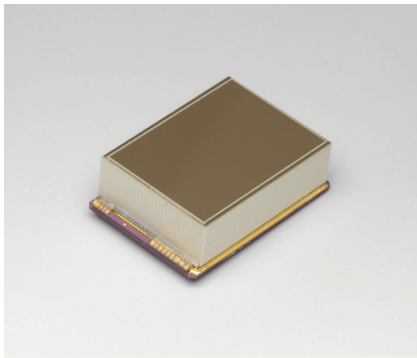


CCD area image sensor



S8984-02

Front-illuminated FFT-CCD for X-ray imaging

The S8984-02 is an FFT-CCD image sensor suitable for X-ray imaging. The user can use the S8984-02 as an X-ray image sensor by attaching a desired scintillator film to the faceplate. The S8984-02 is a variant of the S8984 and uses a FOP (fiber optic plate) as the faceplate instead of a FOS (fiber optic plate with scintillator). The thickness of the FOP was also changed from 1.5 mm to 10 mm, in order to increase resistance to X-ray irradiation.

Features

- X-ray monitoring photodiode incorporated
- High dynamic range: 12-bit
- Long-term stability
- 1700 (H) × 1200 (V) pixel format
- Pixel size: 20 × 20 μm
- Coupled with FOP for X-ray imaging
- 100% fill factor
- Low dark signal
- Low readout noise
- MPP operation
- AC/DC X-ray source adapted

Applications

- General X-ray imaging
- Non-destructive inspection

Structure

Parameter	S8984-02
CCD structure	Full frame transfer
Fill factor	100%
Cooling	Non-cooled
Number of total pixels	1708 (H) × 1202 (V)
Number of effective pixels	1700 (H) × 1200 (V)
Pixel size	20 (H) × 20 (V) μm
Image size	34 (H) × 24 (V) mm
Vertical clock phase	2-phase
Horizontal clock phase	2-phase
Output circuit	Emitter follower without load resistance
Dimensional outline	39.5 (H) × 27.5 (V) mm
Window	FOP (fiber optic plate)
Other	MPP mode (low dark current operation)

Electrical and optical characteristics (Ta=25 °C, Vod=15 V, unless otherwise noted)

Parameter		Symbol	Remark	Min.	Typ.	Max.	Unit	
Full well capacity	Vertical	Fw		100	200	-	ke ⁻	
	Horizontal			-	300	-		
	Summing			-	600	-		
CCD node sensitivity		Sv	*1	1.0	1.4	-	μV/e ⁻	
Dark current (MPP mode)		DS	*2	-	250	2500	e ⁻ /pixel/s	
Readout noise	Ta=25 °C	Nr	*3	-	90	-	e ⁻ rms	
	Ta=-40 °C			-	60	-		
Dynamic range		DR	*4	-	3333	-	-	
Blemish *5	Point defects *6	White spots	-	-	-	20	-	
		Black spots		-	-	20		
	Cluster defects			*7	-	-		3
	Column defects			*8	-	-		1

*1: Vod=15 V, RL (load resistance of emitter follower)=1 kΩ

*2: Dark signal doubles for every 5 to 7 °C.

*3: Operating frequency is 1 MHz.

*4: Dynamic range = Full well capacity / Readout noise

*5: Refer to "Characteristics and use of FFT-CCD area image sensor" of technical information.

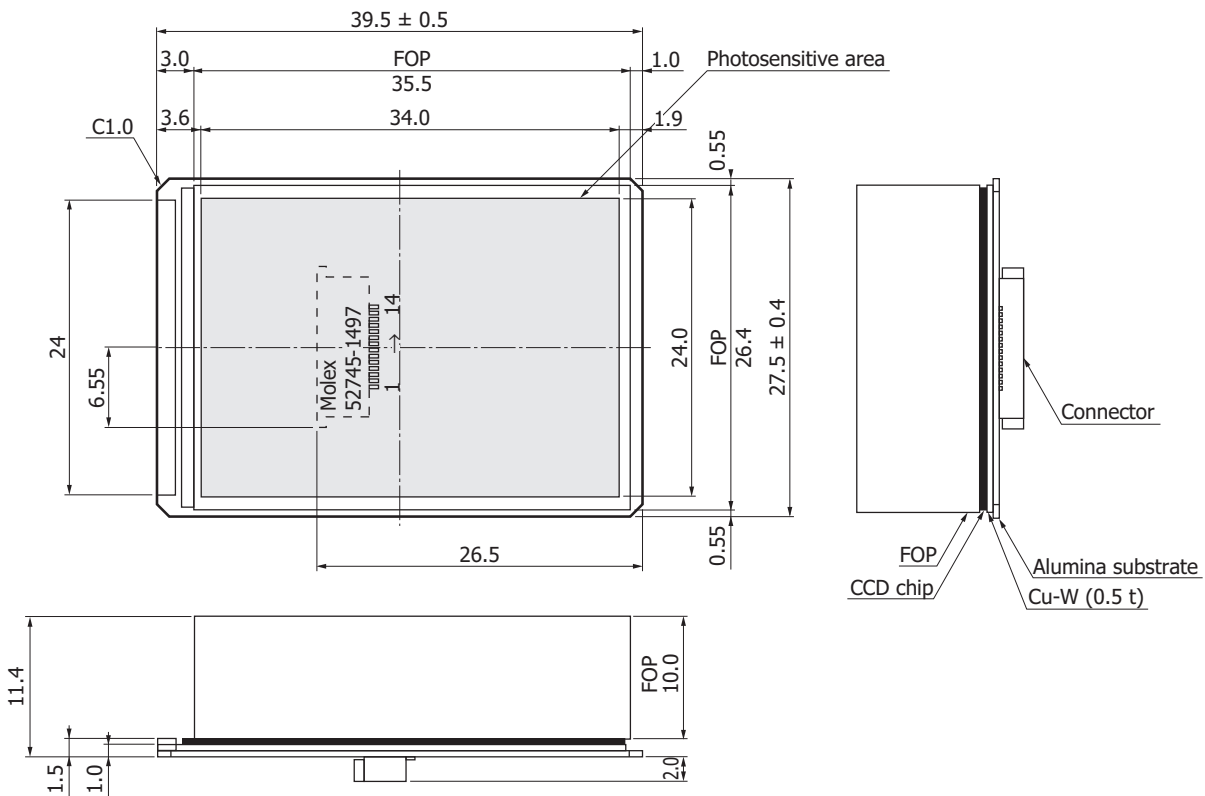
*6: White spots > 10 times of Max. dark current (2500 e⁻/pixel/s)

Black spots > 50% reduction in response relative to adjacent pixels, measured at half of the full well capacity

*7: Continuous 2 to 9 point defects

*8: Continuous > 10 point defects

Dimensional outline (unit: mm)



KMPDA0284EB

Precautions

Operating and storage environment

- X-ray CCDs are not hermetically sealed, so avoid operating or storing them in high humidity locations.
- Do not store in locations subject to excessive vibrations.
- Do not use X-ray CCDs in equipment that requires special quality and reliability, and may directly affect human life or cause personal injury if the equipment breaks down or malfunctions.

Deterioration by X-ray irradiation

- Like other X-ray detectors, X-ray CCD performance deteriorates due to X-ray irradiation, for example causing the dark current to increase and X-ray sensitivity to decrease. In some applications, the image sensor should be replaced as a consumable product.

Others

- If using an X-ray CCD for medical equipment, please contact your local HAMAMATSU sales office.

Information described in this material is current as of August, 2011.

Product specifications are subject to change without prior notice due to improvements or other reasons. Before assembly into final products, please contact us for the delivery specification sheet to check the latest information.

Type numbers of products listed in the delivery specification sheets or supplied as samples may have a suffix "(X)" which means preliminary specifications or a suffix "(Z)" which means developmental specifications.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use.

Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

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, P.O.Box 6910, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1) 908-231-0960, Fax: (1) 908-231-1218

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49) 8152-375-0, Fax: (49) 8152-265-8

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

United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, United Kingdom, Telephone: (44) 1707-294888, Fax: (44) 1707-325777

North Europe: Hamamatsu Photonics Norden AB: Smidesvägen 12, SE-171 41 Solna, Sweden, Telephone: (46) 8-509-031-00, Fax: (46) 8-509-031-01

Italy: Hamamatsu Photonics Italia S.R.L.: Strada della Moia, 1 int. 6, 20020 Arese, (Milano), Italy, Telephone: (39) 02-935-81-733, Fax: (39) 02-935-81-741