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KD-MX series

KD6R309MX
KD6R617MX
KD6R926MX

Data Sheet

Mitsubishi Electric Corp.

Communication Systems Center

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※Camera Link is a trademark or registered trademark of AIA (Automated Imaging Association).

1. Applicable products

This Data Sheet is documented for "Mitsubishi Monochrome Contact Image Sensor for inspection systems" and applied for the following products (hereinafter referred as "Product").

KD6R309MX

KD6R617MX

KD6R926MX

This Product is the illumination integrated models, which with the white LED array illuminations.

2. Related documents

Followings are the related documents to this Product.

Table 1 List of the related docume

Document ID	Name	Contents
TM-XG128	Data Sheet	This document. Specifications, the criteria of the factory shipment inspection, and etc., of this Product are included.
TM-XG537	User's manual	How to use the Product, precautions on use, conditions on the Product warranty, etc. are included. Read before using the Product and follow the described instructions.
TM-XG553	Function specification	Detailed functions of the Product are included. Refer this document when you need to use the functions which are not included in the User's manual.

3. Specifications

Table 2 Specifications

Item		Specifications			Remarks
		KD6R309MX	KD6R617MX	KD6R926MX	
Imaging element		CMOS line sensor			304pixels
Valid Scanning Width (mm)		309.7	619.7	929.6	
Pixel density (dpi)		600			Pixel density in the chip. Density between chips are equivalent to 300dpi.
Number of total pixels	Pixel Interpolation: OFF	7,296	14,592	21,888	
	Pixel Interpolation: ON	7,319	14,639	21,959	
Storing time (μs/line) (line frequency)/ output form	Base 2tap	44	88	132	
	Medium 4tap	23	44	66	
	Medium 4tap*2	-	23	34	
	Medium 4tap*3	-	-	23	
Focal position (mm)		52mm from datum hole (12mm From Glass surface)			See figure 6 for the reference position of datum hole
Sensor-IC Clock		16.0 MHz			
Output clock frequency (MHz) (LVDS transfer rate)		Max. 84 MHz			LVDS output 48MHz~84MHz(changeable) ANSI/TIA/EIA-644Standard
RoHS		Compliant (10 substances)(Note1)			
Function		Pixel rearrangement Dark correction (each pixel/Color) Programmable Gain Amp. White Correction (each pixel/Color) LED control Interpolation Gamma correction Switching resolution Overlap Serial communication Output forms switching Camera Link™ output			
Optical system		Rod lens array			2 rows, TC=54 [mm]
Illuminations		LED array			Both sides, White LED
Power supply	for sensor	DC 5V × 1 (3A Max.)	DC 5V × 2 (6A Max.)	DC 5V × 3 (9A Max.)	
	for illuminations	DC 24V × 1 (1A Max.)	DC 24V × 2 (1.5A Max.)	DC 24V × 2 (2A Max.)	
LED lighting Control		Pulse Duty adjustment			
Communication format		Serial communication (UART)			Baud rate : 9.6kbps/19.2kbps/115.2kbps Data bit : 8bit Parity bit : None Stop bit : 1bit Flow control : None
Timing diagram		Fig.1, Fig.2			
Outline drawing		Fig.3, Fig.4, Fig.5, Fig.6			

(Note1) Applicable RoHS Exemptions are the following ones. AnnexⅢ 6(a),6(c),7(a),7(c)- I ,34

4. Standard Operating Conditions and Property Specifications (Ta=25°C)

Table 3 Specifications

Item	Symbol	Specifications		Unit	Remarks
Dark output	DVd	8bit	2~54	digit	section 4.1
Maximum white output	DVpmax	8bit	123~244	digit	section 4.2
White output uniformity	UEp	50 MAX		%	section 4.3
MTF	MTF	30 MIN		%	section 4.4

(Note 1) This specification is measured by Mitsubishi standard white illumination and white-basis-chart prepared by Mitsubishi Electric.

**Table 4 Measurement Conditions of Property Specifications
(standard condition of delivery inspection)**

Item		Symbol	Specifications	Unit	Remarks
Supply voltage for Sensor unit		VDD	+5.0±0.1	V	
Supply voltage for Light source		VLED	+24.0±0.5	V	
Chart	White	—	0.05~0.09	0.D.	Mitsubishi Electric standard (white-basis-chart)
	MTF	—	5.68	LP/mm	Mitsubishi Electric standard
Position of document		—	52±0.2	mm	Distance from datum hole (nominal focal position)
Storing time		trep	44	μsec	KD6R309MX 8bit 4tap Meduim KD6R617MX: 8bit 4tap Meduim×2 KD6R926MX: 8bit 4tap Meduim×3
Output clock frequency		—	84	MHz	
LED lighting period		—	15	μsec	
Temperature		Ta	23±4	°C	
Resolution		—	600	dpi	

4.1 Dark output (DVd) (black correction :OFF, white correction :OFF, illuminations :OFF)

DVd is output value before black correction when the illuminations is off.

4.2 Maximum white output (DVpmax) (black correction :OFF, white correction :OFF, illuminations :ON)

DVpmax is maximum output value scanning white-reference document before black and white correction.

4.3 White output uniformity (UEp) (black correction :ON, white correction :OFF, illuminations :ON)

The symbols are defined as follows to calculate the White output uniformity.

$$DVEp(n) = DVp(n) - DVd(n)$$

DVEp(n) : nth pixel valid output

DVp(n) : nth pixel output value scanning white-reference document before black and white correction when the illuminations are on. (original data of white output)

DVd(n) : nth pixel output value before black and white correction when the illuminations are off.

$$UEp = \frac{DVEp \text{ max} - DVEp \text{ min}}{DVEp \text{ max}} \times 100\%$$

DVEpmax and DVEpmin are the maximum and minimum values of DVEp(n) respectively.

4.4 MTF (MTF) (black correction :ON, white correction :ON, illuminations :ON)

$$MTF = \frac{IE \text{ max} - IE \text{ min}}{IE \text{ max} + IE \text{ min}} \times 100\%$$

IE max and IE min are the maximum and minimum values, respectively, obtained when scanning the MTF test document.

5. Absolute maximum rating

Table 5 Absolute maximum rating

Item	Symbol	Specifications	Unit	Remarks
Supply voltage	VDD	-0.3 ~ 10	V	
	VLED	-0.3 ~ 30	V	
Input voltage	Vi	GND-0.3 ~ VDD+0.3	V	
Output voltage	Vo	GND-0.3 ~ VDD	V	
Environmental temperature	Ta	+5 ~ +50	°C	During operation
		-5 ~ +55	°C	During operation
Frame temperature	Tw	+5 ~ +70	°C	During operation (refer Fig.7)
Environmental fumidity	Rh	10~90	%(RH)	No dew condensation

6. Operating condition (Ta=25°C)

6.1 Standard operating conditions (recommended operating conditions)

Table 6 Standard operating conditions (recommended operating conditions)

Item	Symbol	Conditions	Specifications			Unit	Remarks
			MIN.	TYP.	MAX.		
Supply voltage	VDD	GND basis(1)	4.75	5.25	5.50	V	
	VLEDI	GND-LED basis	22.8	24.0	25.2	V	
Current consumption	IDD	VDD=5.0V	KD6R309MX	—	2.6	3.00	A
			KD6R617MX	—	5.0	6.00	
			KD6R926MX	—	7.5	9.00	
	ILED	VLED=24V	KD6R309MX	—	0.30	1.0	A
			KD6R617MX	—	0.50	1.5	
			KD6R926MX	—	0.72	2.0	
Input voltage	VIH	VCM = +1.2V		—	+100	mV	
	VIL		-100	—	—	mV	

Input current	IIN	LVDS	-20	-	+20	μA	
Output current	VCM	LVDS-line	ANSI/TIA/EIA-644Standard			V	
	VOD					V	

(1) if CIS operating is unstable, please raise the voltage within the specifications level mentioned above.

6.2 Timing conditions

Table 7 Timing conditions

Item	Symbol	MIN	TYP	MAX	Unit	Remarks
Scanning cycle	Trep	23			μsec	
TyCLK / TxCLK frequency	fc(Tx/yCLK)	48		84	MHz	standard value : 84MHz
LVDS-data setup time (bit0)	Tp0 (SDCLK-SD)	1.5	1.7	1.9		fc(Tx/yCLK)=84MHz
LVDS-data setup time (bit1)	Tp1 (SDCLK-SD)	-0.2	0	0.2	ns	fc(Tx/yCLK)=84MHz
LVDS-data setup time (bit2)	Tp2 (SDCLK-SD)	10.0	10.2	10.4	ns	fc(Tx/yCLK)=84MHz
LVDS-data setup time (bit3)	Tp3 (SDCLK-SD)	8.3	8.5	8.7	ns	fc(Tx/yCLK)=84MHz
LVDS-data setup time (bit4)	Tp4 (SDCLK-SD)	6.6	6.8	7.0	ns	fc(Tx/yCLK)=84MHz
LVDS-data setup time (bit5)	Tp5 (SDCLK-SD)	4.9	5.1	5.3	ns	fc(Tx/yCLK)=84MHz
LVDS-data setup time (bit6)	Tp6 (SDCLK-SD)	3.2	3.4	3.6	ns	fc(Tx/yCLK)=84MHz

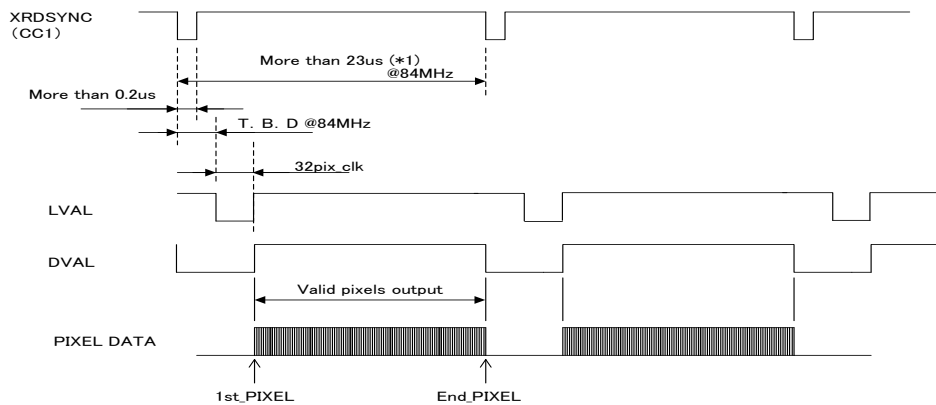


Fig.1 Timing Chart of Horizontal Data Output

*1 Min storing time of KD-MX is 23 μ s. Storing time depends on the output mode setting.

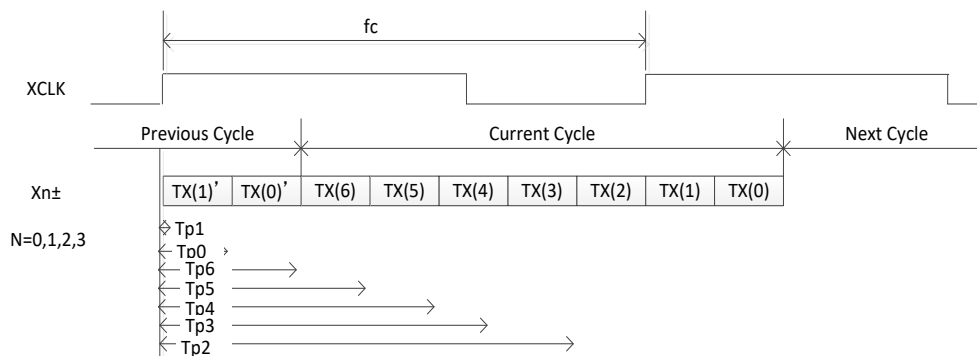


Fig.2 (a) Timing chart of LVDS data

6.3 Data Configuration

6.3.1 Base Configuration (KD6R309MX、KD6R617MX、KD6R926MX)

Table 8 Base Configuration bit allocation

8bit 2tap		10bit2tap	
CN11			
Port A0	D1[0]	Port A0	D1[0]
Port A1	D1[1]	Port A1	D1[1]
Port A2	D1[2]	Port A2	D1[2]
Port A3	D1[3]	Port A3	D1[3]
Port A4	D1[4]	Port A4	D1[4]
Port A5	D1[5]	Port A5	D1[5]
Port A6	D1[6]	Port A6	D1[6]
Port A7	D1[7]	Port A7	D1[7]
Port B0	D2[0]	Port B0	D1[8]
Port B1	D2[1]	Port B1	D1[9]
Port B2	D2[2]	Port B2	nc
Port B3	D2[3]	Port B3	nc
Port B4	D2[4]	Port B4	D2[8]
Port B5	D2[5]	Port B5	D2[9]
Port B6	D2[6]	Port B6	nc
Port B7	D2[7]	Port B7	nc
Port C0	nc	Port C0	D2[0]
Port C1	nc	Port C1	D2[1]
Port C2	nc	Port C2	D2[2]
Port C3	nc	Port C3	D2[3]
Port C4	nc	Port C4	D2[4]
Port C5	nc	Port C5	D2[5]
Port C6	nc	Port C6	D2[6]
Port C7	nc	Port C7	D2[7]

Table 9 Base Configuration Output pixels

Models	MODE	Tap	Interpolation OFF				Interpolation ON			
KD6R309MX	Single	D1	1	2	...	3648	1	2	...	3660
		D2	3649	3650	...	7296	3661	3662	...	7320
	Parallel	D1	1	3	...	7295	1	3	...	7319
		D2	2	4	...	7296	2	4	...	7320
KD6R617MX	Single	D1	1	2	...	7296	1	2	...	7320
		D2	7297	7298	...	14592	7321	7322	...	14640
	Parallel	D1	1	3	...	14951	1	3	...	14639
		D2	2	4	...	14952	2	4	...	14640
KD6R926MX	Single	D1	1	2	...	10944	1	2	...	10980
		D2	10945	10946	...	21888	10981	10982	...	21600
	Parallel	D1	1	3	...	21887	1	3	...	21959
		D2	2	4	...	21888	2	4	...	21600

*When you turn the interpolation on, quasi data comes out on following pixels.

(KD6R309MX:7320pixel、KD6R617MX:14640pixel、KD6R927MX:21960pixel)

6.3.2 Medium Configuration (KD6R309MX、KD6R617MX、KD6R926MX)

Table 10 Medium Configuration Bit allocation

8bit 4tap				10bit 4tap			
CN11		CN12		CN11		CN12	
Port A0	D1[0]	Port D0	D4[0]	Port A0	D1[0]	Port D0	D4[0]
Port A1	D1[1]	Port D1	D4[1]	Port A1	D1[1]	Port D1	D4[1]
Port A2	D1[2]	Port D2	D4[2]	Port A2	D1[2]	Port D2	D4[2]
Port A3	D1[3]	Port D3	D4[3]	Port A3	D1[3]	Port D3	D4[3]
Port A4	D1[4]	Port D4	D4[4]	Port A4	D1[4]	Port D4	D4[4]
Port A5	D1[5]	Port D5	D4[5]	Port A5	D1[5]	Port D5	D4[5]
Port A6	D1[6]	Port D6	D4[6]	Port A6	D1[6]	Port D6	D4[6]
Port A7	D1[7]	Port D7	D4[7]	Port A7	D1[7]	Port D7	D4[7]
Port B0	D2[0]	Port E0	nc	Port B0	D1[8]	Port E0	D3[0]
Port B1	D2[1]	Port E1	nc	Port B1	D1[9]	Port E1	D3[1]
Port B2	D2[2]	Port E2	nc	Port B2	nc	Port E2	D3[2]
Port B3	D2[3]	Port E3	nc	Port B3	nc	Port E3	D3[3]
Port B4	D2[4]	Port E4	nc	Port B4	D2[8]	Port E4	D3[4]
Port B5	D2[5]	Port E5	nc	Port B5	D2[9]	Port E5	D3[5]
Port B6	D2[6]	Port E6	nc	Port B6	nc	Port E6	D3[6]
Port B7	D2[7]	Port E7	nc	Port B7	nc	Port E7	D3[7]
Port C0	D3[0]	Port F0	nc	Port C0	D2[0]	Port F0	D3[8]
Port C1	D3[1]	Port F1	nc	Port C1	D2[1]	Port F1	D3[9]
Port C2	D3[2]	Port F2	nc	Port C2	D2[2]	Port F2	nc
Port C3	D3[3]	Port F3	nc	Port C3	D2[3]	Port F3	nc
Port C4	D3[4]	Port F4	nc	Port C4	D2[4]	Port F4	D4[8]
Port C5	D3[5]	Port F5	nc	Port C5	D2[5]	Port F5	D3[9]
Port C6	D3[6]	Port F6	nc	Port C6	D2[6]	Port F6	nc
Port C7	D3[7]	Port F7	nc	Port C7	D2[7]	Port F7	nc

Table 11 Medium Configuration Output pixel

Models	MODE	Tap	Interpolation OFF				Interpolation ON			
KD6R309MX	Single	D1	1	2	...	1824	1	2	...	1830
		D2	1825	1,826	...	3648	1831	1832	...	3660
		D3	3649	3,650	...	5472	3661	3662	...	5490
		D4	5473	5,474	...	7296	5491	5492	...	7320
	Parallel	D1	1	5	...	7293	1	5	...	7317
		D2	2	6	...	7294	2	6	...	7318
		D3	3	7	...	7295	3	7	...	7319
		D4	4	8	...	7296	4	8	...	7320
KD6R617MX	Single	D1	1	2	...	3648	1	2	...	3660
		D2	3649	3650	...	7296	3661	3662	...	7320
		D3	7297	7298	...	10944	7321	7322	...	10980
		D4	10945	10946	...	14592	10981	10982	...	14640
	Parallel	D1	1	5	...	14589	1	5	...	14367
		D2	2	6	...	14590	2	6	...	14638
		D3	3	7	...	14591	3	7	...	14639
		D4	4	8	...	14592	4	8	...	14640
KD6R926MX	Single	D1	1	2	...	5472	1	2	...	5490
		D2	5473	5474	...	10944	5491	5492	...	10980
		D3	10945	10946	...	16416	10981	10982	...	16470
		D4	16417	16418	...	21888	16471	16472	...	21960
	Parallel	D1	1	5	...	21885	1	5	...	21957
		D2	2	6	...	21886	2	6	...	21958
		D3	3	7	...	21887	3	7	...	21959
		D4	4	8	...	21888	4	8	...	21960

*When you turn the interpolation on, quasi data comes out on following pixels.

(KD6R309MX:7320pixel、KD6R617MX:14640pixel、KD6R927MX:21960pixel)

6.3.3 Medium Configuration*2 (KD6R617MX、KD6R926MX)

Table 12 Medium Configuration*2 Bit allocation (8bit)

8bit 4tap*2							
CN11		CN12		CN13		CN14	
Port A0	D1[0]	Port D0	D4[0]	Port A0	D5[0]	Port D0	D8[0]
Port A1	D1[1]	Port D1	D4[1]	Port A1	D5[1]	Port D1	D8[1]
Port A2	D1[2]	Port D2	D4[2]	Port A2	D5[2]	Port D2	D8[2]
Port A3	D1[3]	Port D3	D4[3]	Port A3	D5[3]	Port D3	D8[3]
Port A4	D1[4]	Port D4	D4[4]	Port A4	D5[4]	Port D4	D8[4]
Port A5	D1[5]	Port D5	D4[5]	Port A5	D5[5]	Port D5	D8[5]
Port A6	D1[6]	Port D6	D4[6]	Port A6	D5[6]	Port D6	D8[6]
Port A7	D1[7]	Port D7	D4[7]	Port A7	D5[7]	Port D7	D8[7]
Port B0	D2[0]	Port E0	nc	Port B0	D6[0]	Port E0	nc
Port B1	D2[1]	Port E1	nc	Port B1	D6[1]	Port E1	nc
Port B2	D2[2]	Port E2	nc	Port B2	D6[2]	Port E2	nc
Port B3	D2[3]	Port E3	nc	Port B3	D6[3]	Port E3	nc
Port B4	D2[4]	Port E4	nc	Port B4	D6[4]	Port E4	nc
Port B5	D2[5]	Port E5	nc	Port B5	D6[5]	Port E5	nc
Port B6	D2[6]	Port E6	nc	Port B6	D6[6]	Port E6	nc
Port B7	D2[7]	Port E7	nc	Port B7	D6[7]	Port E7	nc
Port C0	D3[0]	Port F0	nc	Port C0	D7[0]	Port F0	nc
Port C1	D3[1]	Port F1	nc	Port C1	D7[1]	Port F1	nc
Port C2	D3[2]	Port F2	nc	Port C2	D7[2]	Port F2	nc
Port C3	D3[3]	Port F3	nc	Port C3	D7[3]	Port F3	nc
Port C4	D3[4]	Port F4	nc	Port C4	D7[4]	Port F4	nc
Port C5	D3[5]	Port F5	nc	Port C5	D7[5]	Port F5	nc
Port C6	D3[6]	Port F6	nc	Port C6	D7[6]	Port F6	nc
Port C7	D3[7]	Port F7	nc	Port C7	D7[7]	Port F7	nc

Table 13 Medium Configuration *2 Bit allocation(10bit)

10bit 4tap*2							
CN11		CN12		CN13		CN14	
Port A0	D1[0]	Port D0	D4[0]	Port A0	D5[0]	Port D0	D8[0]
Port A1	D1[1]	Port D1	D4[1]	Port A1	D5[1]	Port D1	D8[1]
Port A2	D1[2]	Port D2	D4[2]	Port A2	D5[2]	Port D2	D8[2]
Port A3	D1[3]	Port D3	D4[3]	Port A3	D5[3]	Port D3	D8[3]
Port A4	D1[4]	Port D4	D4[4]	Port A4	D5[4]	Port D4	D8[4]
Port A5	D1[5]	Port D5	D4[5]	Port A5	D5[5]	Port D5	D8[5]
Port A6	D1[6]	Port D6	D4[6]	Port A6	D5[6]	Port D6	D8[6]
Port A7	D1[7]	Port D7	D4[7]	Port A7	D5[7]	Port D7	D8[7]
Port B0	D1[8]	Port E0	D3[0]	Port B0	D5[8]	Port E0	D7[0]
Port B1	D1[9]	Port E1	D3[1]	Port B1	D5[9]	Port E1	D7[1]
Port B2	nc	Port E2	D3[2]	Port B2	nc	Port E2	D7[2]
Port B3	nc	Port E3	D3[3]	Port B3	nc	Port E3	D7[3]
Port B4	D2[8]	Port E4	D3[4]	Port B4	D6[8]	Port E4	D7[4]
Port B5	D2[9]	Port E5	D3[5]	Port B5	D6[9]	Port E5	D7[5]
Port B6	nc	Port E6	D3[6]	Port B6	nc	Port E6	D7[6]
Port B7	nc	Port E7	D3[7]	Port B7	nc	Port E7	D7[7]
Port C0	D2[0]	Port F0	D3[8]	Port C0	D6[0]	Port F0	D7[8]
Port C1	D2[1]	Port F1	D3[9]	Port C1	D6[1]	Port F1	D7[9]
Port C2	D2[2]	Port F2	nc	Port C2	D6[2]	Port F2	nc
Port C3	D2[3]	Port F3	nc	Port C3	D6[3]	Port F3	nc
Port C4	D2[4]	Port F4	D4[8]	Port C4	D6[4]	Port F4	D8[8]
Port C5	D2[5]	Port F5	D3[9]	Port C5	D6[5]	Port F5	D8[9]
Port C6	D2[6]	Port F6	nc	Port C6	D6[6]	Port F6	nc
Port C7	D2[7]	Port F7	nc	Port C7	D6[7]	Port F7	nc

Table 14 Medium Configuration *2 Output pixels

Models	MODE	Tap	Interpolation OFF				Interpolation ON				Interpolation ON Overlap ON			
KD6R617MX	Single	D1	1	2	...	1824	1	2	...	1830	1	2	...	1846
		D2	1825	1826	...	3648	1831	1832	...	3660	1847	1848	...	3692
		D3	3649	3650	...	5472	3661	3662	...	5490	3693	3694	...	5538
		D4	5473	5474	...	7296	5491	5492	...	7320	5539	5540	...	7384
		D5	7297	7298	...	9120	7321	7322	...	9150	7321	7322	...	9166
		D6	9121	9122	...	10944	9151	9127	...	10980	9167	9168	...	11012
		D7	10945	10946	...	12768	10981	10982	...	12810	11013	11014	...	12858
		D8	12769	12770	...	14592	12811	12812	...	14640	12859	12860	...	14704
	Parallel	D1	1	5	...	7293	1	5	...	7317	1	5	...	7381
		D2	2	6	...	7294	2	6	...	7318	2	6	...	7382
		D3	3	7	...	7295	3	7	...	7319	3	7	...	7383
		D4	4	8	...	7296	4	8	...	7320	4	8	...	7384
		D5	7297	7301	...	14589	7321	7325	...	14637	7321	7325	...	14701
		D6	7298	7302	...	14590	7322	7326	...	14638	7322	7326	...	14702
		D7	7299	7303	...	14591	7323	7327	...	14639	7323	7327	...	14703
		D8	7300	7304	...	14592	7324	7328	...	14640	7324	7329	...	14704
KD6R926MX	Single	D1	1	2	...	2736	1	2	...	2745	1	2	...	2761
		D2	2737	2738	...	5472	2746	2747	...	5490	2762	2763	...	5522
		D3	5473	5474	...	8208	5491	5492	...	8235	5523	5524	...	8283
		D4	8209	8210	...	10944	8236	8237	...	10980	8284	8285	...	11044
		D5	10945	10946	...	13680	10981	10982	...	13725	10981	10982	...	13741
		D6	13681	13682	...	16416	13726	13727	...	16470	13742	13743	...	16502
		D7	16417	16418	...	19152	16471	16472	...	19215	16503	16504	...	19263
		D8	19153	19154	...	21888	19216	19217	...	21960	19264	19265	...	22024
	Parallel	D1	1	5	...	10941	1	5	...	10977	1	5	...	11041
		D2	2	6	...	10942	2	6	...	10978	2	6	...	11042
		D3	3	7	...	10943	3	7	...	10979	3	7	...	11043
		D4	4	8	...	10944	4	8	...	10980	4	8	...	11044
		D5	10945	10949	...	21885	10981	10985	...	21957	10981	10985	...	22021
		D6	10946	10950	...	21886	10982	10986	...	21958	10982	10986	...	22022
		D7	10947	10951	...	21887	10983	10987	...	21959	10983	10987	...	22023
		D8	10948	10952	...	21888	10984	10988	...	21960	10984	10988	...	22024

*When you turn the interpolation on, quasi data comes out on following pixels.

(KD6R617MX: from 14640pixel~, KD6R927MX: from 21960pixel~)

6.3.4 Medium Configuration*3 (KD6R926MX)

Table15 Medium Configuration *3 Bit allocation (8bit)

8bit 4tap*3											
CN11		CN12		CN13		CN14		CN15		CN16	
Port A0	D1[0]	Port D0	D4[0]	Port A0	D5[0]	Port D0	D8[0]	Port A0	D9[0]	Port D0	D12[0]
Port A1	D1[1]	Port D1	D4[1]	Port A1	D5[1]	Port D1	D8[1]	Port A1	D9[1]	Port D1	D12[1]
Port A2	D1[2]	Port D2	D4[2]	Port A2	D5[2]	Port D2	D8[2]	Port A2	D9[2]	Port D2	D12[2]
Port A3	D1[3]	Port D3	D4[3]	Port A3	D5[3]	Port D3	D8[3]	Port A3	D9[3]	Port D3	D12[3]
Port A4	D1[4]	Port D4	D4[4]	Port A4	D5[4]	Port D4	D8[4]	Port A4	D9[4]	Port D4	D12[4]
Port A5	D1[5]	Port D5	D4[5]	Port A5	D5[5]	Port D5	D8[5]	Port A5	D9[5]	Port D5	D12[5]
Port A6	D1[6]	Port D6	D4[6]	Port A6	D5[6]	Port D6	D8[6]	Port A6	D9[6]	Port D6	D12[6]
Port A7	D1[7]	Port D7	D4[7]	Port A7	D5[7]	Port D7	D8[7]	Port A7	D9[7]	Port D7	D12[7]
Port B0	D2[0]	Port E0	nc	Port B0	D6[0]	Port E0	nc	Port B0	D10[0]	Port E0	nc
Port B1	D2[1]	Port E1	nc	Port B1	D6[1]	Port E1	nc	Port B1	D10[1]	Port E1	nc
Port B2	D2[2]	Port E2	nc	Port B2	D6[2]	Port E2	nc	Port B2	D10[2]	Port E2	nc
Port B3	D2[3]	Port E3	nc	Port B3	D6[3]	Port E3	nc	Port B3	D10[3]	Port E3	nc
Port B4	D2[4]	Port E4	nc	Port B4	D6[4]	Port E4	nc	Port B4	D10[4]	Port E4	nc
Port B5	D2[5]	Port E5	nc	Port B5	D6[5]	Port E5	nc	Port B5	D10[5]	Port E5	nc
Port B6	D2[6]	Port E6	nc	Port B6	D6[6]	Port E6	nc	Port B6	D10[6]	Port E6	nc
Port B7	D2[7]	Port E7	nc	Port B7	D6[7]	Port E7	nc	Port B7	D10[7]	Port E7	nc
Port C0	D3[0]	Port F0	nc	Port C0	D7[0]	Port F0	nc	Port C0	D11[0]	Port F0	nc
Port C1	D3[1]	Port F1	nc	Port C1	D7[1]	Port F1	nc	Port C1	D11[1]	Port F1	nc
Port C2	D3[2]	Port F2	nc	Port C2	D7[2]	Port F2	nc	Port C2	D11[2]	Port F2	nc
Port C3	D3[3]	Port F3	nc	Port C3	D7[3]	Port F3	nc	Port C3	D11[3]	Port F3	nc
Port C4	D3[4]	Port F4	nc	Port C4	D7[4]	Port F4	nc	Port C4	D11[4]	Port F4	nc
Port C5	D3[5]	Port F5	nc	Port C5	D7[5]	Port F5	nc	Port C5	D11[5]	Port F5	nc
Port C6	D3[6]	Port F6	nc	Port C6	D7[6]	Port F6	nc	Port C6	D11[6]	Port F6	nc
Port C7	D3[7]	Port F7	nc	Port C7	D7[7]	Port F7	nc	Port C7	D11[7]	Port F7	nc

Table16 Medium Configuration *3 Bit allocation (10bit)

10bit 4tap*3											
CN11		CN12		CN13		CN14		CN15		CN16	
Port A0	D1[0]	Port D0	D4[0]	Port A0	D5[0]	Port D0	D8[0]	Port A0	D9[0]	Port D0	D12[0]
Port A1	D1[1]	Port D1	D4[1]	Port A1	D5[1]	Port D1	D8[1]	Port A1	D9[1]	Port D1	D12[1]
Port A2	D1[2]	Port D2	D4[2]	Port A2	D5[2]	Port D2	D8[2]	Port A2	D9[2]	Port D2	D12[2]
Port A3	D1[3]	Port D3	D4[3]	Port A3	D5[3]	Port D3	D8[3]	Port A3	D9[3]	Port D3	D12[3]
Port A4	D1[4]	Port D4	D4[4]	Port A4	D5[4]	Port D4	D8[4]	Port A4	D9[4]	Port D4	D12[4]
Port A5	D1[5]	Port D5	D4[5]	Port A5	D5[5]	Port D5	D8[5]	Port A5	D9[5]	Port D5	D12[5]
Port A6	D1[6]	Port D6	D4[6]	Port A6	D5[6]	Port D6	D8[6]	Port A6	D9[6]	Port D6	D12[6]
Port A7	D1[7]	Port D7	D4[7]	Port A7	D5[7]	Port D7	D8[7]	Port A7	D9[7]	Port D7	D12[7]
Port B0	D1[8]	Port E0	D3[0]	Port B0	D5[8]	Port E0	D7[0]	Port B0	D9[8]	Port E0	D11[0]
Port B1	D1[9]	Port E1	D3[1]	Port B1	D5[9]	Port E1	D7[1]	Port B1	D9[9]	Port E1	D11[1]
Port B2	nc	Port E2	D3[2]	Port B2	nc	Port E2	D7[2]	Port B2	nc	Port E2	D11[2]
Port B3	nc	Port E3	D3[3]	Port B3	nc	Port E3	D7[3]	Port B3	nc	Port E3	D11[3]
Port B4	D2[8]	Port E4	D3[4]	Port B4	D6[8]	Port E4	D7[4]	Port B4	D10[8]	Port E4	D11[4]
Port B5	D2[9]	Port E5	D3[5]	Port B5	D6[9]	Port E5	D7[5]	Port B5	D10[9]	Port E5	D11[5]
Port B6	nc	Port E6	D3[6]	Port B6	nc	Port E6	D7[6]	Port B6	nc	Port E6	D11[6]
Port B7	nc	Port E7	D3[7]	Port B7	nc	Port E7	D7[7]	Port B7	nc	Port E7	D11[7]
Port C0	D2[0]	Port F0	D3[8]	Port C0	D6[0]	Port F0	D7[8]	Port C0	D10[0]	Port F0	D11[8]
Port C1	D2[1]	Port F1	D3[9]	Port C1	D6[1]	Port F1	D7[9]	Port C1	D10[1]	Port F1	D11[9]
Port C2	D2[2]	Port F2	nc	Port C2	D6[2]	Port F2	nc	Port C2	D10[2]	Port F2	nc
Port C3	D2[3]	Port F3	nc	Port C3	D6[3]	Port F3	nc	Port C3	D10[3]	Port F3	nc
Port C4	D2[4]	Port F4	D4[8]	Port C4	D6[4]	Port F4	D8[8]	Port C4	D10[4]	Port F4	D12[8]
Port C5	D2[5]	Port F5	D3[9]	Port C5	D6[5]	Port F5	D8[9]	Port C5	D10[5]	Port F5	D12[9]
Port C6	D2[6]	Port F6	nc	Port C6	D6[6]	Port F6	nc	Port C6	D10[6]	Port F6	nc
Port C7	D2[7]	Port F7	nc	Port C7	D6[7]	Port F7	nc	Port C7	D10[7]	Port F7	nc

Table 17 Medium Configuration *3 Output pixels

Models	MODE	Tap	Interpolation OFF				Interpolation ON				Interpolation ON Overlap ON			
KD6R926MX	Single	D1	1	2	...	1824	1	2	...	1830	1	2	...	1846
		D2	1825	1826	...	3648	1831	1832	...	3660	1847	1848	...	3692
		D3	3649	3650	...	5472	3661	3662	...	5490	3693	3694	...	5538
		D4	5473	5474	...	7296	5491	5492	...	7320	5539	5540	...	7384
		D5	7297	7298	...	9120	7321	7322	...	9150	7321	7322	...	9166
		D6	9121	9122	...	10944	9151	9152	...	10980	9167	9168	...	11012
		D7	10945	10946	...	12768	10981	10982	...	12810	11013	11014	...	12858
		D8	12769	12770	...	14592	12811	12812	...	14640	12859	12860	...	14704
		D9	14593	14594	...	16416	14641	14642	...	16470	14641	14642	...	16486
		D10	16417	16418	...	18240	16471	16472	...	18300	16487	16488	...	18332
		D11	18241	18242	...	20064	18301	18302	...	20130	18333	18334	...	20178
		D12	20065	20066	...	21888	20131	20132	...	21960	20179	20180	...	22024
	Parallel	D1	1	5	...	7293	1	5	...	7317	1	5	...	7381
		D2	2	6	...	7294	2	6	...	7318	2	6	...	7382
		D3	3	7	...	7295	3	7	...	7319	3	7	...	7383
		D4	4	8	...	7296	4	8	...	7320	4	8	...	7384
		D5	7296	7300	...	14589	7321	7325	...	14637	7321	7325	...	14701
		D6	7297	7301	...	14590	7322	7326	...	14638	7322	7326	...	14702
		D7	7298	7302	...	14591	7323	7327	...	14639	7323	7327	...	14703
		D8	7299	7303	...	14592	7324	7328	...	14640	7324	7328	...	14704
		D9	14592	14596	...	21885	14641	14645	...	21957	14641	14645	...	22021
		D10	14593	14597	...	21886	14642	14646	...	21958	14642	14646	...	22022
		D11	14594	14598	...	21887	14643	14647	...	21959	14643	14647	...	22023
		D12	14595	14599	...	21888	14644	14648	...	21960	14644	14648	...	22024

*When you turn the interpolation on, quasi data comes out on following pixel.

(KD6R927MX: from 21960pixel~)

7. Serial communication

This product has a serial communication (UART). When access to serial interface, connect your PC to this product's the Camera Link™ connector.

8. Connector pin assignments

Refer to Table 18 for the each connector.

Table 18 Connector list

Product	Power supply connector for sensor driving	Camera Link™ connector				Power supply connector for illuminations
		Base	Medium	Medium*2	Medium*3	
KD6R309MX	V1	D1	D1 D2	-	-	V2
KD6R617MX	V1	D1	D1 D2	D1 D2	D3 D4	V2、V3
KD6R926MX	V1	D1	D1 D2	D1 D2	D3 D4	D5 D6

8.1 Power cable connectors (for sensor) V1

V1: DAU-15S-F0R [JAE]

Table 19 Pin alignment

No	Name			symbol
	KD6R309MX	KD6R617MX	KD6R926MX	-
1	+5V	+5V	+5V	VDD
2	NC	+5V	+5V	VDD
3	+5V	+5V	+5V	VDD
4	NC	NC	+5V	VDD
5	NC	NC	NC	
6	NC	NC	NC	
7	NC	NC	NC	
8	NC	NC	NC	
9	GND	GND	GND	GND
10	NC	GND	GND	GND
11	GND	GND	GND	GND
12	NC	NC	GND	GND
13	NC	NC	NC	
14	NC	NC	NC	
15	NC	NC	NC	

8.2 Power cable connectors (for illumination) V2, V3

V2、V3: DEU-9S-F0R [JAE]

Table 20 Pin alignment

No	Name	unit
1	+24V	VLED
2	NC	
3	NC	
4	NC	
5	NC	
6	GND	GND
7	LED_CONT	Open : LED OFF GND : LED ON
8	NC	
9	NC	

8.3 Camera Link™ connector1

D1、D3、D5: 12226-1150-00PL [3M] ※Camera Link™ I/F

Table21 Pin alignment (D1、D3、D5)

No	Name	symbol	I/O	signal
1	GND	GND	—	
2	Data Signal	X0-	O	
3	Data Signal	X1-	O	
4	Data Signal	X2-	O	
5	Clock for Data	XCLK-	O	
6	Data Signal	X3-	O	
7	Control Signal	SERTC+	I	Serial communication (D3,D5:NC)
8	Control Signal	SERTFG-	O	Serial communication (D3,D5:NC)
9	Data Signal	CC1-	I	XRDSYNC : for sync signal
10	Data Signal	CC2+	I	unconnected
11	Data Signal	CC3-	I	unconnected
12	Data Signal	CC4+	I	unconnected
13	GND	GND	—	
14	GND	GND	—	
15	Data Signal	X0+	O	
16	Data Signal	X1+	O	
17	Data Signal	X2+	O	
18	Clock for Data	XCLK+	O	
19	Data Signal	X3	O	
20	Control Signal	SERTC-	I	Serial communication (D3,D5:NC)
21	Control Signal	SERTFG+	O	Serial communication (D3,D5:NC)
22	Data Signal	CC1+	I	XRDSYNC : for sync signal
23	Data Signal	CC2-	I	unconnected
24	Data Signal	CC3+	I	unconnected
25	Data Signal	CC4-	I	unconnected
26	GND	GND	—	

8.4 Camera Link™ connector 2

D2、D4、D6: 12226-1150-00PL [3M] ※Camera Link™ I/F

Table 22 pin alignment (D2、D4、D6)

No	Name	symbol	I/O	signal
1	GND	GND	—	
2	Data Signal	Y0-	O	
3	Data Signal	Y1-	O	
4	Data Signal	Y2-	O	
5	Clock for Data	YCLK-	O	
6	Data Signal	Y3-	O	
7	100ohm Terminated	TERM	O	Inside a board, connect 100Ωresister between No.7 and No.20pin
8	Data Signal	Z0-	O	
9	Data Signal	Z1-	O	
10	Data Signal	Z2-	O	
11	Clock for Data	ZCLK-	O	
12	Data Signal	Z3-	O	
13	GND	GND	—	
14	GND	GND	—	
15	Data Signal	Y0+	O	
16	Data Signal	Y1+	O	
17	Data Signal	Y2+	O	
18	Clock for Data	YCLK+	O	
19	Data Signal	Y3+	O	
20	100ohm Terminated	TERM	O	Inside a board, connect 100Ωresister between No.7 and No.20pin
21	Data Signal	Z0+	O	
22	Data Signal	Z1+	O	
23	Data Signal	Z2+	O	
24	Clock for Data	ZCLK+	O	
25	Data Signal	Z3+	O	
26	GND	GND	—	

9. Precautions

This product is designed for the purpose of being used in general industries. If you plan to use it for special applications (aerospace applications, combustion equipment, transportation equipment, life-support systems, safety devices, etc.) where special quality and reliability are required and failure or malfunction could directly threaten people's lives, or do harm to the human body, or if you plan to use it for applications other than the standard application intended by the Company, please consult our sales department personnel before doing so.

If you have be used it for applications other than the general industries intended by the Company without consulting our sales department personnel, the Company SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT.

The Company will analyze a defective product on your request. And if the defect is attributable to the Company and the product is under warranty*, we will repair it free of charge or deliver an alternative product. The Company's quality assurance responsibility is limited to the above and the Company does not assume any responsibility for any indirect damage, etc.

* Warranty is defined by 1 year from the Product shipment.

The manufactured date of this product can be checked by the product number.

- (1) Be careful with a glass of CIS in the case of carrying them.
- (2) Keep the glass surface always clean. Do not touch the surface directly with hands or use it in a dusty environment. When it is contaminated, wipe it lightly with a cloth soaked with alcohol. Upon doing so use care not to form any streak on the glass. Blow off dust with air guns.
- (3) To prevent foreign objects from entering the CIS unit, take care not to remove the side plates (bracket), etc.
- (4) CIS can be damaged by ESD. Take care about the handling of CIS as shown below.
 - 1) Be careful not to handle CIS on the insulating sheet or wooden desk.
 - 2) In the case of touching CIS, be careful not to use gloves made from chemical fiber (example: nylon) Use gloves and fingerstalls preventing from static electricity.
 - 3) Be careful not to wrap CIS with paper or polyethylene or other charge sheet.
 - 4) To prevent an electrostatic breakdown from occurring in the IC etc., take great care not to touch the terminal, other electrical parts and board directly by hand or allow it to touch a charged body.
- (5) To get the stability behavior of IC, take care about the handling of CIS as shown below.
 - 1) Applying a voltage exceeding the absolute maximum rating of IC could, even if it is a surge, cause a latch-up, resulting in damage to the sensor. At rapid changes in the current passing through the external circuits or at power-ON/OFF, take care not to allow the voltage to each terminal to exceed the absolute maximum rating. If the same power supply is used for this product and your equipment, or if the cable wiring of this product and the wiring of your equipment with a large current flow are connected in parallel, the coupling may cause a surge that exceeds the rating. Please be careful about surges caused by the operation of your equipment.
 - 2) To scan the stable image, it is recommended to refresh the black and white correction data before each scanning.
- (6) Keep this product's boards away from sources of electrical noise, such as boards, cables, and so on. (For information about boards position, refer to Fig. 3~ 6).

(7) Storage environment and usage environment

If the light source unit of this product is exposed to corrosive gas such as hydrogen sulfide, the amount of light may decrease due to the sulfur component. Do not store or use this product in an environment exposed to corrosive gas.

Because corrugated cardboard contains sulfur components, corrosive gas may be generated. When storing this product for a long period of time, please take care not to place cardboard boxes around it after unpacking it from the packing box in which it was shipped from our company.

(8) Refer the User's Manual (TM-XG537) about handling details of this product.

10. Outline drawing

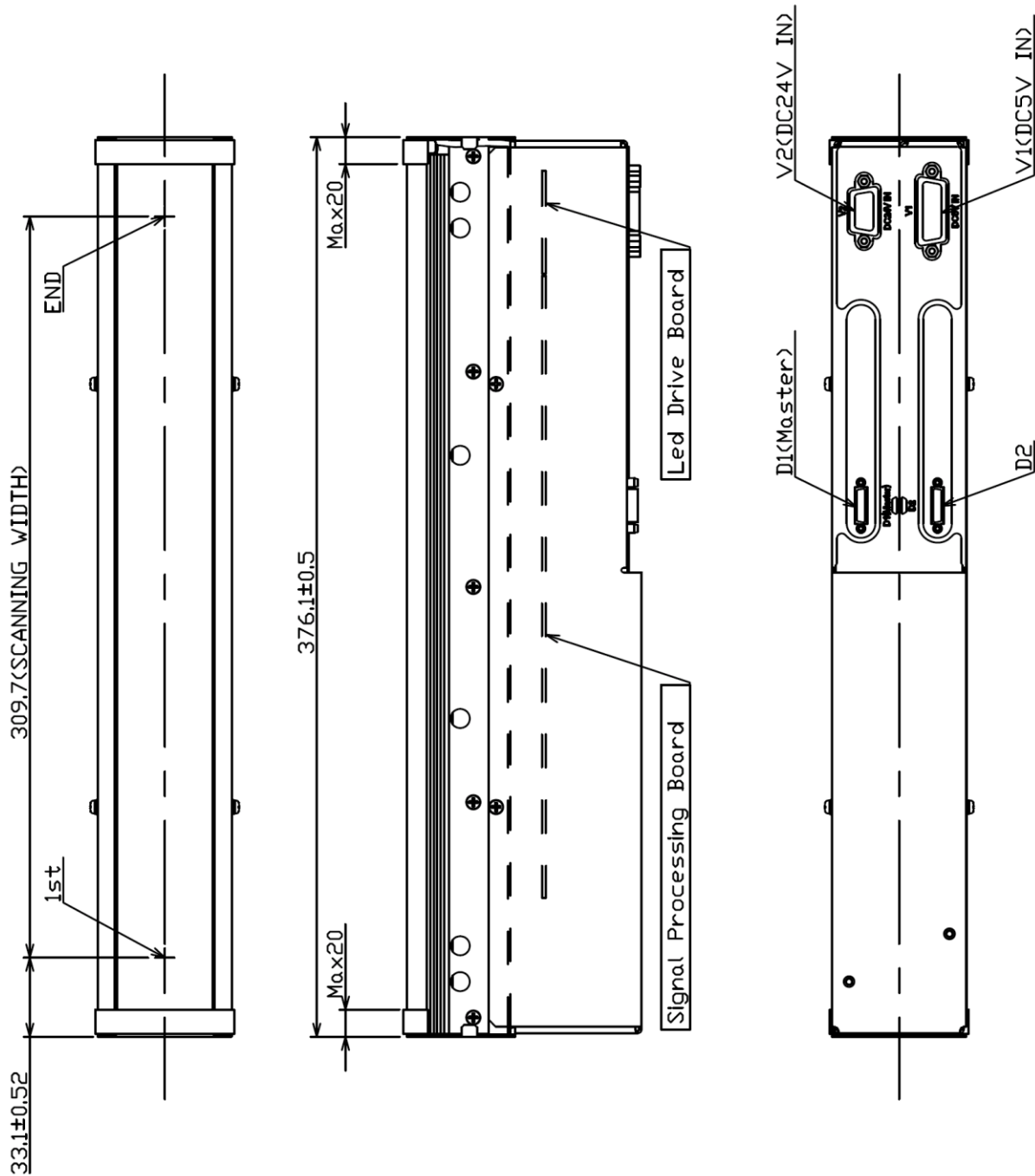


Fig.3 KD6R309MX Outline drawing

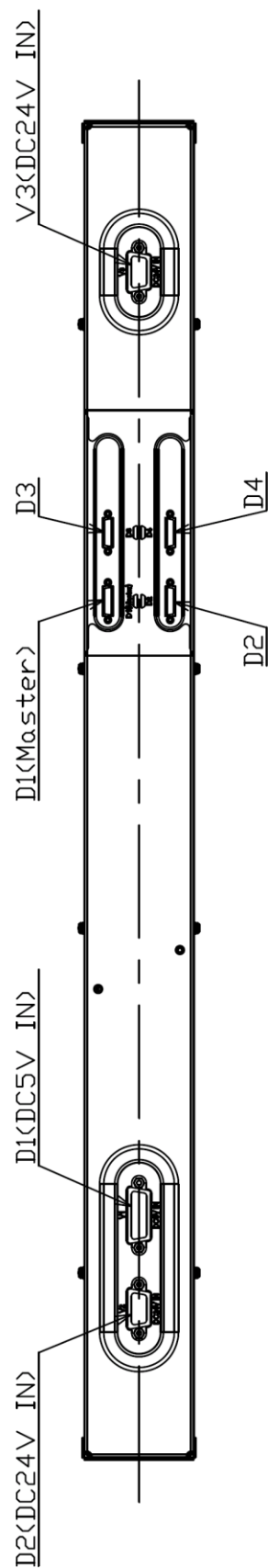
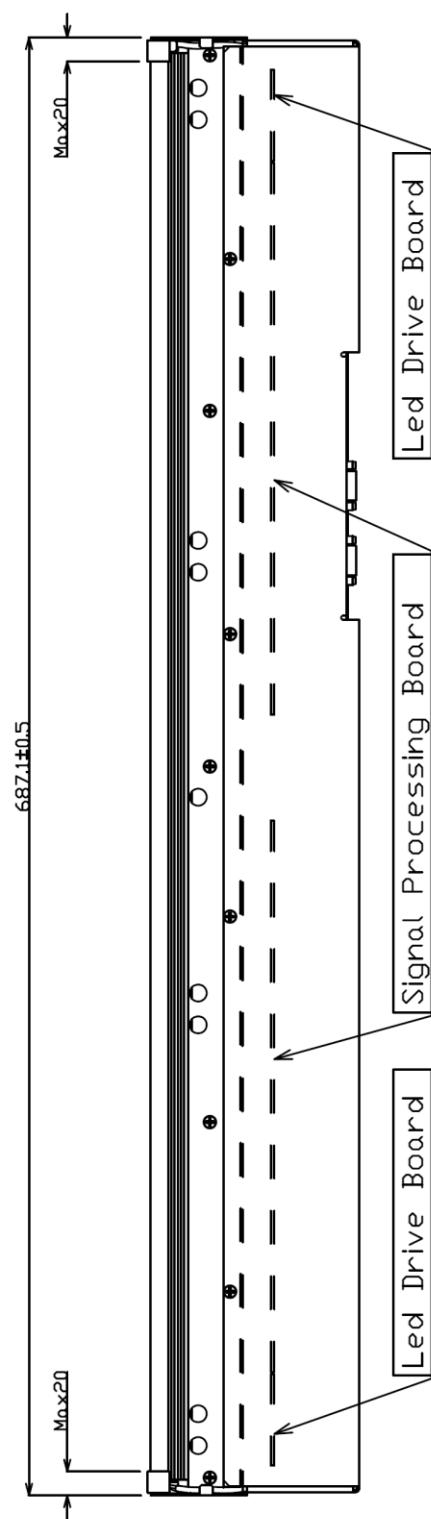
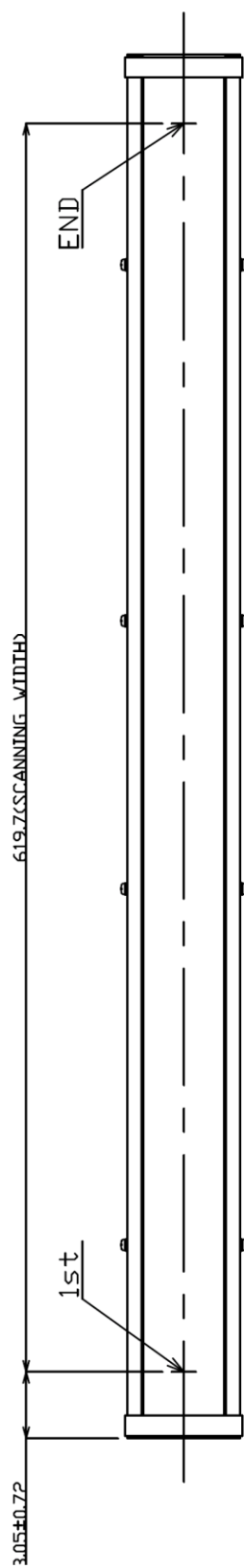


Fig.4 KD6R617MX Outline drawing

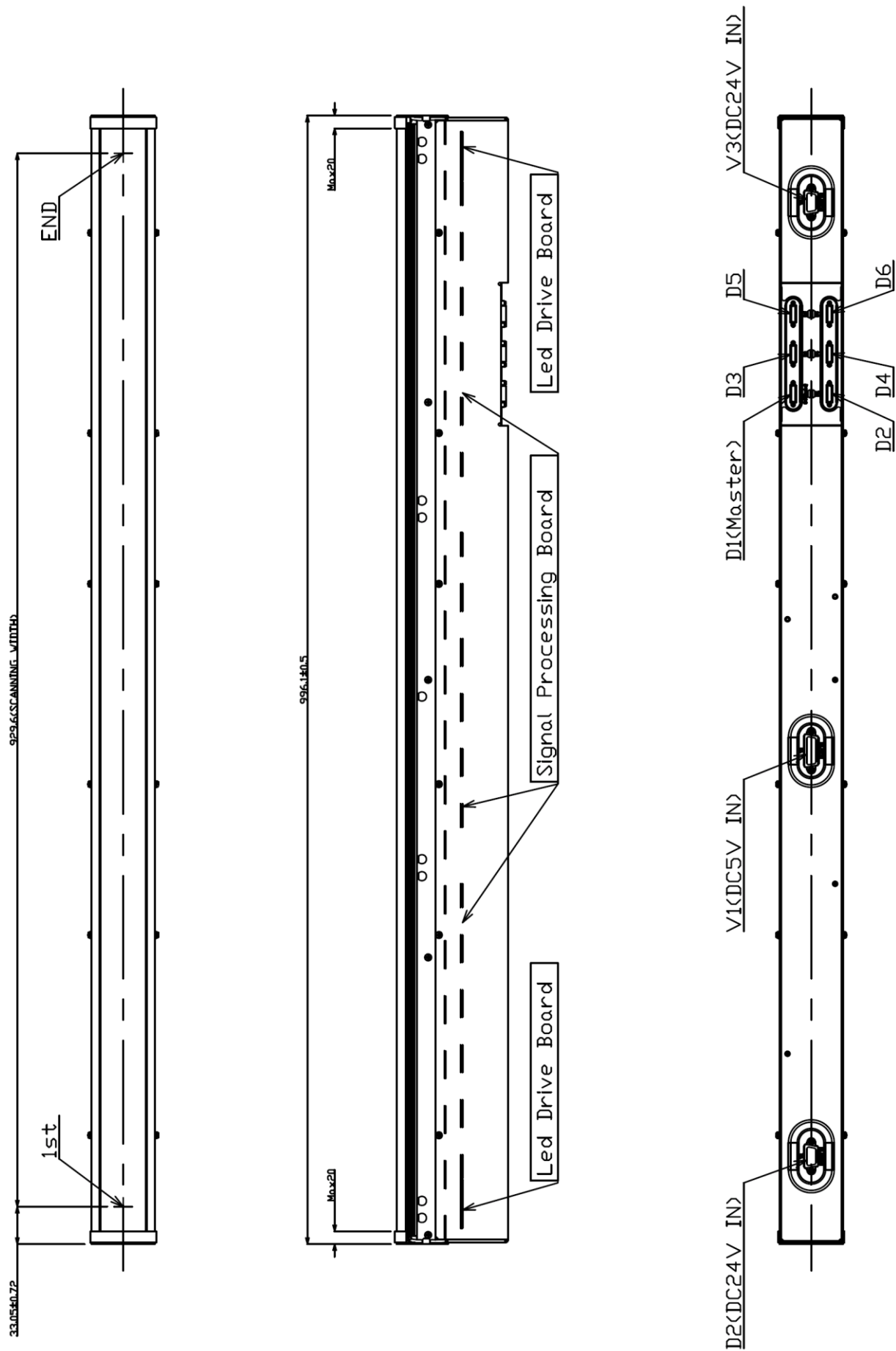


Fig.5 KD6R926MX Outline drawing

