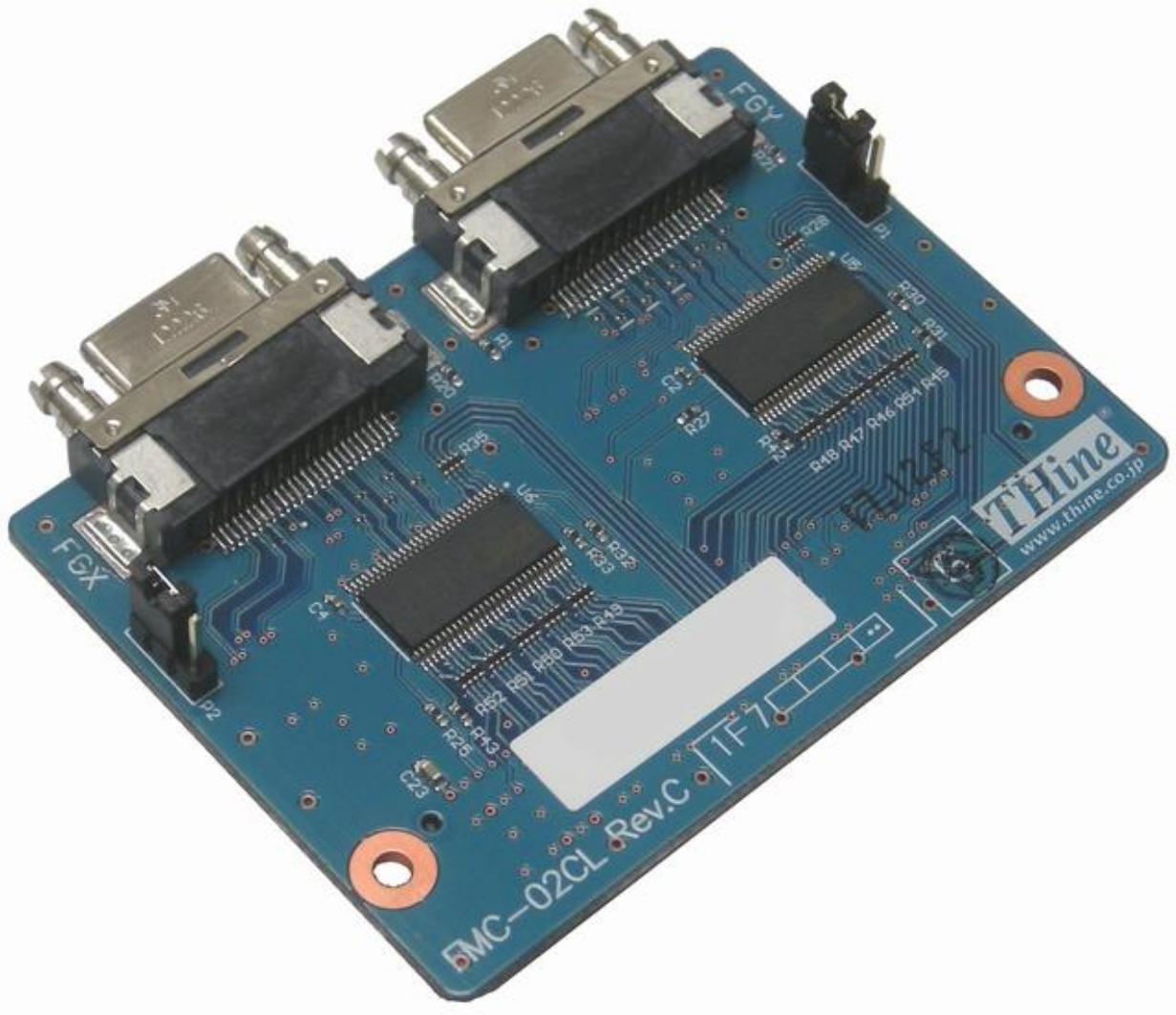
THSB-FMC-02CL is an FMC/LPC daughter card supporting Camera Link receivers. Allows to receive a data stream of Base and Medium configuration of Camera Link.

THC63LVDR84C is applied as Camera Link receiver to provide stable transmission system on long-distance cables.

THSB-FMC-02CL also supports PoCL (Power over Camera Link) standard and enables to supply 12 V power to camera modules.

FEATURE

* W 70mm x H 50mm small size
* FMC/LPC Standard [Vita 57.1] Connector
* 26pin SDR connector for camera link input
* THCV63LVDR84C for channel link receiver, the highest quality of skew margin
* Support PoCL (Power over Camera Link)
* Support 3.3V only for VADJ power supply



FOR SAFETY PURPOSES, SEE 'PRECAUTIONS FOR POCL' OF CHAPTER 3

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FIGURE

TABLE

1. SAFETY PRECAUTIONS

Observe the precautions listed below to prevent injuries to you or other personnel or damage to property.

- Before using the product, read these safety precautions carefully.
- These precautions contain serious safety instructions that must be observed.
- After reading through this manual, be sure to keep it always handy.

The following conventions are used to indicate the possibility of injury/damage and classify precautions if the product is handled incorrectly.

Danger	Indicates the high possibility of serious injury or death if the product is handled incorrectly.
Warning	Indicates the possibility of serious injury or death if the product is handled incorrectly.
Caution	Indicates the possibility of injury or physical damage in connection with houses or household goods if the product is handled incorrectly.

The following graphical symbols are used to indicate and classify precautions in this manual. (Examples)

	**Turn off the power switch.**
	**Do not disassemble the product.**
	**Do not attempt this.**

Warning	
	**In the event of a failure, disconnect the power supply.** If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately and contact our sales personnel for repair.
	**If an unpleasant smell or smoking occurs, disconnect the power supply.** If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately. After verifying that no smoking is observed, contact our sales personnel for repair.
	**Do not disassemble, repair or modify the product.** Otherwise, a fire or electric shock may occur due to a short circuit or heat generation. For inspection, modification or repair, contact our sales personnel.
	**Do not place the product on unstable locations.** Otherwise, it may drop or fall, resulting in injury to persons or failure.
	**If the product is dropped or damaged, do not use it as is.** Otherwise, a fire or electric shock may occur.
	**Do not touch the product with a metallic object.** Otherwise, a fire or electric shock may occur.
	**Do not place the product in a place with dusty or humidity or getting water.** Otherwise, a fire or electric shock may occur.
	**Do not get the product wet or touch it with a wet hand.** Otherwise, the product may break down or it may cause a fire, smoking or electric shock.
	**Do not touch a connector on the product (gold-plated portion).** Otherwise, the surface of a connector may be contaminated with sweat or skin oil, resulting in contact failure of a connector or it may cause a malfunction, fire or electric shock due to static electricity.

Caution	
	**Do not use or place the product in the following locations.** - Humid and dusty locations - Airless locations such as closet or bookshelf - Locations which receive oily smoke or steam - Locations exposed to direct sunlight - Locations close to heating equipment - Closed inside of a car where the temperature becomes high - Staticky locations - Locations close to water or chemicals Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.
	**Do not place heavy things on the product.** Otherwise, the product may be damaged.

2. Disclaimer

This product is an evaluation board intended for **FMC interface Card** function. THine Electronics, Inc. assumes no responsibility for any damages resulting from the use of this product for purposes other than those stated.

Even if the product is used properly, THine Electronics, Inc. assumes no responsibility for any damages caused by:

(1) Earthquake, thunder, natural disaster or fire resulting from the use beyond our responsibility, acts by a third party or other accidents, the customer's willful or accidental misuse or use under other abnormal conditions.

(2) Secondary impact arising from use of this product or its unusable state (business interruption or others)

(3) Use of this product against the instructions given in this manual.

(4) Malfunctions due to connection to other devices.

THine Electronics, Inc. assumes no responsibility or liability for:

(1) Erasure or corruption of data arising from use of this product.

(2) Any consequences or other abnormalities arising from use of this product, or

(3) Damage of this product not due to our responsibility or failure due to modification

This product has been developed by assuming its use for research, testing or evaluation. It is not authorized for use in any system or application that requires high reliability.

Repair of this product is carried out by replacing it on a chargeable basis, not repairing the faulty devices. However, non-chargeable replacement is offered for initial failure if such notification is received within two weeks after delivery of the product.

The specification of this product is subject to change without prior notice. The product is subject to discontinuation without prior notice.

3. Precautions for PoCL

This product is applied PoCL (Power over Camera Link) system. Before using the product, read this special precaution carefully.

 **Special Precaution**	
	**Do not supply 12 V power to non-supported PoCL camera modules** Otherwise, the product and camera may break down or it may cause a fire, smoking or electric shock. Check your camera whether it supports PoCL or not and set jumpers (P1/P2) to 12 V if the camera supports PoCL.

4. Block Diagram

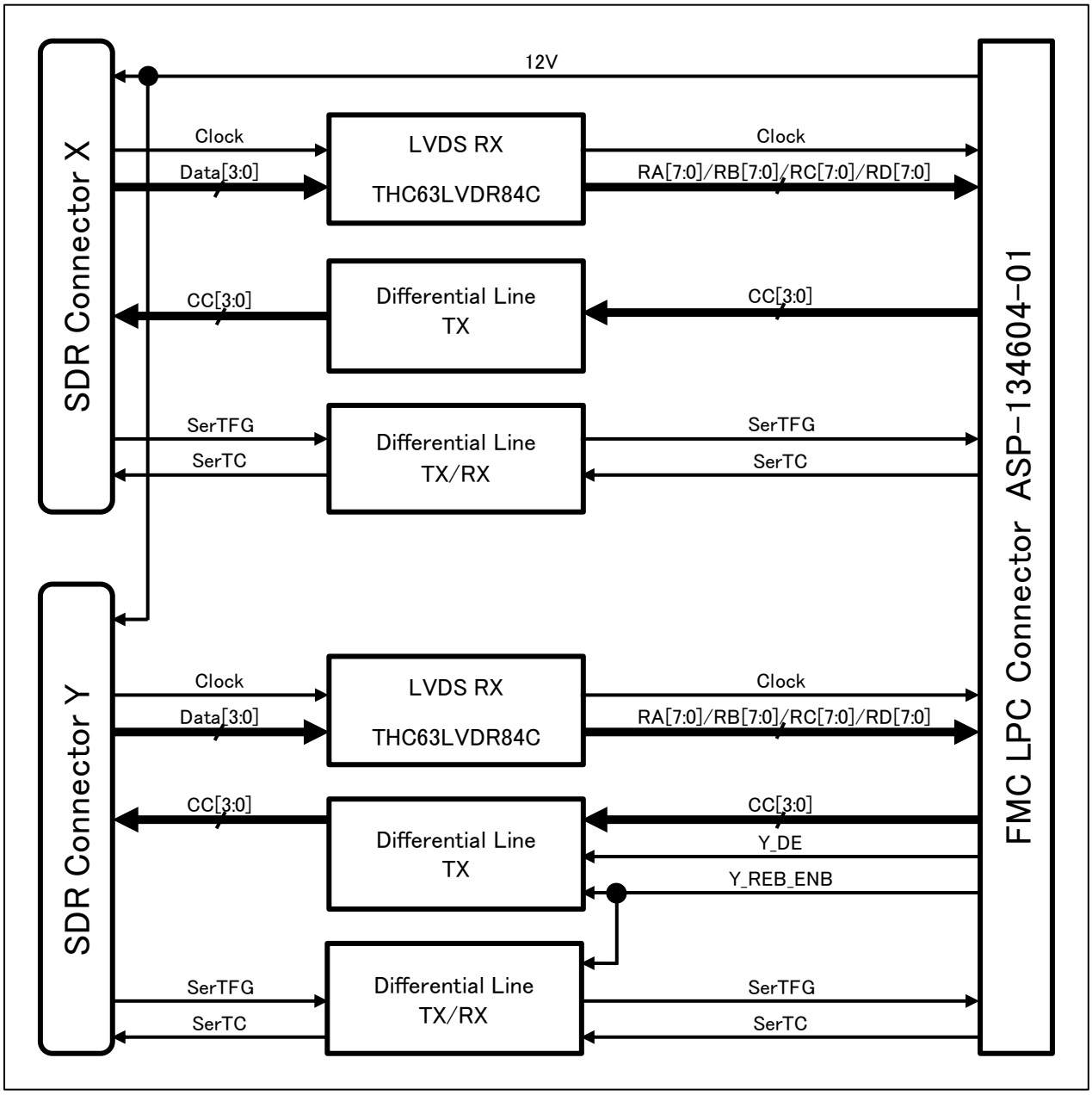


Fig 4-1 Block Diagram

5. Top & Bottom View

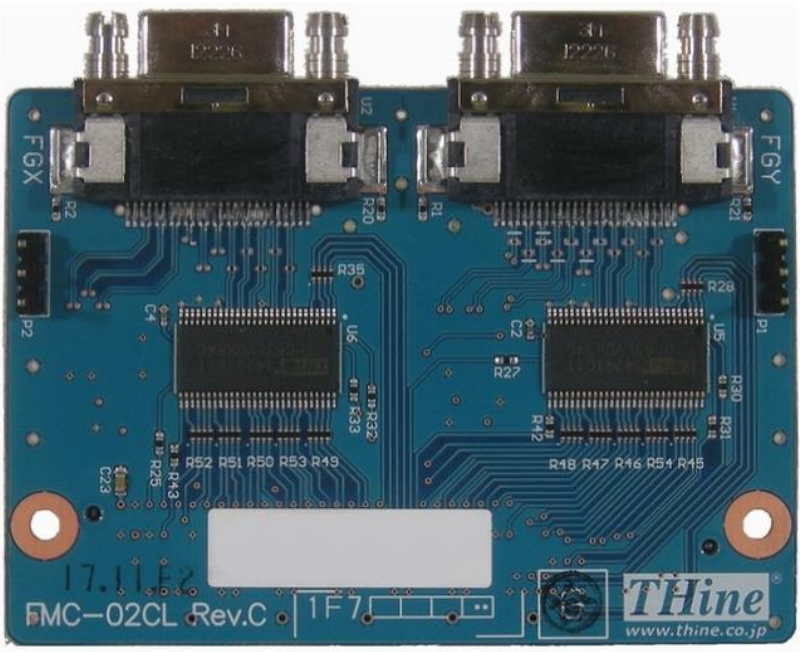


Fig 5-1 Top View

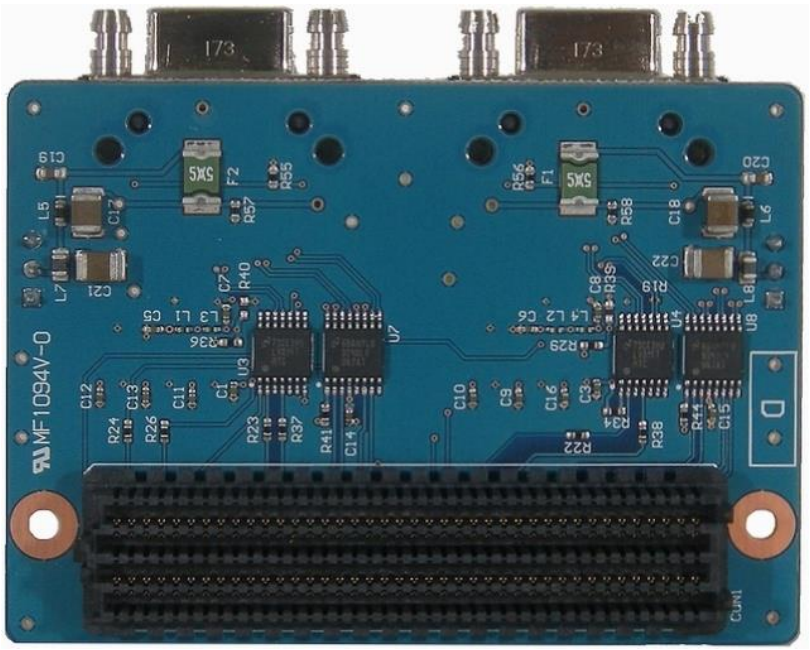


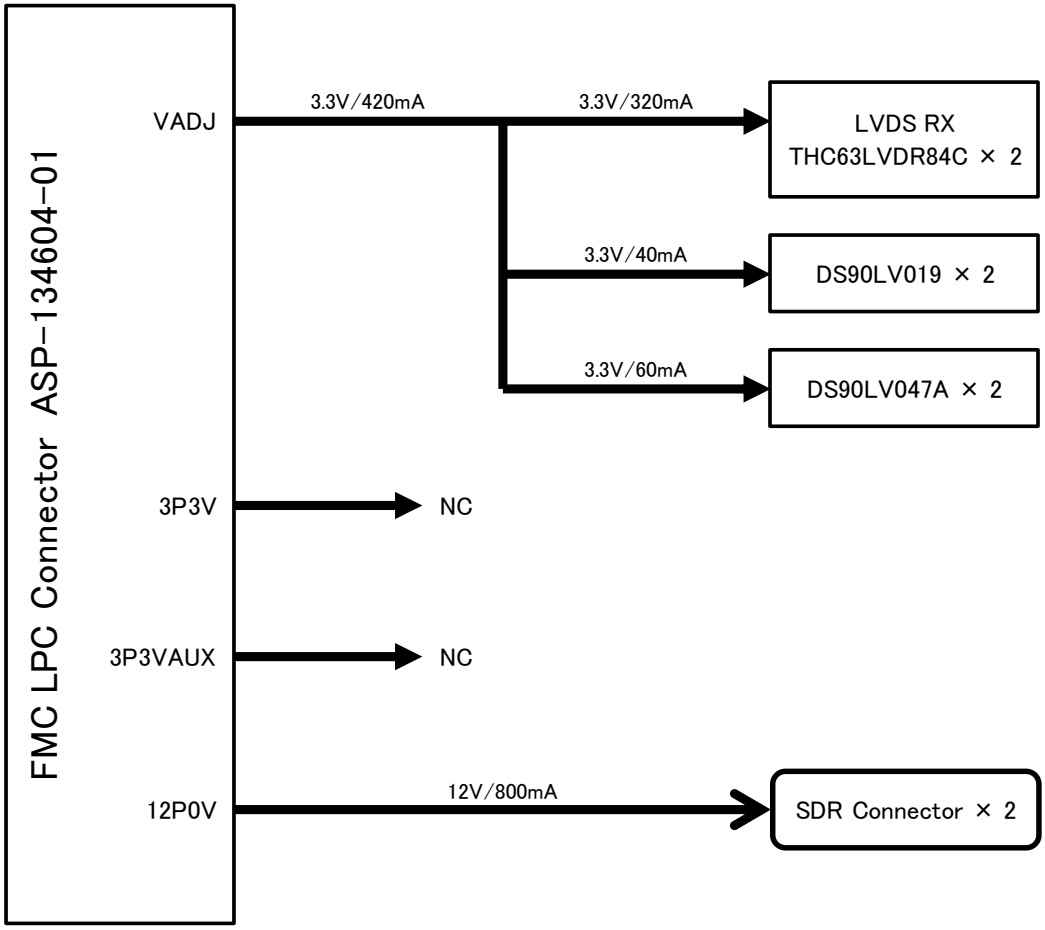
Fig 5-2 Bottom View

6. Board Specification

Outline Size	: W: 70mm × H: 50mm
Layer Structure	: 4 Layer
Thickness of PCB	: 1.6 mm
Material	: FR-4
FMC Connector	: Samtec, ASP-134604-01
MMCX Connector	: Molex, 0734151471
ChannelLink RX IC	: THine Electronics, THC63LVDR84C
Serial Command IC	: Texas Instruments, DS90LV019
CameraLink Control IC	: Texas Instruments, DS90LV047A

7. Power Supply System

Use 3.3 V for VADJ voltage on your FPGA board. Other voltage is not supported.



Use 3.3 V for VADJ Power Supply on your FPGA board

Fig 7-1 Power Supply System

8. Pin Assignment of FMC Connector

Table 8-1 Color Indicator for Pin Assignment

Color Indicator	Description
	Signals from SDR connector X
	Signals from SDR connector Y

Table 8-2 Pin Assignment of FMC C/D columns

THSB-FMC-02CL Signal Name	Column C		Column D	THSB-FMC-02CL Signal Name
GND	GND	1	PG_C2M	GND
NC	DP0_C2M_P	2	GND	GND
NC	DP0_C2M_N	3	GND	GND
GND	GND	4	GBTCLK0_M2C_P	NC
GND	GND	5	GBTCLK0_M2C_N	NC
NC	DP0_M2C_P	6	GND	GND
NC	DP0_M2C_N	7	GND	GND
GND	GND	8	LA01_P_CC	CL-Y-RC6
GND	GND	9	LA01_N_CC	CL-Y-RD0
CL-Y-RC4	LA06_P	10	GND	GND
CL-Y-RC5	LA06_N	11	LA05_P	CL-Y-RC3
GND	GND	12	LA05_N	CL-Y-RD6
GND	GND	13	GND	GND
SerTFG-Y-Rout	LA10_P	14	LA09_P	SerTC-Y-Din
CC-Y-Din2	LA10_N	15	LA09_N	CC-Y-Din1
GND	GND	16	GND	GND
GND	GND	17	LA13_P	CC-Y-Din3
CC-Y-Din4	LA14_P	18	LA13_N	CL-Y-RA1
CL-Y-RA0	LA14_N	19	GND	GND
GND	GND	20	LA17_P_CC	CL-X-RC5
GND	GND	21	LA17_N_CC	CL-X-RC4
CL-X-RC6	LA18_P_CC	22	GND	GND
SerTC-X-Din	LA18_N_CC	23	LA23_P	CL-X-RD0
GND	GND	24	LA23_N	SerTFG-X-Rout
GND	GND	25	GND	GND
CC-X-Din2	LA27_P	26	LA26_P	CC-X-Din1
CC-X-Din4	LA27_N	27	LA26_N	CC-X-Din3
GND	GND	28	GND	GND
GND	GND	29	TCK	NC
NC	SCL	30	TDI	NC
NC	SDA	31	TDO	NC
GND	GND	32	3P3VAUX	NC
GND	GND	33	TMS	NC
NC	GA0	34	TRST_L	NC
12P0V	12P0V	35	GA1	NC
GND	GND	36	3P3V	NC
12P0V	12P0V	37	GND	GND
GND	GND	38	3P3V	NC
NC	3P3V	39	GND	GND
GND	GND	40	3P3V	NC

Table 8-3 Pin Assignment of FMC G/H columns

THSB-FMC-02CL Signal Name	Column G		Column H	THSB-FMC-02CL Signal Name
GND	GND	1	VREF_A_M2C	NC
CL-X-CLK	CLK1_M2C_P	2	PRSNT_M2C_L	NC
Y-REB-ENB	CLK1_M2C_N	3	GND	GND
GND	GND	4	CLK0_M2C_P	CL-Y-CLK
GND	GND	5	CLK0_M2C_N	Y-DE
CL-Y-RC2	LA00_P_CC	6	GND	GND
CL-Y-RC0	LA00_N_CC	7	LA02_P	CL-Y-RC1
GND	GND	8	LA02_N	CL-Y-RB6
CL-Y-RD5	LA03_P	9	GND	GND
CL-Y-RB5	LA03_N	10	LA04_P	CL-Y-RD4
GND	GND	11	LA04_N	CL-Y-RB3
CL-Y-RB4	LA08_P	12	GND	GND
CL-Y-RB2	LA08_N	13	LA07_P	CL-Y-RD3
GND	GND	14	LA07_N	CL-Y-RD2
CL-Y-RB1	LA12_P	15	GND	GND
CL-Y-RB0	LA12_N	16	LA11_P	CL-Y-RA6
GND	GND	17	LA11_N	CL-Y-RA5
CL-Y-RD1	LA16_P	18	GND	GND
CL-Y-RA3	LA16_N	19	LA15_P	CL-Y-RA4
GND	GND	20	LA15_N	CL-Y-RA2
CL-X-RD6	LA20_P	21	GND	GND
CL-X-RC1	LA20_N	22	LA19_P	CL-X-RC3
GND	GND	23	LA19_N	CL-X-RC2
CL-X-RC0	LA22_P	24	GND	GND
CL-X-RD5	LA22_N	25	LA21_P	CL-X-RB6
GND	GND	26	LA21_N	CL-X-RD4
CL-X-RB5	LA25_P	27	GND	GND
CL-X-RB3	LA25_N	28	LA24_P	CL-X-RB4
GND	GND	29	LA24_N	CL-X-RB2
CL-X-RD3	LA29_P	30	GND	GND
CL-X-RB1	LA29_N	31	LA28_P	CL-X-RD2
GND	GND	32	LA28_N	CL-X-RB0
CL-X-RA6	LA31_P	33	GND	GND
CL-X-RA5	LA31_N	34	LA30_P	CL-X-RD1
GND	GND	35	LA30_N	CL-X-RA4
CL-X-RA3	LA33_P	36	GND	GND
CL-X-RA2	LA33_N	37	LA32_P	CL-X-RA1
GND	GND	38	LA32_N	CL-X-RA0
VADJ	VADJ	39	GND	GND
GND	GND	40	VADJ	VADJ

9. Pin Description of FMC Connector

Table 9-1 Pin Description of FMC Connector

Signal Name	FMC Pin Name	Pin Direction	Description
CL-X-CLK	CLK1_M2C_P	Output	SDR connector X, LVDS pixel clock
CL-X-RA0	LA32_N	Output	SDR connector X, pixel data bit 0
CL-X-RA1	LA32_P	Output	SDR connector X, pixel data bit 1
CL-X-RA2	LA33_N	Output	SDR connector X, pixel data bit 2
CL-X-RA3	LA33_P	Output	SDR connector X, pixel data bit 3
CL-X-RA4	LA30_N	Output	SDR connector X, pixel data bit 4
CL-X-RA5	LA31_N	Output	SDR connector X, pixel data bit 5
CL-X-RA6	LA31_P	Output	SDR connector X, pixel data bit 6
CL-X-RB0	LA28_N	Output	SDR connector X, pixel data bit 7
CL-X-RB1	LA29_N	Output	SDR connector X, pixel data bit 8
CL-X-RB2	LA24_N	Output	SDR connector X, pixel data bit 9
CL-X-RB3	LA25_N	Output	SDR connector X, pixel data bit 10
CL-X-RB4	LA24_P	Output	SDR connector X, pixel data bit 11
CL-X-RB5	LA25_P	Output	SDR connector X, pixel data bit 12
CL-X-RB6	LA21_P	Output	SDR connector X, pixel data bit 13
CL-X-RC0	LA22_P	Output	SDR connector X, pixel data bit 14
CL-X-RC1	LA20_N	Output	SDR connector X, pixel data bit 15
CL-X-RC2	LA19_N	Output	SDR connector X, pixel data bit 16
CL-X-RC3	LA19_P	Output	SDR connector X, pixel data bit 17
CL-X-RC4	LA17_N_CC	Output	SDR connector X, pixel data bit 18
CL-X-RC5	LA17_P_CC	Output	SDR connector X, pixel data bit 19
CL-X-RC6	LA18_P_CC	Output	SDR connector X, pixel data bit 20
CL-X-RD0	LA23_P	Output	SDR connector X, pixel data bit 21
CL-X-RD1	LA30_P	Output	SDR connector X, pixel data bit 22
CL-X-RD2	LA28_P	Output	SDR connector X, pixel data bit 23
CL-X-RD3	LA29_P	Output	SDR connector X, pixel data bit 24
CL-X-RD4	LA21_N	Output	SDR connector X, pixel data bit 25
CL-X-RD5	LA22_N	Output	SDR connector X, pixel data bit 26
CL-X-RD6	LA20_P	Output	SDR connector X, pixel data bit 27
CC-X-Din1	LA26_P	Input	SDR connector X, Camera Control 1
CC-X-Din2	LA27_P	Input	SDR connector X, Camera Control 2
CC-X-Din3	LA26_N	Input	SDR connector X, Camera Control 3
CC-X-Din4	LA27_N	Input	SDR connector X, Camera Control 4
SerTC-X-Din	LA18_N_CC	Input	SDR connector X, SERTC Serial Command to Camera.
SerTFG-X-Rout	LA23_N	Output	SDR connector X, SERTFG serial Command from Camera

CL-Y-CLK	CLK0_M2C_P	Output	SDR connector Y, LVDS pixel clock
CL-Y-RA0	LA14_N	Output	SDR connector Y, pixel data bit 0
CL-Y-RA1	LA13_N	Output	SDR connector Y, pixel data bit 1
CL-Y-RA2	LA15_N	Output	SDR connector Y, pixel data bit 2
CL-Y-RA3	LA16_N	Output	SDR connector Y, pixel data bit 3
CL-Y-RA4	LA15_P	Output	SDR connector Y, pixel data bit 4
CL-Y-RA5	LA11_N	Output	SDR connector Y, pixel data bit 5
CL-Y-RA6	LA11_P	Output	SDR connector Y, pixel data bit 6
CL-Y-RB0	LA12_N	Output	SDR connector Y, pixel data bit 7
CL-Y-RB1	LA12_P	Output	SDR connector Y, pixel data bit 8
CL-Y-RB2	LA08_N	Output	SDR connector Y, pixel data bit 9
CL-Y-RB3	LA04_N	Output	SDR connector Y, pixel data bit 10
CL-Y-RB4	LA08_P	Output	SDR connector Y, pixel data bit 11
CL-Y-RB5	LA03_N	Output	SDR connector Y, pixel data bit 12
CL-Y-RB6	LA02_N	Output	SDR connector Y, pixel data bit 13
CL-Y-RC0	LA00_N_CC	Output	SDR connector Y, pixel data bit 14
CL-Y-RC1	LA02_P	Output	SDR connector Y, pixel data bit 15
CL-Y-RC2	LA00_P_CC	Output	SDR connector Y, pixel data bit 16
CL-Y-RC3	LA05_P	Output	SDR connector Y, pixel data bit 17
CL-Y-RC4	LA06_P	Output	SDR connector Y, pixel data bit 18
CL-Y-RC5	LA06_N	Output	SDR connector Y, pixel data bit 19
CL-Y-RC6	LA01_P_CC	Output	SDR connector Y, pixel data bit 20
CL-Y-RD0	LA01_N_CC	Output	SDR connector Y, pixel data bit 21
CL-Y-RD1	LA16_P	Output	SDR connector Y, pixel data bit 22
CL-Y-RD2	LA07_N	Output	SDR connector Y, pixel data bit 23
CL-Y-RD3	LA07_P	Output	SDR connector Y, pixel data bit 24
CL-Y-RD4	LA04_P	Output	SDR connector Y, pixel data bit 25
CL-Y-RD5	LA03_P	Output	SDR connector Y, pixel data bit 26
CL-Y-RD6	LA05_N	Output	SDR connector Y, pixel data bit 27
CC-Y-Din1	LA09_N	Input	SDR connector Y, Camera Control 1
CC-Y-Din2	LA10_N	Input	SDR connector Y, Camera Control 2
CC-Y-Din3	LA13_P	Input	SDR connector Y, Camera Control 3
CC-Y-Din4	LA14_P	Input	SDR connector Y, Camera Control 4
SerTC-Y-Din	LA09_P	Input	SDR connector Y, SERTC Serial Command to Camera
SerTFG-Y-Rout	LA10_P	Output	SDR connector Y, SERTFG serial Command from Camera
Y-DE	CLK0_M2C_N	Output	SDR connector Y, Camera Control *
Y-REB-ENB	CLK1_M2C_N	Output	SDR connector Y, Serial Command *

(*) see section 12 about Y-DE / Y-REB-ENB

10. How to connect Camera Link cables

This product supports Base/Medium configuration and Dual Base configuration of Camera Link.

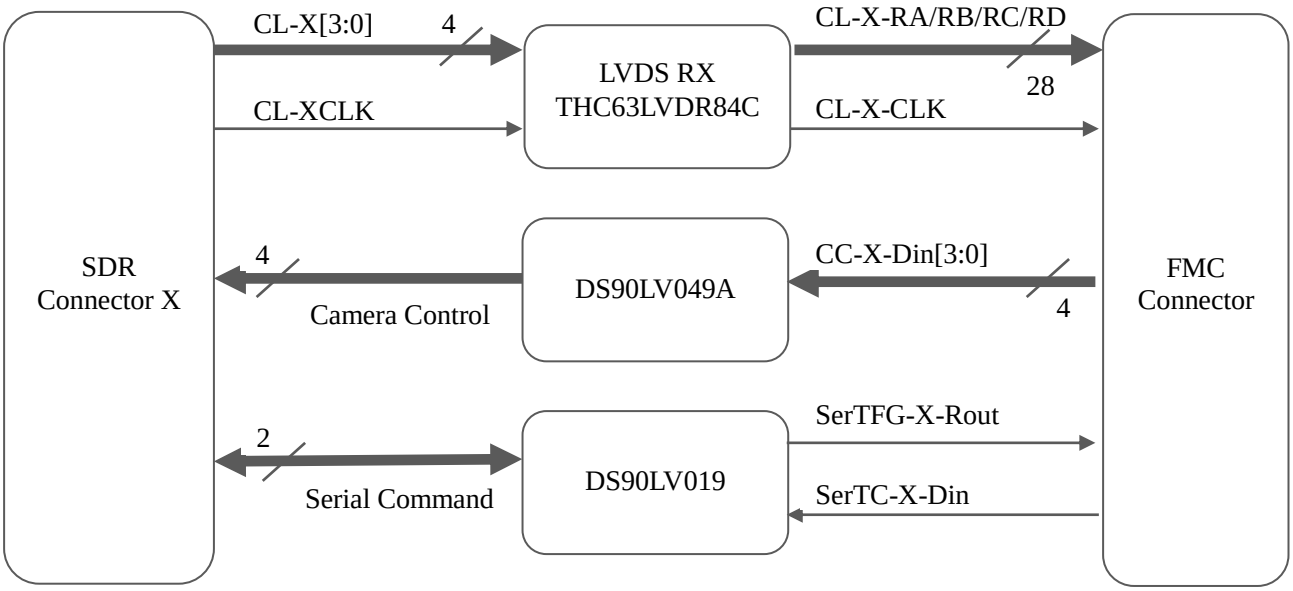


Fig 10-1 Base Configuration

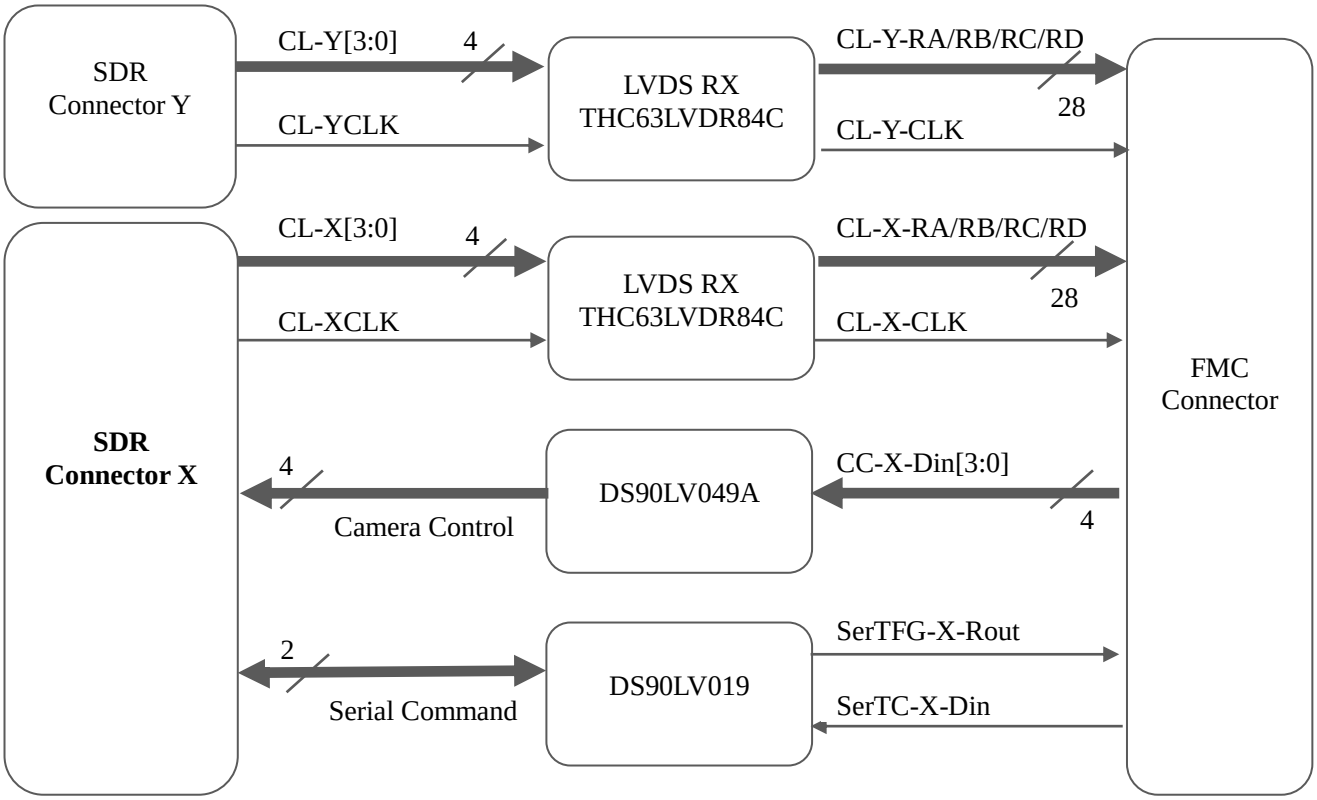


Fig 10-2 Medium Configuration

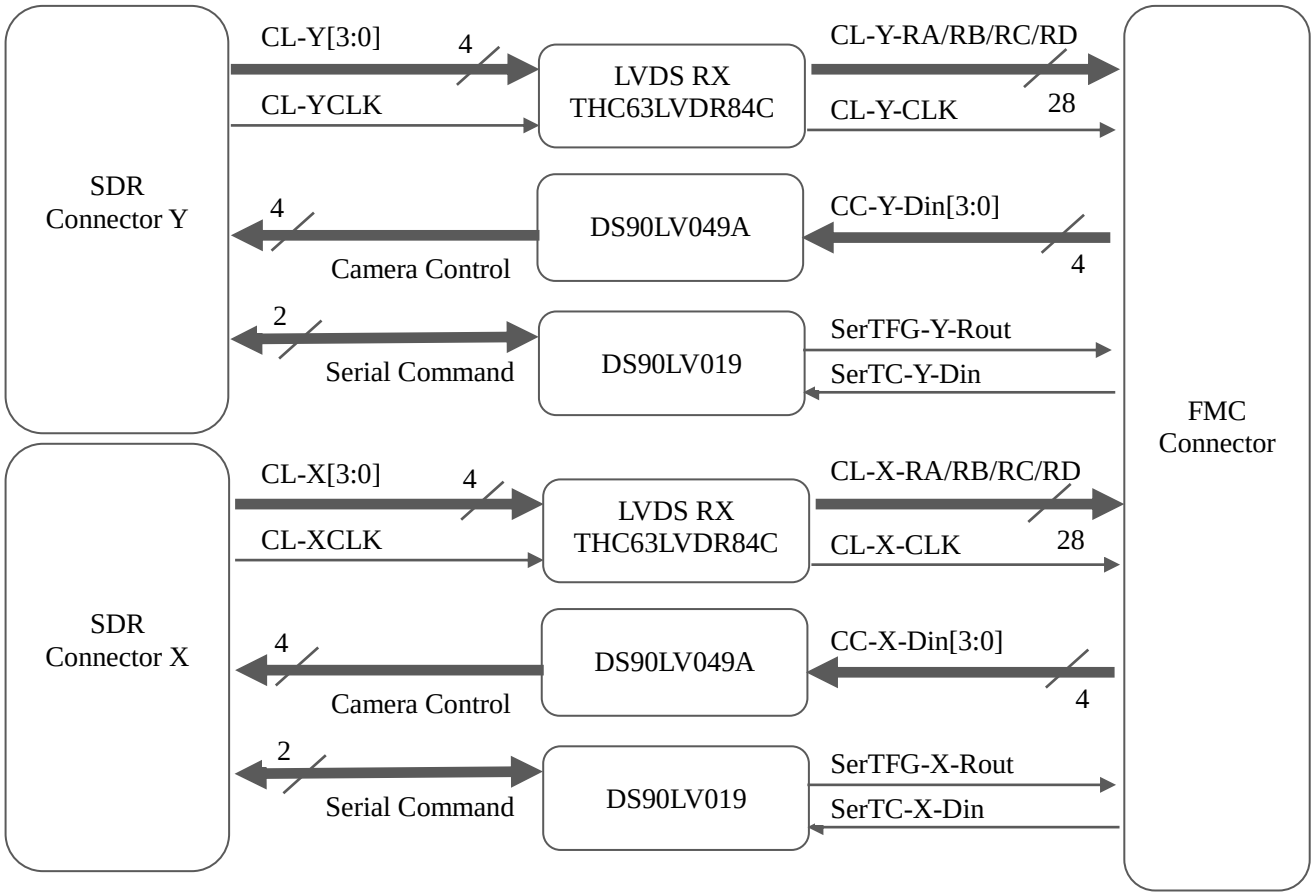


Fig 10-3 Dual Base Configuration

11. Jumper Setting

This product supports PoCL (Power over Camera Link) power supply system. Jumpers (P1/P2) determine the power supply.

This function is just for camera supported PoCL. If you supply 12 V power to a non-supported PoCL camera, the product and your system may break down or it may cause a fire, smoking.

Set the jumpers to GND for a non-supported PoCL camera system.

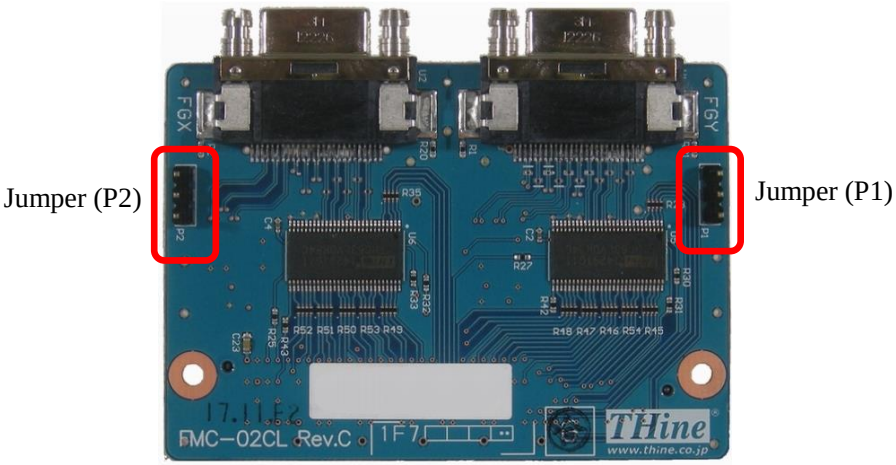
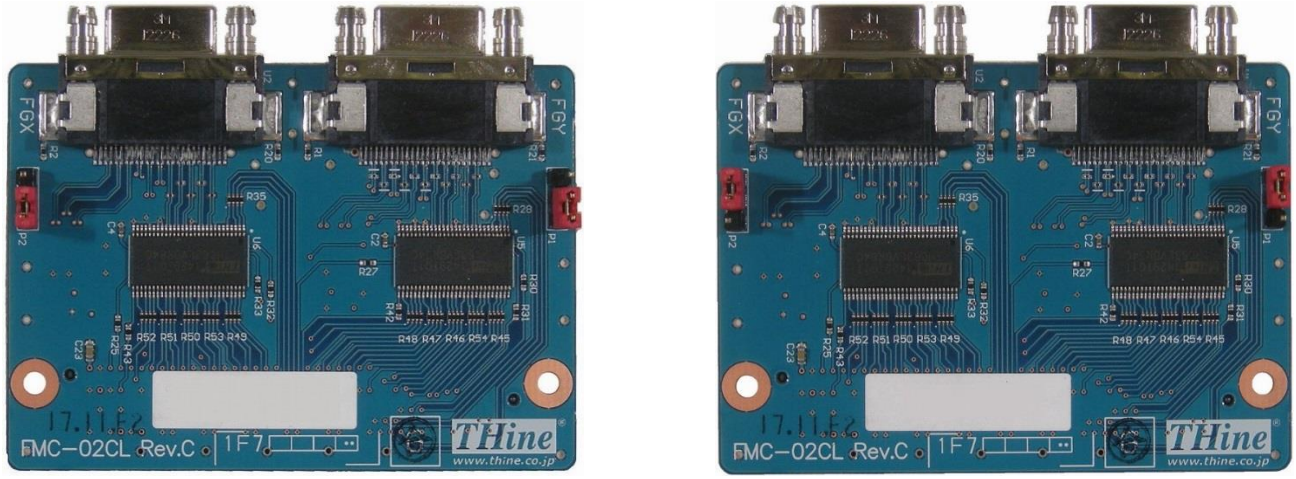


Fig 11-1 Jumper Location



12 V Power Supply　　GND

Fig 11-2 Jumper Setting

Table 11-1 Jumper Description

Jumper No.	Description	Status	Function
P2	SDR Connector X PoCL Power Supply	12 V	12 V Power supply to SDR Connector X
		GND	GND connect to SDR connector X
P1	SDR Connector Y PoCL Power Supply	12 V	12 V Power supply to SDR Connector Y
		GND	GND connect to SDR connector Y

Note1: Set jumper to GND for a non-supported PoCL camera system.

Note2: Set jumper to GND for Medium configuration of Camera Link.

12. Switch Enable/Disable function for Camera Control IC and Serial Command IC

Interface ICs (Camera Control and Serial Command) of SDR connector Y have enable/disable function.

Table 12-1 Enable/Disable Setting for Camera Control and Serial Command

SDR Connector Y Status	Y-REB-ENB	Y-DE
Medium Configuration	High	Low
Dual Base Configuration	Low	High
Don’t Use	High	Low

13. Pin Assignment of SDR Connector

Table 13-1 Pin Assignment of SDR Connector X (Base/Medium configuration)

Pin No.	I/O	Signal Name	Pin No.	I/O	Signal Name
1	-	DC+12 V (PoCL) / Inner Shield	14	-	Inner Shield
2	O	CC4-	15	O	CC4+
3	O	CC3+	16	O	CC3-
4	O	CC2-	17	O	CC2+
5	O	CC1+	18	O	CC1-
6	I	Ser TFG+	19	I	Ser TFG-
7	O	Ser TC-	20	O	Ser TC-
8	I	X3+-	21	I	X3-
9	I	CLK X+	22	I	CLK X-
10	I	X2+	23	I	X2-
11	I	X1+	24	I	X1-
12	I	X0+	25	I	X0-
13	-	Inner Shield	26	-	DC + 12 V (PoCL) / Inner Shield

Table 13-2 Pin Assignment of SDR Connector Y (Medium configuration)

Pin No.	I/O	Signal Name	Pin No.	I/O	Signal Name
1	-	Inner Shield	14	-	Inner Shield
2	-	-	15	-	-
3	-	-	16	-	-
4	-	-	17	-	-
5	-	-	18	-	-
6	-	-	19	-	-
7	-	-	20	-	
8	I	Y3+	21	I	Y3-
9	I	CLK Y+	22	I	CLK Y-
10	I	Y2+	23	I	Y2-
11	I	Y1+	24	I	Y1-
12	I	Y0+	25	I	Y0-
13	-	Inner Shield	26	-	Inner Shield

Table 13-3 Pin Assignment of SDR Connector Y (Dual Base configuration)

Pin No.	I/O	Signal Name	Pin No.	I/O	Signal Name
1	-	DC + 12V (PoCL) / Inner Shield	14	-	Inner Shield
2	O	CC4-	15	O	CC4+
3	O	CC3+	16	O	CC3-
4	O	CC2-	17	O	CC2+
5	O	CC1+	18	O	CC1-
6	I	Ser TFG+	19	I	Ser TFG-
7	O	Ser TC-	20	O	Ser TC-
8	I	Y3+-	21	I	Y3--
9	I	CLK Y+	22	I	CLK Y-
10	I	Y2+	23	I	X2-
11	I	Y1+	24	I	X1-
12	I	Y0+	25	I	X0-
13	-	Inner Shield	26	-	DC + 12V (PoCL) / Inner Shield

Notices and Requests

1. The product specifications described in this material are subject to change without prior notice.
2. This material contains our copyright, know-how or other proprietary. Copying or disclosing to third parties the contents of this material without our prior permission is prohibited.
3. Note that if infringement of any third party's industrial ownership should occur by using this product, we will be exempted from the responsibility unless it directly relates to the production process or functions of the product.
4. Please note that this product is not designed to be radiation-proof.
5. Customers are asked, if required, to judge by themselves if this product falls under the category of strategic goods under the Foreign Exchange and Foreign Trade Control Law.

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