

CCD multichannel detector heads



C10150-01

C10151-01

Designed for back-thinned CCD area image sensor

The C10150-01 and C10151-01 are multichannel detector heads for use with back-thinned FFT-CCD area image sensors [S10140/S10141 series (-01)] specifically designed for low-light-level detection. The C10150-01 is designed for the non-cooled back-thinned CCD image sensor [S10140 series (-01)], while the C10151-01 for the one-stage TE-cooled CCD area image sensors [S10141 series (-01)] for detection at even lower light levels. Both the C10150-01 and C10151-01 incorporate a low-noise driver circuit that provides reliable operation by supplying external start and CLK signals. The C10151-01 also includes a highly stable temperature controller that cools the sensor to a preset temperature level ($T_{chip} = -10\text{ }^{\circ}\text{C}$) as soon as the power is turned on. If the cooler fails and causes internal circuitry to overheat, the built-in protection circuit automatically turns off the power to the thermoelectric cooler. Despite its compact size, the housing configuration is designed for good heat dissipation, and threaded mounting holes on the front panel allow connections to other devices such as monochrometers. The table below shows back-thinned CCD image sensors for the C10150-01 and C10151-01. The C10150-01 and C10151-01 do not come with a CCD image sensor, so select the desired sensor and order it separately.

The controller for multichannel detector head C7557-01 is also available. The software supplied with the C7557-01 allows easy control of the multichannel detector head and data acquisition.

Features

- **Designed for back-thinned CCD area image sensor^{*1}**
C10150-01: for non-cooled type [S10140 series (-01)]
C10151-01: for TE-cooled type [S10141 series (-01)]
- **Line binning operation^{*2}/area scanning operation**
- **Driver/amplifier circuit for low noise CCD operation**
- **Highly stable temperature controller (C10151-01)**
- **Simple operation by supplying two types of signals**
- **Compact configuration**

Applications

- **Fluorescence spectroscopy**
- **Raman spectroscopy**
- **Semiconductor inspection**

*1: In normal CCD image sensors that receive light from the front surface, the active area is covered with electrodes for charge transfer. These electrodes cut off UV radiation incident on the image sensor and also reduce the quantum efficiency. In contrast, back-thinned CCD image sensors have a unique structure in which the back of the active area is finely ground to allow light to enter from the back surface. This structure ensures high UV sensitivity and quantum efficiency because incident light need not pass through the electrodes.

*2: The FFT-CCD was originally designed as a two-dimensional image sensor. However, it can be operated like a linear image sensor having a large active area by transferring all the pixel signals in the vertical direction to the horizontal register (this is referred to as line binning).

Selection guide

The table below shows CCD area image sensors applicable for the C10150-01 or C10151-01. For detail information of the CCD area image sensors, see the datasheet. Since the C10150-01 and C10151-01 do not include a CCD area image sensor, so select the desired sensor and order it separately.

Type no.	CCD area image sensor			
	Type no.	Number of pixels	Number of effective pixels	Image area [mm (H) × mm (V)]
C10150-01	S10140-1107-01	2068 × 128	2048 × 122	24.576 × 1.464
	S10140-1108-01	2068 × 256	2048 × 250	24.576 × 3.000
	S10140-1109-01	2068 × 512	2048 × 506	24.576 × 6.072
C10151-01	S10141-1107S-01	2068 × 128	2048 × 122	24.576 × 1.464
	S10141-1108S-01	2068 × 256	2048 × 250	24.576 × 3.000
	S10141-1109S-01	2068 × 512	2048 × 506	24.576 × 6.072

Absolute maximum ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	
Supply voltage (for digital circuitry)	VD1	-0.5	-	+7	V	
	VA1+	-	-	+18		
Supply voltage (for analog circuitry)	VA1-	-	-	-18		
	VA2	-	-	+30		
Supply voltage*3	VD2	-	-	+7		
	Vp	-	-	+7		
	VF	-	-	+14		
Digital input voltage	-	-	-	VD1		
Operating temperature*4	C10150-01	0	-	+50		°C
	C10151-01	+10	-	+30*5		
Storage temperature*4	C10150-01	-20	-	+70		
	C10151-01	0	-	+50		

*3: C10151-01

*4: No dew condensation

When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.

*5: The maximum value may be lower, depending on the drive frequency and the number of sensor pixels.

Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

Electrical characteristics

(Ta=25 °C, VD1=+5 V, VA1+=+15 V, VA1=-15 V, VA2=+24 V, VD2=+5 V, Vp=+5 V, VF=+12 V, unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	
Digital input	High level	VIH	+2.0	-	+5.0	V
	Low level	VIL	-0.5	-	+0.8	V
CLK frequency	fCLK	-	-	1	MHz	
Data video readout frequency	fv	-	-	fCLK/4	Hz	
Start pulse width	tst	1/fCLK	-	-	s	
Digital output	High level (Io=-6 mA)	VIH	+2.0	-	-	V
	Low level (Io=+6 mA)	VIL	-	-	+0.8	V
Power supply operating conditions						
Voltage	Digital circuitry	VD1	+4.75	+5.0	+5.25	V
	Analog circuitry	VA1+	+14.75	+15.0	+15.25	V
		VA1-	-14.75	-15.0	-15.25	V
		VA2	+23.75	+24.0	+24.25	V
	Other*6	VD2	+4.75	+5.0	+5.25	V
		Vp	+4.75	+5.0	+5.25	V
VF		+11.75	+12.0	+12.25	V	
Current	VD1 (+5 VDC)	-	-	-	+65	mA
	VA1+ (+15 VDC)	-	-	-	+55	mA
	VA1- (-15 VDC)	-	-	-	-65	mA
	VA2 (+24 VDC)	-	-	-	+15	mA
	VD2 (+5 VDC)*6	-	-	-	+15	mA
	Vp (+5 VDC)*6	-	-	-	+2.5	A
VF (+12 VDC)*6	-	-	-	+150	mA	

*6: C10151-01

Electrical and optical characteristics

[Ta=25 °C, Tchip=-10 °C (C10151-01), Vd1=+5 V, VA1+=+15 V, VA1=-15 V, VA2=+24 V, Vd2=+5 V, Vp=+5 V, Vf=+12 V, unless otherwise noted]

Parameter	Symbol	Min.	Typ.	Max.	Unit
Spectral response range	λ	-	200 to 1100	-	nm
Full well capacity	Vertical	60	70	-	ke ⁻
	Horizontal	400	500	-	
Conversion gain*7	Sv	17	-	25	$\mu\text{V}/e^-$
Saturation output voltage	Vsat	10	-	-	V
Dark current*8	C10150-01 (Tchip=25 °C)	-	30	300	e ⁻ /pixel/s
	C10151-01 (Tchip=-10 °C)	-	1.5	15	
Readout noise	Nread	5	-	18	e ⁻ rms
Dynamic range	Line binning	-	25000	-	-
	Area scanning	-	3500	-	
Photoresponse nonuniformity*9	PRNU	-	± 3	± 10	%

*7: Including the circuit gain

*8: At MPP mode. Vertical register value. The actual value equals the sum of the vertical direction because of the binning operation.

*9: Measured at 50% of the full well capacity

Specifications for temperature controller (C10151-01)

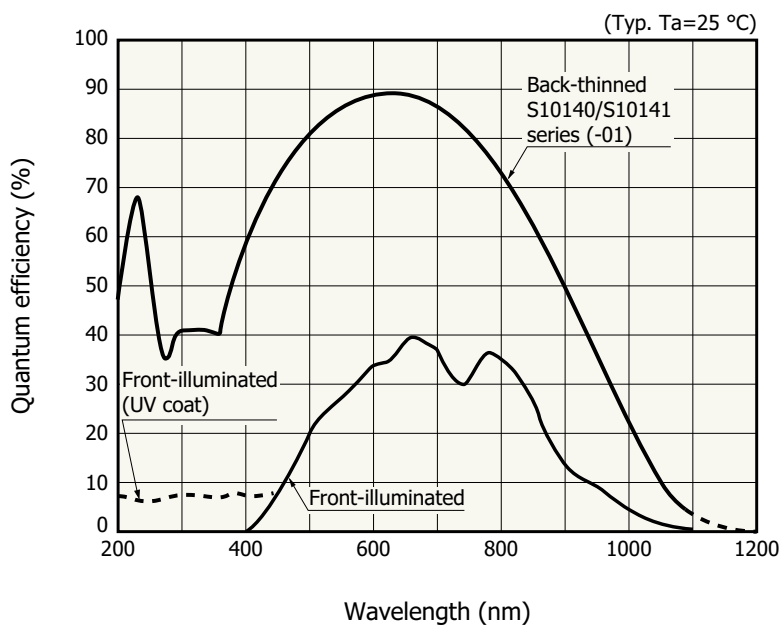
(Ta=25 °C, Vd1=+5 V, VA1+=+15 V, VA1=-15 V, VA2=+24 V, Vd2=+5 V, Vp=+5 V, Vf=+12 V, CLK frequency=250 kHz, unless otherwise noted)

Parameter*10	Symbol	Min.	Typ.	Max.	Unit
Cooling temperature	Ts	-11.5	-10	-8.5	°C
Temperature control range	ΔT_s	-0.05	-	+0.05	°C
Power dissipation of TE-cooler element	Pp	-	-	7	W
Cool down time to reset temperature	to	-	-	5	min
Setting temperature for overheat protection*11	To	-	+45	-	°C

*10: Other functions include error display, automatic power off, and detection of electrical opens and shorts by the thermosensor.

*11: Temperature on the rear of the case (where the fan is installed)

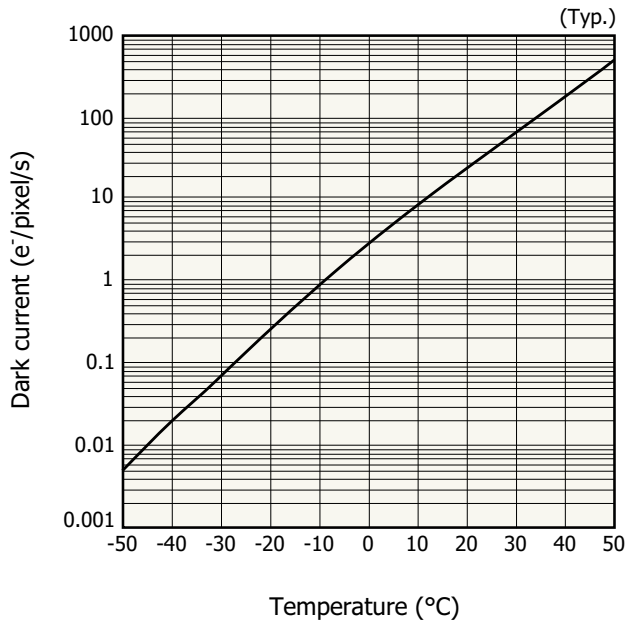
Spectral response (without window)*12



KMPDB0561EA

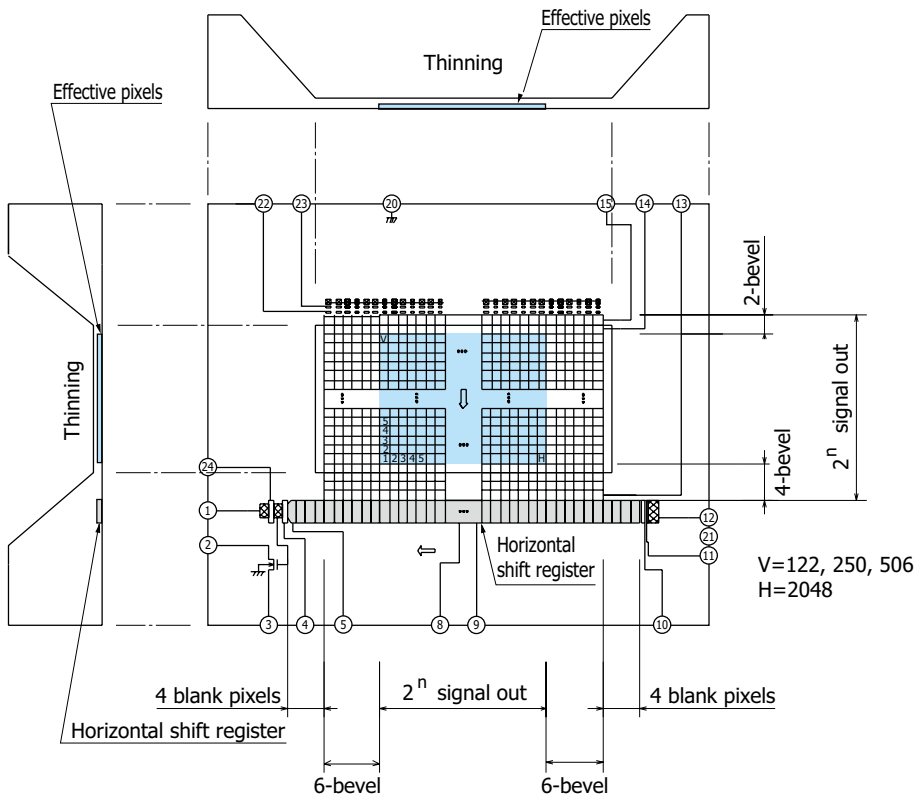
*12: Spectral response with quartz glass (or AR-coated sapphire glass) is decreased by the transmittance.

Dark current vs. temperature



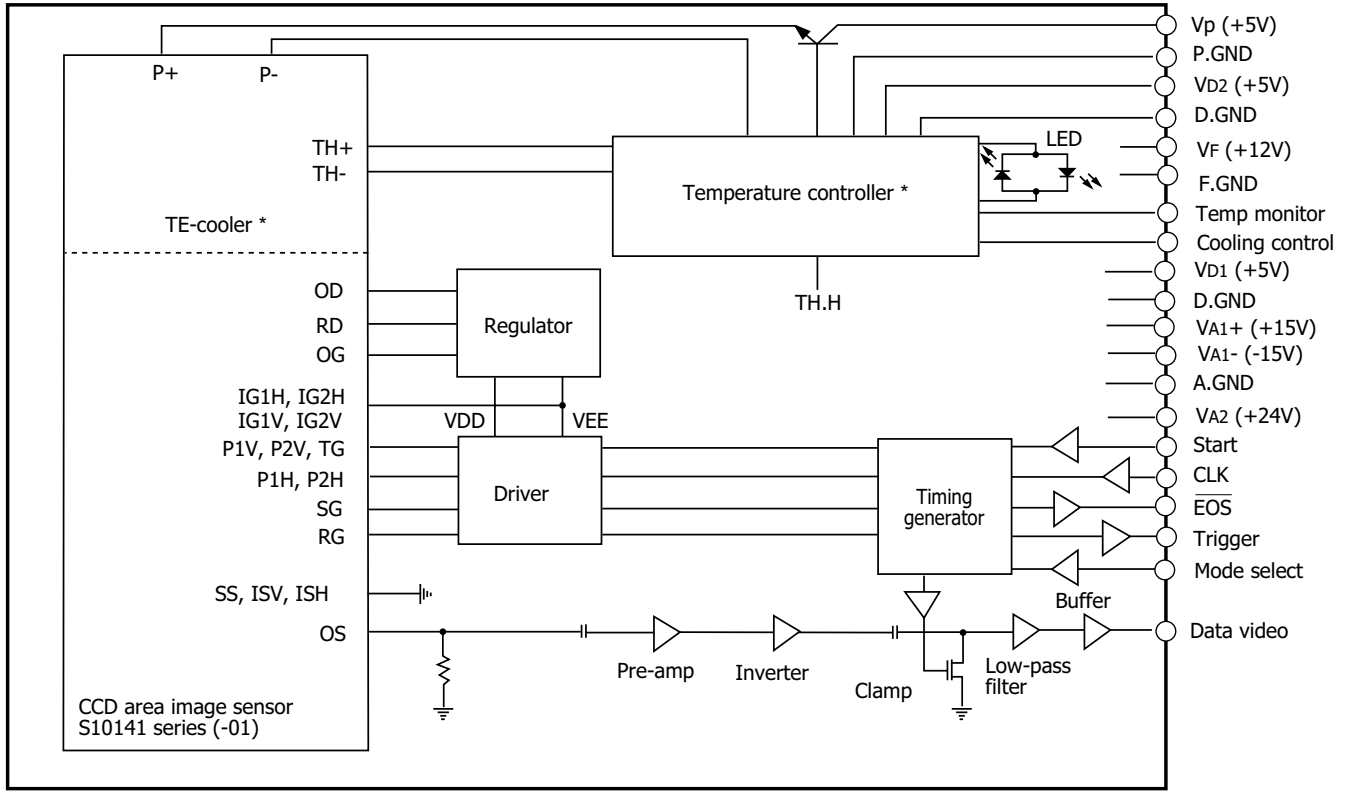
KMPDB0255EC

Device structure (Conceptual drawing)



KMPDC0613EA

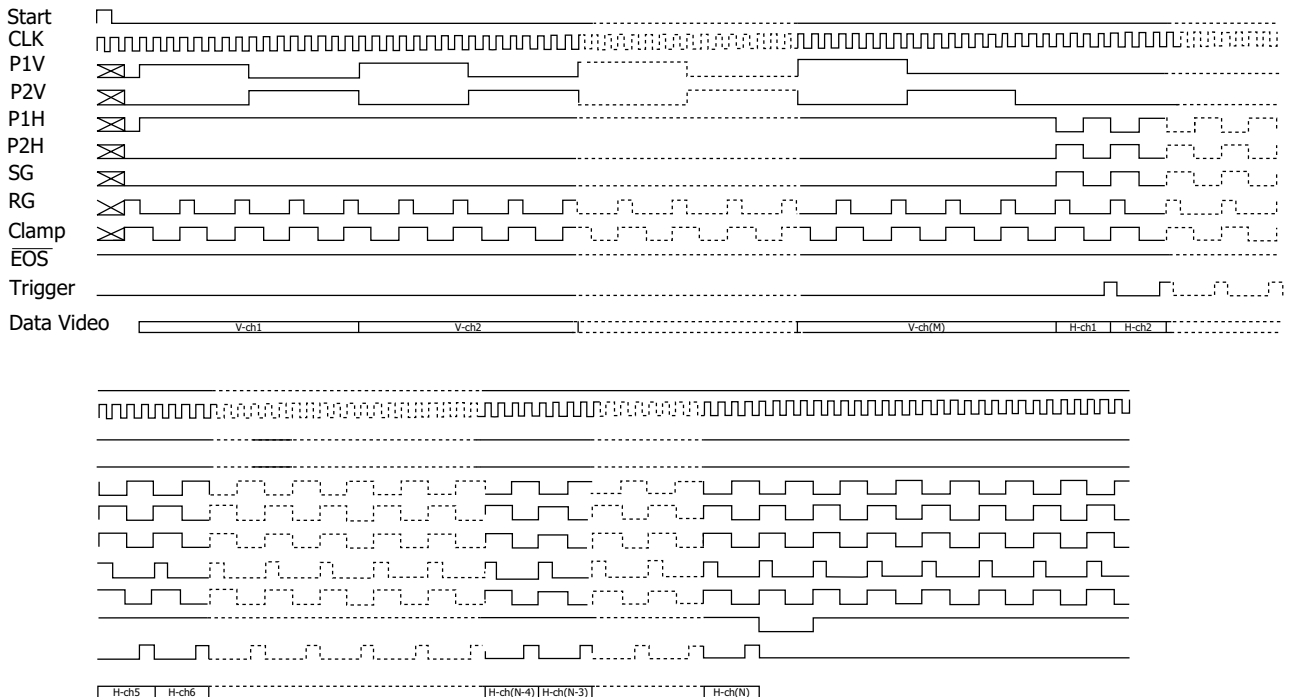
Block diagram (C10151-01)



* The C10150-01 does not include the temperature controller and TE-cooler.

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Timing chart (line binning operation)

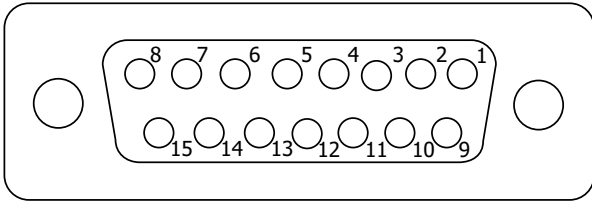


M=128, 256, 512 N=2068
 V-ch1--V-ch2, V-ch (M-1)--V-ch (M): Isolation pixels
 H-ch1--H-ch4, H-ch (N-3)--H-ch (N): Blank pixels

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Pin connections of "SIGNAL I/O" connector

15-pin D-sub connector

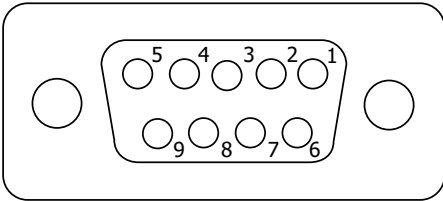


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Pin no.	Terminal name	Description
1	Mode select	Digital input signal used to select between the line binning operation and area scanning operation. HCMOS compatible. High level or left open: line binning operation Low level: area scanning operation
2	Data video	Analog video output. Positive polarity.
3	VA1+ (+15 V)	Analog power supply
4	VA1- (-15 V)	Analog power supply
5	VD1 (+5 V)	Digital power supply
6	Start	Digital input signal for initializing the circuit. HCMOS compatible. Positive logic. The interval of the Start pulses determines the integration time of the CCD image sensor.
7	CLK	Digital input signal for operating the circuit. HCMOS compatible. Rising edge operation.
8	EOS	Digital output signal for indicating end-of-scan of the image sensor. HCMOS compatible. Negative logic.
9	A.GND	Analog ground
10	A.GND	Analog ground
11	VA2 (+24 V)	Analog power supply
12	D.GND	Digital ground
13	D.GND	Digital ground
14	D.GND	Digital ground
15	Trigger	Digital output signal for A/D conversion. HCMOS compatible. Positive logic.

Pin connection of "TE CONTROL I/O" connector (C10151-01)

9-pin D-sub connector



KACCC0075EA

Pin no.	Terminal name	Description
1	Vd2 (+5 V)	Digital power supply
2	Temp monitor	Analog output signal of the temperature of the CCD image sensor
3	Cooling control	Digital input signal for starting to cool down. HCMOS compatible. High level or left open: cooling Low level: stand-by
4	Vp (+5 V)	Power supply for the thermoelectric cooler in the CCD image sensor (Please use AWG 18 wire)
5	Vf (+12 V)	Power supply for cooling fan
6	D.GND	Ground
7	D.GND	Ground
8	P.GND	Power supply return of the thermoelectric cooler mounted in the CCD image sensor (Please use AWG 18 wire)
9	F.GND	Power supply return for cooling fan

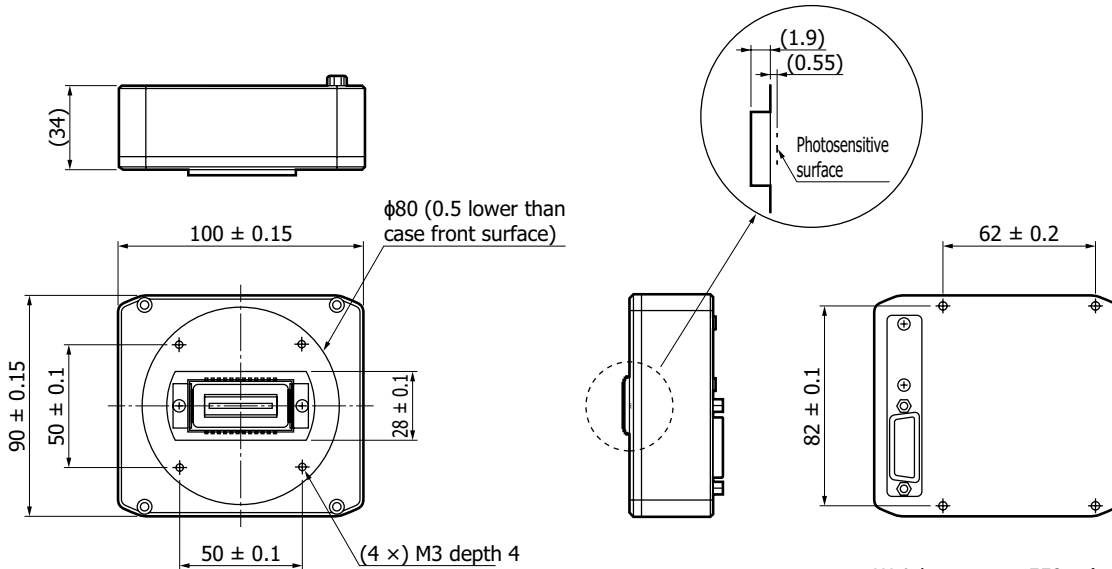
Available for using same power supply (+5 V) for "+Vd2" and "+Vp".

Caution: Do not connect "Vd2" and "Vp" together on the backside of the 9-pin D-sub connector.

These may be connected (shorted) at the power supply end, not 9-pin D-sub connector.

Dimensional outlines (unit: mm)

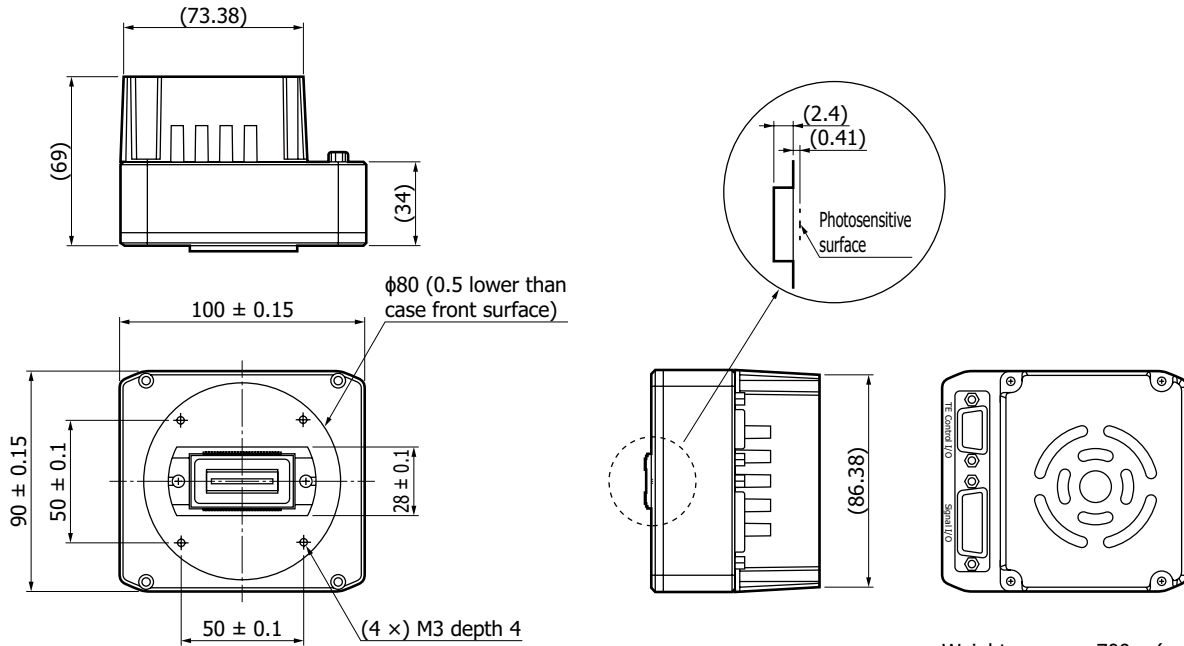
C10150-01



Weight: approx. 550 g (sensor included)
Note: The sensor is sold separately.

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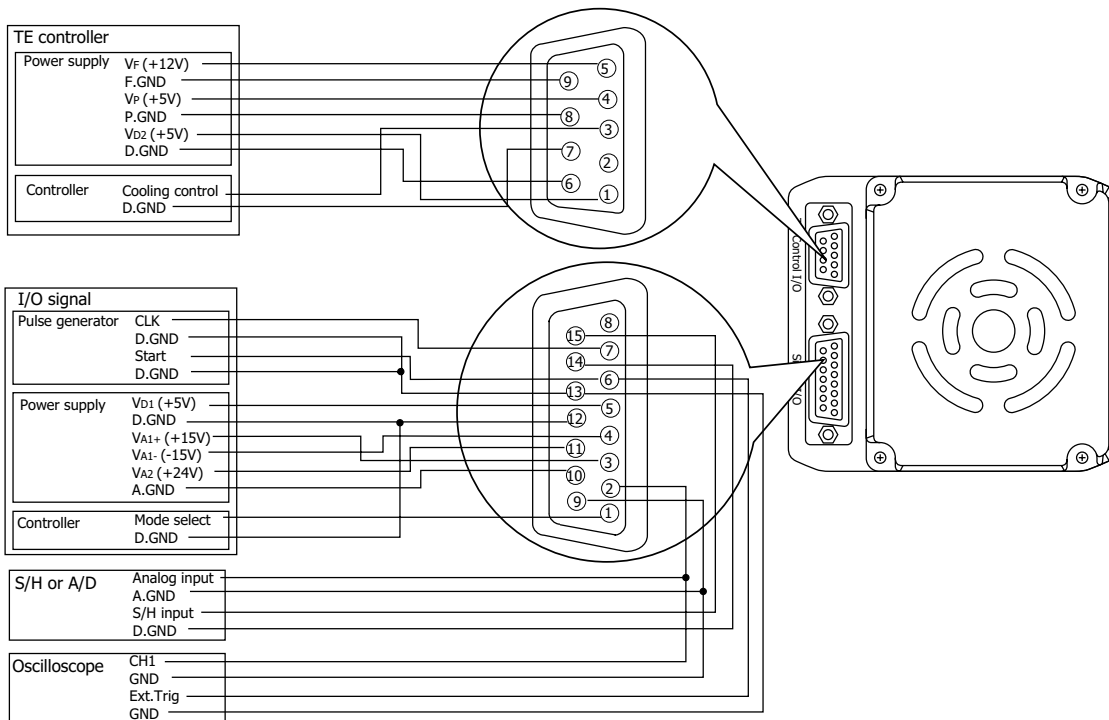
C10151-01



Weight: approx. 700 g (sensor included)
 Note: The sensor is sold separately.

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Connection example (C10151-01)



KACCC0076EE

Multichannel detector head controller C7557-01

When connected to a Hamamatsu multichannel detector head and a personal computer, the C7557-01 allows easy control of the detector head and data acquisition by using dedicated software that comes with the unit.

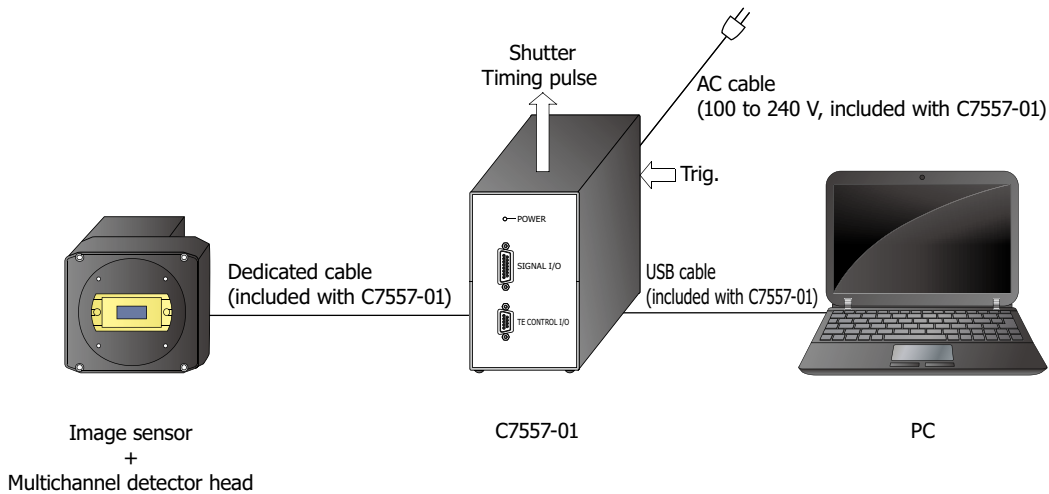
Accessories

- Spare fuse (2.5 A)*13
- AC cable
- 2 to 3 conversion adapter
- USB cable
- Detector head connection cables
(for "SIGNAL I/O" and "TE CONTROL I/O" terminal of multichannel detector head)
- CD-R (MCD USB driver, software, operation manual)
- MOS adapter*14

*13: Contained in the holder just above the AC cable connector on the C7557-01 rear panel.
 *14: For connection of NMOS multichannel detector head. Do not use for CCD multichannel detector head. It can cause abnormal operation.



Connection example



Note: Shutter, etc. are not available.

KACCC0402EF

Related information

www.hamamatsu.com/sp/ssd/doc_en.html

- Precautions
- Disclaimer

Information described in this material is current as of June 2023.

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HAMAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184

U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218

Germany: HAMAMATSU PHOTONICS DEUTSCHLAND GMBH: Arzbergerstr. 10, 82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8 E-mail: info@hamamatsu.de

France: HAMAMATSU PHOTONICS FRANCE S.A.R.L.: 19 Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: infos@hamamatsu.fr

United Kingdom: HAMAMATSU PHOTONICS UK LIMITED: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire, AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: info@hamamatsu.co.uk

North Europe: HAMAMATSU PHOTONICS NORDEN AB: Torshamnsgatan 35, 16440 Kista, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01 E-mail: info@hamamatsu.se

Italy: HAMAMATSU PHOTONICS ITALIA S.R.L.: Strada della Moia, 1 int. 6 20044 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41 E-mail: info@hamamatsu.it

China: HAMAMATSU PHOTONICS (CHINA) CO., LTD.: 1201, Tower B, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R. China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn

Taiwan: HAMAMATSU PHOTONICS TAIWAN CO., LTD.: 13F-1, No.101, Section 2, Gongdao 5th Road, East Dist., Hsinchu City, 300046, Taiwan(R.O.C) Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.tw