High-performance technologies for advanced biomedical applications

PerkinElmer®
precisely.

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One source for industry-leading OEM products.

PerkinElmer Optoelectronics offers a wide selection of complete, high-performance technologies, making us a valuable partner for all your biomedical applications. Our component and subsystem solutions play a critical role in patient monitoring, functional genomics, proteomics, cellomics, diagnostics, molecular identification, and therapy monitoring and procedures.

From design to product launch, PerkinElmer Optoelectronics consistently delivers performance-driven, high reliability solutions for demanding applications. With a full range of complete solutions from Gamma to Infrared, customization capabilities and extensive experience, PerkinElmer provides customers with faster time to market and significantly reduced manufacturing, test and calibration costs. Every product is engineered to meet stringent performance requirements in extreme environments. The entire product family is backed by PerkinElmer's exceptional ISO 9001 - certified design, production and test capabilities with more than 50 years of experience in hardware, software, and system solutions integration.

PerkinElmer Optoelectronics is a global technology leader providing market-driven, integrated solutions for biomedical and industrial applications. Our technologies, services and support fuel the medical, genomic and digital revolutions by enhancing our Customers' productivity, optimizing their performance, and accelerating their time-to-market.

We leverage our global engineering and manufacturing Centers of Excellence to provide products, custom qualified solutions, and exceptional service to our Customers around the world.

amorphous silicon

Features

- Self contained digital camera
- Monolithic sensor
- Mega pixel resolution
- Pixel resolution 200 µm, 400 µm and 800 µm
- Over 65,000 shades of grey
- Ultra high sensitivity
- Electronic zoom
- Live images @ 3fps and 7fps
- Compatible with all standard image processing software
- Compatible with all Windows-based PCs with a PCI slot

Typical Applications

- Portable Radiography
- Densitometry
- PCB Inspection
- Pipeline Inspection
- NDT
- Portal Imaging
- Veterinary Medicine
- Foreign Material Detection

Principle of Operation

Unique flat panel technology offers a new approach to medical, industrial and scientific imaging applications.

Datasheets available upon request

Description

All Amorphous Silicon X-Ray Detectors (XRD) work as a digital x-ray camera. The detectors are each based on a single solid state amorphous silicon sensor operating as a two-dimensional photodiode array. The cameras are well suited to perform digital image acquisitions and include all drive and readout processing electronics including an x-ray interlock. X-rays are converted to light by using different scintillators. The information is digitized in 16 bit (65,536 grey levels).

XRD 512-400 Family

The XRD 512-400 family has 512 x 512 pixels at a resolution of 400 µm pitch forming 262,144 discrete pixels on an active area of 204.8 x 204.8 mm^2. The base frame rate is 7 fps. The XRD 512-400 is available in different configurations allowing the user to apply x-ray energies from 30 keV up to 15 MeV. Different scintillators allow the user to customize to their specific applications and respective x-ray dosage.

XRD 16xx family

The XRD 16xx family is based on a single amorphous silicon substrate of 16 x 16 $inch^2$. The family has three branches XRD 1620, XRD 1640 and XRD 1680, presented by their pixel resolution of 200, 400 and 800 µm pitch respectively.

XRD 1640 Branch

The major member of the XRD 1640 branch is the XRD 1640 AL1, a camera having 1024 x 1024 pixels at a resolution of 400 µm pitch forming 1,048,576 discrete pixels on an active area of 409.6 x 409.6 mm^2. The camera uses a fast, Lanex® scintillator. The frame rate is 3 fps. Higher frame rates are available upon request. The unique design of the XRD 1640 AL1 allows the user to apply x-ray energies from 30 keV up to 15 MeV.

XRD 1680 Branch

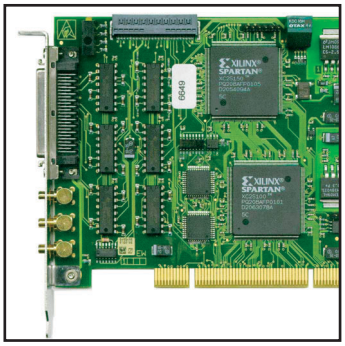
In the specific XRD 1680 version, the detector allows the user to collect image data of 512 x 512 pixels at a resolution of 800 µm forming 262,144 discrete pixels on an active area of 409.6 x 409.6 mm^2. The lower resolution is well suited to perform 3-D image reconstruction applications.

XRD 1620 Branch

With the XRD 1620 version, the detector allows the user to collect image data of 2048 x 2048 pixels at a resolution of 200 µm pitch forming 4,194,304 discrete pixels on an active area of 409.6 x 409.6 mm^2.

Digital X-ray Cameras—XRD 512-400

Digital X-ray Cameras—XRD 16xx



PCI Frame Grabber II

Sensor Specification

Part Number	Pixel Number	Pixel Pitch	Active Area mm²	Photodiode Capacitance	Saturation Charge @ 10 V	Scintillator	Radiation Energy
512-400 AL1	512 x 512	400 µm	204.8 x 204.8	8.4 pF	84 pC	Lanex® fast	30–200 keV
512-400 AL2	512 x 512	400 µm	204.8 x 204.8	8.4 pF	84 pC	Lanex fine	30–200 keV
512-400 AL3	512 x 512	400 µm	204.8 x 204.8	8.4 pF	84 pC	CsI	30–200 keV
512-400 AG1	512 x 512	400 µm	204.8 x 204.8	8.4 pF	84 pC	Lanex fast	30–200 keV
512-400 ML1	512 x 512	400 µm	204.8 x 204.8	8.4 pF	84 pC	Lanex fast	30–350 keV
512-400 EL1	512 x 512	400 µm	204.8 x 204.8	8.4 pF	84 pC	Lanex fast	30 keV–15 MeV
1640 AL1 (ES)	1024 x 1024	400 µm	409.6 x 409.6	8.4 pF	84 pC	Lanex fast	30 keV–15 MeV
1640 AL2 (ES)	1024 x 1024	400 µm	409.6 x 409.6	8.4 pF	84 pC	Lanex fine	30 keV–15 MeV
1640 AL3 (ES)	1024 x 1024	400 µm	409.6 x 409.6	8.4 pF	84 pC	CsI	30 keV–15 MeV
1640 AG1 (ES)	1024 x 1024	400 µm	409.6 x 409.6	8.4 pF	84 pC	Lanex fast	30 keV–15 MeV
1620 AJ1	2048 x 2048	200 µm	409.6 x 409.6	2.1 pF	21 pC	Lanex fast	30 keV–15 MeV
1620 AJ3	2048 x 2048	200 µm	409.6 x 409.6	2.1 pF	21 pC	CsI	30 keV–15 MeV

Electronics Specification

Part Number	Charge Amplifier chl ASIC	ADC 16-bit, 250 kSps	Saturation Charge of ASIC @ 5 V	Non-linearity	Minimum Integration Time
512-400 AL1	8 x 128	8	5 pC	<±1%	135 ms
512-400 AL2	8 x 128	8	5 pC	<±1%	135 ms
512-400 AL3	8 x 128	8	5 pC	<±1%	135 ms
512-400 AG1	8 x 128	8	30 pC	<±1%	135 ms
512-400 ML1	8 x 128	8	5 pC	<±1%	135 ms
512-400 EL1	8 x 128	8	5 pC	<±1%	135 ms
1640 AL1 (ES)	16 x 128	16	5 pC	<±1%	284 ms (143 ms)
1640 AL2 (ES)	16 x 128	16	5 pC	<±1%	284 ms (143 ms)
1640 AL3 (ES)	16 x 128	16	5 pC	<±1%	284 ms (143 ms)
1640 AG1 (ES)	16 x 128	16	30 pC	<±1%	284 ms (143 ms)
1620 AJ1	16 x 256	16	2 pC	<±1%	333 ms
1620 AJ3	16 x 256	16	2 pC	<±1%	333 ms

Detector Specification

Part Number	Dynamic Range	(10%–90% of FSR)	Image Lag	Frame Rate	Detector Housing mm²
512-400 AL1	>80 dB	<±2%	<8%	7 fps	335 x 320 x 46
512-400 AL2	>80 dB	<±2%	<8%	7 fps	335 x 320 x 46
512-400 AL3	>80 dB	<±2%	<8%	7 fps	335 x 320 x 46
512-400 AG1	>80 dB	<±2%	<8%	7 fps	335 x 320 x 46
512-400 ML1	>80 dB	<±2%	<8%	7 fps	335 x 320 x 52
512-400 EL1	>80 dB	<±2%	<8%	7 fps	629.5 x 328 x 49
1640 AL1 (ES)	>80 dB	<±2%	<8%	3.5–7 fps	672 x 599 x 44
1640 AL2 (ES)	>80 dB	<±2%	<8%	3.5–7 fps	672 x 599 x 44
1640 AL3 (ES)	>80 dB	<±2%	<8%	3.5–7 fps	672 x 599 x 44
1640 AG1 (ES)	>80 dB	<±2%	<8%	3.5–7 fps	672 x 599 x 44
1620 AJ1	>80 dB	<±2%	<8%	3 fps	672 x 599 x 44
1620 AJ3	>80 dB	<±2%	<8%	3 fps	672 x 599 x 44

Frame Grabber

Technical Specification

Physical Dimension	PCI Compliant	DMA	DMA Addressing	PCI-Power Supply	PCI-Bus	Bandwidth typ.	Operation System
120 x 107 mm	2.2	Bus master	Scatter-gather	5 V, 0.5 A (typ.) 0.7 A (max) 3.3 V, 0.18 A (typ.) 0.2 A (max)	32 bit 33 MHz	>80 MB/s	Windows NT 4.0, Windows 2000, Windows 98, Windows XP

cooled ccd sensors

Features

- 363,000 picture elements (pixels) in a 1100x330 configuration
- 24 µm square pixels
- 2-phase buried channel process
- On-chip amplifier for low noise and high-speed readout
- Dynamic range greater than 25,000:1
- On-chip temperature sensor
- Two-stage TE cooler integrated into the package
- Hermetically sealed
- 100% fill factor
- 10MHz data rate

Typical Applications

- Spectroscopy
- Fluorescence Microscopy
- Luminescence
- Protein Quantification

Datasheet available upon request

Description

The RA1133J is a full-frame CCD sensor with reset capabilities designed specifically for use in spectroscopy, biomedical imaging and related scientific imaging applications. The package for the array is designed with an integrated two-stage thermoelectric cooler. This enables the device to be run 40°C below ambient temperature, -15°C when compared to room temperature. Its combination of very low noise and low dark current make the RA1133J ideal for low-light, high dynamic range, and high-resolution applications.

The imager is structured with a single-output register at one end of the imaging columns. A lateral reset drain is located adjacent to this readout register, which enables the dumping of accumulated charge from the array. Two-phase clocks are needed to drive the readout register, and three-phase clocks are needed to drive imaging cells. The array is available in a 30-pin metal package with an integrated TE cooler.

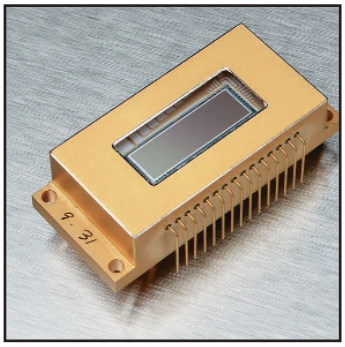
General Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Format			1100x330		
Pixel Size			24x24		µm
Imaging Area			26.4x7.92		mm
Dynamic Range	DR		25,000:1		
Full Well Charge	Q_{SAT}	250	300		Ke-
Saturation Voltage	V_{SAT}	1000	1200		mV
Dark Current MPP	DL		1	3	pA/cm2
Photo Response Non Uniformity	PRNU		5	10	±%
Dark Signal Uniformity	DSNU		2	5	±%
Charge Transfer Efficiency	CTE	>0.9999	>0.99995		
Output Amplifier Gain			4		µV/e-
Operating Frequency	fclock			10	MHz
Read Noise			10		e-

Dynamic Range: Full well/read noise, MPP mode
Full Well Charge: RLoad = 5.1 kΩ, MPP mode
Dark Current MPP: MPP mode at -15˚C
Read Noise: Measured at 500 kHz at -15˚C

Absolute Maximum Ratings

Storage Temperature: -55°C min. to 85°C max.
Operating Temperature: 0°C min. to 55°C max.



Cooled CCD Sensor—
24 µm sq. pitch,
1100x330 pixel configuration

Principle of Operation

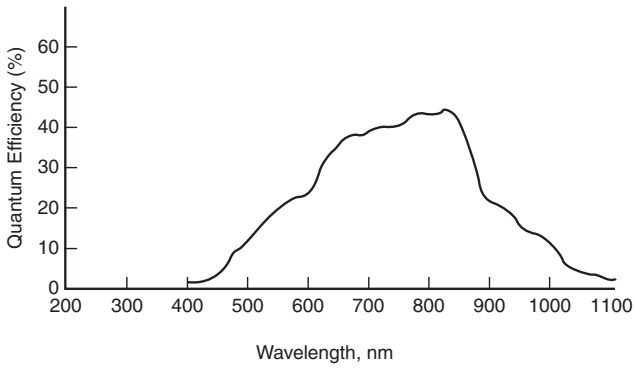
A major source of dark current in devices such as these originates in surface states at the Si-SiO_2 interface. A unique design and process enables the RA1133J to be run in "multi-pinned phase" or MPP mode of operation. This helps eliminate dark current generation in the interface surface states. By holding the vertical clocks at negative potential during integration and horizontal signal readout, the surface will not be depleted and the surface state will not generate dark current.

Technical Specification

Part Number	Format	Pixel Size µm	Image Area mm	Saturation Voltage mV typ.	Dark Current MPP pA/cm²	Dynamic Range	Read Noise
RA1133JAS-912	1100x330	24x24	26.4x7.92	1200	1	>25,000:1	10e-

Dynamic Range: Full well/read noise, MPP mode
Dark Current MPP: MPP mode at -15˚C
Read Noise: Measured at 500 kHz at -15˚C
Storage Temperature: -55˚C min. to +85˚C max.
Operating Temperature: 0˚C min. to 55˚C max.

Quantum Efficiency



cooled ccd cameras

Features

- 3,214,848 picture elements (pixels) in a 2184 x 1472 configuration
- 6.8 µm square pixels
- USB 2.0 Interface
- Peltier cooling to -30˚C at 25˚C ambient
- 16-bit output depth with 8 electrons noise typical
- Up to 16 x 16 binning (asymmetric)
- Hermetically sealed sensor head reduces risk of contamination
- Varying readout rates (1250 kHz max)
- 300–1000 nm spectral range
- Includes power supply and software

Typical Applications

- Protein Quantification
- Fluorescence Microscopy
- Luminescence
- Sequencing

Description

PerkinElmer Optoelectronics ColdBlue™ series of cooled CCD camera systems offer scientific-grade CCD technology integrated with the latest in camera electronics to offer the user an unparalleled solution for advanced imaging applications. Featuring the Eastman Kodak KAF-3200ME imager, the FD2114KNU offers pixel resolutions of 2184 x 1472 (6.8 µm x 6.8 µm pixel size). The modular sensor head design allows the camera system to be customized with different sensors at a minimum of design time.

To eliminate contamination and moisture within the sensor package, the package that surrounds the sensor has been hermetically-sealed under vacuum. The sensor head has been sealed against light and dust.

The camera is supplied with a Win32.dll, Windows drivers library, regulated power supply, and cables necessary for operation.

The FD2114 also features an integrated Thermo-Electric (TE) cooler, which cools the sensor to -30˚C. This reduction in temperature allows for almost a 1000X reduction in dark current. Additionally, Area of Interest readout and binning are supported within the camera.

General Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Format			2184 x 1472		
Pixel Size			6.8 x 6.8		µm
Imaging Area			14.85 x 10.26		mm
Noise (typical)				8	e-
Imager Full Well	Q_{SAT}		55		Ke-
Interface Style			USB 2.0		
Gain Settings			8		
Quantum Efficiency				85	%
Spectral Range		300		1000	nm
Exposure Time		32 ms		1.9 hrs	
Binning		1 x 1		16 x 16	
Operating Temperature		0		30	˚C
Storage Temperature		0		50	˚C

Windows is a registered trademark of Microsoft.

Cooled CCD Camera

Principle of Operation

The Perkinelmer ColdBlue series incorporates high performance, high resolution area image sensors. Each pixel within the sensor converts light into discrete charge packets, that are then converted to an analog voltage.

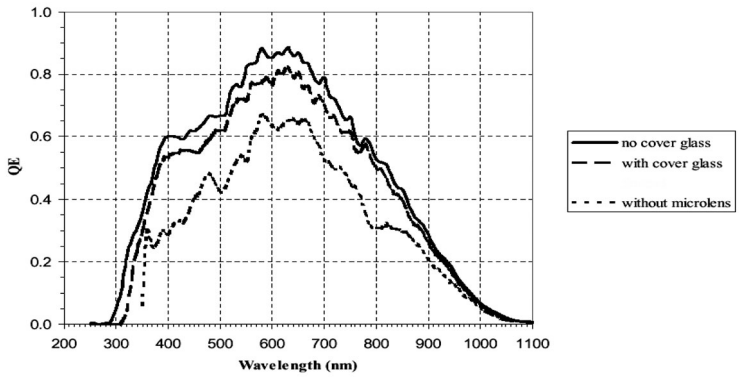
The analog voltage is then processed as a single channel of sampled-and-held, raster order analog video data. Analog processing circuitry provides adjustable gain levels, allowing the accomodation of user's unique lighting and application requirements. Once the signal is processed, it is then digitized to 16-bit depth and formatted for ouput.

Technical Specification

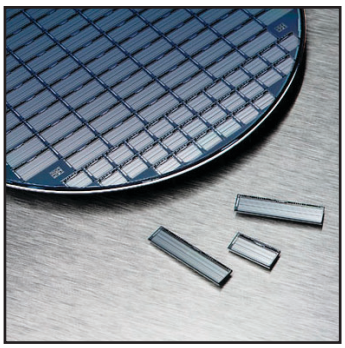
Part Number	Format	Pixel Size µm	Image Area mm	Saturation Voltage mV typ.	Dark Current pA/cm^2	Dynamic Range	Read Noise
FD2114KNU-011	Cooled Area	6.8µm x 6.8µm	14.85mm x 10.86mm	N/A	0.015 e-/pixel/ sec @ -35C	76 dB minimum, unbinned	8 e- typical

Dynamic Range: Full well/read noise, MPP mode
Dark Current MPP: MPP mode at -15˚C
Read Noise: Measured at 500 kHz at -15˚C
Storage Temperature: -55˚C min. to +85˚C max.
Operating Temperature: 0˚C min. to 55˚C max.

Quantum Efficiency



buffered multiplexers



XL-1 Variable-Gain Multiplexers

Description

PerkinElmer Optoelectronics' CMOS buffered multiplexers offer the ideal solution to the increasing demand for low noise amplification and multiplexing applications. They are designed to interface with a variety of photosensitive arrays constructed from materials such as amorphous silicon, gallium arsenide, germanium or mercury cadmium telluride. These devices, available in 64, 128 and 256 channel models, are widely used in medical, scientific, and industrial applications to read electrical signals generated by x-ray, infrared, and other radiation beyond the direct detection range of silicon.

XL-1 Variable-Gain Multiplexers

These advanced devices offer a versatile solution to the increasing demand for low noise amplification and multiplexing. They are designed to interface with linear photosensitive arrays, such as those made of gallium arsenide, germanium or amorphous silicon, or any of several special purpose infrared-sensitive materials. Each channel of the multiplexer consists of a charge amplifier in series with two separate buffered sample-and-hold paths for correlated double sampling (CDS). A broad range of electrically selectable integrating capacitors provide accommodation for charge packets from a wide range of sensor materials, pixel sizes and exposure levels.

XL-1 multiplexers are available in 64, 128 or 256 active channels, all with 100µm channel-to-channel spacing. They offer a dynamic range in excess of 90 db, low offset voltage, bidirectional readout, and integrated calibration facilities.

Multiplexer Individual Channel Schematic

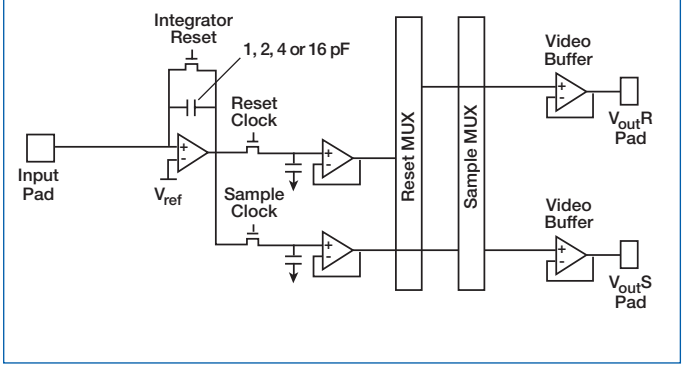


image tubes

High-Resolution Image Tubes

Description

The use of image tubes in special applications is indispensable. The camera tube is superior to solid-state image sensors in high-resolution television systems with high frame-repetition rates. The essential characteristics of the camera tubes, such as absolute and spectral sensitivity, resolution and lag are determined by the photoconducting material (target) and the electron optical parameters of the scanning electron beam.

Resistron Tubes

These are universally applied low cost image tubes. The target material is Antimony Trisulfide (Sb_2S_3) which provides good resolution and integration of quantum noise.

Saticon Tubes

Saticon Tubes with a Selenium storage layer (SeAsTe) are suited for acquiring fast moving images, especially in medical applications. Their typical characteristics: low lag, excellent resolution and signal uniformity.

Newvicon Tubes

Worldwide, these tubes have been taken out of production. We offer Resistron tubes as a close equivalent to replace Newvicons.

Industrial and Surveillance 2/3" Tubes

Technical Specification

Part Number	Version	Characteristics	Length mm	Diameter mm	Facepl. Temperature °C	Dark Current nA	Illumination lx
XQ1305	Resistron	electrostatic focusing	108	19.8	30+/-2	20	10
XQ1371	Resistron	large dyn. range, gr.1	103	19.8	30+/-2	20	10
XQ1372	Resistron	gr.2	103	19.8	30+/-2	20	10

Industrial and Surveillance 1" Tubes

Technical Specification

Part Number	Version	Characteristics	Length mm	Diameter mm	Facepl. Temperature °C	Dark Current nA	Illumination lx
XQ1292	Resistron	large dyn. range, gr.1	162	28.6	30+/-2	20	10
XQ1293	Resistron	gr.2	162	28.6	30+/-2	20	10

Special TV 2/3" Tubes

Technical Specification

Part Number	Version	Characteristics	Length mm	Diameter mm	Facepl. Temperature °C	Dark Current nA	Illumination lx
XQ1371SF	Resistron	radiation resistant	103	19.8	30+/-2	20	10
XQ1372SF	Resistron	radiation resistant	103	19.8	30+/-2	20	10
XQ1300F	Saticon	radiation resistant	108	19.8	30+/-2	<1	10

Special TV 1" Tubes

Technical Specification

Part Number	Version	Characteristics	Length mm	Diameter mm	Facepl. Temperature °C	Dark Current nA	Illumination lx
XQ1292F	Resistron	fiberoptic faceplate	162	28.6	30+/-2	20	10
XQ1292SF	Resistron	radiation resistant	162	28.6	30+/-2	20	10
XQ1292RF	Resistron	with reticles	162	28.6	30+/-2	20	10

Medical 1" Tubes

Technical Specification

Part Number	Version	Characteristics	Length mm	Diameter mm	Facepl. Temperature °C	Dark Current nA	Illumination lx
XQ1290	Resistron	high sensitivity + resolution	162	28.6	30+/-2	30	1.7
XQ1395	Resistron	high resolution / line no.	162	28.6	30+/-2	30	1.7
XQ1560	Saticon	short lag / high beam	162	28.6	30+/-2	<1	1.7
XQ1570	Saticon	low lag / high beam	162	28.6	30+/-2	<1	1.7
XQ1575	Saticon	with diode gun structure	162	28.6	30+/-2	<1	1.7

line scan imagers

Features
- 2500:1 dynamic range
- Ultra-low image lag
- Electronic exposure control
- Antiblooming control
- Square pixels with 100% fill factor
- Extended spectral range—250-1000 nm

Typical Applications
- High-Speed Document Reading
- Web Inspection
- Mail Sorting
- Production Measurement
- Position Sensing
- Spectroscopy

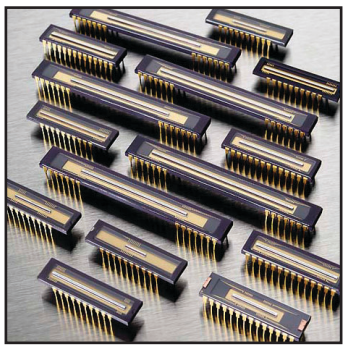
Principle of Operation
Line scan sensors are ideal for imaging objects in motion on webs or conveyors.

Datasheet available upon request

Description
Line scan sensors are ideal for imaging objects in motion on webs or conveyors. Applications range from inspection of lead frames and labels to scanning mail and parcels.

P-Series Linear Photodiode Array Imagers
In P-series linear imagers, PerkinElmer has combined the best features of high-sensitivity photodiode array detection and high-speed, charge-coupled scanning to offer an uncompromising solution to the increasing demands of advanced imaging applications. These high-performance imagers feature low noise, high sensitivity, impressive charge-storage capacity, and lag-free dynamic imaging in a convenient 1-output architecture. The 14 µm square contiguous pixels in these imagers reproduce images with minimum information loss and artifact generation, while their unique photodiode structure provides excellent blue response extending below 250 nm in the ultraviolet.

The two-phase CCD readout registers require only modest clocking voltages, yet achieve excellent charge-transfer efficiency. Additional electrodes provide independent control of exposure and antiblooming. Finally, high-sensitivity readout amplifiers provide a large-output signal to relax the noise requirements on the camera electronics that follow. These versatile imagers are available in array lengths of 512 to 2048 elements with either low-cost glass or UV-enhanced fused silica windows. PerkinElmer Optoelectronics also maintains capabilities to manufacture line scan imagers up to 8192 pixels combined with 4 outputs and 7 or 14µm pixels with existing designs. Contact PerkinElmer for more information.



Line Scan Imagers—P Series

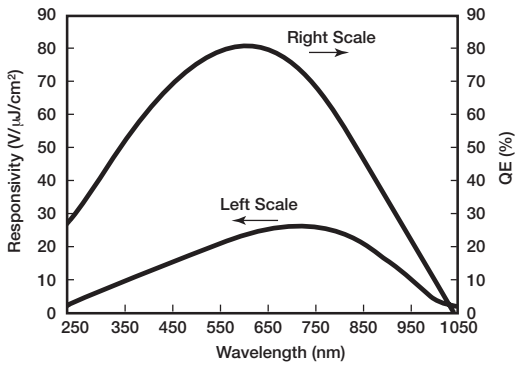
P Series

Technical Specification

Part Number	Pixel Count elements	Pixel Size µm	Number of Outputs	Spectral Response Range nm	Pixel Data Rate MHz	Dynamic Range	Horizontal Clocking typ.
RL0512P	512	14x14	1	250-1000	40	2500:1	2 ø @ 5 V
RL1024P	1024	14x14	1	250-1000	40	2500:1	2 ø @ 5 V
RL2048P	2048	14x14	1	250-1000	40	2500:1	2 ø @ 5 V

Operating Temperature: 0˚C min. to +55˚C max.
Storage Temperature: -25˚C min. to +85˚C max.
Lag: <1%
Saturation Voltage: 600 mV

Spectral Sensitivity Curve



cmos photodiode arrays

Features

- 2.5 mm photodiode aperture
- Extremely low dark leakage current
- Low power dissipation
- Clock-controlled sequential readout at rates up to 1 MHz
- Single-supply operation with HCMOS-compatible inputs
- Single shift register design
- Wide dynamic range
- Differential video output for clock noise cancellation
- High saturation charge 10 pC (25 µm) or 20 pC (50 µm)
- Antiblooming function for low crosstalk
- Line Reset Mode for simultaneous reset of all photodiodes
- Wide spectral response: 300 to 1000 nm
- Polished fused silica window
- On-chip diodes (two) for temperature monitoring

Typical Applications

- Spectroscopy
- Colorimetry

Datasheet available upon request

Description

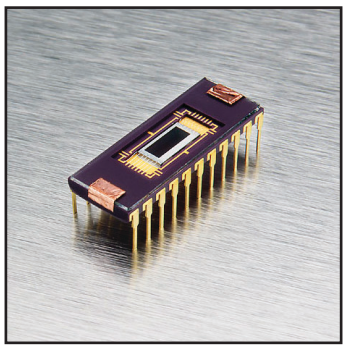
For nearly thirty years, PerkinElmer Optoelectronics has been a leader in the development of sensors for spectroscopy. In spectroscopy and other instrumentation applications, large pixels, very high charge storage capacity, low readout noise and dark current, and direct access to the charge packet are all critical to delivering the high dynamic range and linear response demanded. The CMOS photodiode array architecture meets all of these needs in a way no other sensor technology can match.

L-Series Visible Range Spectroscopy Arrays

PerkinElmer Optoelectronics' L-series CMOS linear photodiode arrays offer a high-quality, low-cost solution for spectroscopy and colorimetry applications in the 300-1000 nm range. The L-Series family's combination of high sensitivity, low dark current, low switching noise and high saturation charge provides excellent dynamic range and great flexibility in setting integration time.

L-series sensors consist of a linear array of silicon photodiodes, each connected to a MOS switch for readout controlled by an integrated shift register scanning circuit. Under external clock control, the shift register sequentially enables each of the switches, directing the charge on the associated photodiode to an output line. A dummy output provides clock noise cancellation. L-series devices are mounted in ceramic side-brazed, 22-pin, dual-inline packages with ground and polished fused silica windows and are pin-compatible with earlier PerkinElmer SB and TB-series sensors.

L-series models are available with pixel spacings of 25 µm and 50 µm and lengths from 128 to 1024 pixels. All models feature a 2500 µm pixel aperture to simplify alignment in spectroscopic instruments.



L-Series Linear CMOS Spectroscopy Sensor— 25 or 50 µm pitch, 2.5 mm aperture

- 128, 256, 512 or 1024 photodiode elements with 25 µm center-to-center spacing
- 128, 256, or 512 photodiode elements with 50 µm center-to-center spacing

L Series

Technical Specification

Part Number	Video Capacitance @ 5 V bias pF	Video Capacitance @ 2.5 V bias pF	Sensitivity C/J/cm²	Saturation Exposure nJ/cm²	Saturation Charge pC	Dynamic Range	Dark Current typ. pA
RL1201	—	6.7	$2x10^{-4}$	50	10	70,000	0.2
RL1202	—	10.2	$2x10^{-4}$	50	10	70,000	0.2
RL1205	—	15.4	$2x10^{-4}$	50	10	70,000	0.2
RL1210	—	28.7	$2x10^{-4}$	50	10	70,000	0.2
RL1501	9.1	—	$4x10^{-4}$	50	20	100,000	0.4
RL1502	14	—	$4x10^{-4}$	50	20	100,000	0.4
RL1505	25	—	$4x10^{-4}$	50	20	100,000	0.4

Sensitivity Exposure/ Saturation Charge: Measured at 2.5 V video line bias average 600-700 nm, includes 8% window loss

Dark Current: Maximum dark current ≤1.5 x average dark current

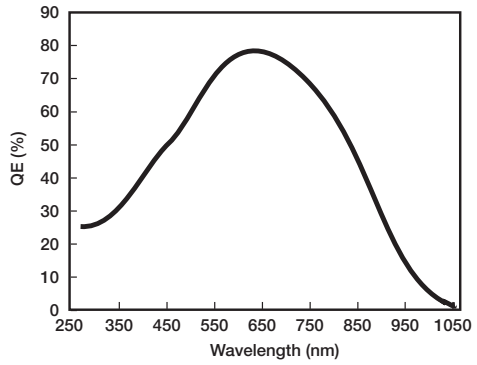
Spectral Response Peak: 650 nm, Range: 300-1000 nm typ.

Operating Temperature: 0°C min. to 55°C max.

Storage Temperature: -78°C min. to +85°C max.

Center-to-center spacing: RL12XX, 25 µm
RL15XX, 50 µm

Quantum Efficiency



tdi imagers

PT1109AAQ-711 Features

- 1024 pixel x 96 stage
- Unidirectional operation
- 20 MHz data rate
- High dynamic range (>5000:1)
- Line rates to 19 kHz
- Quantum efficiency of 42% at 700 nm
- 13 µm x 13 µm pixel size
- >0.99995 horizontal, >0.9999 vertical CTE at maximum saturation exposure

Typical Applications

- Semiconductor Inspection
- Wafer Inspection
- Sorting Applications

Datasheets available upon request

Description

The PT1109AAQ Time Delay Integration (TDI) imagers combine the best features of photodiode array detection and TDI operation to offer an uncompromising solution to the increasing demands of high-speed imaging applications.

PT 1109AAQ

The PT1109AAQ is a high-performance TDI imager featuring a unique 13 µm x 13 µm-square TDI pixel architecture. The chip has 96 stages with 1024 pixels per stage, allowing for stable imaging in both fast and low-light applications. Eight extra stages are present at the front end of the sensor, allowing for adequate dark balancing. Full well capacity of the sensor is >400,000 electrons, and readout noise is <70 electrons, allowing for a >5000:1 dynamic range.

TDI Imagers—PT 1109AAQ

Technical Specification

	PT1109AAQ-711
Pixel Count*	1024 active elements
Extra Stages*	8
Pixel Size	13x13 µm
Number of Directions	1
Integration Stages**	96
Extra Stages**	1
Number of Outputs	1
Pixel Rate	20 MHz
Line Output Rate (max.)	18.1 kHz
Pixel Fill Factor	100%
Net Quantum Efficiency	>42% at 700 nm
Power Dissipation	—
Well Capacity	>400,000 electrons per pixel
RMS Noise	—
Dynamic Range	>5000:1
CTE @ Q_{sat}	>0.99995 (horizontal) >0.9999 (vertical)
Photo Response Non-Uniformity (PRNU)	+/-10%
Spectral Response	450 to 1000 nm
Dark Current	—
Sensitivity	5 µV/electron
Operating Temperature	0 to 55˚C
Package Type	32 pin ceramic

Operating Temperature: 0˚C min. to 50˚C max.
* In readout direction
** In TDI direction

cermax xenon lighting

Features

- Very robust ceramic body
- Integrated reflector
- Broad band xenon emission spectrum
- CW operation
- Instant ON

Typical Applications

- Tunable Excitation Source for Fluorescence Applications
- Photo-Activation Source for Photo Therapy Applications
- Medical Fiber Optic Illuminators Used for Endoscopy, Surgical Headlamp, Surgical Microscropy
- Spectroscopy
- UV Curing
- Video Projection

Available Related Products

Power supplies, accessories and complete fiber optic systems

Datasheets available upon request

Description

PerkinElmer Optoelectronics' Cermax® xenon short arc lamps and associated operating equipment are a unique and innovative approach to many challenging and demanding lighting applications.

Utilizing an integrated parabolic or ellipsoidal reflector, Cermax® lamps produce high intensity, collimated or focused light output. Due to the xenon lamps broad color spectrum, the lamp is filtered to emit either visible, UV or IR light depending on application or usage. With their internal reflector and rugged ceramic body and seal construction, Cermax® lamps are a safe and compact alternative to conventional quartz xenon lamps making them ideal for such applications as medical endoscopy, fiber optic illumination and video projection.

Cermax® Xenon Arc 1.5" Lamps

Cermax® Xenon Arc 1.0" Lamps

Cermax® Xenon Arc Mini Lamps

Cermax® Xenon Arc Lamps

Technical Specification

Part Number	Power Watts	Operating Current Amps (DC)	Ignition Voltage Vdc	Voltage kV min.	Temperature	Arc Gap	Reflector	Window Diameter
PE80AF/AUV	85–100	7–10	10.5–13.5	28	120˚C	.025"	Parabolic	.770"
PE80A-10F/AUV	85–100	7–10	10.5–13.5	28	120˚C	.025"	Ellipsoidal	.770"
PE80A-13F/AUV	85–100	7–10	10.5–13.5	28	120˚C	.025"	Ellipsoidal	.770"
PE150AF/AUV	100–150	10–14	10–13.6	28	120˚C	.032"	Parabolic	.770"
PE150A-10F/AUV	100–150	10–14	10–13.6	28	120˚C	.032"	Ellipsoidal	.770"
PE150A-13F/AUV	100–150	10–14	10–13.6	28	120˚C	.032"	Ellipsoidal	.770"
PE125BF	75–150	7–14	9.5–12.5	23	150˚C	.044"	Parabolic	1"
PE125BUV	75–150	8–14	9.5–12.5	23	150˚C	.044"	Parabolic	1"
PE125B-10F/UV	75–150	7–14	10–12.5	23	150˚C	.038"	Ellipsoidal	1"
PE175BF	150–200	12–16	11–14	23	150˚C	.045"	Parabolic	1"
PE175BUV	150–200	13–16	11–14	23	150˚C	.045"	Parabolic	1"
PE175B-10F/UV	150–200	12–16	10.5–13.5	23	150˚C	.038"	Ellipsoidal	1"
PE300BF	180–320	10–22	13–16	23	150˚C	.049"	Parabolic	1"
PE300BUV	180–320	11–22	13–16	23	150˚C	.049"	Parabolic	1"
PE300B-10F/UV	175–305	13–23	11.5–15	23	150˚C	.038"	Ellipsoidal	1"
PE300C-10F/UV	175–300	13–23	11.5–15	23	150˚C	.045"	Ellipsoidal	1"
PE300C-13F/UV	175–300	13–23	11.5–15	23	150˚C	.045"	Ellipsoidal	1"
PE500C-10F/UV	350–525	23–35	14–16.5	30	150˚C	.045"	Ellipsoidal	1"
PE500C-13F/UV	350–525	23–35	14–16.5	30	150˚C	.045"	Ellipsoidal	1"
PE700C-10F/UV	600–750	35–46	15.5–18	38	180˚C	.045"	Ellipsoidal	1"
PE700C-13F/UV	600–750	35–46	15.5–18	38	180˚C	.045"	Ellipsoidal	1"
PE500DF/DUV	340–575	20–32	16–21	35	150˚C	.090"	Parabolic	2"
PE1000DF/DUV	850–1050	46–54	18.5–22	35	150˚C	.090"	Parabolic	2"
PE1000D-10F/UV	600–1050	30–56	15–24	28	150˚C	.062"	Ellipsoidal	1.375"
PE1000D-13F/UV	600–1050	30–56	15–24	28	150˚C	.062"	Ellipsoidal	1.375"
PE1200D-10F/UV	950–1250	45–70	17–22	28	160˚C	.067"	Ellipsoidal	1.375"
PE1200D-13F/UV	950–1250	45–70	17–22	28	160˚C	.067"	Ellipsoidal	1.375"
PE1500D-10F/UV	900–1550	45–80	17–23	28	160˚C	.075"	Ellipsoidal	1.375"
PE1500D-13F/UV	900–1550	45–80	17–23	28	160˚C	.075"	Ellipsoidal	1.375"

PE=PerkinElmer
A=0.75"
B=1"
C=1.4"
D=2"
E=3"
F=UV Filtered Output
UV=Enhanced Output
-10=f/1 reflector (elliptical)
-13=f/1.3 reflector (elliptical)

cermax xenon lighting

Features

- Output of 3480 lumens
- Input voltage: 90–264VAC, 50/60 Hz, auto select
- Line cord: IEC320, 6', US and European options
- ACMI fiber optic adapter—Storz, Olympus, Wolf, ACMI, or Liquid Light Guide
- Mechanical shutter: continuously adjustable from front panel knob, 0–100%
- Main power switch: located on rear panel
- AC power connector: located n rear panel, dual fuses
- Warranty: 12 months, excluding lamp

Typical Applications

- Tunable Excitation Source for Fluorescence Applications
- Photo-activation Source for Photo Therapy Applications
- Medical Fiber Optic Illuminators used for Endoscopy, Surgical Microscopy, and Surgical Headlamp
- Spectroscopy
- Dental Curing

Datasheets available upon request

Description

The XL-2000 fiber optic light source is a superior choice for machine vision, endoscopy, boroscopy, microscopy, minimally invasive surgery, headlamps, and dental curing. This is a high performance light source, which is light weight, compact and cost competitive with lower performing light sources.

This light source utilizes the latest in Cermax® technology, the PE300C-10F, 300 watt xenon lamp. This lamp sets new standards in optical efficiency and ease of use. As with all Cermax® lamps the PE300C-10F has an integral reflector, extremely high brightness, excellent color rendering, stable color over life and operating range, instant-on operation, and modulation capability.

The XL-2000 Fiber Optic Light Source can be supplied with fiber optic adapters for Storz, Olympus, Wolf, ACMI or Liquid Light Guides. A manually operated mechanical shutter allows the output intensity to be continuously adjusted from 0–100% without affecting color temperature. Additionally, this unit can be customized to individual specifications to meet all customer needs.

Optional Features

- Constant output: Optical feedback
- Electronic shutter
- Remote on/off
- Turret fiber optic adapter—Storz, Olympus, Wolf, ACMI, or Liquid Light Guide
- Hour meter
- Lamp aging/Over voltage indicator
- Dental adaptation—filters, EPROM, switches, membrane control panel
- Alternate fiber optic adapters—Storz, Olympus, Wolf, Liquid Light Guide, turret or custom.

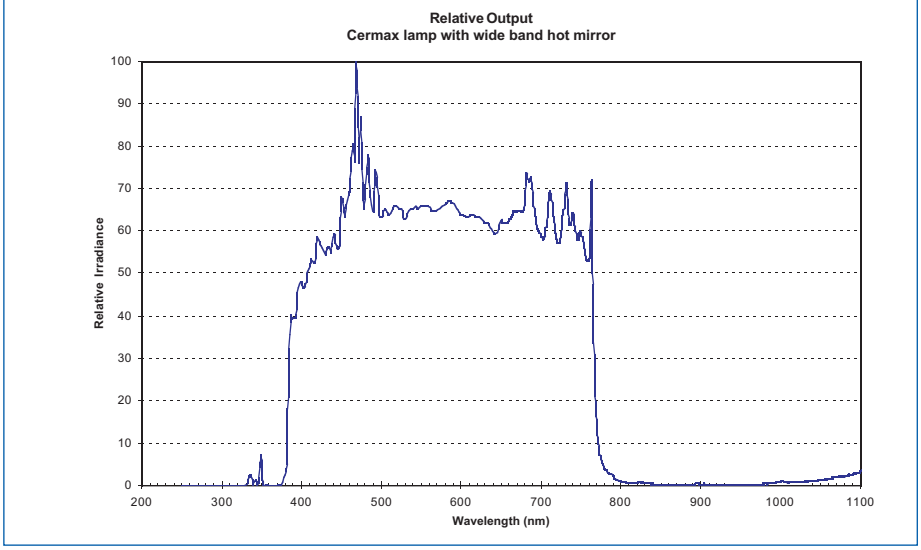
Fiber Optic Light Source—
XL-2000

XL-2000 Fiber Optic Light Source

Technical Specification

Part Number	Dimension inches	Weight lbs.	Operating Temperature	Storage Temperature	Humidity non-condensing	Noise
XL-2000	11.5W x 4.5T x 8.37D	9.75	6–40˚C	20–+85˚C	0%–95%	<45 dB

Spectral Output



guided arc pulsed xenon lighting

Features

- Small size
- High radiant intensity
- Continuous spectrum UV-VIS-IR
- Long life
- Adjustable intensity control
- Ozone free windows and collimating lens options
- Metal enclosure for improved EMI performance
- Optional SMA fiber optic connector
- Customization available

Typical Applications

- Absorption Analysis
- Clinical Chemistry Analysis
- Liquid Chromatography
- Immunoassay Systems
- Fluorimetry
- Gas Chromatography
- Colorimetry
- Machine Vision
- Particle Sizing
- Portable Instrumentation

Principle of Operation

Miniature xenon flashlamp systems that offer exceptional arc stability, microsecond flash duration and long life characteristics.

Datasheets available upon request

Description

The RSL2100 is a miniature, pulsed xenon system with broadband spectrum from UV to IR. The system operates at up to 2 watts and produces high peak intensities from 200–1100+ nm.

The RSL3100 offers SMA connector flexibility, intensity control and reduced EMI, all in a small package designed to meet CE directives. Along with a standardized “D-Sub” connector, various window options and optimized lamp alignment, the new RSL3100 meets the most demanding system requirements. The RSL3100 operates at up to 2 watts and offers high radiant, broad-band optical energy with the long life customers have grown to expect.

RSL2100

RSL3100

Input Specification

Part Number	Voltage	DC Current	Peak Current	Trigger	Input Connector
RSL2100	11–15 VDC	0.2 amps RMS	1.0 amps	TTL	9-pin sub-D
RSL3100	11–28 VDC	0.2 amps RMS	1.0 amps	TTL	9-pin sub-D

Opto-isolated, +5 V TTL Compatible, 20–50 mA Peak Input, 10–100 µsec Pulse Width, Leading Edge Trigger, Internal Resistor 150 ohms.

Electrical Output

Part Number	Voltage	Power (Joules/sec)	Standard Discharge Capacitor	Flash Rate Hz
RSL2100	400–600 VDC	2 Watts max.	0.047 min. µfd	$F_{MAX}=2/E$
RSL3100	400–600 VDC	2 Watts max.	0.047 min. µfd	$F_{MAX}=2/E$

$E=1/2CV^2$.

Power=Joules x Flash Rate

Light Output

Part Number	Spectral Range	Stability CV	Lifetime
RSL2100	190–2,000 nm	<3%	>1 x 10^8 Flashes
RSL3100	160–5,000 nm	<3%	>1 x 10^8 Flashes

CV or Coefficient of Variation is Defined as: CV%=(standard deviation of 20 flashes) ÷ (mean of 20 flashes)

Operating Temperature: 32 to 104˚F (0 to 40˚C)

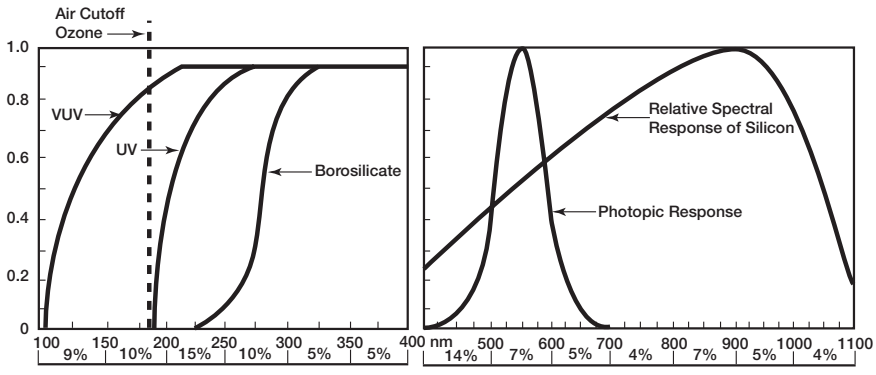
Storage Temperature: -40 to 194˚F (-40 to 90˚C)

Humidity: 95% RH, Non-condensing

Shock and Vibration: 1.5G, 5–200 Hz (Mil-STD-810C)

Safety and EMI Compliance: Designed to Meet EN60950

Spectral Output



guided arc pulsed xenon lighting

Features

- Exceptional arc stability
- High radiant intensity
- Continuous spectrum UV-VIS-IR
- Long life
- High repetition flash rates
- Low heat radiation
- Microsecond flash durations
- Various envelope materials
- No warm up period
- High efficiency output in the blue
- Simple fiber optic coupling
- Small size

Typical Applications

- Absorption Analysis
- Clinical Chemistry Analysis
- Liquid Chromatography
- Immunoassay Systems
- Fluorimetry
- Gas Chromatography
- Colorimetry
- Machine Vision
- Particle Sizing

Available Related Products

Power Supplies:
PS-1105
PS-1110
PS-1120

FlashPacs:
LS-1102
LS-1130

Lite-Pac® Trigger Modules:
FYD-1101
FYD-1104
FYD-113-
FYD-1150
FYD-1153

Datasheets available upon request

Description

The 1100 Series short arc xenon flashlamps are unconfined arc flashlamps which produce microsecond duration pulses of broadband light of high radiant intensities. Capable of operating at high repetition rates, these small flashlamps generate light over a continuous spectrum from ultraviolet to infrared. Exceptional arc stability and life characteristics will make the 1100 Series Flashlamps indispensable in precision photometry, radiometry, and spectroradiometry. When coupled with the 1100 Series Trigger Modules and highly regulated-low ripple power supplies, the short arc flashlamps make ideal sources of pulsed light for absorption analysis, immunoassay systems, fluorescent photometers, spectroradiometry, liquid chromatography, gas chromatography, colorimetry and ultraviolet applications.

A broad range of flashlamp, trigger modules, and power supply configurations are available to satisfy the most demanding application.

The FX-1160 Reflector Lamp has greater than 40% more usable light intensity than our standard FX-1150 and is completely interchangeable. PerkinElmer customers have the option of either taking advantage of the greatly increased light output or they can operate the FX-1160 at a reduced input energy. Lower energy operation equates to increased lamp life and stability.

The hemispherical reflector internal to the FX-1160 should not be confused with competitive types employing paraboloids or ellipsoids in which all of the forward direct light is nonrecoverable and becomes a serious source of optical scattering. PerkinElmer's FX-1160 has an electrode orientation which does not block the forward light emission and therefore does not cause a "black hole" in the output beam profile.

The optical design of the FX-1160 is ideal for use with lenses and fiber bundles, and provides the additional advantage of reduced optical noise by preventing back-plane scattering caused by the pin base. Applications that will benefit from this new PerkinElmer product introduction include: Absorption Spectroscopy, Fluorimetry, HPLC and Machine Vision.

1100 Series Flashlamps

LitePac Trigger Modules with Pulsed Xenon Flashlamps

1100 Series Pulsed Xenon Flashlamps

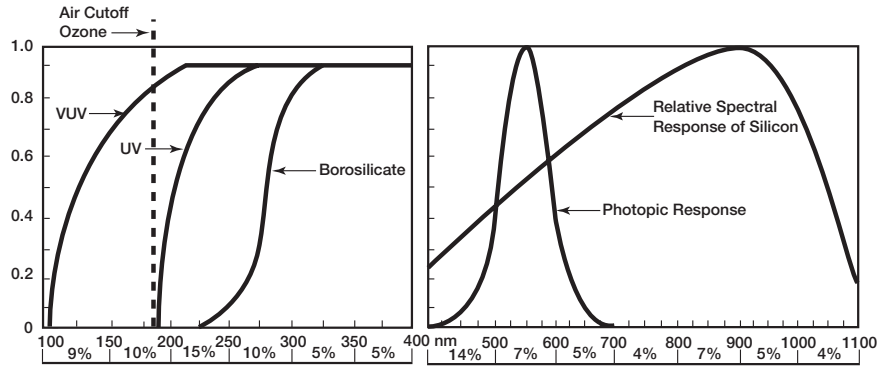
Technical Specification

Part Number	Power Level	Arc Length mm	Spectral Distribution nm	Window Material	Energy Per Flash joules max.	Average Power W max.	Voltage Vdc	Flash Rate Hz max.	Life flashes
FX 1101	Low	1.5	225–1100+	Borosilicate	0.15	10	350–1000	300	>1 x 10^9
FX 1102	Low	1.5	190–1100+	UV	0.15	10	350–1000	300	>1 x 10^9
FX 1103	Low	1.5	120–1100+	VUV	0.15	10	350–1000	300	>1 x 10^9
FX 1104	Low	3.0	225–1100+	Borosilicate	0.15	10	350–1000	300	>1 x 10^9
FX 1105	Low	3.0	190–1100+	UV	0.15	10	350–1000	300	>1 x 10^9
FX 1106	Low	3.0	120–1100+	VUV	0.15	10	350–1000	300	>1 x 10^9
FX 1130	Medium	1.5	225–1100+	Borosilicate	0.25	15	350–1000	300	>1 x 10^9
FX 1131	Medium	1.5	190–1100+	UV	0.25	15	350–1000	300	>1 x 10^9
FX 1132	Medium	1.5	120–1100+	VUV	0.25	15	350–1000	300	>1 x 10^9
FX 1160	Medium	1.5	225–1100+	Borosilicate	0.5	20	350–1000	300	>1 x 10^9
FX 1161	Medium	1.5	190–1100+	UV	0.5	20	350–1000	300	>1 x 10^9
FX 1162	Medium	1.5	120–1100+	VUV	0.5	20	350–1000	300	>1 x 10^9
FX 1163	Medium	3.0	225–1100+	Borosilicate	0.5	20	350–1000	300	>1 x 10^9
FX 1164	Medium	3.0	190–1100+	UV	0.5	20	350–1000	300	>1 x 10^9
FX 1165	Medium	3.0	120–1100+	VUV	0.5	20	350–1000	300	>1 x 10^9
FX 1150	High	1.5	225–1100+	Borosilicate	0.5	20	350–1000	300	>1 x 10^9
FX 1151	High	1.5	190–1100+	UV	0.5	20	350–1000	300	>1 x 10^9
FX 1152	High	1.5	120–1100+	VUV	0.5	20	350–1000	300	>1 x 10^9
FX 1153	High	3.0	225–1100+	Borosilicate	0.5	20	350–1000	300	>1 x 10^9
FX 1154	High	3.0	190–1100+	UV	0.5	20	350–1000	300	>1 x 10^9
FX 1155	High	3.0	120–1100+	VUV	0.5	20	350–1000	300	>1 x 10^9

Arc Stability Light Output: 1%

Arc Stability Spatial Movement: <0.1 mm

Spectral Output



guided arc pulsed xenon lighting

Features

- Up to 20x the output intensity of traditional xenon style lamps
- Exceptional arc stability
- Long life
- Continuous spectrum UV-VIS-IR
- Collimated output beam
- Ideal for use with optical lenses and fiber bundles
- Low optical noise
- Microsecond flash durations
- Various window materials (transmissions ranging from 160 nm to 20 microns)
- High repetition flash rates
- No warm-up period required
- Compact size

Typical Applications

- Absorption Analysis
- Clinical Chemistry Analysis
- Liquid Chromatography
- Immunoassay Systems
- Fluorimetry
- Gas Chromatography
- Colorimetry
- Machine Vision
- Particle Sizing

Available Related Products

Power Supplies:

PS-4400

Datasheets available upon request

Description

The new FX-4400 light source from PerkinElmer Optoelectronics is a compact, high-output, long-life pulsed xenon flashlamp that offers exceptional arc stability, microsecond pulse durations and a high-intensity continuous line spectrum from the deep UV to the far IR.

The lamp utilizes an integral parabolic reflector to provide a collimated output beam and is capable of operating at up to 60 Watts average power. This new design measures approximately the same size as our traditional pulsed xenon lamps, yet provides up to 20X the light output intensity. This allows customers the option of either taking advantage of the greatly increased light output or operating the FX-4400 at a reduced input energy for increased lamp life and stability.

Lamp life exceeds 1 billion flashes, when operating at an input energy of up to 0.5 Joules per flash. The maximum flash rate is 1 kHz for an input energy of 60 milli Joules. Several window materials are available to provide customers with transmission output ranging from 160nm to 20 microns.

PerkinElmer will work closely with OEM's to customize the light source and related electronics to meet the most demanding applications. Also, our broad technical expertise in light sources, optics, detectors, light management and signal processing allows us to work with and provide OEM's with unique Sensor solutions that generate, control and measure light.

High Output Xenon Flashlamp—FX-4400

FX-4400 Series High Output Xenon Flashlamp

Technical Specification

Part Number	Energy Per Flash Joules* max.	Average Power W**	Voltage volts	Flash Rate Hz***	Life flashes****	Output Stability*****	Spectral Distribution	Window Material
FX-4400	1.0	60	400–1000	1000	>1 x 10^9	<3%	275–2000+	Borosilicate
FX-4401	1.0	60	400–1000	1000	>1 x 10^9	<3%	190–2000+	UV Glass
FX-4402	1.0	60	400–1000	1000	>1 x 10^9	<3%	160–4000	Sapphire
FX-4403	1.0	60	400–1000	1000	>1 x 10^9	<3%	600–20,000	ZnSe

* Input Energy or $E=1/2\ CV^2$ where E=Discharge Energy (joules)

C=Discharge Capacitor Value

V=discharge Voltage

The lamp is capable of an input energy higher than 1.0 J/flash but long life cannot be guaranteed.

** Maximum Average Power or $P_{AVE}=EF$ where

P_{AVE}=Average Power (watts)

E=Discharge Energy

F=Rate of flashes in pulses per second

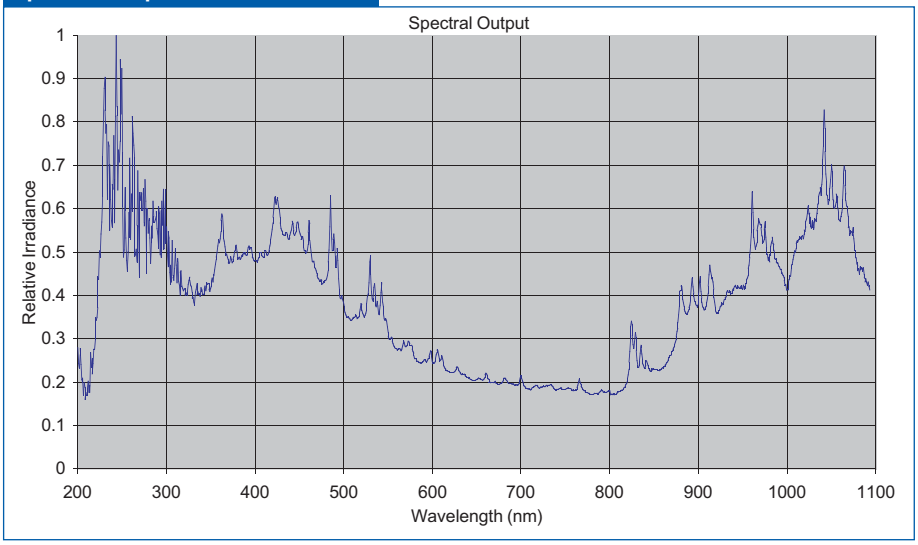
Additional cooling required when operating above 40 watts.

*** Flash rate must be set so as not to exceed 60-watts Average Power. To operate the lamp at greater than 1000 Hz consult with a PerkinElmer Product Specialist.

**** Life is primarily a function of input energy per flash ($E=1/2\ CV^2$) but is also influenced by average power and peak current.

*****Typical for most operating conditions. Lamp output stability is dependent on a number of variables including input energy, flash rate, optics design, Lite Pac and Power Supply.

Spectral Output



UV/Vis/NIR spectrophotometers

Features

- Custom OEM design solutions
- Designs from 190–1,950 nm
- High resolution
- Low stray light
- Fast data acquisition (10 ms)
- Spectral calibration
- Built-in scan control and data acquisition
- Small footprint
- Deuterium, Xenon and Tungsten sources
- Photodiode array, photodiode, CPM, SPCM or PMT type detectors
- Cuvette, fiber or gas sampling
- Solid state design
- Vibration tolerant

Typical Applications

- Molecular Spectroscopy
- Materials Analysis
- Process Control

Datasheets available upon request

Description

PerkinElmer's spectrophotometer platforms are rugged, high performance modules that can be customized for a variety of applications in the field of Analytical Chemistry, Clinical Diagnostics, Colorimetry, Process Monitoring, Food and Agriculture, Gas Chromatography and many others. The Cross Czerny-Turner design utilizes high performance optics to minimize stray light and maximize optical performance. The modules include an integrated, miniature UV-Vis or NIR light source that provide extremely stable, high-intensity broad band output to ensure maximum signal to noise. The modules also feature compact size, high speed, solid state design and RS232/USB interface.

Companies depend on PerkinElmer for their unique ability to design and manufacture precision electro-optical OEM subsystems. In doing so, we call upon our broad technical expertise in emitters, detectors, optics design, circuit design, embedded programming and signal processing. Specializing in managing light within complex optical systems, we work with OEM teams to ensure minimum lead times, maximum value and superior performance.

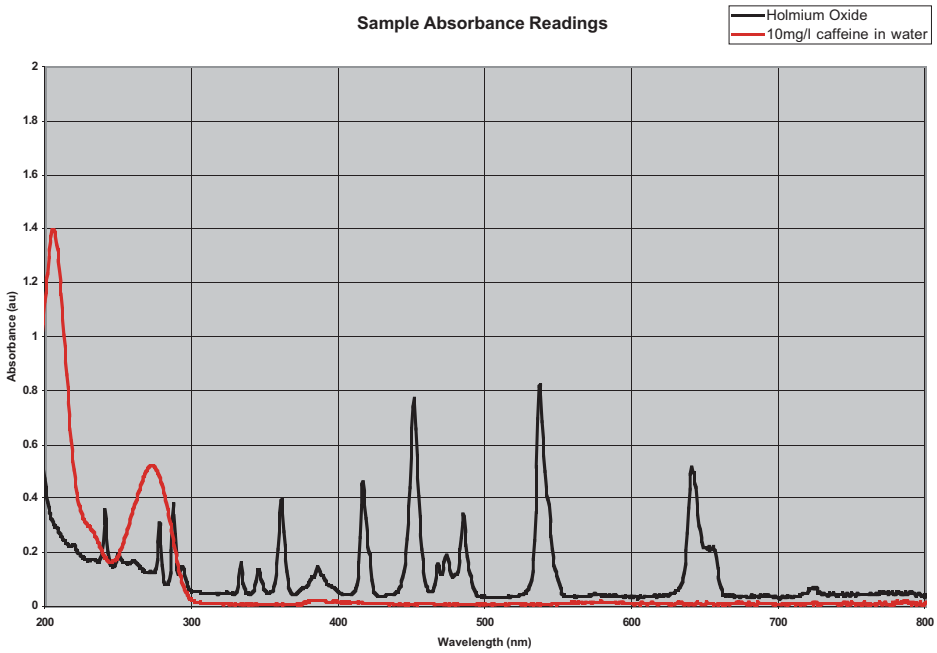
Cuvette Based UV/Vis Spectrophotometer

Fiber Coupled UV/Vis Spectrophotometer

Technical Specification

	UV-Vis	NIR
Spectral Range*	190–800 nm	900–1700 nm
Spectral Resolution*	<3 nm	5 nm
Detector	1024 Si	256 InGaAs
Source	Pulsed Xenon	Halogen
A/D Converter	16-bit	16-bit
Photometric Accuracy	±0.01A @1 AU	±0.02A @1 AU
Photometric Repeatability	±0.005 @1 AU	±0.01A @1 AU
Photometric Noise	0.001 @0 AU, 550 nm	0.001 @0 AU, 1400 nm
Stray Light	<0.1% @ 220 nm	<0.1%
Photometric Range	0–3 AU	0–3 AU
Minimum Scan Speed	0.035 seconds	0.035 seconds
Wavelength Producibility	0.1 nm	0.4 nm
Wavelength Accuracy	0.2 nm	0.8 nm
Outputs*	USB or RS232	USB or RS232
Computer Capability	700 MHz Pentium or equiv.	700 MHz Pentium or equiv.
Power Requirements	12 V	12 V
Size (including light source)	6" x 4" x 2"	6" x 4" x 2"
Weight	2 lbs.	2 lbs.

* Configurable for application specific requirements



photon counting modules

Features

- Peak Photon-Detection Efficiency @ 650 nm: 65% Typical
- Active Area: SPCM-AQR-1X: 175 µm
- User Friendly
- Gated Input
- Single +5 V Supply

Typical Applications

- LIDAR
- Photon-Correlation Spectroscopy
- Astronomical Observation
- Optical Range Finding
- Adaptive Optics
- Ultra-Sensitive Fluorescence
- Particle Sizing

Datasheets available upon request

Description

PerkinElmer Optoelectronics provides photon-counting modules based on both APDs and innovative Channel Photomultipliers.

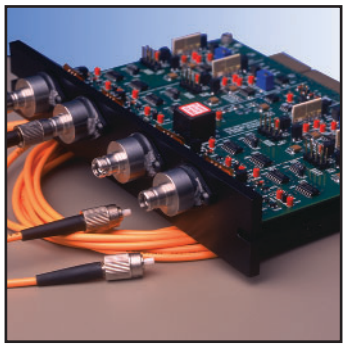
APD Based Single-Photon Counting Modules

The Single-Photon Counting Module (SPCM) is a self-contained photon counter which covers the wavelength range from 400 nm to 1100 nm, with photon detection efficiencies exceeding 60% at 650 nm. It has an integral 2-stage TE cooler, cooler controller, amplifier, discriminator and TTL output driver. It also contains a high-voltage DC-to-DC converter and is powered from a single 5 V source. The module utilizes a patented active-quench circuit which allows it to count over 10 million photons per second. The photosensitive area is 0.2 mm, and units are available with dark-count rates less than 25 counts/second.

SPCM-AQ4C Single-Photon Counting Array

The SPCM-AQ4C is a 4-channel photon-counting card capable of detecting single photons of light over a wavelength range from 400 nm to 1160 nm. Each channel is independent from the others. The SPCM-AQ4C utilizes a unique silicon avalanche photodiode (SliK™) with a circular active area whose peak photon-detection efficiency exceeds 60% at 650 nm. Each photodiode is both thermoelectrically cooled and temperature controlled, ensuring stabilized performance despite changes in the ambient temperature.

Single-Photon Counting Module—SPCM



SPCM-AQ4C Single-Photon Counting Array

SPCM-AQR-1X Series

Technical Specification

Parameter	Typical	Parameter	Typical
Supply current	0.5 Amps	Supply voltage	5 V
Power cable total resistance	0.2 Ω	Case operating temperature	5-40°C
Active area (diameter) @ min. Pd	175 µm		
Photon detection efficiency (Pd) @ 400 nm 650 nm 830 nm 1060 nm	 5% 65% 45% 2%	Output pulse width	35ns
Pd variation at constant case temperature (2 h @ 25° C)	±1-±3%	Pd variation 5° C to 40° C case temperature	±4-±10%
Dark count (cps) = SPCM-AQR-12 SPCM-AQR-13 SPCM-AQR-14	 250-500 150-250 50-100	Dark count (cps) = SPCM-AQR-15 SPCM-AQR-16	 50 max. 25 max.
Average dark count variation at constant case temperature (6 hrs @ 25°C) SPCM-AQR-12/13 SPCM-AQR-14/15/16	 ±10% max. ±1σ max.	Average dark count variation at 5°C to 40°C case temperature SPCM-AQR-12/13 SPCM-AQR-14/15/16	 ±20% max. ±2σ max.
Single-photon timing resolution	Contact Factory	Dead time (Count rates below 5 Mc/s)	50 ns
Output count rate before saturation	15 Mc/s	Afterpulsing probability	0.5%
Linearity correction factor @200 kc/s @1 Mc/s @5 Mc/s	 1.01 1.08 1.4	Gating turn on/off (50 Ω output) Disable = TTL Low Enable = TTL High	 2 ns 45 ns
Settling time following power up (1% stability) @ 1 meg counts/sec and 25°C	15 S	Threshold setting required on counter for digital output pulse (terminate in 50 Ω)	1 V
Gate threshold voltage: (@ V_{supply} = 5 V) Low level (sink current >90 mA)	 0 V-0.4 V	Gate threshold voltage: (@ V_{supply} = 5 V) High level (sink current >30 mA)	 3.5-5.25 V

Test Conditions: T=22˚C

SPCM-AQ4C

Technical Specification

Parameter	Typical	Parameter	Typical
Supply currents: @+2 V @+5 V @+30 V	 1 Amp 0.25 Amps 0.01 Amps	Maximum power consumption: @+2 V @+5 V @+30 V	Counts/Second 6 Watts max. 5 Watts max. 1.2 Watts max.
Supply voltage 1.95 V-2.05 V 4.75 V-5.25 V 29 V-31 V		Photon detection efficiency (per channel) @400 nm @650 nm @830 nm	 5% 65% 25%
Operating temperature (heatsink)	5˚C-40˚C	Dark count (per channel)	500 counts/sec.
Average dark count variation per channel @ constant heatsink temp.	10%	Average dark count variation per channel @ 5˚ to 40˚C heatsink temp.	20%
Timing resolution	Contact Factory	Dead time	50 ns
Output pulse width	25 ns	Maximum count rate*	4 Mc/s
Continuous	1.5 Mc/s	Afterpulsing probability	0.3%
Gate threshold voltage: (@ V_{supply} = 5 V) Low level (sink current >90 mA)	 0 V-0.4 V	Gate threshold voltage: (@ V_{supply} = 5 V) High level (source current >30 mA)	 3.5 V-5.25 V

Test Conditions: T=22˚C *500 ms duration, 25% duty cycle

channel photomultipliers

CPM Features

- Ultra-high anode sensitivity up to 10^7 A/W
- Extremely low dark current, typically 3 pA @ 10^6 gain
- Very low equivalent noise input (down to 10^{-17} W)
- High stability in dark current ("no bursts")
- High gain exceeding 10^8
- Compact dimensions
- High dynamic range
- Wide spectral response through multiple window materials
- High resolution
- Fast response time
- High immunity to magnetic fields
- Rugged design

Module Features

- High dynamic range
- No cooling required
- Very high stability in noise level
- Adjustable gain
- Active quenching circuit for high light protection
- Gateable CPM input
- Optical fiber read-out possible
- 5 volts operating voltage
- Monitor voltage output

Typical Applications

- Photon Detection and Counting
- Fluorescence Measurements
- Analytical and Clinical Instrumentation
- Bioluminescence
- High-Energy Physics

Available Related Products

CPM:

1/3" C900 Series
1/2" C1300 Series
3/4" C1900 Series

CPM Modules:

MD Series
MP Series
MH Series
MP 96X-2, MP 97X-2

High Voltage Power Supply:

CHV 30N
CHV 30P

Datasheets available upon request

Description

PerkinElmer Optoelectronics' Channel Photomultiplier (CPM) is an ultra-high sensitivity optical detector capable of replacing conventional photomultipliers (PMTs). This device uses a proprietary detector principle to produce ultra-high gain and dynamic range, extremely low noise, and fast response within a compact form factor. These detectors are available as components or in complete modules designed for DC operation and photon counting. All modules are gateable by an external TTL pulse for time-resolved measurements.

Modules

- MD Series DC-Module—contains the CPM, a high-voltage power supply, an amplifier with I/U conversion, and an active quenching circuit for high light protection.
- MP Series Photon Counting Module—The Photon Counting Head MP 900 contains the Channel Photomultiplier, a high-voltage power supply, a discrimination amplifier and a pulse shaper for fast output pulses.
- MH Series Channel Photomultiplier Head Module—The Channel Photomultiplier module MH 900 series is designed for both photon counting and dc operating modes. It contains an adjustable high-voltage supply and a Channel Photomultiplier of the C900 series.
- MP 96X-2, MP 97X-2 Single Photon Counting Module—These modules are specially designed for particle measurement with 530 nm and 632 nm lasers. Based on the standard multialkali photocathode, the sensitive diameter is reduced to 2 mm in order to achieve an excellent low dark-count performance.

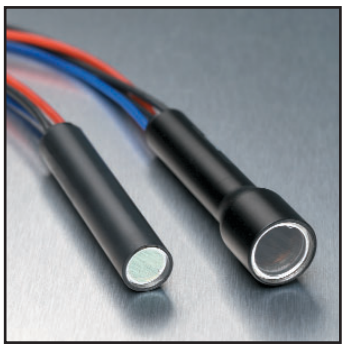
Power Supply

- CHV 30N—A self-contained high-voltage supply specially designed for the Channel Photomultipliers CPM C900, C1300 and C1900. It provides the matching voltages for the cathode, channel entrance, and channel end.
- CHV 30P—The equivalent power supply for positive high voltage.

All given values are nominal/typical at 20˚C ambient temperature; specifications are subject to change without notice.

Principle of Operation

The CPM converts a very low light level into photoelectrons through a semitransparent photocathode deposited on the inner surface of the entrance window. On their way from the cathode to the anode, the photoelectrons pass through a narrow semiconductive channel. Each time the electrons hit the inner surface of the curved channel, multiple secondary electrons are emitted. This effect occurs multiple times along the path, leading to an avalanche effect with a gain exceeding 10^8. The curved shape of the glass tube improves the multiplication effect.



Channel Photomultipliers—CPM Formats 1/2"and 3/4"

CPM—1/3" C 900 Series

Technical Specification

Spectral Response /nm	Model	@140 nm A/W	@200 nm A/W	@400 nm A/W	@560 nm A/W	ENI (W)	Dark Current pA	Model	Dark Counts per Second (cps)
115-200	C911	$6x10^5$				$1x10^{-17}$	2	C911P	0.1
115-200	C921		$1x10^6$			$1x10^{-17}$	10	C921P	1
165-320	C922		$1x10^6$			$1x10^{-17}$	10	C922P	1
165-650	C942			$3x10^6$		$1x10^{-17}$	80	C942P	10
185-650	C943			$3x10^6$		$1x10^{-17}$	80	C943P	10
300-650	C944			$3x10^6$		$1x10^{-17}$	80	C944P	10
165-750	C952			$3x10^6$		$2.5x10^{-17}$	250	C952P	40
185-750	C953			$3x10^6$		$2.5x10^{-17}$	250	C953P	40
165-850	C962				$2x10^6$	$4x10^{-17}$	1000	C962P	100
185-850	C963				$2x10^6$	$4x10^{-17}$	1000	C963P	100
165-900	C972				$2x10^6$	$1.5x10^{-16}$	5000	C972P	500
185-900	C973				$2x10^6$	$1.5x10^{-16}$	5000	C973P	500
165-650	C982			$3x10^6$		$6x10^{-18}$	25	C982P	3
185-650	C983			$3x10^6$		$6x10^{-18}$	25	C983P	3
165-750	C992			$3x10^6$	$2x10^6$	$1x10^{-17}$	50	C992P	5
185-750	C993			$3x10^6$	$2x10^6$	$1x10^{-17}$	50	C993P	5

Useful Area: Min. 5 mm
Window Material: MgF_2, Quartz or UV Glass
Electron Multiplication: Channel Electron Multiplier
Current Amplification: $5x10^7$
Bias Current (μA): 50
Anode Current: Max. 10 μA (Max. 30 sec.)
Single Photo Electron gain: $3x10^6$
Ambient Temperature (˚C): Max. 50
Photocathode Material: CsI, CsTe, Low-noise Bialkali, Bialkali, Low-noise Multialk., Multialk. Extended Red Multialk, or yellow enhanced.
Supply Voltage (V): 2400 (Max. 3000)
Linear Anode Current: Max. (DC linearity limit) 10% of Bias Current
Response Time Rise Time (ns): 3
Pulse Width/FWHM (ns): 6
Peak to Valley: 10:1

Channel Photomultipliers—CPM Format 1/3"

CPM—1/2" C 1300 Series

Technical Specification

Spectral Response /nm	Model	@140 nm A/W	@200 nm A/W	@400 nm A/W	@560 nm A/W	ENI (W)	Dark Current pA	Model	Dark Counts per Second (cps)
115-200	C1311	$6x10^5$				$2x10^{-17}$	8	C1311P	0.4
115-320	C1321		$1x10^6$			$2x10^{-17}$	40	C1321P	4
165-320	C1322		$1x10^6$			$2x10^{-17}$	40	C1322P	4
165-650	C1342			$3x10^6$		$2x10^{-17}$	320	C1342P	40
185-650	C1343			$3x10^6$		$2x10^{-17}$	320	C1343P	40
300-650	C1344			$3x10^6$		$2x10^{-17}$	320	C1344P	40
165-750	C1352			$3x10^6$		$4x10^{-17}$	1000	C1352P	160
185-750	C1353			$3x10^6$		$4x10^{-17}$	1000	C1353P	160
165-850	C1362				$2x10^6$	$8x10^{-17}$	4000	C1362P	400
185-850	C1363				$2x10^6$	$8x10^{-17}$	4000	C1363P	400
165-900	C1372				$2x10^6$	$3x10^{-16}$	20000	C1372P	2000
185-900	C1373				$2x10^6$	$3x10^{-16}$	20000	C1373P	2000
165-650	C1382			$3x10^6$		$1x10^{-17}$	100	C1382P	10
185-650	C1383			$3x10^6$		$1x10^{-17}$	100	C1383P	10
165-750	C1392			$3x10^6$	$2x10^6$	$2x10^{-17}$	200	C1392P	20
185-750	C1393			$3x10^6$	$2x10^6$	$2x10^{-17}$	200	C1393P	20

Useful Area: Min. 9 mm
Window Material: MgF_2, Quartz, UV Glass or Borosil.
Supply Voltage (V): 2400 (Max. 3000)
Bias Current (μA): 50
Response Time Rise Time (ns): 3
Pulse Width/FWHM (ns): 6
Peak to Valley: 10:1
Photocathode Material: CsI, CsTe, Low-noise Bialkali, Bialkali, Low-noise, Multialk., Multialk. Extended Red Multialk, or yellow enhanced.
Current Amplification: $5x10^7$
Linear Anode Current: Max. (DC linearity limit) 10% of Bias Current
Anode Current: Max. 10 μA (Max. 30 sec.)
Single Photoelectron gain: $3x10^6$
Ambient Temperature (˚C): Max. 50

channel photomultipliers

CPM—3/4" C 1900 Series

Technical Specification

Spectral Response /nm	Model	@140 nm A/W	@200 nm AW	@400 nm A/W	@560 nm A/W	ENI (W)	Dark Current pA	Model	Dark Counts per Second (cps)
115-200	C1911	$6x10^5$				$3x10^{-17}$	20	C1911P	1
115-320	C1921		$1x10^6$			$3x10^{-17}$	100	C1921P	10
165-320	C1922		$1x10^6$			$3x10^{-17}$	100	C1922P	10
165-650	C1942			$3x10^6$		$3x10^{-17}$	800	C1942P	100
185-650	C1943			$3x10^6$		$3x10^{-17}$	800	C1943P	100
300-650	C1944			$3x10^6$		$3x10^{-17}$	800	C1944P	100
165-750	C1952			$3x10^6$		$8x10^{-17}$	2500	C1952P	400
185-750	C1953			$3x10^6$		$8x10^{-17}$	2500	C1953P	400
165-850	C1962				$2x10^6$	$1x10^{-16}$	10000	C1962P	1000
185-850	C1963				$2x10^6$	$1x10^{-16}$	10000	C1963P	1000
165-900	C1972				$2x10^6$	$5x10^{-16}$	50000	C1972P	5000
185-900	C1973				$2x10^6$	$5x10^{-16}$	50000	C1973P	5000
165-650	C1982			$3x10^6$		$2x10^{-17}$	250	C1982P	25
185-650	C1983			$3x10^6$		$2x10^{-17}$	250	C1983P	25
165-750	C1992			$3x10^6$	$2x10^6$	$3x10^{-17}$	500	C1992P	50
185-750	C1993			$3x10^6$	$2x10^6$	$3x10^{-17}$	500	C1993P	50

Useful Area: Min. 15 mm
Window Material: MgF_2, Quartz, UV Glass or Borosil.
Electron Multiplication: Channel Electron Multiplier
Current Amplification: $5x10^7$
Bias Current (µA): 50
Anode Current: Max. 10 µA (Max. 30 sec.)
Single Photoelectron gain: $3x10^6$
Ambient Temperature (°C): Max. 50
Photocathode Material: CsI, CsTe, Low-noise Bialkali, Bialkali, Low-noise Multialk., Multialk. Extended Red Multialk, or yellow enhanced.
Supply Voltage (V): 2400 (Max. 3000)
Linear Anode Current: Max. (DC linearity limit) 10% of Bias Current
Response Time Rise Time (ns): 3
Pulse Width/FWHM (ns): 6
Peak to Valley: 10:1

Power Supply
CHV30N, CHV30P

Power Supply—CHV30N

Technical Specification

Part Number	Voltage Channel Entrance	Voltage Cathode	Output Current	Long Term Stability typ.	Output Ripple typ.	Supply Voltage
CHV30N	-2900 V max.	-3000 V max.	100 µA max.	< 1E-5	< 50 mV_{pp}	5 V

Test conditions: T = 20°C
Voltage channel entrance: V_{SET}=0-2.9 V
Voltage cathode: V_{gate}=low or open
Long-term stability @ V_{SET}: <<1 E-5
Weight: 45 g
Operating temperature: 0-50°C
Storage temperature: -20-60°C

Power Supply—CHV30P

Technical Specification

Part Number	Voltage Anode	Voltage Cathode typ.	Voltage Channel Entrance typ.	Output Current	Long Term Stability typ.	Output Ripple typ.	Supply Voltage
CHV30P	+3000 V max.	0 V	140 V	100 µA max.	< 1E-5	< 30 mV_{pp}	5 V

Test conditions: T = 20°C
Voltage Anode: @ V_{SET}=0-3 V
Voltage cathode: 190 V—when gated
Voltage channel entrance: @ V_A ≥1400 V
Long-term stability @ V_{SET}: <<1 E-5
Weight: 45 g
Operating temperature: 0-50°C
Storage temperature: -20-60°C

CPM Module—1/3" 900 Series

Technical Specification

Spectral Response /nm	Model	ENI (W)	Dark Current/Offset Voltage @1x10^6 Gain & 1 V/20 nA	Model	Dark Counts per Second (cps)	Model	Dark Current pA @5x10^7 Gain	Model	ENI (W)	Dark Counts per Second (cps)
165-650	MD 942	$1x10^{-17}$	3 pA/150 µV	MP 942	10	MH 942	80	MH 942P	$1x10^{-17}$	10
185-650	MD 943	$1x10^{-17}$	3 pA/150 µV	MP 943	10	MH 943	80	MH 943P	$1x10^{-17}$	10
165-750	MD 952	$2.5x10^{-17}$	10 pA/500 µV	MP 952	40	MH 952	250	MH 952P	$2.56x10^{-17}$	40
185-750	MD 953	$2.5x10^{-17}$	10 pA/500 µV	MP 953	40	MH 953	250	MH 953P	$2.5x10^{-17}$	40
165-850	MD 962	$4x10^{-17}$	30 pA/1.5 mV	MP 962 MP 962-2	100 40	MH 962	1000	MH 962P	$4x10^{-17}$	100
185-850	MD 963	$4x10^{-17}$	30 pA/1.5 mV	MP 963 MP 963-2	100 40	MH 963	1000	MH 963P	$4x10^{-17}$	100
165-900	MD 972	$1.5x10^{-16}$	200 pA/10 mV	MP 972 MP 972-2	500 160	MH 972	5000	MH 972P	$1.5x10^{-16}$	400
185-900	MD 973	$1.5x10^{-16}$	200 pA/10 mV	MP 973 MP 973-2	500 160	MH 973	5000	MH 973P	$1.5x10^{-16}$	400
165-650	MD 982	$6x10^{-18}$	1 pA/50 µV	MP 982	3	MH 982	25	MH 982P	$6x10^{-18}$	3
185-650	MD 983	$6x10^{-18}$	1 pA/50 µV	MP 983	3	MH 983	25	MH 983P	$6x10^{-18}$	3
165-750	MD 992	$1x10^{-17}$	2 pA/100 µV	MP 992	5	MH 992	50	MH 992P	$1x10^{-17}$	5
185-750	MD 993	$1x10^{-17}$	2 pA/100 µV	MP 993	5	MH 993	50	MH 993P	$1x10^{-17}$	5

Photocathode Diameter: 5 mm (MP 9xx-2 types: 2 mm)
Window Material: Quartz or UV Glass
Additional models on request

Photocathode Material: Low-noise Bialkali, Bialkali, Low-noise Multialk., Multialk. Extended Red Multialk, or yellow enhanced.
Quantum Efficiency: 20% typical (Ext. Red MA: 10% typical)

CPM Module—1/2" 1300 Series

Technical Specification

Spectral Response /nm	Model	ENI (W)	Dark Current/Offset Voltage @1x10^6 Gain & 1 V/20 nA	Model	Dark Counts per Second (cps)	Model	Dark Current pA @5x10^7 Gain	Model	ENI (W)	Dark Counts per Second (cps)
165-650	MD1342	$2x10^{-17}$	12 pA/600 µV	MP1342	40	MH1342	320	MH1342P	$2x10^{-17}$	40
185-650	MD1343	$2x10^{-17}$	12 pA/600 µV	MP1343	40	MH1343	320	MH1343P	$2x10^{-17}$	40
165-750	MD1352	$4x10^{-17}$	40 pA/2 mV	MP1352	160	MH1352	1000	MH1352P	$4x10^{-17}$	160
185-750	MD1353	$4x10^{-17}$	40 pA/2 mV	MP1353	160	MH1353	1000	MH1353P	$4x10^{-17}$	160
165-850	MD1362	$8x10^{-17}$	120 pA/6 mV	MP1362	400	MH1362	4000	MH1362P	$8x10^{-17}$	400
185-850	MD1363	$8x10^{-17}$	120 pA/6 mV	MP1363	400	MH1363	4000	MH1363P	$8x10^{-17}$	400
165-900	MD1372	$3x10^{-16}$	800 pA/40 mV	MP1372	2000	MH1372	20000	MH1372P	$3x10^{-16}$	2000
185-900	MD1373	$3x10^{-16}$	800 pA/40 mV	MP1373	2000	MH1373	20000	MH1373P	$3x10^{-16}$	2000
165-650	MD1382	$1x10^{-17}$	4 pA/200 µV	MP1382	10	MH1382	100	MH1382P	$1x10^{-17}$	10
185-650	MD1383	$1x10^{-17}$	4 pA/200 µV	MP1383	10	MH1383	100	MH1383P	$1x10^{-17}$	10
165-750	MD1392	$2x10^{-17}$	8 pA/400 µV	MP1392	20	MH1392	200	MH1392P	$2x10^{-17}$	20
185-750	MD1393	$2x10^{-17}$	8 pA/400 µV	MP1393	20	MH1393	200	MH1393P	$2x10^{-17}$	20

Photocathode Diameter: Min. 9 mm
Window Material: Quartz or UV Glass
Additional models on request

Photocathode Material: Low-noise Bialkali, Bialkali, Low-noise Multialk., Multialk. Extended Red Multialk, or yellow enhanced.
Quantum Efficiency: 20% typical (Ext. Red MA: 10% typical)

CPM Modules—
3/4" 1900 Series

CPM Module—3/4" 1900 Series

Technical Specification

Spectral Response /nm	Model	ENI (W)	Dark Current/Offset Voltage @1x10^6 Gain & 1 V/20 nA	Model	Dark Counts per Second (cps)	Model	Dark Current pA @5x10^7 Gain	Model	ENI (W)	Dark Counts per Second (cps)
165-650	MD1942	$3x10^{-17}$	30 pA/1.5 mV	MP1942	100	MH1942	800	MH1942P	$3x10^{-17}$	100
185-650	MD1943	$3x10^{-17}$	30 pA/1.5 mV	MP1943	100	MH1943	800	MH1943P	$3x10^{-17}$	100
165-750	MD1952	$8x10^{-17}$	100 pA/5 mV	MP1952	400	MH1952	2500	MH1952P	$8x10^{-17}$	400
185-750	MD1953	$8x10^{-17}$	100 pA/5 mV	MP1953	400	MH1953	2500	MH1953P	$8x10^{-17}$	400
165-850	MD1962	$1x10^{-16}$	300 pA/15 mV	MP1962	1000	MH1962	10000	MH1962P	$1x10^{-16}$	1000
185-850	MD1963	$1x10^{-16}$	300 pA/15 mV	MP1963	1000	MH1963	10000	MH1963P	$1x10^{-16}$	1000
165-900	MD1972	$5x10^{-16}$	2 nA/100 mV	MP1972	5000	MH1972	50000	MH1972P	$5x10^{-16}$	5000
185-900	MD1973	$5x10^{-16}$	2 nA/100 mV	MP1973	5000	MH1973	50000	MH1973P	$5x10^{-16}$	5000
165-650	MD1982	$2x10^{-17}$	10 pA/500 µV	MP1982	25	MH1982	250	MH1982P	$2x10^{-17}$	25
185-650	MD1983	$2x10^{-17}$	10 pA/500 µV	MP1983	25	MH1983	250	MH1983P	$2x10^{-17}$	25
165-750	MD1992	$3x10^{-17}$	16 pA/800 µV	MP1992	50	MH1992	500	MH1992P	$3x10^{-17}$	50
185-750	MD1993	$3x10^{-17}$	16 pA/800 µV	MP1993	50	MH1993	500	MH1993P	$3x10^{-17}$	50

Photocathode Diameter: Min. 15 mm
Window Material: Quartz or UV Glass
Additional models on request

Photocathode Material: Low-noise Bialkali, Bialkali, Low-noise Multialk., Multialk. Extended Red Multialk, or yellow enhanced.
Quantum Efficiency: 20% typical (Ext. Red MA: 10% typical)

photodiodes

Features

- Low-cost visible and near-IR photodetector
- Excellent linearity in output photocurrent over 7 to 9 decades of light intensity
- Fast response times
- Available in a wide range of packages including epoxy-coated, transfer-molded, cast, and hermetic packages, as well as in chip form
- Low noise
- Mechanically rugged, yet compact and lightweight
- Available as duals, quads or as linear arrays
- Usable with almost any visible or near-infrared light source such as solid state laser diodes, neon, fluorescent, incandescent bulbs, lasers, flame sources, sunlight, etc.
- Can be designed and tested to meet the requirements of your application

Typical Applications

- Fiber-Optic Communications
- Instrumentation
- High-Speed Switching
- Spot Position Tracking and Measurement
- Photometry
- Data Transmission
- UV Light Meters
- Fluorescent Light Detection
- Laser Range Finding
- Barcode Scanning
- Laser Safety Scanning
- Distance Measurement

Datasheets available upon request

Description

PerkinElmer Optoelectronics offers a broad array of Silicon and InGaAs PIN and APDs.

InGaAs Avalanche Photodiodes

The high-quality InGaAs avalanche photodiodes (APDs) are packaged in hermetically sealed TO cans and ceramic blocks designed for the 900 to 1700 nm wavelength region.

InGaAs PIN Photodiodes

High-quality Indium Gallium Arsenide photodiodes designed for the 900 to 1700 nm wavelength region, these photodiodes are available in standard sizes ranging from 50 microns to 5 mm in diameter. Packages include ceramic submount, TO packages, and chip form.

Silicon Avalanche Photodiodes

These are reliable, high-quality detectors in hermetically sealed TO packages designed for high-speed and high-gain applications. A “reach-through” structure is utilized which provides very low noise performance at high gains, and a full range of active areas is available.

Silicon PIN Photodiodes

Offered for low- to high-speed applications, these PINs are designed for the 250 nm to 1100 nm range. Standard sizes range from 100 microns to 10 mm in diameter.

Silicon PN Photodiodes

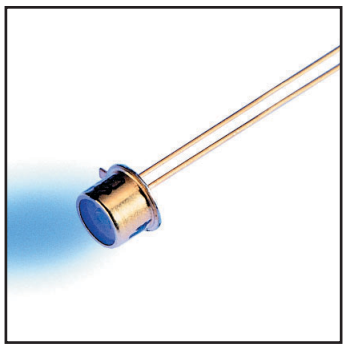
This format includes a variety of high-volume, low-cost silicon photodiodes that meet the demanding requirements of today’s commercial and consumer markets.

Alternate Source/Second Source Photodiodes

PerkinElmer’s nearest equivalent devices are selected on the basis of general similarity of electro-optical characteristics and mechanical configuration. Interchangeability in any particular application is not guaranteed, suitability should be determined by the customer's own evaluation.

Detector Modules

Preamplifier modules are hybrid devices with a photodiode and a matching amplifier in a compact hermetic TO package. An integral amplifier allows for better ease of use and noise bandwidth performance. 14-pin, DIL, and/or fibered packaged modules are available on a custom basis.



Indium Gallium Arsenide PIN Photodiodes, Large-Area, and Small-Area
Indium Gallium Arsenide APDs

- High Responsivity
- Low Capacitance for High Bandwidths
- Available in Various Hermetic Packages

InGaAs APDs—900 nm to 1700 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. µm	Resp. A/W @1300 nm	Resp. A/W @1550 nm	Dark Curr. Id (nA)	Spect. Noise Curr. Dens. In (pA/√Hz)	Cap. @100 kHz Cd (pF)	Bandwidth GHz into 50 W	NEP @ 1550 nm pW/√Hz	VOP for Gain=10 V
C30644E	TO window	50	8.4	9.4	6	0.15	1	2	0.03	40-90
C30644ECER	Ceramic	50	8.4	9.4	6	0.15	0.8	2	0.03	40-90
C30645E	TO window	80	8.4	9.4	10	0.25	1.2	1	0.13	40-90
C30645ECER	Ceramic	80	8.4	9.4	10	0.25	1	1	0.13	40-90
C30662E	TO window	200	8.4	9.4	200	1.4	2.5	0.2	0.15	40-90
C30662ECER	Ceramic	200	8.4	9.4	200	1.4	2.5	0.2	0.15	40-90
C30733ECER	Ceramic	30	8.4	9.4	5	<0.1	0.25	3	0.01	40-90

Test conditions: T = 22ºC

InGaAs PIN Large-Area—900 nm to 1700 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. A/W @850 nm	Resp. A/W @1300 nm	Resp. A/W @1550 nm	Dark Curr. Id (nA)	NEP @ 1300 nm pW/√Hz	Cap. @100 kHz Cd (pF)	Bandwidth MHz into 50 W	Max. Power for .15 dB Linearity (dBm)	Bias Volt for these Specs V
C30619G	TO-18	0.5	0.2	0.86	0.95	5	<0.1	8	350	>+13	5
C30641G	TO-18	1	0.2	0.86	0.95	5	<0.1	40	75	>+13	2
C30642G	TO-5	2	0.2	0.86	0.95	10	0.1	350	20	+11	0
C30665G	TO-5	3	0.2	0.86	0.95	25	0.2	1000	3	+11	0
C30723G	TO-8	5	0.2	0.86	0.95	30	0.3	2500	2.5	+11	0

Test conditions: T = 22ºC

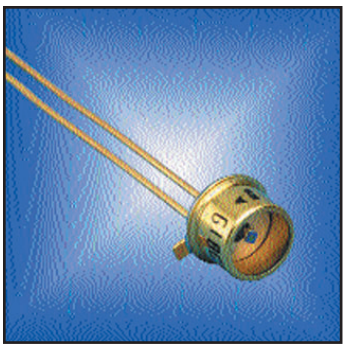
InGaAs PIN Small-Area—900 nm to 1700 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. µm	Resp. A/W @1300 nm	Resp. A/W @1550 nm	Dark Curr. Id (nA)	Spect. Noise Curr. Dens. In (pA/√Hz)	Cap. @100 kHz Cd (pF)	Bandwidth GHz into 50 W	NEP @ 1550 nm pW/√Hz	Bias Volt for these Specs V
C30616ECER	Ceramic	50	0.86	0.95	0.5	<0.02	0.35	>3.5	<0.02	5
C30637ECER	Ceramic	75	0.86	0.95	0.8	<0.02	0.4	3.5	<0.02	5
C30617ECER	Ceramic	100	0.86	0.95	1	<0.02	0.55	3.5	<0.02	5
C30617B	Ball lens	100	0.8	0.9	1	<0.02	0.8	3.5	<0.02	5
C30618ECER	Ceramic	350	0.86	0.95	2	0.02	4	0.8	0.02	5
C30618G	TO window	350	0.86	0.95	2	0.02	4	0.8	0.02	5

Test conditions: T = 22ºC

photodiodes



Silicon Avalanche Photodiodes

- Hermetically Sealed Packages

Si APD—Standard Types–400 nm to 1100 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. 900 nm A/W	Dark Curr. Id (nA)	Spect. Noise Curr. Dens. In (pA/√Hz)	Cap. @100 kHz: Cd (pF)	Resp. Time tr (ns)	NEP @ 900 nm fW/√Hz	VOP Range V
C30817E	TO-5	0.8	75	50	0.5	2	2	7	275-425
C30872E	TO-8	3	45	100	0.5	10	2	11	275-425
C30902E	TO-18	0.5	77 (@ 830 nm)	15	0.23	1.6	0.05	3 (@ 830 nm)	180-250
C30902S	TO-18	0.5	128 (@ 830 nm)	15	0.11	1.6	0.05	0.86 (@ 830 nm)	180-250
C30916E	TO-5	1.5	70	100	0.5	3	2	8	275-425

Test conditions: T = 22ºC

Si APD—Arrays Quadrant and Linear–400 nm to 1100 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. @830 nm A/W	Dark Curr. Id (nA)	Spect. Noise Curr. Dens. In (pA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ 830 nm fW/√Hz	VOP Range V
C30927E-01	TO-8	1.5 total	62 (@900 nm)	25	0.25	1	3	16 (@900 nm)	275-425
C30927E-02	TO-8	1.5 total	62 (@900 nm)	25	0.25	1	3	16 (@900 nm)	275-425
C30927E-03	TO-8	1.5 total	62 (@900 nm)	25	0.25	1	3	16 (@900 nm)	275-425
C30985E	Custom	0.3 pitch	31	1	0.1	0.5	2	3	250-425

Test conditions: T = 22ºC

Si APD—Low Cost, High Volume–400 nm to 1000 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. @900 nm A/W	Dark Curr. Id (nA)	Spect. Noise Curr. Dens. In (pA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ 900 nm fW/√Hz	VOP Range V
C30724E	TO-18	0.5	9 (@ M=15)	25	0.1	1	5	11	120-200
C30724P	Plastic	0.5	9 (@ M=15)	25	0.1	1	5	11	120-200
C30737E	TO-18	0.5	47 (@ I-800 nm M=100)	20	0.3	2.5	0.3	6.4 (@ 800 nm M=100)	120-200

Test conditions: T = 22ºC

Si APD—TE-Cooled

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. @830 nm A/W	Dark Curr. Id (nA)	Spect. Noise Curr. Dens. In (pA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ 830 nm fW/√Hz	ADP VOP Range V
C30902S-TC	TO-66	0.5	128	2	0.04	1.6	0.5	0.3	160-250
C30902S-DTC	TO-66	0.5	128	1	0.02	1.6	0.5	0.16	160-250

Test conditions: T = 0ºC for -TC and -20ºC for -DTC ADP VOP Range: temperature dependent

Silicon Avalanche Photodiodes

- Low Cost, High Volume

Si APD—NIR-Enhanced–400 nm to 1100 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. @1060 nm A/W	Dark Curr. Id (nA)	Spect. Noise Curr. Dens. In (pA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ 900 nm m=15 fW/√Hz	VOP Range V
C30954E	TO-5	0.8	36	50	0.5	2	2	14	275-425
C30955E	TO-5	1.5	34	100	0.5	3	2	15	275-425
C30956E	TO-8	3	25	100	0.5	10	2	20	275-425

Test conditions: T = 22ºC

Si APD—Lightpipe

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. @830 nm A/W	Dark Curr. Id (nA)	Spect. Noise Curr. Dens. In (pA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ 830 nm fW/√Hz	VOP Range V
C30921E	TO-18	0.5	77	15	0.23	1.6	0.05	3	180-250
C30921S	TO-18	0.5	128	15	0.11	1.6	0.05	0.86	180-250

Test conditions: T = 22ºC

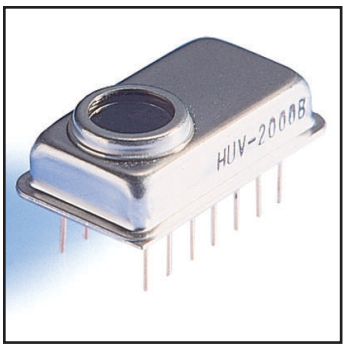
Si APD—Radiation Detection

Technical Specification

Part Number	Photo Sens. Diam. mm	Resp. A/W	Dark Curr. Id (nA)	Spect. Noise Curr. Dens. In (pA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ Peak fW/√Hz	VOP Range V
C30626	5x5	22 (@900 nm)	250	0.5	30	5	23 (@900 nm)	275-425
C30703	10x10	16 (@530 nm)	10	0.7	120	5	40 (@530 nm)	275-425

Test conditions: T = 22ºC

photodiodes



Silicon PIN Photodiodes and Modules

- Broad Range of Photosensitive Areas
- Low Operating Voltage
- Hermetically Sealed Packages

Si PINs—Window and Lightpipe Packages, Fast Response–400 nm to 1100 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. @830 nm A/W	Dark Curr. Id nA	Spect. Noise Curr. Dens. In (fA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ 830 nm fW/√Hz	Bias Volt for These Specs V
C30971E	TO-18	0.5	0.5	10	57	1.6	0.5	113	100
C30971EL	TO-18 Lightpipe	0.25	0.5	10	57	1.6	0.5	113	100

Test conditions: T = 22˚C

Si PINs—Large Area, Fast Response–400 nm to 1100 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. @900 nm A/W	Dark Curr. Id nA	Spect. Noise Curr. Dens. (fA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ 900 nm fW/√Hz	Bias Volt for These Specs V
FFD-100	TO-5	2.5	0.58	2	25	8.5	3.5	44	15
FFD-200	TO-8	5.1	0.58	4	36	30	5	62	15

Test conditions: T = 22˚C

Si PINs—Quadrant–220 nm to 1100 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. total mm	Resp. @900 nm A/W	Dark Curr. Id nA	Spect. Noise Curr. Dens. In (fA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ 900 nm fW/√Hz	Bias Volt for These Specs V
C30845E	TO-5	8	0.6	7	47	8	6	79	45
UV-140BQ-4	TO-5	1.3x1.3 (x4)	0.58	—	4	34	<1 µsec	7	0
YAG-444-4A	Custom	11.4	0.4 @1.06 µm	40	118	9	25	295	180

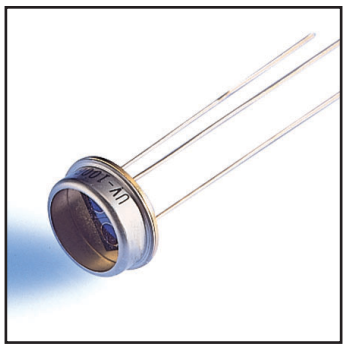
Test conditions: T = 22˚C

Si PINs—Standard N-Type–400 nm to 1100 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. @900 nm A/W	Dark Curr. Id nA	Spect. Noise Curr. Dens. In (fA/√Hz)	Cap. @100 kHz Cd (pF)	Resp. Time tr (ns)	NEP @ 900 nm fW/√Hz	Bias Volt for These Specs V
C30807E	TO-18	1	0.6	1	18	2.5	3	30	45
C30808E	TO-5	2.5	0.6	3	31	6	5	52	45
C30822E	TO-8	5	0.6	5	40	17	7	67	45
C30809E	TO-8	8	0.6	7	47	35	10	79	45
C30810E	Custom	11.4	0.6	30	98	70	12	163	45

Test conditions: T = 22˚C



Silicon PINs—UV Enhanced

Si PINs—UV Enhanced, Low Noise–220 nm to 1100 nm

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. A/W @250 nm	Resp. A/W @900 nm	Shunt Resis. Rd MW	Spect. Noise Curr. Dens.: In (fW/√Hz)	Cap. @100 kHz: Cd (pF)	NEP @ 900 nm fA/√Hz
UV-040BQ	TO-8	1	0.12	0.58	2000	3	25	5
UV-100BQ	TO-8	2.5	0.12	0.58	1000	4	120	7
UV-215BQ	TO-8	5.4	0.12	0.58	250	8	450	25
UV-245BQ	TO-8	4.4x4.7	0.12	0.58	375	7	375	20
UV-140BQ-2	TO-5	2.5x1.3 (x2)	0.12	0.58	1000	4	68	7
UV-140BQ-4	TO-5	1.3x1.3 (x4)	0.12	0.58	1000	4	34	7

Test conditions: T = 22˚C

Si PIN Modules—Low Bandwidth–1 kHz to 50 kHz

Technical Specification

Part Number	Standard Package	Photo Sens. Diam. mm	Resp. MV/W @250 nm	Resp. MV/W @900 nm	Spect. Noise Volt. Dens. Vn (µV/√Hz)	NEP @ 900 nm pW/√Hz	Bandwidth kHz into 50 W	Bias Volt for These Specs V
HUV-2000B	Custom	5.4	24	116	2.5	0.02	2	0
HUV-1100BG	TO-5	2.5	24	116	20	0.17	20	0

Test conditions: T = 22ºC

Si PIN Modules—High Bandwidth–40 MHz to 100 MHz

Technical Specification

Part Number	PIN or APD Used	Standard Package	Photo Sens. Diam. mm	Resp. kV/W @900 nm	Lin. Volt. Out Swing (V)	Spect. Noise Volt. Dens. Vn (nV/√Hz)	NEP @900 nm pW/√Hz	Bandwidth MHz (3 dB, into 50 W)	Photo. Diod. Bias Volt V
C30608E	C30971	TO-5	0.5	32 (@ 830 nm)	0.7	60	1.8 (@ 830 nm)	50	12
C30659-1550-R2A	C30662	TO-8	0.2	340 (@ 1550 nm)	2	35	0.103 (@ 1550 nm)	50	40-90
C30950E	C30817	TO-8	0.8	560	0.7	20	.036	50	275-425
C30919E	C30817	Custom	0.8	1000	0.7	25	.025	40	275-425

Test conditions: T = 22ºC

photodiodes

Silicon PN Photodiodes

Table Key

I_{SC}	Short-Circuit Current H=100 fc, 2850 K
TC I_{SC}	I_{SC} Temperature Coefficient, 2850 K
V_{OC}	Open-Circuit Voltage H=100 fc, 2850 K
TC V_{OC}	V_{OC} Temperature Coefficient, 2850 K
I_D	Dark Current H=0, VR=10, 50, 100 V
R_{SH}	Shunt Resistance H=0, V=10 mV
C_J	Junction Capacitance H=0, V=0, 3, 15 V
R_E	Responsivity 880-940 nm
S_R	Sensitivity @ Peak
λ_{range}	Spectral Application Range
λ_p	Spectral Response @ Peak
V_{BR}	Breakdown Voltage

Table Key

I_{SC}	Short-Circuit Current H=1000 lux, 2850 K
TC I_{SC}	I_{SC} Temperature Coefficient H=1000 lux, 2850 K
I_D	Dark Current H=0, VR=100 mV
TC I_D	ID Temperature Coefficient H=0, VR=100 mV
R_{SH}	Shunt Resistance H=0, VR=10 mV
C_J	Junction Capacitance H=0, V=0 V, 1 MHz
S_R	Sensitivity @ 400 nm
R_E	Responsivity 400 nm, 0.18 A/W
t_R/t_R	Rise/Fall Time @ 1 KΩ load VR=1 V, 830 nm
V_{OC}	Open-Circuit Voltage H=1000 lux, 2850 K
TC V_{OC}	V_{OC} Temperature Coefficient H=1000 lux, 2850 K

Silicon PN—VTP Series

Technical Specification

Part Number	I_{SC} µA	TC I_{SC} %/°C	V_{OC} mV	TC V_{OC} mV/°C	I_D nA max.	R_{SH} GΩ	C_J pF	Re A/(W/cm²)	S_R A/W	λ_{range} nm	λ_p nm	V_{BR} V
VTP100	55	0.24	300	-2	30	0.25	50 max.	0.047	0.5	725-1150	925	140
VTP100C	70	0.2	350	-2	30	0.25	50 max.	0.05	0.55	400-1150	925	140
VTP1012	17	0.2	350	-2	7	0.5	6 max.	0.011	0.55	400-1150	925	140
VTP1112	90	0.2	350	-2	7	0.5	6 max.	0.033	0.55	400-1150	925	140
VTP1188S	200	0.2	330	-2	30	67	180	—	0.55	400-1100	925	—
VTP1232	100 min.	0.2	420 min.	-2	25	—	180 max.	0.076	0.6	400-1100	920	—
VTP3310LA	36	0.2	350	-2	35	10	25 max.	0.015	0.55	400-1150	925	140
VTP3410LA	22	0.26	350	-2	35	10	25 max.	0.013	0.55	700-1150	925	140
VTP4085	200	0.2	330	-2	100	2	350	—	0.55	400-1100	925	—
VTP4085S	200	0.2	330	-2	50	4	350	—	0.55	400-1100	925	—
VTP5050	70	0.2	350	-2	18	0.25	24 max.	0.05	0.55	400-1150	925	140
VTP6060	200	0.2	350	-2	35	100	60 max.	0.14	0.55	400-1150	925	140
VTP7110	9	0.2	350	-2	35	7	25 max.	0.015	0.55	400-1150	925	140
VTP7210	7	0.26	350	-2	35	7	25 max.	0.015	0.55	700-1150	925	140
VTP7840	70	0.2	325	-2	20	0.25	40 max.	—	0.55	725-1150	925	1@10 mA
VTP8350	80	0.2	350	-2	30	100	50 max.	0.06	0.55	400-1150	925	140
VTP8440	55	0.2	350	-2	15	0.5	15 max.	0.025	0.55	400-1150	925	140
VTP8551	70	0.2	350	-2	30	0.15	50 max.	0.05	0.55	400-1150	925	140
VTP8651	55	0.24	300	-2	30	0.15	50 max.	0.045	0.5	725-1150	925	140
VTP9412	17	0.2	350	-2	7	0.4	6 max.	0.011	0.55	400-1150	925	140

Electro-optical characteristics @ 25°C

Silicon PN—VTS Series

Technical Specification

Part Number	I_{SC} mA	TC I_{SC} %/°C	I_D nA	TC I_D %/°C	R_{SH} MΩ	C_J nF	S_R A/W	Re A/(W/cm²)	t_R/t_F µsec	V_{OC} V	TC V_{OC} mV/°C
VTS__80	3	0.2	200	+11	0.3	7.5	0.2	0.7	13	0.45	-2.6
VTS__81	1.5	0.2	100	+11	0.6	3.5	0.2	0.34	6.4	0.45	-2.6
VTS__82	0.69	0.2	50	+11	1.2	1.75	0.2	0.16	3.4	0.45	-2.6
VTS__83	0.64	0.2	50	+11	1.2	1.75	0.2	0.15	3.4	0.45	-2.6
VTS__84	0.33	0.2	40	+11	1.5	1	0.2	0.07	1.8	0.45	-2.6
VTS__85	0.16	0.2	20	+11	3	0.5	0.2	0.04	1.2	0.45	-2.6
VTS__86	0.080	0.2	10	+11	6	0.25	0.2	0.02	0.75	0.45	-2.6

Electro-optical characteristics @ 25°C

Table Key

I_{SC} Short-Circuit Current
940 nm, H=0.5 mW/cm^2 (VTD205, VTD206)
H=5 mW/cm^2, 2850 K (VTD31AA, VTB Series)
100 Lux, 2850 K (VTD34, VTD205K)
100 Lux, 2856 K (VTD206K)

TC I_{SC} I_{SC} Temperature Coefficient
2850 K (VTD31AA, VTD34, VTD34F, VTB Series)
2856 K (VTD205, VTD205K, VTD206, VTD206K)

V_{OC} Open-Circuit Voltage
940 nm, H=0.5 mW/cm^2 (VTD 205, VTD205K, VTD206, VTD206K)
2850 K (VTD31AA, VTD34, VTD34F)

TC V_{OC} V_{OC} Temperature Coefficient
2850 K (VTD31AA, VTD34, VTD34F, VTB Series)
2856 K (VTD205, VTD205K, VTD206, VTD206K)

I_D Dark Current
H=0, V_R=2 V (VTB Series)
H=0, V_R=10 V (VTD34, VTD34F, VTD205, VTD205K, VTD206, VTD206K, VTB100)
H=0, V_R=15 V (VTD31AA)

R_{SH} Shunt Resistance
H=0, V=10 mV (VTB Series)

TC R_{SH} R_{SH} Temperature Coefficient
H=0, V=10 mV (VTB Series)

C_J Junction Capacitance
H=0, V_R=0 V, 1 MHz (VTD205, VTD205K, VTD206, VTD206K)
@ 1 MHz, V_R=0 V (VTD34, VTD34F)
H=0, V=0 V (VTD31AA, VTB Series)

t_R/t_R Rise/Fall Time
@ RL=50 Ω, V_R=5 V, 850 nm (VTD205, VTD205K, VTD206, VTD206K)
@ RL=1 kΩ Lead, V_R=10 V, 833 nm (VTD34, VTD34F)

S_R Sensitivity @ Peak
365 nm (VTB Series)

λ_{range} Spectral Application Range

λ_p Spectral Response @ Peak

V_{BR} Breakdown Voltage

Silicon PN—VTD Series

Technical Specification

Part Number	I_{SC} µA	TC I_{SC} %/°C	V_{OC} mV	TC V_{OC} mV/°C	I_D nA max.	C_J pF	t_R/t_F nsec	S_R A/W	λ_{range} nm	λ_p nm	V_{BR} V
VTD31AA	150-225	0.2	350	-2	50	500 max.	—	0.55	400-1150	860	5 min.
VTD34	70	0.2	365	-2	30	60	50	0.6	400-1100	900	40 min.
VTD34F	—	—	350	-2	30	60	50	0.6	725-1150	940	40 min.
VTD205	25	0.2	350	-2.6	30.	72	20	0.6	800-1100	925	50
VTD205K	80	0.2	365	-2.6	30	72	20	0.6	400-1100	925	50
VTD206	25	0.2	350	-2.6	30	72	20	0.6	750-1100	925	50
VTD206K	80	0.2	365	-2.6	30	72	20	0.6	400-1100	925	50

Electro-optical characteristics @ 25°C

Silicon PN—VTB Series

Technical Specification

Part Number	I_{SC} µA	TC I_{SC} %/°C	V_{OC} mV	TC V_{OC} mV/°C	I_D pA max.	R_{SH} GΩ	TC R_{SH} %/°C	C_J nF	S_R A/W	λ_{range} nm	λ_p nm	V_{BR} V
VTB100	65	0.12	490	-2	500	1.4	-8	2 max.	0.1	320-1100	920	40
VTB1012	13	0.12	490	-2	100	0.25	-8	0.31	0.09	320-1100	920	40
VTB1012B	1.3	0.02	420	-2	100	0.25	-8	0.31	—	330-720	580	40
VTB1013	13	0.12	490	-2	20	7	-8	0.31	0.09	320-1100	920	40
VTB1013B	1.3	0.02	420	-2	20	7	-8	0.31	—	330-720	580	40
VTB1112	60	0.12	490	-2	100	0.25	-8	0.31	0.19	320-1100	920	40
VTB1112B	6	0.02	420	-2	100	0.25	-8	0.31	—	330-720	580	40
VTB1113	60	0.12	490	-2	20	7	-8	0.31	0.19	320-1100	920	40
VTB1113B	6	0.02	420	-2	20	7	-8	0.31	—	330-720	580	40
VTB4051	200	0.12	490	-2	250	0.56	-8	3	0.1	320-1100	920	40
VTB5051	130	0.12	490	-2	250	0.56	-8	3	0.1	320-1100	920	40
VTB5051B	13	0.02	420	-2	250	0.56	-8	3	—	330-720	580	40
VTB5051J	130	0.12	490	-2	250	0.56	-8	3	0.1	320-1100	920	40
VTB5051UV	130	0.12	490	-2	250	0.56	-8	3	0.1	200-1100	920	40
VTB5051UVJ	130	0.12	490	-2	250	0.56	-8	3	0.1	200-1100	920	40
VTB6061	350	0.12	490	-2	2000	0.1	-8	8	0.1	320-1100	920	40
VTB6061B	35	0.02	420	-2	2000	0.1	-8	8	—	330-720	580	40
VTB6061CIE	12	—	—	—	2000	0.1	-8	8	—	475-650	555	—
VTB6061J	350	0.12	490	-2	2000	0.1	-8	8	0.1	320-1100	920	40
VTB6061UV	350	0.12	490	-2	2000	0.1	-8	8	0.1	200-1100	920	40
VTB6061UVJ	350	0.12	490	-2	2000	0.1	-8	8	0.1	200-1100	920	40
VTB8341	60	0.12	490	-2	100	1.4	-8	1	0.1	320-1100	920	40
VTB8440	45	0.12	490	-2	2000	0.07	-8	1	0.1	320-1100	920	40
VTB8440B	5	0.02	420	-2	2000	0.07	-8	1	—	330-720	580	40
VTB8441	45	0.12	490	-2	100	1.4	-8	1	0.1	320-1100	920	40
VTB8441B	5	0.02	420	-2	100	1.4	-8	1	—	330-720	580	40
VTB9412	13	0.12	490	-2	100	0.25	-8	0.31	0.09	320-1100	920	40
VTB9412B	1.3	0.02	420	-2	100	0.25	-8	0.31	—	330-720	580	40
VTB9413	13	0.12	490	-2	20	7	-8	0.31	0.09	320-1100	920	40
VTB9413B	1.3	0.02	420	-2	20	7	-8	0.31	—	330-720	580	40

thermopile detectors

Features

- Available in TO-39 and TO-18 housings
- Integrated signal processing ASIC available (TPMI)
- Single, dual or quad elements
- 8 element line arrays and 4x4 matrix arrays with various lens optics and integrated ASIC with multiplexer
- Various filters for optical broadband or narrow-band applications
- Excellent repeatability of electro-optical parameters
- Ambient temperature reference (thermistor) included
- High sensitivity of several 10 V/W; DC radiation sensitive
- Extremely low temperature coefficient of sensitivity and resistivity
- Constant response over the infrared spectrum
- The absence of microphonic noise effects
- Low susceptibility to electromagnetic pulses (EMP) due to the low internal resistance (<100 kΩ)
- Rugged construction based on CMOS silicon micromachining technology

Typical Applications

- Remote Temperature Sensing, Hand-Held or Industrial Pyrometers
- Ear or Body Thermometers
- Temperature-Sensor Modules in Microwave Ovens, Hair Dryers, Cookers, Toasters
- Sensor Modules for Control of Air Condition Systems (Heat Management, Home, Automotive)
- Temperature Control in Copiers and Printers
- Sensor Arrays for Spatial Temperature Measurements (Imaging Applications)
- Sensors with Infrared Bandpass Filters for Gas Detection by Infrared Absorption

Datasheets available upon request

Description

Thermopile detectors directly sense thermal radiation, providing the perfect device for remotely measuring temperatures without the need for any mechanical chopper. PerkinElmer's proprietary and innovative Si-based micromachining technology guarantees a new generation of components: extreme long-term stability, very low temperature coefficient in sensitivity, and excellent repeatability of electro-optical parameters.

Thermopile sensors allow remote temperature sensing at a low system cost. The sensor does not require cooling, and can reach an accuracy of ±1°C, dependent on the measurement range. For narrow temperature ranges, as in body temperature measurement, a precision of 0.1°C is possible.

Single-Element Thermopile Detectors: TPS series

The different available chip sizes and packaging types, together with the variety in window openings with and without a silicon lens, enable the adaptation of the PerkinElmer thermopiles to virtually every application where a remote temperature measurement or control is needed.

Dual- and Quad-Element Types: TPS 2, TPS 4 series

PerkinElmer offers thermopile detectors with two or four channels, each of which can be equipped with one of the many available infrared spectral bandpass filters. The main application of multiple channel thermopiles is gas detection through IR absorption. Prominent gases to be detected are CO_2, hydrocarbons and CO.

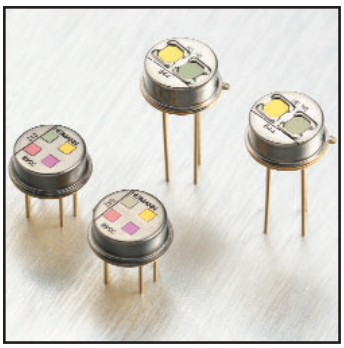
Thermopile Modules with integrated signal processing: TPMI series

For convenient use, PerkinElmer offers thermopile sensors with an integrated electronic circuit for the necessary signal condition and ambient temperature compensation – the TPMI. This very compact and miniature thermopile module is offered as a fully calibrated, ready-to-go sensor. Various temperature ranges and optics are available.

Thermopile Line and Matrix Arrays: TPL, TPA series

The latest PerkinElmer thermopile technology development features more than a single test spot. The new TPA- (matrix array) and TPL- (line array) series offer multi-element thermopile arrays combined with an optical lens, amplifier, and interface electronics (multiplexer, ambient temperature sensor) in a compact TO-39-type housing. This combines solid-state, non-choppered temperature measurement without the need for in-field calibration.

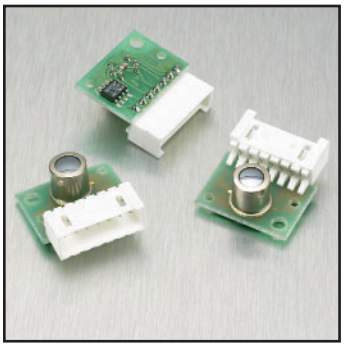
Typically, the array sensors are sold as a modular type, i.e. on a PCB with external data memory. These TPA- and TPL-Modules are p recalibrated with the data stored in an EEPROM. In an application, the associated micro controller (µC) reads this calibration information and converts the sensor signals to the object temperatures.



Dual and Quad Element Thermopile Detectors

General Data

Tc of sensitivity (absolute value):
0.02%/K
Tc of resistance (absolute value):
0.02%/K
Max. operating temperature: -20 to 100°C
Max. storage temperature: -40 to 100°C
Thermistor BETA: 3964 K
Option for all types: 8-14 um
Pyrometry filter: G9



Thermopile Arrays

Thermopile TPMI Modules

Single Element Thermopile Detectors

Technical Specification

Part Number	Housing	Field of View	DC Sensitivity V/W	Time Constant ms	Active Area mm²	TP Chip Resistance kΩ	Noise nV/√Hz	NEP nW/√Hz	D* cm√Hz/W	Thermistor (25°C) kΩ
TPS333	TO-18	100°	35	25	0.7x0.7	75	35	1	$0.7x10^8$	100
TPS334	TO-39	60°	35	25	0.7x0.7	75	35	1	$0.7x10^8$	30
TPS334L5.5	TO-39**	7°	55	25	0.7x0.7	75	35	0.6	$1.1x10^8$	30
TPS434	TO-39	55°	35	20	0.5x0.5	35	24	0.7	$0.7x10^8$	30
TPS434IRA	TO-39***	15°	55	20	0.5x0.5	35	24	0.4	$1.1x10^8$	30
TPS534	TO-39	80°	20	35	1.2x1.2	50	29	1.4	$0.8x10^8$	30
TPS535	TO-39	80°	20	35	1.2x1.2	50	29	1.4	$0.8x10^8$	30

Test conditions: T = 25°C
Field of view: at 50% intensity points
Noise: r.m.s., 300 K

* 500 K black body
** with 5.5 mm lens
*** with int. reflector

Dual and Quad Thermopile Detectors

Technical Specification

Part Number	Housing	Field of View	DC Sensitivity V/W	Time Constant ms	Active Area mm²	TP Chip Resistance kΩ	Noise nV/√Hz	NEP nW/√Hz	D* cm√Hz/W	Thermistor (25°C) kΩ
TPS2534	TO-39**	2x90°	42	35	1.2x.1.2	50	29	0.7	$1.8x10^8$	30
TPS4339	TO-39***	4x60°	75	25	0.7x0.7	75	35	0.5	$1.5x10^8$	100

Test conditions: T = 25°C
Field of view: at 50% intensity points
Noise: r.m.s., 300 K
Above data are referenced without the bp filter. Option for all types: individual bp filters for each channel

* 500 K black body
** with 2 channels
*** with 4 channels

Line and Matrix Arrays

Technical Specification

Part Number	Housing	Number of Pixels	Field of View	Optics	Output Voltage V (80°C object, 20°C ambient)	Object temperature	Noise mV/√Hz (.5–20Hz)
TPLM086L5.5	TO-39 on PCB	8 element line	41°x6°	f/1 optics, f=5.5 mm	0.95	-20-100°C	0.4
TPLM086L3.9	TO-39 on PCB	8 element line	56°x8°	f/1 optics, f=3.9 mm	0.95	-20-100°C	0.4
TPAM166L3.9	TO-39 on PCB	4x4 matrix	41°x32°	f/1 optics, f=3.9 mm	0.95	-20-100°C	0.4

Test conditions: T = 25°C

Operating voltage: 5 V
Operating current: 1 mA
Zero signal offset: $V_{DD}/2$
Output resistance: 200 Ω
Power up time: 0.3 s

Sample frequency: 3 kHz
Max. operating temperature: -20-100°C
Max. storage temperature: -40-100°C
Temperature reference slope: 10 mV/K
Temperature reference offset: 0 mV

TPMI Modules

Technical Specification

Part Number	Housing	Optics	Field of View
a2TPMI 334	TO-39	window opening 2.5 mm	60°
a2TPMI 334 L5.5	TO-39	integrated Si lens, 5.5 mm focal length	7° (D:S = 8:1)
a2TPMI 334 IRA	TO-39	internal mirror	15° (D:S = 4:1)

For further details please contact us.

medical sensors

Features

- Designed to meet ASTM standards for capnometers
- Neonatal, Pediatric and Adult use
- Low-flow design
- Fast rise time for high respiration rates
- Compatible with standard sampling disposables
- Easy-to-interface RS232 Digital Output
- Rugged solid-state sensor—no moving parts
- Low power consumption
- Fast warm-up time
- Long life
- Small footprint
- Custom packaging available

Typical Applications

Real-time breath-to-breath quantitative end-tidal CO_2 measurement

Datasheets available upon request

Digital Sidestream CO_2 Bench

The PerkinElmer Digital Sidestream CO_2 Bench represents a breakthrough in solid-state technology. These sensors achieve the highest levels of accuracy and reliability while having no moving parts. The low power consumption and compact design set a new standard in sidestream monitoring. The bench incorporates our latest advances in component design and signal processing.

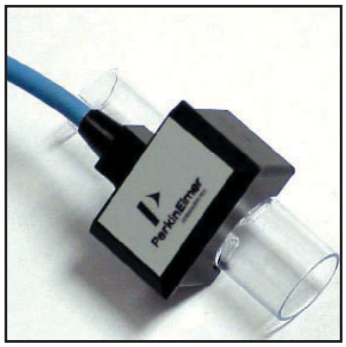
All design requirements of ASTM standards have been met or exceeded. The measurement technique is non-dispersive infrared absorption, which utilizes a unique infrared emitter design in conjunction with state-of-the-art detector technology. Output from the bench is a digitized voltage function of CO_2 concentration within the sampling cell. The sidestream sensor is on a printed circuit board with a single low-cost connector, has added pneumatics circuit, and uses standard sampling disposables.

Digital Mainstream CO_2 Sensor

PerkinElmer introduces a significant advancement in mainstream CO_2 sensing. Output from the sensor is a digitized voltage function of CO_2 concentration, providing a low noise signal and easy interfacing. All processing electronics are self-contained within the compact and rugged sensor head. The solid-state design incorporates our latest advances in component innovation and signal processing, and ensures high accuracy and long life.

All design requirements of ASTM standards have been met or exceeded. The measurement technique is non-dispersive infrared absorption, which utilizes a unique infrared emitter design in conjunction with state-of-the-art detector technology. This sensor has self-contained electronics on a flex circuit, a cable, and uses low-cost disposable airway adapters.

CO_2 Sidestream Sensors



Mainstream CO_2 Sensors

Technical Specification

	Digital Sidestream CO_2 Bench	Digital Mainstream CO_2 Sensor
Method	Non-dispersive Infrared Absorption	Non-dispersive Infrared Absorption
Calibration	3-point calibration	3-point calibration
Respiration Rate	150 bpm	150 bpm
Input Voltage	5 V	5 V
Power Consumption	1.0 W typical, 1.5 W max	1.0 W typical, 1.5 W max
Output	Digital Serial RS232	Digital Serial RS232
Measurement Range	0-76 mmHg	0-76 mmHg
Accuracy	±2 mmHg plus ± 5% of reading	±2 mmHg plus ± 5% of reading
Resolution	1 mmHg	1 mmHg
Rise Time	Less than 200 ms*	Less than 200 ms
Flow Rate	50 ml/min ± 10 ml/min	N/A
Warm-up Time	≤ 1 minute to ASTM Standards ≤5 minutes to published specifications	≤ 1 minute to ASTM Standards ≤5 minutes to published specifications
Mechanical Shock	N/A	100 G 1/2 sine wave
Temperature	10-40˚C (operating) -40-75˚C (storage)	10-40˚C (operating) -40-75˚C (storage)
Relative Humidity	15-95% non-condensing (operating) 10-95% non-condensing (storage)	15-95% non-condensing (operating) 10-95% non-condensing (storage)
Physical Dimensions	33x59x77.5 mm (1.3x2.32x3.05")	35x30x22.3 mm (1.38x1.06x0.88")
Cable	N/A	10-foot standard length
Connector	10 pin, dual in-line	Standard or custom

*with PerkinElmer recommended algorithms

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