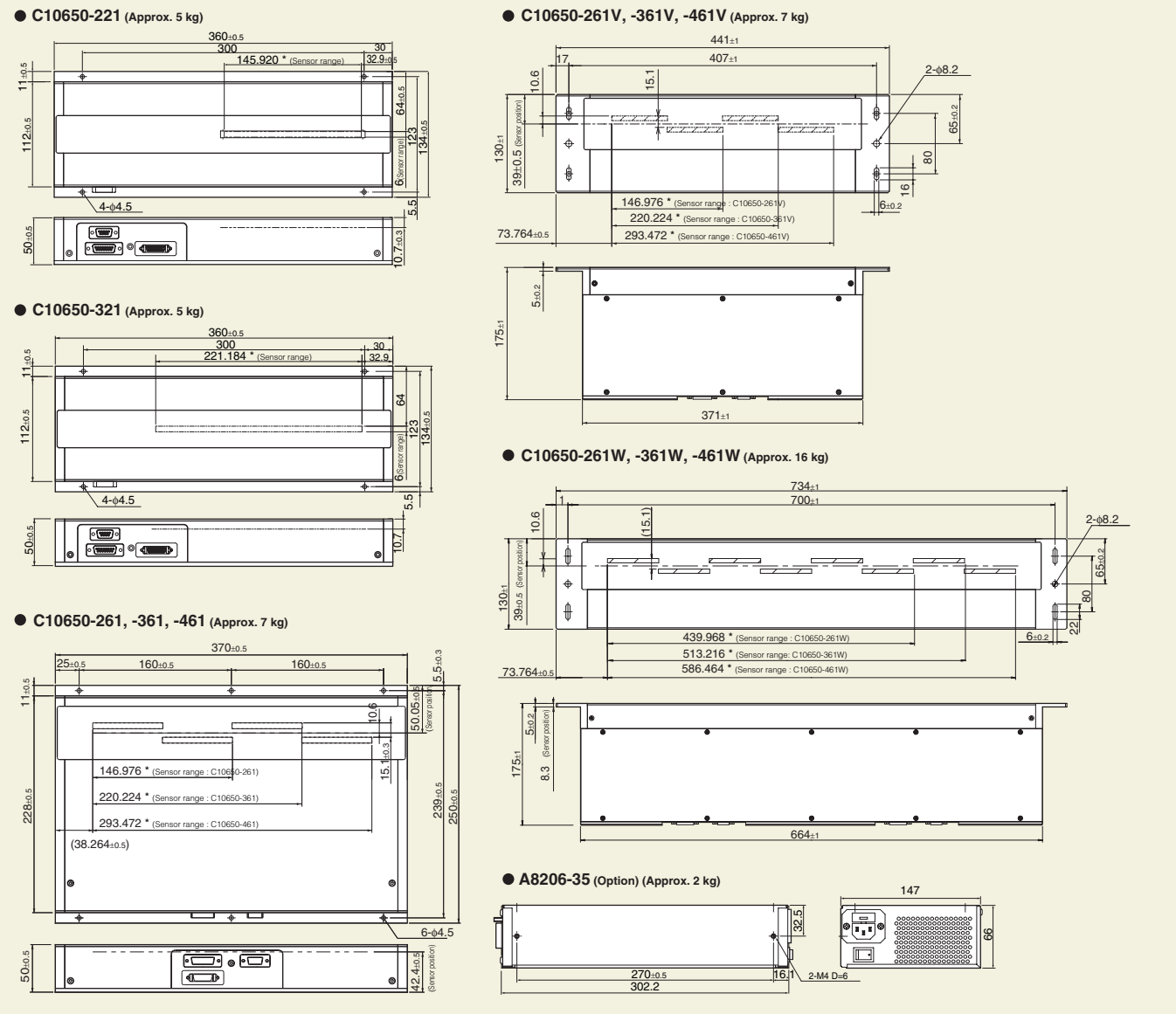


DIMENSIONAL OUTLINES (Unit: mm)



* Sensor length is a theoretical value and does not include the dead space between CCDs. In case of overlapped type, the overlapped pixels are defined as 10 pixels.

OPTIONS

- DC power supply: **A8206-35**
- Power supply cable 5 m: **A10847-05**
- Camera Link cable 5 m: **A9262-05**
- Software API Support (Microsoft Windows): **DCAM-API** (<http://www.dcamapi.com>)
- Multi A/D gain value: **M8815-01**

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HAMAMATSU PHOTONICS K.K. www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Systems Division

812 Joko-cho, Higashi-ku, Hamamatsu City, 431-3196, Japan, Telephone: (81)53-431-0124, Fax: (81)53-435-1574, E-mail: export@sys.hpk.co.jp

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 E-mail: usa@hamamatsu.com

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-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, United Kingdom, Telephone: 44-(0)1707-294888, Fax: 44(0)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/E, 20020 Arese, (Milano), Italy, Telephone: (39)02-935 81 733, Fax: (39)02-935 81 741 E-mail: info@hamamatsu.it

China: Hamamatsu Photonics (China) Co., Ltd.: 1201 Tower B, Jiaming Center, 27 Dongsanhuan Road North, Chaoyang District, Beijing 100020, China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn

Cat. No. SFAS0025E02
APR/2013 HPK
Created in Japan

X-ray TDI Camera C10650 Series

High speed readout

Large field of view

High resolution

High sensitivity



High quality image output with high resolution achieved by TDI technology

High speed readout

10.7
m/min.

Detection area

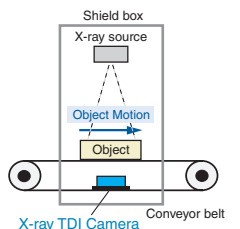
Max.
586
mm

Horizontal spatial resolution

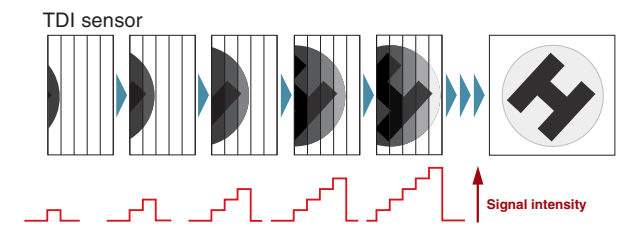
Max.
6144x2
pixels

TDI technology

Time Delay Integration is a scanning technology in which a frame transfer device produces a continuous video image of a moving object by means of a stack of linear arrays aligned with and synchronized to the motion of the object to be imaged in such a way that, as the image moves from one line to the next, the integrated charge moves along with it, providing higher resolution at lower light levels than is possible with a line-scan camera.



X-ray TDI camera C10650 series is useful for in-line applications requiring high-speed operation with high sensitivity. TDI imaging is appropriate for applications where it is desired to record a linear movement, or where the aspect ratio of the subject being imaged is significantly asymmetric. Low brightness under high resolution usage, a problem with conventional line sensor cameras, is improved with this X-ray TDI camera, making it suitable for applications which require high resolution. Vertical X-ray TDI cameras that can be installed in narrow spaces are new additions to the series.



Printed circuit board (PCB) inspection

Surface-mounted component inspection

Lithium-ion battery inspection

High-resolution in-line non-destructive inspection

Features

- High S/N ratio with 12 bit / 16 bit output
- Camera Link interface (Base configuration)
- Single power supply (+15 V) operation
- Real time dark current / shading correction function
- Frame readout mode for easy installation alignment

HAMAMATSU
PHOTON IS OUR BUSINESS

High-resolution, High-speed Camera with a Wide Field of View for In-line 100 % X-ray Inspection

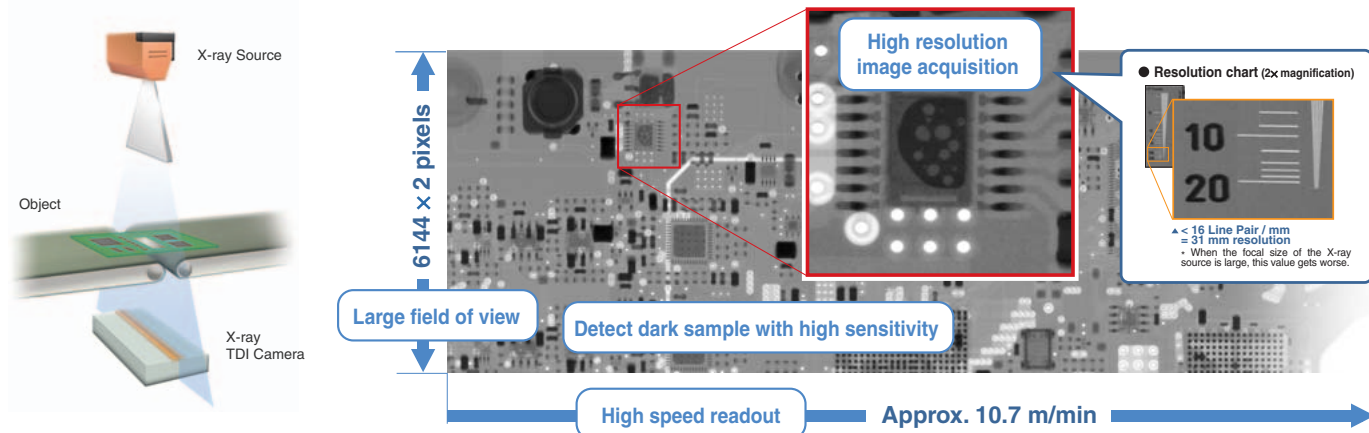
High speed readout

Large field of view

High resolution

High sensitivity

TDI technology offers all four simultaneously.



PRODUCT LINEUP

Standard type

Type number	C10650-221	C10650-321
Sensor number	2	3
X-ray sensitive area	145 mm	221 mm

Overlapped horizontal type

Type number	C10650-261	C10650-361	C10650-461
Sensor number	2	3	4
X-ray sensitive area	146 mm	220 mm	293 mm

Overlapped vertical type

Type number	C10650-261V	C10650-361V	C10650-461V
Sensor number	2	3	4
X-ray sensitive area	146 mm	220 mm	293 mm

Overlapped vertical type (2 cameras)

Type number	C10650-261W	C10650-361W	C10650-461W
Sensor number	6	7	8
X-ray sensitive area	439 mm	513 mm	586 mm

SPECIFICATIONS

Type number	C10650-221	C10650-321	C10650-461	C10650-461V	C10650-461W
CCD pixel number	3072(H) × 128(V)	4608(H) × 128(V)	6144(H) × 128(V)	6144(H) × 128(V)	6144 × 2(H) × 128(V)
Active CCD pixel number	3040(H) × 128(V)	4608(H) × 128(V)	6144(H) × 128(V) *1	6144(H) × 128(V) *1	6144 × 2(H) × 128(V) *1
CCD pixel size	48 μm × 48 μm				
X-ray sensitive area	145 mm(H) × 6 mm(V)	221 mm(H) × 6 mm(V)	293 mm(H) × 6 mm(V) *1	293 mm(H) × 6 mm(V) *1	586 mm(H) × 6 mm(V) *1
Window	FOS (Fiber optic plate with scintillator)				
Recommended use range	Approx. 25 kV to 90 kV *2				
CCD pixel clock	4.0 MHz				
TDI line rate	Max. 2.109 kHz (6.073 m/min)				
	binning 2 × 2 Max. 1.858 kHz (10.702 m/min)				
A/D converter	12 bit		16 bit		
Data output	12 bit		16 bit		
Interface (Camera Link)	Base Configuration				
Pixel clock (Camera Link)	16.0 MHz				
TDI line rate control *3	External mode or internal mode				
A/D gain value *4	0 dB to 20 dB (64 steps)				
Power requirements	DC +15 V (±1 V)				
Power consumption	25 VA	30 VA	30 VA	30 VA	60 VA

*1 "Active CCD pixel number" is all outputting pixel number including overlapped pixel. When the overlapped pixels are deleted, actual pixel numbers will vary. And also, X-ray sensitive area will vary.

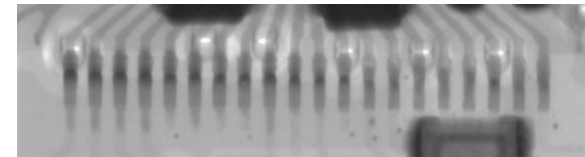
*2 Usable range of X-ray strength may vary depending on the tube current, the tube voltage and the distance.

*3 Selectable by serial command

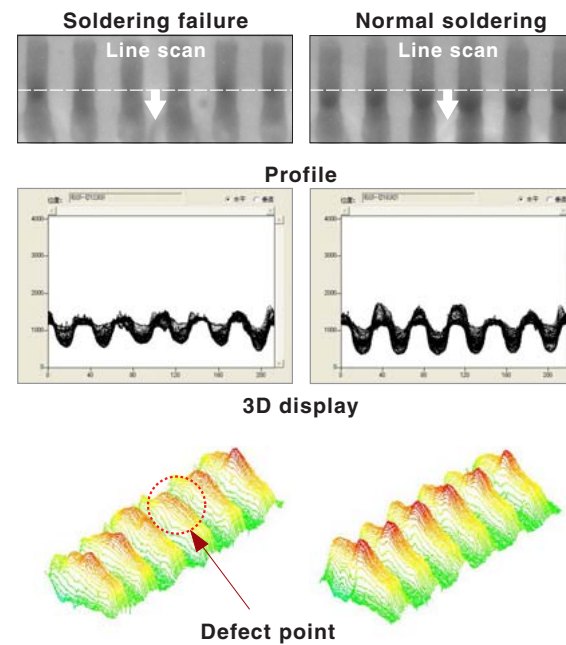
*4 A/D gain value (M8815-01) is optional.

MEASUREMENT EXAMPLES

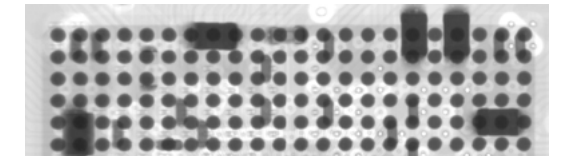
Inspection of a solder's back fillet



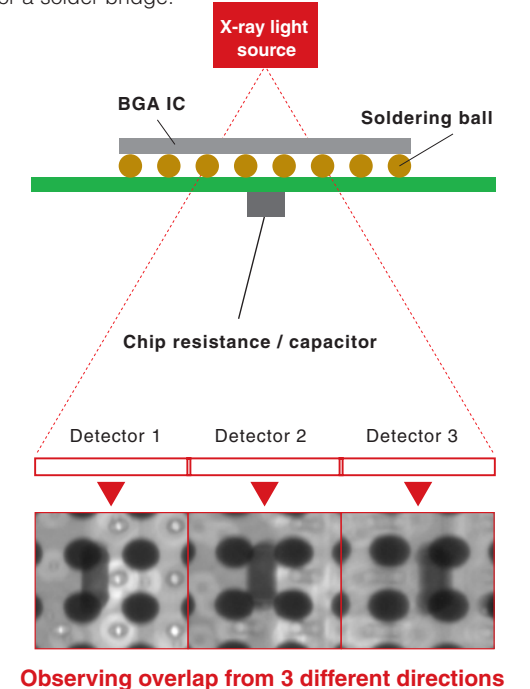
If the back fillet of the solder on a PCB has a defect, a connection error will occur even with small vibrations. For observation of the back fillet part, X-ray transmission technique has been applied but only with an off-line system. Our X-ray TDI camera realizes in-line inspection because it can acquire high speed profile data with high sensitivity. 3D brightness level can be displayed using software.



Multiangule PCB inspection

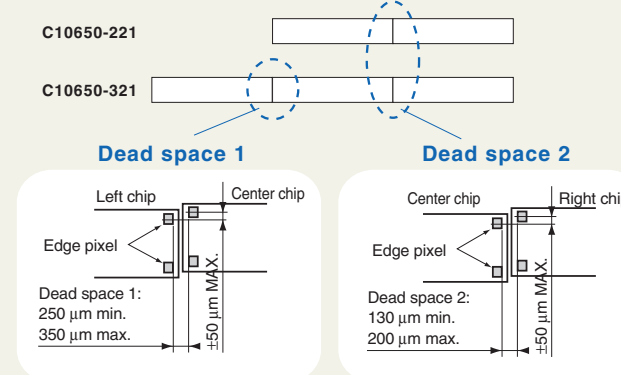


Inspecting a narrow pitch soldering such as BGAs can be difficult because images of mounted components can overlap the BGA, making it hard to detect possible solder bridges. If X-ray cameras are placed at different positions, then comparing the images can determine if the feature is a component or a solder bridge.



Dead space between chips

C10650-221, -321 have dead space between chips as shown below. The effect of the dead space on an X-ray image depends on the measurement conditions such as X-ray magnification ratio and X-ray source's focus size.



Wide detection width with no dead areas.

The overlapped type offers a wide detection area with no dead areas due to its staggered sensors. The output image can be corrected by the camera driver software automatically.

