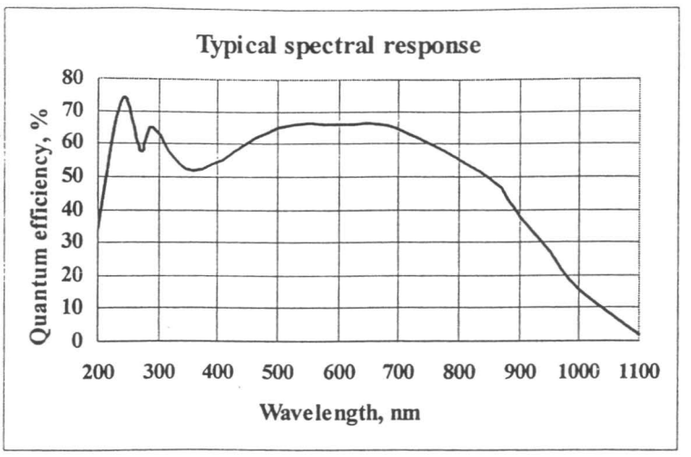
1024 x 256 Back Illuminated UV Enhanced CCD Detector



Main features:

- **Back illuminated format for enhanced quantum efficiency.**
- **Anti reflection coating optimized for near ultraviolet and visible response.**
- **Advanced Inverted Mode Operation (AIMO) for extremely low dark current operation.**

Chip Format:
High performance back illuminated CCD30-11 sensor from EEV.
Pixel format: 1024 x 256
Pixel size: 26 micron square
Image Area: 26.6 mm x 6.7 mm

Readout register:
Organized along long (1024 pixel) edge of the chip for spectroscopic applications.
Anti blooming drains for high speed binning operations of strong light signals which may be adjacent to weak signals for high dynamic range.
Readout noise: 6 electrons rms at 20 KHz (Typical)
8 electrons rms at 20 KHz (Maximum)
Dynamic Range: 83000:1
Pixel readout frequency: 20 - 5000 KHz

Cooling options:
-90°C to -140 °C in liquid nitrogen cooled housing.
Up to -65 °C in high performance forced air cooled thermoelectric housing.
-30 °C in mini forced air cooled thermoelectric housing.

Detector Specifications:
Dark signal: < 3 electrons/pixel/hour at -133 °C
< 2 electrons/pixel/min at -65 °C
2-5 electrons/pixel/sec at -30 °C
Pixel full well capacity: 500 Ke^- (Typ), 300 Ke^- (Min)
Read out register full well capacity: 750 Ke^- (Typ)
Response non-linearity : Maximum 3 % with signal levels up to 140 Ke^-
Response non uniformity: Maximum +/- 10 % of mean
Dark Signal Non-Uniformity (DSNU): Typical standard deviation is 250 electrons/pixel/sec at 293 K.

Blemish Specifications:
ISA and EEV define various types of defects for this CCD chip:
Traps: Pixels where charge is temporarily held. Typically trap capacity is greater than 200 e^- at 233 K.
Slipped column: A column with an amplitude greater than 200 e^-.
Black Spots: Also called dark pixels. Pixels with a responsivity of less than 80% of the local mean signal illuminated at 50 % saturation.
White spots: Also known as hot pixels. Pixels that at 293 K have a dark signal generation rate 100 times the maximum dark current (2000 e^- /pixel/sec) at 293 K.
White column: A column which contains at least 10 white spots.
Black column: A column which contains at least 10 black spots.

All CCD detectors supplied by ISA use grade I chips with the following allowable defects:
Pixel defects:
- 12 or fewer black spots.
- 30 or fewer white spots.
- 3 or fewer dark clusters. Clusters are a collection of 3 –5 dark pixels. No white clusters

Column defects:
- 2 maximum black or slipped columns, no white columns. Minimum separation between adjacent column defects is 50 pixels.

Traps:
- 2 maximum.

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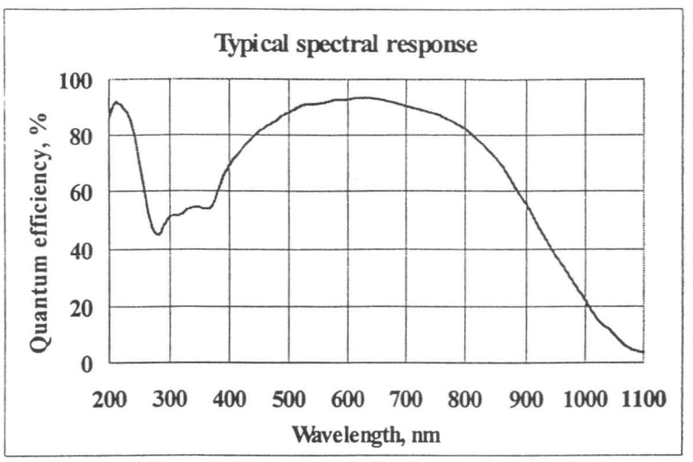
1024 x 252 Back Illuminated Scientific CCD Detector



Main features:

- **Back illuminated format for enhanced quantum efficiency.**
- **Scientific grade CCD ideally suited for scientific and spectroscopic applications.**
- **Multi Phase Pinned (MPP) Operation for low dark current operation.**

Chip Format:
High performance back illuminated S7030-1008 sensor from Hamamatsu.

Pixel format:	1044x 256
Active Pixels:	1024 x 250
Pixel size:	24 micron square
Image Area:	24.57 mm x 6.00 mm

Readout register:
Organized along long (1024 pixel) edge of the chip for spectroscopic applications.
Readout noise: 12 electrons rms at 150 KHz (Typical)
15 electrons rms at 150 KHz (Maximum)
Dynamic Range: 25000:1 (in image mode)
50000:1 (in spectroscopic mode)
Pixel readout frequency: 20 - 1000 KHz

Cooling options:
-90°C to -140 °C in liquid nitrogen cooled housing.
-30 °C in mini forced air cooled thermoelectric housing.

Detector Specifications:
Dark signal: < 3 electron/pixel/hour at -133 °C
< 20 electron/pixel/sec at -30 °C
Pixel full well capacity: 300 Ke^- (Typ), 200 Ke^- (Min)
Read out register full well capacity: 600 Ke^- (Typ)
Response non-linearity : Maximum 3 % with signal levels up to 140 Ke^-
Response non uniformity: Maximum +/- 5 % of mean up to signal levels of 150 Ke^-.

Blemish Specifications:
ISA and Hamamatsu define various types of defects for this CCD chip:
Traps: Pixels where charge is temporarily held. Typically trap capacity is greater than 200 e^-.
Black Spots: Also called dark pixels. Pixels with a output signal 50% of the local mean signal illuminated at 50 % saturation.
White spots: Also known as hot pixels. Pixels that have a dark signal generation rate 20 times greater than the average dark current (200 electrons/pixel/sec) at 273 K.
Column defect: A column which contains continuous point defects.

All CCD detectors supplied by ISA use grade I chips with the following allowable defects:
Pixel defects:
- 9 or fewer black spots.
- 9 or fewer white spots.

Column defects:
- No black or white columns.

Traps:
- 2 maximum.

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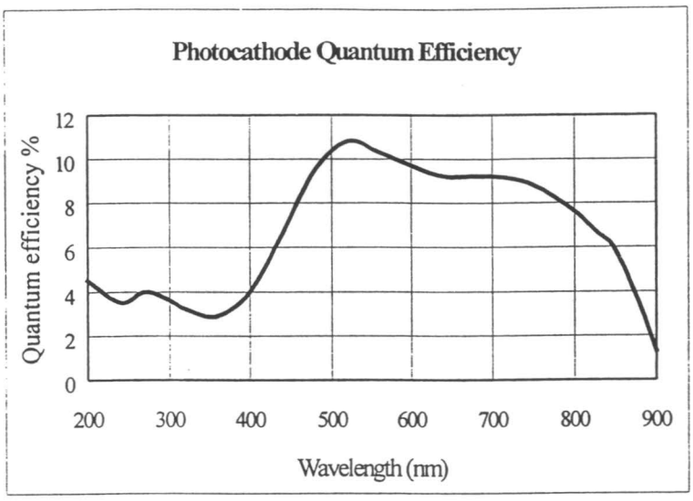
IR SENSITIVE ICCD WITH 18 MM INTENSIFIER & 1024 X 128 CCD CHIP



Main features:

- **S25 photocathode optimized for visible and near infrared response.**
- **Integrated fiber optic coupling between CCD chip and intensifier.**
- **Scientific grade CCD sensor.**
- **Optional water cooling of photocathode for low dark current operation.**

CCD Chip Format:
High performance front illuminated CCD40-11 sensor from EEV.
Pixel format: 1024 x 128
Pixel size: 26 micron square
Image Area: 26.6 mm x 3.3 mm

Intensifier:
SuperGen, 18 mm diameter, non-inverting intensifier with external gain control, glass input window and fiber optic output window.
Photocathode: S25 IR-sensitive
Phosphor: P43
Sensitivity: 60 mA/Watt at 800 nm (Typical)
43 mA/Watt at 800 nm (Minimum)
50 mA/Watt at 850 nm (Typical)
33 mA/Watt at 800 nm (Minimum)
MCP Resolution: 36 lp/mm (Typical),
30 lp/mm (Minimum)
Fiber Optic Coupling: 1:1.39

Gating Speed:
High Voltage power supply integrated right into the compact camera head.
Variable gating speed from nanoseconds to DC.
Fast Gating: ICCD-1024x128-18IRF, 5 ns FWHM to DC;
Slow Gating: ICCD-1024x128-18IRS, 20 ns FWHM to DC with higher quantum efficiency.

CCD Detector Specifications:
Pixel full well capacity: 500 Ke^- (Typ), 300 Ke^- (Min)
Read out register full well capacity: 750 Ke^- (Typ)
Response non-linearity: Maximum 3 % with signal levels up to 200 Ke^-
Response non uniformity: Maximum +/- 10 % of mean
Dark Signal Non-Uniformity (DSNU): Typical standard deviation is 100 electrons/pixel/sec at 293 K

Cooling:
CCD chip: -25 °C in mini forced air cooled thermoelectric housing.
Intensifier: Provided with optional water cooling.

CCD Readout register:
Organized along long (1024 pixel) edge of the chip for spectroscopic applications.
Anti-blooming drains for high speed binning operations of strong light signals, which may be adjacent to weak signals, for high dynamic range.
Readout noise: 4 electrons rms at 20 KHz (Typical)
6 electrons rms at 20 KHz (Maximum)
Pixel readout frequency: 20 - 5000 KHz

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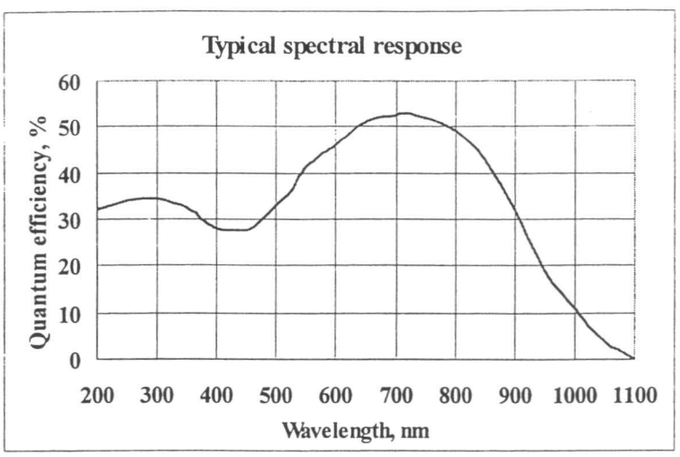
1024 x 256 Open electrode Scientific CCD Detector



Main features:

- **Open electrode structure for enhanced quantum efficiency.**
- **No etaloning effects in the near infrared region.**
- **Advanced Inverted Mode Operation (AIMO) for extremely low dark current operation.**

Chip Format:
High performance front illuminated open electrode CCD30-11 sensor from EEV.
Pixel format: 1024 x 256
Pixel size: 26 micron square
Image Area: 26.6 mm x 6.7 mm

Readout register:
Organized along long (1024 pixel) edge of the chip for spectroscopic applications.
Anti blooming drains for high speed binning operations of strong light signals which may be adjacent to weak signals for high dynamic range.
Readout noise: 4 electrons rms at 20 KHz (Typical)
6 electrons rms at 20 KHz (Maximum)
Dynamic Range: 75000:1
Pixel readout frequency: 20 - 1000 KHz

Cooling options:
-90°C to -140 °C in liquid nitrogen cooled housing.
Up to -65 °C in high performance forced air cooled thermoelectric housing.
-30 °C in mini forced air cooled thermoelectric housing.

Detector Specifications:
Dark signal: < 1 electron/pixel/hour at -133 °C
< 1 electron/pixel/minute at -65 °C
2-5 electrons/pixel/sec at -30 °C
Pixel full well capacity: 300 Ke^- (Typ), 200 Ke^- (Min)
Read out register full well capacity: 600 Ke^- (Typ)
Response non-linearity: Maximum 3 % with signal levels up to 140 Ke^-
Response non uniformity: Maximum +/- 10 % of mean
Dark Signal Non-Uniformity (DSNU): Typical standard deviation is 200 electrons/pixel/sec at 293 K.

Blemish Specifications:
ISA and EEV define various types of defects for this CCD chip:
Traps: Pixels where charge is temporarily held. Typically trap capacity is greater than 200 e^- at 233 K.
Slipped column: A column with an amplitude greater than 200 e^-.
Black Spots: Also called dark pixels. Pixels with a responsivity of less than 90% of the local mean signal illuminated at 50 % saturation.
White spots: Also known as hot pixels. Pixels that between 233 K and 273 K have a dark signal generation rate 100 times the maximum dark current (500 electrons/pixel/sec) at 293 K.
White column: A column which contains at least 9 white spots.
Black column: A column which contains at least 9 black spots.

All CCD detectors supplied by ISA use grade I chips with the following allowable defects:
Pixel defects:
- 16 or fewer black spots.
- 10 or fewer white spots.
- 2 or fewer dark or white clusters. Clusters are a collection of 3 –5 dark pixels.

Column defects:
- 1 maximum black or slipped column, no white columns.

Traps:
- 2 maximum.

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Since ISA is continually striving to improve the quality of our products, these specifications are subject to change without notice. Please contact your sales representative for the latest information.
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