PHOTON DETECTION
FOR TOMORROW’S
CUTTING-EDGE APPLICATIONS.

Photon Detection Solutions
For Health, Safety and Security Applications
At PerkinElmer, we’re sensing what you need for a healthier, cleaner and safer tomorrow. From Photon Counting Modules to Silicon Detectors, InGaAs Detectors, and Pulsed Laser Diodes, our photon detection technologies are addressing your high-performance and high-volume applications. We have the detection technologies and capabilities to enhance and accelerate your OEM designs. You can depend on our seven world-class design, manufacturing and R&D facilities including: Montreal, Canada; Wiesbaden, Germany; Fremont, USA; Singapore; Manila, Philippines; Shenzhen, China; and Batam, Indonesia. We’re sensing what you need. For The Better.

**SECTION 1 • MODULES AND OPTICAL RECEIVERS**
- SPCMs based on high-performing APDs – for visible and NIR single photon counting
- CPMs and modules for lowest dark noise applications
- CCD cameras – for high speed imaging
- PIN and APD hybrid receivers – for high signal detection

**SECTION 2 • PHOTODIODE ARRAYS FOR X-RAY SECURITY SCANNING**
- Photodiode solutions with scintillators for x-ray scanners

**SECTION 3 • PHOTODIODES FOR HIGH-PERFORMANCE APPLICATIONS**
- Si and InGaAs APDs and PIN photodiodes – for industrial applications and high-volume laser range finding
- Si APD arrays – for beam positioning and spectrometers
- Large-area/UV-enhanced APDs – for molecular imaging, high-energy radiation detection

**SECTION 4 • PHOTODIODES & TRANSISTORS FOR HIGH-VOLUME APPLICATIONS**
- Smoke detection components
- Ambient light sensors
- Si-photodiodes and-transistors
- Infrared switches

**SECTION 5 • PULSED LASER DIODES AND INFRARED LEDS (IREDS)**
- High power laser diodes – for laser range finding
- Infrared emitting diodes – for smoke detection and safety curtains
Single Photon Counting Modules – SPCM

Applications
- Particle sizing
- Confocal microscopy
- Photon correlation spectroscopy
- Quantum cryptography
- Astronomical observation
- Optical range finding
- Adaptive optics
- Ultra sensitive fluorescence

Features and Benefits
- Peak photon detection efficiency at 650 nm: 65% typical
- Active area: 180 µm diameter
- Gated output
- Single +5 V supply
- FC receptacle option for fiber coupling
- EU RoHS compliant
- Array of 4 channels available

Product Description
SPCM-AQRH is a self-contained module that detects single photons of light over the 400 nm to 1060 nm wavelength range - a range and sensitivity that often outperforms a photomultiplier tube. The SPCM-AQRH uses a unique silicon avalanche photodiode (SLiK®) with a circular active area that achieves a peak photon detection efficiency of more than 65% at 650 nm over a 180 µm diameter. The photodiode is both thermoelectrically cooled and temperature controlled, ensuring stabilized performance despite ambient temperature changes. Circuit improvements have reduced the overall power consumption.

Count speeds exceeding 20 million counts per second (Mc/s) are achieved by the SPCM-AQRH-1X module (> 30 million counts per second on some models). There is a “dead time” of 35 ns between pulses but other values can be set at the factory.

As each photon is detected, a TTL pulse of 2.5 Volts (minimum) high into a 50 Ohm load and 15 ns wide is output at the rear BNC connector. The module is designed to give a linear performance at a case temperature between 5°C and 40°C.

The SPCM is also available in a 4 channel array format, the SPCM-AQ4C. It is a module of 4 APDs with single power supply and 4 individual outputs.

This series of photon counting modules are designed and built to be fully compliant with the European Union Directive 2002/95/EC - Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS).

Graph 1

Characteristics SPCM Series

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Photo Sensitive Diameter</th>
<th>Maximum Dark Rate</th>
<th>Photon Detection Efficiency @ 700 nm</th>
<th>Max. Count Rate before Saturation</th>
<th>Dead Time</th>
<th>Pulse Width</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit mm</td>
<td>c/s</td>
<td>%</td>
<td>c/s</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>SPCM-AQRH-10</td>
<td>0.18</td>
<td>1500</td>
<td>65%</td>
<td>25M</td>
<td>32</td>
<td>15</td>
</tr>
<tr>
<td>SPCM-AQRH-11</td>
<td>0.18</td>
<td>1000</td>
<td>65%</td>
<td>25M</td>
<td>32</td>
<td>15</td>
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<tr>
<td>SPCM-AQRH-12</td>
<td>0.18</td>
<td>500</td>
<td>65%</td>
<td>25M</td>
<td>32</td>
<td>15</td>
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<tr>
<td>SPCM-AQRH-13</td>
<td>0.18</td>
<td>250</td>
<td>65%</td>
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<tr>
<td>SPCM-AQRH-14</td>
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<td>100</td>
<td>65%</td>
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<tr>
<td>SPCM-AQRH-15</td>
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<td>50</td>
<td>65%</td>
<td>25M</td>
<td>32</td>
<td>15</td>
</tr>
<tr>
<td>SPCM-AQRH-16</td>
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<td>65%</td>
<td>25M</td>
<td>32</td>
<td>15</td>
</tr>
<tr>
<td>SPCM-AQ4C</td>
<td>Fibered</td>
<td>500</td>
<td>60%</td>
<td>&gt;2M / channel</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>C30902SH-TC¹</td>
<td>0.475</td>
<td>2500</td>
<td>&gt;5%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C30902SH-DTC²</td>
<td>0.475</td>
<td>350</td>
<td>&gt;5%</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1. C30902SH-TC (0°C operation), 2. C30902SH-DTC (-20°C operation)
1. P-types are Photon counting suitable CPM or module types. When ordering please add -P: e.g.: C993-P, MH984-P

2. Also order number

<table>
<thead>
<tr>
<th>CPM Tube Model</th>
<th>Spectral Response (nm)</th>
<th>Active Diameter (mm)</th>
<th>Remarks, Other Available Types</th>
<th>Dark Current/ pk @ 1e5</th>
<th>Equivalent Noise Input (ENI/W/√Hz) at Peak Resp. Wavel. (typ.)</th>
<th>Peak Wavelength (μm)</th>
<th>Dark Counts for -P Type and MH-P</th>
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<tbody>
<tr>
<td>C911</td>
<td>115 - 200</td>
<td>5</td>
<td>-</td>
<td>0.1</td>
<td>1.0e-17</td>
<td>140</td>
<td>0.1</td>
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<tr>
<td>C1311</td>
<td>135 - 320</td>
<td>5</td>
<td>MgfI window available</td>
<td>0.2</td>
<td>2.0e-17</td>
<td></td>
<td>0.4</td>
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<tr>
<td>C1322</td>
<td>165 - 450</td>
<td>5</td>
<td></td>
<td>0.5</td>
<td>3.0e-17</td>
<td></td>
<td>1</td>
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<tr>
<td>C1911</td>
<td>185 - 650</td>
<td>5</td>
<td></td>
<td>0.5</td>
<td>1.0e-17</td>
<td></td>
<td>1</td>
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<tr>
<td>C1922</td>
<td>185 - 850</td>
<td>5</td>
<td></td>
<td>1</td>
<td>2.0e-17</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>C1933</td>
<td>185 - 1000</td>
<td>5</td>
<td></td>
<td>2</td>
<td>3.0e-17</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>C1943</td>
<td>185 - 1200</td>
<td>5</td>
<td></td>
<td>2</td>
<td>4.0e-17</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>C1963</td>
<td>185 - 1400</td>
<td>5</td>
<td></td>
<td>2</td>
<td>5.0e-17</td>
<td></td>
<td>20</td>
</tr>
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</table>

Product Description
PerkinElmer’s Channel Photomultiplier (CPM) Technology offers a portfolio of ultra-high sensitivity optical detectors designed for extremely low noise, high dynamic range, highest gain and fast response for analytical, scientific and clinical diagnostic applications. A variety of easy-to-use modules with different read-out electronics is available, enabling customers to benefit from the unique performance characteristics of the CPM technology.

Depending on the application requirements, customers can select plug-and-play modules for photon counting, DC applications, photon-counting detection up to gigacount range or any other method of photon detection. Added features like thermoelectric cooling, shuttering and other sorts of customization are available upon request. The CPM modules are ideally suited for use in human and environmental health, supporting the market needs for ever smaller sample sizes and lower detection limits in applications like microplate readers, nucleic acid amplification (PCR), luminescence or fluorescence spectroscopy.

Ordering Guide

<table>
<thead>
<tr>
<th>Series</th>
<th>All modules are available with optical input aperture of 9mm (9xx-series), 13mm (13xx-series) and 19mm (19xx-series).</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH series</td>
<td>Modules with direct anode output (comprising CPM and high voltage supply only)</td>
</tr>
<tr>
<td>MH P-type</td>
<td>MH modules with CPM tube specially selected for photon-counting applications</td>
</tr>
<tr>
<td>MD series</td>
<td>Modules for DC measurement, analog output: 0 to 10 Volts</td>
</tr>
<tr>
<td>MP series</td>
<td>Modules optimized for photon counting, digitized output via TTL interface</td>
</tr>
<tr>
<td>MPRS series</td>
<td>Modules optimized for photon counting, digitized output via RS232 interface</td>
</tr>
<tr>
<td>MPC series</td>
<td>Temperature stabilized (TE-cooled) MP modules, customized OEM projects only</td>
</tr>
<tr>
<td>GPDM series</td>
<td>Highest dynamic range (single photon/s to 1G photon/s range) module with digital output for fluorescence and luminescence measurements and other demanding applications.</td>
</tr>
</tbody>
</table>
### General Specification

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Remarks / Conditions</th>
<th>Symbol</th>
<th>CPM (tube)</th>
<th>MPH Module</th>
<th>MD</th>
<th>MP</th>
<th>MPRS</th>
<th>GPDM</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Window materials</strong></td>
<td>MgF₂, quartz, UV glass, borosilicate</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td><strong>Photocathode materials</strong></td>
<td>CsI, CsTe, low noise bialkali, bialkali, yellow enhanced, multialkali, extended red multialkali</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Max. input current</td>
<td>Module input current</td>
<td>I_{in}</td>
<td>200</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>300</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Bias current (typ.)</td>
<td>CPM input current</td>
<td>I_{bias}</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>Supply voltage/Input voltage</td>
<td>Modules include CPM high voltage supply</td>
<td>V_{DC}</td>
<td>2000 V (typ.)</td>
<td>+5 to +5.5 (max.)</td>
<td>+5 to +5.5 (max.)</td>
<td>+5 to +5.5 (max.)</td>
<td>+5 to +5.5 (max.)</td>
<td>Volts</td>
<td>dc</td>
</tr>
<tr>
<td>Current amplification</td>
<td>Module input current</td>
<td>I_{kmax}</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>Max. anode current</td>
<td>Output current (max. 30 sec.)</td>
<td>I_{an}</td>
<td>20</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear anode current</td>
<td>Max. (DC linearity limit) 10% bias current</td>
<td>I_{an}</td>
<td>20</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Linear count rate (typ.)</td>
<td>(see note 1)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td>Response time</td>
<td>Output pulse rise time</td>
<td>t_{ps}</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>ns</td>
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<td>Transit time</td>
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<td>t</td>
<td>17</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ns</td>
</tr>
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<td>Transit time spread</td>
<td>Timing resolution/jitter</td>
<td>t_{ts}</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ns</td>
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<tr>
<td>Output pulse width (FWHM)</td>
<td>Typical value</td>
<td>PW</td>
<td>6</td>
<td>6</td>
<td>20</td>
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<tr>
<td>Over-illumination protection</td>
<td>Active gate control</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Output impedance</td>
<td>Termination for fast output pulse</td>
<td></td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>Digital</td>
<td>Ohms</td>
<td></td>
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<tr>
<td>Active gate control</td>
<td>TTL pulse, active high</td>
<td></td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>GATE voltage</td>
<td>TTL-level: low to high/high to low</td>
<td>V_{GATE}</td>
<td>100/300</td>
<td>100/300</td>
<td>0.02/0.02</td>
<td>100/300</td>
<td>µs</td>
<td></td>
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<tr>
<td>Operating temperature</td>
<td>+5 to +40°C (other temperatures on request)</td>
<td>I_{TP}</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Storage temperature</td>
<td>-20 to +50°C</td>
<td>V_{STORE}</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Weight</td>
<td>max. 350g/420g/450g (modules 9xx-series/13xx-series/19xx-series)</td>
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<td></td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Output</td>
<td>Anode signal</td>
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<td></td>
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<td>✓</td>
<td>✓</td>
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<tr>
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<td>Anode sig.</td>
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<tr>
<td></td>
<td>0–10 V</td>
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<td>RS232</td>
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<tr>
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<td>USB/SPI</td>
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<tr>
<td><strong>Graph 1</strong></td>
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<tr>
<td><strong>Spectral Response</strong></td>
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<td></td>
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<td></td>
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<tr>
<td><strong>Quantum Efficiency (%)</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1. For long term operation: max. average output countrate of < 100 Kcps (anode current of < 100 nA) is recommended
2. Cooling input power: 9 VDC/3.5 A Fan input power: 24 VDC/100 mA
3. Gain setting depending on operating mode – see separate datasheet

### Housing / Package Drawings

<table>
<thead>
<tr>
<th>Dimensions (mm)</th>
<th>Module Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
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<tbody>
<tr>
<td>9xx</td>
<td></td>
<td>4.5</td>
<td>36</td>
<td>4.5</td>
<td>33</td>
<td>127</td>
<td>120</td>
<td>30</td>
<td>20</td>
<td>19.5</td>
<td>10</td>
<td>18</td>
<td>45</td>
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<tr>
<td>13xx</td>
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<td>7</td>
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<td>132</td>
<td>125</td>
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<td>19</td>
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<tr>
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<td>4.5</td>
<td>36</td>
<td>7</td>
<td>33</td>
<td>137</td>
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<td>19</td>
<td>10</td>
<td>22.1</td>
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**Graph 2**

**Equivalent Noise Input**

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<thead>
<tr>
<th>ENI (W)</th>
<th>ENI (W)</th>
<th>ENI (W)</th>
<th>ENI (W)</th>
<th>ENI (W)</th>
<th>ENI (W)</th>
<th>ENI (W)</th>
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<tr>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>350</td>
<td>400</td>
<td>450</td>
<td>500</td>
</tr>
</tbody>
</table>

---

**Technical Specification**

**Dimensions (mm)**

<table>
<thead>
<tr>
<th>Module Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
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</thead>
<tbody>
<tr>
<td>9xx</td>
<td>4.5</td>
<td>36</td>
<td>4.5</td>
<td>33</td>
<td>127</td>
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<td>20</td>
<td>19</td>
<td>10</td>
<td>22.1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>19xx</td>
<td>4.5</td>
<td>36</td>
<td>7</td>
<td>33</td>
<td>137</td>
<td>130</td>
<td>30</td>
<td>20</td>
<td>19</td>
<td>10</td>
<td>22.1</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

---

**Housing / Package Drawings**

[Chart of dimensions and packaging drawings]
**Applications**

- Multimodal analytical measurements
- Luminescence spectroscopy
- Time-resolved fluorescence
- High throughput screening
- DNA & cell analysis
- Microplate reading

**Features and Benefits**

- Extremely low background noise
- Highest dynamic range
- High gain
- 4 different operating modes
- Variable Interface options
- Best suited for multimodal analytical applications

---

**Product Description**

The new CPM Gigahertz Photon Detection Module (GPDM) provides the capability of ultra low-light-level detection in DC mode operation. Using DC mode operation with single-photon-sensitivity makes the GPDM module superior to traditional counting circuits with their performance limitation at high-light-levels. The fully equipped module includes the Channel Photomultiplier, the high voltage supply, analog current amplifier, A to D conversion and a microcontroller with USB/SPI interface allowing the optimal adaptation to a wide range of applications. Additional features like the synchronization I/O offer the possibility to synchronize the measurement with other devices in the application like flash lamp trigger etc. Utilizing the generic noise advantage of the CPM technology together with highest dynamic range electronics the GPDM represents a real innovation in photon detection, well suited to increase overall OEM system performance.

---

**Technical Specification**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>Supply voltage</td>
<td>-</td>
<td>5.0</td>
<td>5.3</td>
<td>5.6</td>
<td>VDC</td>
</tr>
<tr>
<td>Supply current</td>
<td>-</td>
<td>-</td>
<td>300</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>Detection range&lt;sup&gt;1&lt;/sup&gt;</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real counting mode</td>
<td>1</td>
<td>-</td>
<td>1e4</td>
<td>-</td>
<td>Counts per second&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Straight output mode</td>
<td>1</td>
<td>-</td>
<td>5e7</td>
<td>-</td>
<td>Counts per second&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Fast switching mode</td>
<td>1</td>
<td>-</td>
<td>1e9</td>
<td>-</td>
<td>Counts per second&lt;sup&gt;4&lt;/sup&gt;</td>
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<tr>
<td>HV reduction mode</td>
<td>3e5</td>
<td>-</td>
<td>1e10</td>
<td>-</td>
<td>Counts per second&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Switching dead time</td>
<td>w/o offset calibration</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>ms</td>
</tr>
<tr>
<td>In fast switching mode</td>
<td>Including offset calibration</td>
<td>-</td>
<td>20</td>
<td>-</td>
<td>ms</td>
</tr>
<tr>
<td>QE&lt;sup&gt;2&lt;/sup&gt;</td>
<td>λ&lt;sub&gt;peak&lt;/sub&gt;</td>
<td>-</td>
<td>20%</td>
<td>-</td>
<td>Photoelectrons/photons</td>
</tr>
<tr>
<td>CPM gain&lt;sup&gt;3&lt;/sup&gt;</td>
<td>-</td>
<td>1E3</td>
<td>adjustable</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sample time</td>
<td>Continuous data output</td>
<td>200</td>
<td>-</td>
<td>5000</td>
<td>ms</td>
</tr>
<tr>
<td>(under development)</td>
<td>1</td>
<td>-</td>
<td>5000</td>
<td>-</td>
<td>ms</td>
</tr>
<tr>
<td>Acquisition time</td>
<td>Width of measurement</td>
<td>3</td>
<td>-</td>
<td>200</td>
<td>µs</td>
</tr>
<tr>
<td>Window for flash sequence measurements</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>USB 2.0</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>Mbit/second</td>
</tr>
<tr>
<td>(under development)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

1. See below performance characteristics
2. CPM characteristics can be matched to the application’s requirements – see spectral response curve
3. Gain pre-set to optimal single photons sensitivity
4. Actual output information is RLU (Relative Light Unit) – counts per second is the µC calculated value based on RLU
5. Recommended for best performance

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**PHOTOMULTIPLIERS FOR MOLECULAR DETECTION IN ANALYTICAL APPLICATIONS & MEDICAL DIAGNOSTICS**

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**Gigahertz Photon Detection Module**

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**www.perkinelmer.com**
HIGH SPEED HIGH SENSITIVITY LINEAR CAMERAS FOR MACHINE VISION

Applications
- High speed machine vision
- Postal / parcel sorting
- Web inspection
- Surface inspection
- OCR / barcode reading web inspection

Features and Benefits
- High speed, up to 80 MHz data rate.
- 14 µm square pixels in 512, 1024, 2048 or 4096 element resolutions.
- Small size 101.6 x 57.2 x 38.1 mm
- 8/10/12-bit output format
- High line rates up to 68 kHz
- 66 dB dynamic range
- High sensitivity pinned photodiode CCD sensor
- CameraLink™ base output
- User controlled smart pixel correction
- Antiblooming control
- Single 12 VDC power supply
- Electronic exposure control
- Adjustable gain levels
- Real time status LEDs
- Ultra-low image lag
- Square pixels with 100 % fill factor
- Extended spectral range – 200 – 1000 nm

Product Description
The SmartBlue™ digital linescan cameras incorporate the latest in photodiode array technology based on the industry standard Reticon® devices with state of the art electronics and a robust industrial camera housing. The linescan photodiode array is a pinned photodiode Charge Couple Device which allows for high sensitivity, fast readout, while maintaining high dynamic range, and low image lag. The SmartBlue™ cameras are cost effective high-performance digital linescan cameras, and feature a CameraLink™ digital interface. These cameras feature geometrically precise photodiode CCD image sensor with 14 um square pixels with resolutions of 512, 1024, 2048 and 4096 pixels. This “next generation” array can achieve data rates up to 80 MHz with superior noise immunity, precise linearity, and high CTE. The SmartBlue™ digital cameras are designed for high line rate applications with low to moderate light conditions and where small size, and low cost are required.

Part Number Resolution Window Aperture Length Max. Line Rate
SB0440CLG-011 512 Glass 7.2 mm 68 kHz
SB0440CLQ-011 512 Quartz 7.2 mm 68 kHz
SB1440CLG-011 1024 Glass 14.4 mm 36.4 kHz
SB1440CLQ-011 1024 Quartz 14.4 mm 36.4 kHz
SB2480CLG-011 2048 Glass 28.7 mm 37.3 kHz
SB2480CLQ-011 2048 Quartz 28.7 mm 37.3 kHz
SB4480CLG-011 4096 Glass 57.3 mm 19.1 kHz
SB4480CLQ-011 4096 Quartz 57.3 mm 19.1 kHz

Responsivity (V/mJ/cm²) QE (%)

Responsivity (left scale)
QE (right scale)

Technical Specification
Package Drawing*

Spectral Sensitivity Curve (1x Gain)

www.perkinelmer.com
Product Description
PerkinElmer’s P-series linear imager combines 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. 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 200 nm in the ultraviolet. These versatile imagers are available in array lengths of 512 to 4096 elements with either low-cost glass or UV-enhanced fused silica windows.

Technical Specification

### P-Series CCD Linear Array

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Pixel Count Elements</th>
<th>Pixel Size µm</th>
<th>Number of Outputs</th>
<th>Spectral Response Range nm</th>
<th>Pixel Data Rate MHz</th>
<th>Dynamic Range</th>
<th>Horizontal Clocking typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RL0512P</td>
<td>512</td>
<td>14 x 14</td>
<td>1</td>
<td>200 – 1000</td>
<td>40</td>
<td>2500 : 1</td>
<td>2 σ @ 5 V</td>
</tr>
<tr>
<td>RL1024P</td>
<td>1024</td>
<td>14 x 14</td>
<td>1</td>
<td>200 – 1000</td>
<td>40</td>
<td>2500 : 1</td>
<td>2 σ @ 5 V</td>
</tr>
<tr>
<td>RL2048P</td>
<td>2048</td>
<td>14 x 14</td>
<td>1</td>
<td>200 – 1000</td>
<td>40</td>
<td>2500 : 1</td>
<td>2 σ @ 5 V</td>
</tr>
<tr>
<td>HL2048P</td>
<td>2048</td>
<td>14 x 14</td>
<td>2</td>
<td>200 – 1000</td>
<td>80</td>
<td>2500 : 1</td>
<td>2 σ @ 5 V</td>
</tr>
<tr>
<td>HL4096P</td>
<td>4096</td>
<td>14 x 14</td>
<td>2</td>
<td>200 – 1000</td>
<td>80</td>
<td>2500 : 1</td>
<td>2 σ @ 5 V</td>
</tr>
</tbody>
</table>

### Quantum Efficiency

**Responsivity (V/mJ/cm²)** vs **Wavelength** (nm): 250 – 1050

- **QE (%)** (right scale)
- **Responsivity** (left scale)

---

www.perkinelmer.com
Applications
- Spectroscopy
- Colorimetry

Features and Benefits
- 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
- Two on-chip diodes for temperature monitoring

Product Description
PerkinElmer’s 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.

Technical Specification

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Video Capacitance @ 5 V bias pF</th>
<th>Video Capacitance @ 2.5 V bias pF</th>
<th>Sensitivity C/2e0cm²</th>
<th>Saturation Exposure nJ/cm²</th>
<th>Saturation Charge pC</th>
<th>Dynamic Range</th>
<th>Dark Current Typ. pA</th>
</tr>
</thead>
<tbody>
<tr>
<td>RL1201</td>
<td>–</td>
<td>6.7</td>
<td>2x10⁴</td>
<td>50</td>
<td>10</td>
<td>70.000</td>
<td>0.2</td>
</tr>
<tr>
<td>RL1202</td>
<td>–</td>
<td>10.2</td>
<td>2x10⁴</td>
<td>50</td>
<td>10</td>
<td>70.000</td>
<td>0.2</td>
</tr>
<tr>
<td>RL1205</td>
<td>–</td>
<td>15.4</td>
<td>2x10⁴</td>
<td>50</td>
<td>10</td>
<td>70.000</td>
<td>0.2</td>
</tr>
<tr>
<td>RL1210</td>
<td>9.1</td>
<td>28.7</td>
<td>2x10⁴</td>
<td>50</td>
<td>10</td>
<td>70.000</td>
<td>0.2</td>
</tr>
<tr>
<td>RL1501</td>
<td>14</td>
<td>–</td>
<td>4x10⁴</td>
<td>50</td>
<td>20</td>
<td>100.000</td>
<td>0.4</td>
</tr>
<tr>
<td>RL1502</td>
<td>25</td>
<td>–</td>
<td>4x10⁴</td>
<td>50</td>
<td>20</td>
<td>100.000</td>
<td>0.4</td>
</tr>
</tbody>
</table>

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

Quantum Efficiency

<table>
<thead>
<tr>
<th>Wavelength (nm)</th>
<th>QE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>0</td>
</tr>
<tr>
<td>300</td>
<td>10</td>
</tr>
<tr>
<td>350</td>
<td>30</td>
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<tr>
<td>450</td>
<td>50</td>
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<tr>
<td>550</td>
<td>70</td>
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<td>650</td>
<td>70</td>
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<td>750</td>
<td>50</td>
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<td>850</td>
<td>30</td>
</tr>
<tr>
<td>950</td>
<td>10</td>
</tr>
<tr>
<td>1050</td>
<td>0</td>
</tr>
</tbody>
</table>

P-Series CCD Linear Array

<table>
<thead>
<tr>
<th>Pixels</th>
<th>Pixel Pitch 25 µm</th>
<th>Pixel Pitch 50 µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>128</td>
<td>RL1201LGQ-711</td>
<td>RL1501LFQ-711</td>
</tr>
<tr>
<td>256</td>
<td>RL1202LGQ-711</td>
<td>RL1502LFQ-711</td>
</tr>
<tr>
<td>512</td>
<td>RL1205LGQ-711</td>
<td>RL1505LFQ-711</td>
</tr>
<tr>
<td>1024</td>
<td>RL1210LGQ-711</td>
<td>–</td>
</tr>
</tbody>
</table>
PRODUCTS AND OPTICAL RECEIVERS

Si PIN and APD Modules

Applications
- Laser range finder
- Confocal microscopy
- Video scanning imager
- High speed analytical instrumentation
- Free space communication
- UV light sensing
- Distributed temperature sensing

Features and Benefits
- Ultra low noise
- High speed
- High transimpedance gain

Product Description
These modules comprise of a photodetector (PIN or APD) and a transimpedance amplifier in the same hermetically sealed package. Having both amplifier and photodetector in the same package allows low noise pickup from the surrounding environment and reduces parasitic capacitances from interconnect allowing lower noise operation.

The hybrid amplifier C30659 series includes an APD connected to a low noise transimpedance amplifier. 4 models are offered with Silicon APD and 2 models with InGaAs APD. Standard bandwidth of 50 MHz and 200 MHz can accommodate a wide range of applications. Two C30659 models are offered with the APD mounted on a Thermo-electric cooler (the LLAM series) to help improving noise or to keep the APD at constant temperature regardless of the ambient temperature.

The C30659 can be customized to meet application specific requirements by using one of the PerkinElmer rear entry APDs, by choosing a custom bandwidth or by qualifying it to your environmental conditions. Pigtailed versions are also available in a 14 pins DIL package allowing nearly 100% coupling efficiency.

The C30950EH offers a low cost alternative to the C30659. The amplifier is designed to neutralize the input capacitance of a unity voltage gain amplifier. The C30919E uses the same architecture of the C30950EH with the addition of a high voltage temperature compensation circuit which maintain module responsivity constant over a wide temperature range.

Two HUV modules are offered with a PIN detector for low frequency high gain application, covering a broad spectrum range from the UV to the near IR.

All optical receiver products can be qualified to meet the most demanding environmental specification as described in MIL-PRF-38534.

### Product Table

<table>
<thead>
<tr>
<th>Unit</th>
<th>Detector</th>
<th>Active Area</th>
<th>Bandwidth</th>
<th>Responsivity, 830 nm kV/W</th>
<th>Responsivity, 900 nm kV/W</th>
<th>Responsivity, 1060 nm kV/W</th>
<th>NEP W/√Hz</th>
<th>Output Voltage Swing, 50 Ohm V</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>C30659-900-R5BH</td>
<td>C30902</td>
<td>0.5</td>
<td>200</td>
<td>460</td>
<td>400</td>
<td>-</td>
<td>35</td>
<td>0.9</td>
<td>TO-8</td>
</tr>
<tr>
<td>C30659-900-R8AH</td>
<td>C30817</td>
<td>0.8</td>
<td>50</td>
<td>2700</td>
<td>3000</td>
<td>-</td>
<td>14</td>
<td>0.9</td>
<td>TO-8</td>
</tr>
<tr>
<td>C30659-1060-R8BH</td>
<td>C30954</td>
<td>0.8</td>
<td>200</td>
<td>-</td>
<td>370</td>
<td>200</td>
<td>55</td>
<td>0.9</td>
<td>TO-8</td>
</tr>
<tr>
<td>C30659-1060-3AH</td>
<td>C30956</td>
<td>3</td>
<td>50</td>
<td>-</td>
<td>450</td>
<td>280</td>
<td>55</td>
<td>0.9</td>
<td>TO-8</td>
</tr>
<tr>
<td>C30659-1550-R08BH</td>
<td>C30645</td>
<td>80 µm</td>
<td>200</td>
<td>-</td>
<td>90 Ω 1550 nm</td>
<td>-</td>
<td>220</td>
<td>0.9</td>
<td>TO-8</td>
</tr>
<tr>
<td>C30659-1550-R2AH</td>
<td>C30645</td>
<td>200 µm</td>
<td>50</td>
<td>-</td>
<td>340 Ω 1550 nm</td>
<td>-</td>
<td>130</td>
<td>0.9</td>
<td>TO-8</td>
</tr>
<tr>
<td>C30919E</td>
<td>C30817</td>
<td>0.8</td>
<td>40</td>
<td>-</td>
<td>1000</td>
<td>250</td>
<td>20</td>
<td>0.7</td>
<td>TO-1 in</td>
</tr>
<tr>
<td>C30950EH</td>
<td>C30817</td>
<td>0.8</td>
<td>50</td>
<td>520</td>
<td>560</td>
<td>140</td>
<td>27</td>
<td>0.7</td>
<td>TO-8</td>
</tr>
<tr>
<td>LLAM-1550-R2AH</td>
<td>C30662</td>
<td>0.2</td>
<td>50</td>
<td>-</td>
<td>340 Ω 1550 nm</td>
<td>-</td>
<td>130</td>
<td>0.9</td>
<td>TO-8 flange</td>
</tr>
<tr>
<td>LLAM-1060-R8BH</td>
<td>C30954</td>
<td>0.8</td>
<td>200</td>
<td>-</td>
<td>370</td>
<td>200</td>
<td>55</td>
<td>0.9</td>
<td>TO-8 flange</td>
</tr>
<tr>
<td>HUV-1100BGH</td>
<td>UV-100</td>
<td>2.5</td>
<td>1 kHz</td>
<td>-</td>
<td>130 MV/W</td>
<td>-</td>
<td>30</td>
<td>5 min</td>
<td>Custom</td>
</tr>
<tr>
<td>HUV-2000BH</td>
<td>UV-215</td>
<td>5.4</td>
<td>1 kHz</td>
<td>-</td>
<td>130 MV/W</td>
<td>-</td>
<td>70</td>
<td>5 min</td>
<td>Custom</td>
</tr>
</tbody>
</table>
Product Description

These photodiode arrays are used to generate an X-ray image by scanning an object line by line. The X-rays are converted into light through the attached scintillator crystal. The light intensity is then measured by the photodiodes. The boards are employing chip-on-board technology with optically adapted scintillator crystals. The listed designs can be ordered as a standard part, but can also be customized to meet the needs of a wide variety of applications. PerkinElmer custom photodiode arrays give customers the option to choose the:

- active photodiode area
- total number of elements
- overall PCB and photodiode chip dimensions
- photodiode chip geometry and orientation
- electro-optical specifications
- single sided vs. double sided PCB
- alternative substrate materials (e.g. ceramic)
- electrical interface (e.g. connector)

First stage amplification electronics can also be added to the custom board design to convert the current generated by the photodiode into an easy to measure voltage.

**Product Table**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Substrate Material</th>
<th>Active Area Dimension (mm)</th>
<th>Photodiode Chip Dimensions (mm)</th>
<th>Pitch</th>
<th>Number of Elements</th>
<th>Scintillator Crystal Type</th>
<th>Light Current Uniformity @ 540 nm, 30 mW/cm² typ max</th>
<th>Dark Current @ H =0, VR =10 mV typ max</th>
<th>Junction Capacitance @ H =0, VR =0V typ max</th>
<th>Radiometric Sensitivity @ 540 nm typ max</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTA2164H-D-NC-00-0</td>
<td>FR4</td>
<td>43.2 x 67.7</td>
<td>1.41</td>
<td>1.40 x 3.50</td>
<td>2.1</td>
<td>64</td>
<td>Custom</td>
<td>±5</td>
<td>&lt;100</td>
<td>-</td>
</tr>
<tr>
<td>VTA1616H-H-SC-01-0</td>
<td>FR4</td>
<td>8.0 x 25.4</td>
<td>2.58</td>
<td>1.51 x 3.25</td>
<td>1.6</td>
<td>16</td>
<td>CsI</td>
<td>±5</td>
<td>- 50</td>
<td>- 350</td>
</tr>
<tr>
<td>VTA1616H-L-SC-02-0</td>
<td>FR4</td>
<td>16.0 x 25.4</td>
<td>2.58</td>
<td>1.51 x 3.25</td>
<td>1.6</td>
<td>16</td>
<td>GOS</td>
<td>±5</td>
<td>- 50</td>
<td>- 350</td>
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<td>2.45 x 3.15</td>
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<td>CsI</td>
<td>±5</td>
<td>- 50</td>
<td>- 600</td>
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<td>GOS</td>
<td>±5</td>
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<td>- 600</td>
</tr>
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<td>2.30 x 4.95 (dual cell)</td>
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<td>- 300</td>
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<td>FR4</td>
<td>17.8 x 19.0</td>
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Electrical characteristics at $T_{Ambient} = 25^\circ C$.
Photodiode Arrays – VTA Series
Avalanche Photodiodes – Silicon and InGaAs APDs

Product Description
These rear entry “reach-through” silicon APDs offer the best compromise in terms of cost and performance for applications requiring high speed and low noise photon detection from 400 nm up to 1100 nm. They feature low noise, high quantum efficiency and high gain while maintaining reasonably low operating voltage. The active area varies from 0.5 mm to 3 mm to accommodate a large variety of applications.

The “S” series of the C30902 family of APDs can be used in either their normal linear mode (VR < VBR) or as photon counter in the Geiger mode (VR > VBR). This series is particularly well-suited for ultra-sensitive photon measurements in biomedical and analytical instruments.

Precise temperature control can be achieved with a thermo electric cooler which can be used to improve noise and responsivity or to maintain constant responsivity over a wide range of ambient temperature.

High quantum efficiency can be achieved from 1100 nm to 1700 nm with our InGaAs Avalanche Photodiodes. They were designed to maintain high gain, high quantum efficiency and high bandwidth even with their large area of up to 200 μm. The short distance between to window and the active area allows easy interface with optical system.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Active Diameter</th>
<th>Capacitance</th>
<th>Rise/Fall Time</th>
<th>Dark Current</th>
<th>Breakdown Voltage min</th>
<th>Breakdown Voltage max</th>
<th>Temperature Coefficient</th>
<th>Typical Gain</th>
<th>Responsivity 830nm</th>
<th>Responsivity 900 nm</th>
<th>Responsivity 1060 nm</th>
<th>NEP (W/Hz)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>C30817EH</td>
<td>0.8</td>
<td>2</td>
<td>2</td>
<td>50</td>
<td>300</td>
<td>475</td>
<td>2.2</td>
<td>120</td>
<td>75</td>
<td>37</td>
<td>63</td>
<td>80</td>
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<tr>
<td>C30817EH</td>
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<td>10</td>
<td>2</td>
<td>100</td>
<td>325</td>
<td>500</td>
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<td>60</td>
<td>37</td>
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<td>30</td>
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<tr>
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<td>1</td>
<td>100</td>
<td>190</td>
<td>290</td>
<td>1.1</td>
<td>100</td>
<td>63</td>
<td>8</td>
<td>13</td>
<td>6.3</td>
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<tr>
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<td>1.6</td>
<td>0.5</td>
<td>15</td>
<td>185</td>
<td>265</td>
<td>0.7</td>
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<td>77</td>
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<td>3</td>
<td>7</td>
<td>Ball lens TO-18</td>
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<td>185</td>
<td>265</td>
<td>0.7</td>
<td>150</td>
<td>77</td>
<td>60</td>
<td>3</td>
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<td>FC receptacle</td>
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<td>0.5</td>
<td>15</td>
<td>185</td>
<td>265</td>
<td>0.7</td>
<td>150</td>
<td>77</td>
<td>60</td>
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<td>ST receptacle</td>
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<td>150</td>
<td>77</td>
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<td>7</td>
<td>TO-18, flat window</td>
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<tr>
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<td>3</td>
<td>3</td>
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<td>490</td>
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<td>265</td>
<td>0.7</td>
<td>150</td>
<td>77</td>
<td>60</td>
<td>3</td>
<td>7</td>
<td>TO-18, flat window</td>
</tr>
<tr>
<td>C30921EH</td>
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<td>0.5</td>
<td>15</td>
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<td>265</td>
<td>0.7</td>
<td>150</td>
<td>77</td>
<td>60</td>
<td>3</td>
<td>7</td>
<td>TO-18, light pipe</td>
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<tr>
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<td>2</td>
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<td>50</td>
<td>300</td>
<td>475</td>
<td>2.4</td>
<td>120</td>
<td>75</td>
<td>36</td>
<td>13</td>
<td>9</td>
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<tr>
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<td>2</td>
<td>100</td>
<td>315</td>
<td>490</td>
<td>2.4</td>
<td>100</td>
<td>70</td>
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<td>9</td>
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<tr>
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<td>10</td>
<td>2</td>
<td>100</td>
<td>325</td>
<td>500</td>
<td>2.4</td>
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<td>45</td>
<td>25</td>
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<td>TO-8</td>
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www.perkinelmer.com
**Silicon APD – TE-Cooled**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Active Diameter</th>
<th>Active Area</th>
<th>Total Capacitance</th>
<th>Rise/Fall Time</th>
<th>Dark Current</th>
<th>Breakdown Voltage min</th>
<th>Breakdown Voltage max</th>
<th>Temperature Coefficient</th>
<th>Typical Gain</th>
<th>Responivity 830 nm</th>
<th>Responivity 900 nm</th>
<th>Responivity 1080 nm</th>
<th>Noise Current</th>
<th>Package</th>
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<td>-</td>
<td>0.7</td>
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<td>108</td>
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<td>300</td>
<td>475</td>
<td>2.4</td>
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<td>2</td>
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<td>475</td>
<td>2.4</td>
<td>120</td>
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<td>1.8</td>
<td>3</td>
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<td>100</td>
<td>315</td>
<td>490</td>
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<td>0.2</td>
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<td>490</td>
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<td>100</td>
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<td>75</td>
<td>-</td>
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<td>45</td>
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TC stands for single stage cooler, operating temperature 0°C
DTC stands for double stage cooler, operating temperature -20°C

**InGaAs APD**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Active Diameter</th>
<th>Capacitance</th>
<th>Bandwidth (MHz)</th>
<th>Dark Current</th>
<th>Breakdown Voltage min</th>
<th>Breakdown Voltage max</th>
<th>Temperature Coefficient</th>
<th>Typical Gain</th>
<th>Responsivity 1550nm</th>
<th>NEP (W/sqrt(Hz))</th>
<th>Package</th>
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<tr>
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<td>90</td>
<td>0.14</td>
<td>10</td>
<td>9.3</td>
<td>100</td>
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<td>2.5</td>
<td>800</td>
<td>70</td>
<td>40</td>
<td>90</td>
<td>0.14</td>
<td>10</td>
<td>9.3</td>
<td>100</td>
<td>Ceramic carrier</td>
</tr>
<tr>
<td>C30645EH</td>
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<td>1.25</td>
<td>1000</td>
<td>35</td>
<td>40</td>
<td>90</td>
<td>0.14</td>
<td>10</td>
<td>9.3</td>
<td>25</td>
<td>TO-18</td>
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<tr>
<td>C30645ECERH</td>
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<td>1.25</td>
<td>1000</td>
<td>35</td>
<td>40</td>
<td>90</td>
<td>0.14</td>
<td>10</td>
<td>9.3</td>
<td>25</td>
<td>Ceramic carrier</td>
</tr>
<tr>
<td>C30644EH</td>
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<td>0.6</td>
<td>2000</td>
<td>25</td>
<td>40</td>
<td>90</td>
<td>0.14</td>
<td>10</td>
<td>9.3</td>
<td>15</td>
<td>TO-18</td>
</tr>
<tr>
<td>C30644ECERH</td>
<td>50</td>
<td>0.6</td>
<td>2000</td>
<td>25</td>
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<td>90</td>
<td>0.14</td>
<td>10</td>
<td>9.3</td>
<td>15</td>
<td>Ceramic carrier</td>
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**Typical Spectral Responsivity @ 22°C**

Responsivity (A/W)

<table>
<thead>
<tr>
<th>Wavelength (nm)</th>
<th>Responsivity (A/W)</th>
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<tr>
<td>400</td>
<td>10</td>
</tr>
<tr>
<td>500</td>
<td>1</td>
</tr>
<tr>
<td>600</td>
<td>0.1</td>
</tr>
<tr>
<td>700</td>
<td>0.01</td>
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<td>800</td>
<td>0.001</td>
</tr>
<tr>
<td>900</td>
<td>0.0001</td>
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<tr>
<td>1000</td>
<td>0.00001</td>
</tr>
</tbody>
</table>

**Package Drawing – TO-8 Flange**

**Typical TO-5 Package**

**Typical TO-8 Package**

**Ceramic Carrier**

*Note: Package dimension for indication only. Exact package dimension can be found on products datasheets.*
Product Description

C30927 series of quadrant Si Avalanche Photodiode and the C3098SE multi-element APD array utilize the double-diffused "reach-through" structure. This structure provides ultra high sensitivity at 400-1000 nm.

The C30927 quadrant structure has a common avalanche junction, with separation of the quadrants achieved by segmentation of the light entry p+ surface opposite the junction. With this design, there is no dead space between the elements and therefore no loss of response at boresight.

The C30927EH-01, -02 and -03 are optimized for use at wavelengths of 1060, 900, and 800 nm respectively. Each device type will provide high responsivity and excellent performance when operated within about 50 nm of the specified wavelength.

The C30985E is a 25 element monolithic linear APD array having a high inter-electrode resistance with a 75 μm dead space between the elements. Packages have a common ground and bias with a separate lead for each element output.

Applications
- Spectroscopy
- Particle detection
- Spot tracking and alignment systems
- Adaptive optics
- Lidar

Features and Benefits
- High quantum efficiency
- Hermetically sealed packages
- Monolithic chip with minimal dead space between elements
- Specific tailored wavelength response
- RoHS compliant
Product Description

The C30954EH, C30955EH, and C30956EH are general purpose silicon avalanche photodiodes made using a double-diffused "reach-through" structure. The design of these photodiodes are such that their long wave response (i.e. >900 nm) has been enhanced without introducing any undesirable properties.

These APDs have quantum efficiency of up to 40 % at 1060 nm. At the same time, the diodes retain the low noise, low capacitance, and fast rise and fall times characteristics.

To help simplify many design needs, these APDs are also available in PerkinElmer's high-performance hybrid preamplifier module type C30659 series, as well as the preamplifier and TE cooler incorporated module type LLAM series. Please refer to the respective sections in this catalog.

Product Table

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Photodiode Diameter</th>
<th>Responsivity @ 1060 nm</th>
<th>Dark Current</th>
<th>Spectral Noise Current</th>
<th>Capacitance @ 100 KHz</th>
<th>Response Time</th>
<th>NEP @ 1060 nm</th>
<th>Vop Range</th>
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<tr>
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<td>36</td>
<td>50</td>
<td>0.5</td>
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<td>2</td>
<td>14</td>
<td>275-425</td>
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<tr>
<td>C30955EH</td>
<td>1.5</td>
<td>34</td>
<td>100</td>
<td>0.5</td>
<td>3</td>
<td>2</td>
<td>15</td>
<td>275-425</td>
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<tr>
<td>C30956EH</td>
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<td>100</td>
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<td>10</td>
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<td>20</td>
<td>275-425</td>
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</tbody>
</table>

Applications

- Range finding
- Lidar
- YAG laser detection

Features and Benefits

- High quantum efficiency at 1060 nm
- Fast response time
- Wide operating temperature range
- Low capacitance
- Hermetically sealed packages
- RoHS compliant

1060 nm NIR Enhanced Si APDs
Avalanche Photodiodes for High Energy Radiation Detections Applications, Molecular Imaging

Large Area Si-APDs – UV-Enhanced APDs

Applications
- Nuclear medicine
- Fluorescence detection
- High energy physics
- Medical imaging
- Radiation detection
- Particle physics
- Instrumentation
- Environmental monitoring

Features and Benefits
- High quantum efficiency
- Low dark currents
- Easy coupling to scintillator crystals
- Immunity to electromagnetic fields
- Short wavelength enhanced responsivity
- Custom packaging available
- Excellent timing resolution
- RoHS compliant

Product Description

The C30739ECERH Silicon Avalanche Photodiode (APD) is intended for use in a wide variety of broadband low light level applications covering the spectral range from below 400 to over 700 nanometers. It has low noise, low capacitance and high gain. It is designed to have an enhanced short wavelength sensitivity, with quantum efficiency of 60% at 430 nm. The standard ceramic carrier package allows for easy handling and coupling to scintillating crystals such as LSO and BGO. Combined with the superior short wavelength responsivity, it makes this APD ideal in demanding applications such as Positron Emission Tomography (PET).

The C30626FH and C30703FH series are large area Si APDs in flat pack packages for either direct detection or easy coupling to scintillator crystals.

The C30626 uses a standard reach through structure and has peak detection at about 900 nm. The C30703 is enhanced for blue wavelength response and has peak quantum efficiency at ~530 nm. These APDs are packaged in square flat pack with or without windows or on ceramics. The no-window devices can detect direct radiation of X-rays and electrons at the energies listed, and the windowed packages are best for easy scintillator coupling.

Product Table

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Photo Sensitive Diameter (mm)</th>
<th>Responsivity (A/W)</th>
<th>Dark Current (nA)</th>
<th>Spectral Noise Current (pA/√Hz)</th>
<th>Capacitance @ 100 kHz (pF)</th>
<th>Response Time (ns)</th>
<th>NEP (fW/√Hz)</th>
<th>Vop Range (V)</th>
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<td>C30626FH</td>
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<td>0.5</td>
<td>20</td>
<td>5</td>
<td>23</td>
<td>275 - 425</td>
</tr>
<tr>
<td>C30703FH</td>
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<td>16</td>
<td>10</td>
<td>0.7</td>
<td>120</td>
<td>5</td>
<td>40</td>
<td>275 - 425</td>
</tr>
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<td>C30739ECERH</td>
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<td>20</td>
<td>50</td>
<td>1.4</td>
<td>60</td>
<td>2</td>
<td>-</td>
<td>275 - 425</td>
</tr>
</tbody>
</table>

Graph 1

Quantum Efficiency vs. Wavelength

Graph 2

Quantum Efficiency vs. Wavelength
**C30737 High Speed, Low Voltage APD — C30724 Low Temperature Coefficient APD**

### Applications
- Laser range finding for 600 to 950 nm range
- Optical communication
- Analytical Instrumentation

### Features and Benefits
- Optimized versions for 900 and 800 nm peak sensitivity
- Standard versions with 500 and 230 µm active diameter
- Various package types: hermetic TO, plastic TO, SMD
- High gain at low bias voltage
- Low breakdown voltage
- Fast response, $t_r \approx 300\, \text{ps}$
- Low noise, in ~ $0.2\, \text{pA/Hz}$
- RoHS compliant

### Product Table

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
<th>Optical Bandwidth</th>
<th>Active Area Diameter</th>
<th>Peak Sensitivity Wavelength</th>
<th>Breakdown Voltage</th>
<th>Temp. Coeff. Of $V_{BR}$ for Constant M</th>
<th>Gain @ $V_{peak}$</th>
<th>Responsivity @ $V_{peak}$</th>
<th>Total Dark Current (Bulk + Surface)</th>
<th>Noise Current, (f = 10 kHz, Δf=1 Hz)</th>
<th>Capacitance</th>
<th>Rise &amp; Fall Time, (RL = 50 Ω, 10% - 90% Points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C30737EH-230-80</td>
<td>TO -</td>
<td>230</td>
<td>800</td>
<td>120</td>
<td>200</td>
<td>0.5</td>
<td>100</td>
<td>50</td>
<td>2.5</td>
<td>10</td>
<td>0.1</td>
<td>1.0</td>
</tr>
<tr>
<td>C30737PH-230-80</td>
<td>T-1¾ -</td>
<td>230</td>
<td>800</td>
<td>120</td>
<td>200</td>
<td>0.5</td>
<td>100</td>
<td>50</td>
<td>2.5</td>
<td>10</td>
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<td>1.0</td>
</tr>
<tr>
<td>C30737LH-230-81</td>
<td>LCC -</td>
<td>230</td>
<td>800</td>
<td>120</td>
<td>200</td>
<td>0.5</td>
<td>100</td>
<td>35</td>
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<td>10</td>
<td>0.1</td>
<td>1.0</td>
</tr>
<tr>
<td>C30737EH-500-80</td>
<td>TO -</td>
<td>500</td>
<td>800</td>
<td>120</td>
<td>200</td>
<td>0.5</td>
<td>100</td>
<td>50</td>
<td>5</td>
<td>20</td>
<td>0.3</td>
<td>2.0</td>
</tr>
<tr>
<td>C30737PH-500-80</td>
<td>T-1¾ -</td>
<td>500</td>
<td>800</td>
<td>120</td>
<td>200</td>
<td>0.5</td>
<td>100</td>
<td>50</td>
<td>5</td>
<td>20</td>
<td>0.3</td>
<td>2.0</td>
</tr>
<tr>
<td>C30737LH-500-81</td>
<td>LCC -</td>
<td>500</td>
<td>800</td>
<td>120</td>
<td>200</td>
<td>0.5</td>
<td>100</td>
<td>35</td>
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<td>2.0</td>
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<td>TO -</td>
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<td>900</td>
<td>180</td>
<td>260</td>
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<td>10</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>C30737PH-230-90</td>
<td>T-1¾ -</td>
<td>230</td>
<td>900</td>
<td>180</td>
<td>260</td>
<td>1.3</td>
<td>100</td>
<td>60</td>
<td>2.5</td>
<td>10</td>
<td>0.2</td>
<td>0.6</td>
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<tr>
<td>C30737LH-230-91</td>
<td>LCC -</td>
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<td>900</td>
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<td>260</td>
<td>1.3</td>
<td>100</td>
<td>60</td>
<td>2.5</td>
<td>10</td>
<td>0.2</td>
<td>0.6</td>
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<tr>
<td>C30737EH-500-90</td>
<td>TO -</td>
<td>500</td>
<td>900</td>
<td>180</td>
<td>260</td>
<td>1.3</td>
<td>100</td>
<td>60</td>
<td>5</td>
<td>20</td>
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<td>1.0</td>
</tr>
<tr>
<td>C30737PH-500-90</td>
<td>T-1¾ -</td>
<td>500</td>
<td>900</td>
<td>180</td>
<td>260</td>
<td>1.3</td>
<td>100</td>
<td>60</td>
<td>5</td>
<td>20</td>
<td>0.4</td>
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</tr>
<tr>
<td>C30737LH-500-91</td>
<td>LCC -</td>
<td>500</td>
<td>900</td>
<td>180</td>
<td>260</td>
<td>1.3</td>
<td>100</td>
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<td>C30724EH</td>
<td>TO -</td>
<td>500</td>
<td>920</td>
<td>-</td>
<td>350</td>
<td>-</td>
<td>15</td>
<td>8.5</td>
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<td>920</td>
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<td>8.5</td>
<td>20</td>
<td>40</td>
<td>0.1</td>
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</table>

Electrical Characteristics at $T_{Ambient} \approx 22\, \text{°C}$, at operating voltage, $V_{op}$. 

### Product Description

The PerkinElmer C30737 series silicon APDs provide high responsivity between 500 nm and 1000 nm, as well as extremely fast rise times at all wavelengths with a frequency response above 1 GHz. The C30724 as a low gain APD can be operated at fixed voltage without the need of a temperature compensation.

Standard versions are available in two active area sizes: 0.23 and 0.5 mm diameter. They are offered in the traditional hermetic TO housing (“E”), in cost effective plastic through-hole T-1¾ (“P”) packages, and in leadless ceramic carrier (LCC, “L”) package for surface mount technology. All listed varieties are ideally suited for high-volume, low cost applications. Customization of these APDs is offered to meet your design challenges. Operation voltage selection and binning or specific wavelength filtering options are among many of the application specific solutions available.
**Product Description**

Silicon PIN photodiodes are available in a wide variety of active area to accommodate a large variety of applications. The PIN structure allows high quantum efficiency and fast response for detection of photon in the 400 nm to 1100 nm range. The YAG series offers an exceptional 0.4 A/W at 1060 nm by using a thick silicon material. Designed with a guard ring to collect current generated outside of the active area, they are the detectors of choice when the entire chip is illuminated by reducing unwanted carriers responsible for noise. Precise beam positioning can be achieved by using our quadrant detectors. They are designed with 4 pie-shaped quadrant sections from doping process thus reducing to almost zero the “dead” space between each quadrant. Each quadrant is connected to an isolated lead.

The C30741 provide fast response and good quantum efficiency in the spectral range between 300 nm to 1100 nm. Designed for high-speed, high-volume production and cost sensitive applications, these photodiodes are offered in plastic package, either TO style or SMD packages with a visible blocking filter option.

Our UV series are high quality Si PIN photodiode in hermatically sealed TO package designed for the 220 nm to 1100 nm wavelength region with enhanced operation in the UV range. Low noise detection is achieved by operating the UV series in photovoltaic mode (0 V bias).

The InGaAs PIN detectors provide high quantum efficiency from 800 nm to 1700 nm. They feature low capacitance for extended bandwidth, high resistance for high sensitivity, high linearity, and uniformity within 2 % across the detector active area.

---

**Product Table**

**InGaAs PIN, High Speed, Peak Wavelength at 1550 nm**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Active Diameter</th>
<th>Responsivity Peak</th>
<th>Capacitance</th>
<th>B&lt;sub&gt;0&lt;/sub&gt;</th>
<th>Dark Current</th>
<th>Breakdown Voltage</th>
<th>Operating Voltage</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>C30616ECERH</td>
<td>50</td>
<td>0.95</td>
<td>0.35</td>
<td>3.5</td>
<td>&lt;1</td>
<td>100</td>
<td>5</td>
<td>Ceramic carrier</td>
</tr>
<tr>
<td>C30617BH</td>
<td>100</td>
<td>0.95</td>
<td>0.8</td>
<td>3.5</td>
<td>&lt;1</td>
<td>100</td>
<td>5</td>
<td>TO-18, ball lens</td>
</tr>
<tr>
<td>C30617BFC</td>
<td>100</td>
<td>0.95</td>
<td>0.8</td>
<td>3.5</td>
<td>&lt;1</td>
<td>100</td>
<td>5</td>
<td>TO-18, FC receptacle</td>
</tr>
<tr>
<td>C30617BSC</td>
<td>100</td>
<td>0.95</td>
<td>0.8</td>
<td>3.5</td>
<td>&lt;1</td>
<td>100</td>
<td>5</td>
<td>TO-18, SC receptacle</td>
</tr>
<tr>
<td>C30617BSTH</td>
<td>100</td>
<td>0.95</td>
<td>0.8</td>
<td>3.5</td>
<td>&lt;1</td>
<td>100</td>
<td>5</td>
<td>TO-18 ST receptacle</td>
</tr>
<tr>
<td>C30617ECERH</td>
<td>100</td>
<td>0.95</td>
<td>0.6</td>
<td>3.5</td>
<td>&lt;1</td>
<td>100</td>
<td>5</td>
<td>Ceramic carrier</td>
</tr>
<tr>
<td>C30618BFC</td>
<td>350</td>
<td>0.95</td>
<td>4</td>
<td>0.75</td>
<td>1</td>
<td>100</td>
<td>5</td>
<td>TO-18, FC receptacle</td>
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<tr>
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<td>0.95</td>
<td>4</td>
<td>0.75</td>
<td>1</td>
<td>100</td>
<td>5</td>
<td>TO-18</td>
</tr>
<tr>
<td>C30618ECERH</td>
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<td>0.95</td>
<td>4</td>
<td>0.75</td>
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<td>0.4</td>
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<td>&lt;1</td>
<td>100</td>
<td>5</td>
<td>Ceramic carrier</td>
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</table>
### Product Table

#### InGaAs PIN, Large Area, Peak Wavelength at 1550 nm

<table>
<thead>
<tr>
<th>Unit</th>
<th>Active Diameter</th>
<th>Responsivity Peak</th>
<th>Capacitance</th>
<th>Shunt Resistance</th>
<th>Rise/Fall Time</th>
<th>Dark Current</th>
<th>Breakdown Voltage</th>
<th>Operating Voltage</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>A/W</td>
<td>pF</td>
<td>Mega Ohm</td>
<td>GHz</td>
<td>nA</td>
<td>V</td>
<td>V</td>
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<tr>
<td>C30641EH-TC</td>
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<td>40</td>
<td>50</td>
<td>75</td>
<td>5</td>
<td>80</td>
<td>0-5</td>
<td>TO-8, flange, TE-cooled</td>
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<tr>
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<td>0.95</td>
<td>40</td>
<td>50</td>
<td>75</td>
<td>5</td>
<td>80</td>
<td>0-5</td>
<td>TO-8, flange, dual TE</td>
</tr>
<tr>
<td>C30641GH</td>
<td>1</td>
<td>0.95</td>
<td>40</td>
<td>50</td>
<td>75</td>
<td>5</td>
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<td>0-5</td>
<td>TO-5</td>
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<td>C30642GH</td>
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<td>150</td>
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<td>0-5</td>
<td>TO-5</td>
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<td>10</td>
<td>3</td>
<td>25</td>
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<td>250</td>
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<td>1</td>
<td>80</td>
<td>0-10</td>
<td>TO-18</td>
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</table>

### Product Table

#### Silicon PIN

<table>
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<tr>
<th>Unit</th>
<th>Active Diameter</th>
<th>Active Area</th>
<th>Responsivity Peak</th>
<th>Peak Wavelength</th>
<th>Capacitance</th>
<th>Rise/Fall Time</th>
<th>Dark Current</th>
<th>Breakdown Voltage</th>
<th>Operating Voltage</th>
<th>Package</th>
</tr>
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<tr>
<td></td>
<td>mm</td>
<td>mm²</td>
<td>A/W</td>
<td>nm</td>
<td>pF</td>
<td>ns</td>
<td>nA</td>
<td>V</td>
<td>V</td>
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<td>800</td>
<td>11</td>
<td>2</td>
<td>0.05</td>
<td>-</td>
<td>300</td>
<td>10 Plastic T-¾ throughhole</td>
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<td>800</td>
<td>800</td>
<td>11</td>
<td>2</td>
<td>0.05</td>
<td>-</td>
<td>300</td>
<td>10 T-¾ visible blocking</td>
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<td>-</td>
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<td>&gt;75</td>
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<td>UV-2545BQH</td>
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<td>630</td>
<td>-</td>
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<td>&gt;75</td>
<td>-</td>
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<td>TO-5, response down to 200 nm</td>
</tr>
<tr>
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<td>1000</td>
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<td>5</td>
<td>&lt;20</td>
<td>-</td>
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<td></td>
<td></td>
<td>SMT</td>
</tr>
<tr>
<td>CR50DE</td>
<td>0.5</td>
<td>880</td>
<td>2.5</td>
<td>3000</td>
<td>0.5</td>
<td>-</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Product Table

#### Specialty Silicon Detectors

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
<th>Active Diameter</th>
<th>Active Area</th>
<th>Capacitance</th>
<th>Rise/Fall Time</th>
<th>Dark Current</th>
<th>Breakdown Voltage min</th>
<th>Responsivity 900nm</th>
<th>Responsivity 1060nm</th>
<th>Noise Current</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>C30845EH</td>
<td>Quadrant PIN</td>
<td>8</td>
<td>50</td>
<td>8/p</td>
<td>6</td>
<td>70nA</td>
<td>100</td>
<td>0.6</td>
<td>0.17</td>
<td>0.26/p</td>
<td>TO-8</td>
</tr>
<tr>
<td>YAG-444-4AH</td>
<td>Quadrant Pin</td>
<td>11.3</td>
<td>100</td>
<td>9/p</td>
<td>8</td>
<td>&lt;75nA</td>
<td>100</td>
<td>0.6</td>
<td>0.5</td>
<td>0.2/g</td>
<td>Custom</td>
</tr>
<tr>
<td>DTC-140H</td>
<td>Dual wavelength detector Si-Si</td>
<td>3.5</td>
<td>9.9</td>
<td>300/300</td>
<td>-</td>
<td>50/50 MΩ</td>
<td>-</td>
<td>0.6/0</td>
<td>0.25/0.15</td>
<td>0.033/0.133</td>
<td>Custom</td>
</tr>
</tbody>
</table>
An electro-optical smoke detector consists of an Infrared LED (IRED) and Photodiode (PD) assembly, which exhibits a signal under the presence of smoke in the detection volume (smoke chamber). Signal range under smoke and clean-air conditions and their long term stability are key features of a smoke detector module. PerkinElmer offers IRED and PD components as well as customized assemblies with specified signal level range. Such an assembly can be an optical block containing an IRED and PD for (SMD) board soldering or the complete smoke chamber, which are produced in high-volumes. Please contact PerkinElmer to discuss your requirements.

### Product Description

Selected Photodiodes and Infrared Emitting Diodes (IREDs)

**Applications**
- Electro-optical smoke detection

**Features and Benefits**
- High quality components: photodiodes, IREDs (UL-listed)
- Binning for optimized transfer function
- Customized optical block (PD+IRED) assemblies
- Smoke chamber assemblies according specified transfer function

#### Selected Photodiodes Used in Smoke Detection Applications

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Package</th>
<th>Active Area</th>
<th>Short Circuit Current</th>
<th>Dark Current</th>
<th>Dark Current</th>
<th>Dark Current</th>
<th>Junction Capacitance</th>
<th>Radiometric Sensitivity @ λ &lt;sub&gt;P&lt;/sub&gt;</th>
<th>Spectral Range</th>
<th>Peak Wavelength</th>
<th>Noise Equivalent Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTP7840H</td>
<td>Lensed sidelooker IRT</td>
<td>5.27</td>
<td>50</td>
<td>20</td>
<td>40</td>
<td>0.55</td>
<td>725-1150</td>
<td>925</td>
<td>5.3 x 10^-14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VTP413H</td>
<td>Lensed sidelooker</td>
<td>7.45</td>
<td>120 (typ)</td>
<td>30</td>
<td>50</td>
<td>0.55</td>
<td>400-1150</td>
<td>925</td>
<td>2.3 x 10^-14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VTP100H</td>
<td>Flat sidelooker IRT</td>
<td>7.45</td>
<td>35</td>
<td>30</td>
<td>50</td>
<td>0.5</td>
<td>725-1150</td>
<td>925</td>
<td>2.5 x 10^-14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VTP11885H</td>
<td>Lensed ceramic</td>
<td>11</td>
<td>200 (typ)</td>
<td>30</td>
<td>300</td>
<td>0.55</td>
<td>400-1100</td>
<td>925</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Selected Infrared LEDs (IREDs) Used in Smoke Detection Applications

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Package</th>
<th>Total Power</th>
<th>Test Current</th>
<th>Forward Drop Voltage</th>
<th>Half Power Beam Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTE1291-1H</td>
<td>T-1¾ lensed</td>
<td>20 mW</td>
<td>100 mA (pulsed)</td>
<td>1.5 V</td>
<td>±12 degree</td>
</tr>
<tr>
<td>VTE1291-2H</td>
<td>T-1¾ lensed</td>
<td>25 mW</td>
<td>100 mA (pulsed)</td>
<td>1.5 V</td>
<td>±12 degree</td>
</tr>
<tr>
<td>VTE1295</td>
<td>T-1¾ lensed</td>
<td>20 mW</td>
<td>100 mA (pulsed)</td>
<td>1.5 V</td>
<td>±8 degree</td>
</tr>
</tbody>
</table>
AMBIENT LIGHT SENSORS

Product Description
Ambient light sensors from PerkinElmer provide an easy solution for applications that require a response similar to the human eye, making it ideal when the response should only be influenced by visible light. These devices contribute in various applications to energy conservation in both fixed and portable devices. There are three main devices types, one being filtered photodiodes, the second filtered phototransistors and finally wavelength selective devices based on III-V material. They are available in a number of standard packages, including surface mount for automated assembly.

<table>
<thead>
<tr>
<th>Photodiodes &amp; Phototransistors for High-Volume Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left: Spectrally Adapted Photodiodes and Phototransistors</td>
</tr>
<tr>
<td>Right: C30737PH Series</td>
</tr>
<tr>
<td>T-1⅜ (TO-like) Through-Hole Package (4.9 mm Diameter)</td>
</tr>
</tbody>
</table>

Spectrally Adapted Photodiodes and Phototransistors

Applications
- Interior and exterior light switching (dusk/dawn switch)
- Interior and exterior light control (dimming)
- Automotive headlight dimmer
- Display contrast control
- Energy conservation
- Oil burner flame monitoring

Features and Benefits
- Response approaching human eye using PerkinElmer’s IR-BLOC™ technology
- Perfect light sensor in conjunction with PerkinElmer pyroelectric detectors for motion controlled light switches
- RoHS compliant
- Selectable wavelength detection range
- Small footprint
- Surface mount packages

Product Table

<table>
<thead>
<tr>
<th>Spectrally Adapted Photodiodes and Phototransistors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>VTP1220FBH</td>
</tr>
<tr>
<td>VTP9812FH</td>
</tr>
<tr>
<td>VTT9812FH</td>
</tr>
<tr>
<td>SR10SPD 470-0.9</td>
</tr>
<tr>
<td>SR10SPD 525-0.9</td>
</tr>
</tbody>
</table>

Electrical characteristics at T_{ambient} = 25 °C
FAST RESPONSE
SILICON
PHOTODIODES
FOR INDUSTRIAL AND
COMMERCIAL APPLICATIONS

Silicon Photodiodes – VTP Series

Applications
- Smoke detection
- Barcode scanning
- Light meters
- Pulse oximeters

Features and Benefits
- Visible to IR spectral range
- Integral visible rejection filters available
- 1 to 2 % linearity over 7 to 9 decades
- Low dark currents
- High shunt resistance
- Low capacitance

Product Description
Photodiodes in this series have been designed for low junction capacitance. The lower the capacitance, the faster the response of the photodiode when the RC time constant is your limiting factor. Also, speed can be further increased by reverse biasing the photodiodes. These devices have excellent response in the IR region and are well matched to IR LEDs (VTE series). Some photodiodes are available in packages which incorporate a visible rejection filter, effectively blocking light below 700 nm. Photodiodes made with the VTP process are suitable for operation under reverse bias conditions but may be used in the photovoltaic mode. Typical reverse breakdown voltages are around 140 V. Low dark currents under reverse bias are also a feature of this series.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Package</th>
<th>Active Area</th>
<th>Short Circuit Current</th>
<th>Dark Current</th>
<th>Junction Capacitance</th>
<th>Radiometric Sensitivity @ ( \lambda_p )</th>
<th>Spectral Range</th>
<th>Peak Wavelength</th>
<th>Active Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>mm²</td>
<td>( I_{SC} ) (min)</td>
<td>( I_0 ) max</td>
<td>( C_J ) max</td>
<td>( S_A ) W/AW</td>
<td>( \lambda_{MIN} ) nm</td>
<td>( \lambda_p ) nm</td>
<td>NEP W√Hz</td>
</tr>
<tr>
<td>VTP100H</td>
<td>Flat sidelooker IRT</td>
<td>7.45</td>
<td>35</td>
<td>30</td>
<td>50</td>
<td>0.5</td>
<td>725-1150</td>
<td>925</td>
<td>2.5 x 10^-14</td>
</tr>
<tr>
<td>VTP100CH</td>
<td>Flat sidelooker</td>
<td>7.45</td>
<td>50</td>
<td>30</td>
<td>50</td>
<td>0.5</td>
<td>400-1150</td>
<td>925</td>
<td>9.0 x 10^-14</td>
</tr>
<tr>
<td>VTP1012H</td>
<td>TO-46</td>
<td>1.6</td>
<td>10</td>
<td>7</td>
<td>6</td>
<td>0.5</td>
<td>400-1150</td>
<td>925</td>
<td>8.7 x 10^-14</td>
</tr>
<tr>
<td>VTP1112H</td>
<td>TO-46 lensed</td>
<td>1.6</td>
<td>30</td>
<td>7</td>
<td>6</td>
<td>0.5</td>
<td>400-1150</td>
<td>925</td>
<td>8.7 x 10^-14</td>
</tr>
<tr>
<td>VTP11885H</td>
<td>Lensed ceramic</td>
<td>11</td>
<td>200</td>
<td>30</td>
<td>300</td>
<td>0.5</td>
<td>400-1100</td>
<td>925</td>
<td>-</td>
</tr>
<tr>
<td>VTP1220FBH</td>
<td>T-1½ flat</td>
<td>1.219</td>
<td>0.7</td>
<td>10</td>
<td>18</td>
<td>0.27</td>
<td>400-725</td>
<td>550</td>
<td>-</td>
</tr>
<tr>
<td>VTP1232H</td>
<td>T-1¼</td>
<td>2.326</td>
<td>100</td>
<td>25</td>
<td>180</td>
<td>0.6</td>
<td>400-1100</td>
<td>920</td>
<td>-</td>
</tr>
<tr>
<td>VTP1332H</td>
<td>T-1¼ IRT</td>
<td>2.326</td>
<td>75</td>
<td>25</td>
<td>180</td>
<td>0.55</td>
<td>725-1150</td>
<td>920</td>
<td>-</td>
</tr>
<tr>
<td>VTP1332FH</td>
<td>T-1½ flat IRT</td>
<td>2.326</td>
<td>17</td>
<td>25</td>
<td>180</td>
<td>0.55</td>
<td>725-1150</td>
<td>920</td>
<td>-</td>
</tr>
<tr>
<td>VTP3310LAH</td>
<td>T1</td>
<td>0.684</td>
<td>24</td>
<td>35</td>
<td>25</td>
<td>0.55</td>
<td>400-1150</td>
<td>925</td>
<td>1.9 x 10^-13</td>
</tr>
<tr>
<td>VTP3410LAH</td>
<td>T1 IRT</td>
<td>0.684</td>
<td>15</td>
<td>35</td>
<td>25</td>
<td>0.55</td>
<td>700-1150</td>
<td>925</td>
<td>1.9 x 10^-13</td>
</tr>
</tbody>
</table>

Electrical characteristics at \( T_{JUNCTION} = 25 ^\circ C \)
## Silicon Photodiodes – VTP Series

### Electrical Characteristics at T<sub>Ambient</sub> = 25 °C (unless otherwise noted)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Package</th>
<th>Active Area</th>
<th>Short Circuit Current</th>
<th>Dark Current</th>
<th>Junction Capacitance</th>
<th>Radiometric Sensitivity @ λ&lt;sub&gt;P&lt;/sub&gt;</th>
<th>Spectral Range</th>
<th>Peak Wavelength</th>
<th>Active Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTP413H</td>
<td>Lensed sidelooker</td>
<td>7.45</td>
<td>120 (typ)</td>
<td>30</td>
<td>50</td>
<td>0.55</td>
<td>400-1150</td>
<td>925</td>
<td>-</td>
</tr>
<tr>
<td>VTP4085H</td>
<td>Ceramic</td>
<td>21</td>
<td>200 (typ)</td>
<td>100</td>
<td>500</td>
<td>0.55</td>
<td>400-1100</td>
<td>925</td>
<td>-</td>
</tr>
<tr>
<td>VTP4085SH</td>
<td>Ceramic</td>
<td>21</td>
<td>200 (typ)</td>
<td>50</td>
<td>500</td>
<td>0.55</td>
<td>400-1100</td>
<td>925</td>
<td>-</td>
</tr>
<tr>
<td>VTP5050H</td>
<td>TO-5</td>
<td>7.45</td>
<td>40</td>
<td>18</td>
<td>24</td>
<td>0.55</td>
<td>400-1150</td>
<td>925</td>
<td>1.4 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP6060H</td>
<td>TO-8</td>
<td>20.6</td>
<td>120</td>
<td>35</td>
<td>60</td>
<td>0.55</td>
<td>400-1100</td>
<td>925</td>
<td>1.9 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP7110H</td>
<td>Lateral IRT</td>
<td>0.684</td>
<td>6</td>
<td>35</td>
<td>25</td>
<td>0.55</td>
<td>400-1150</td>
<td>925</td>
<td>1.9 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP7210H</td>
<td>Lateral IRT</td>
<td>0.684</td>
<td>5</td>
<td>35</td>
<td>25</td>
<td>0.55</td>
<td>700-1150</td>
<td>925</td>
<td>1.9 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP7840H</td>
<td>Lensed sidelooker IRT</td>
<td>5.27</td>
<td>50</td>
<td>20</td>
<td>40</td>
<td>0.55</td>
<td>725-1150</td>
<td>925</td>
<td>5.3 x 10&lt;sup&gt;-14&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP8350H</td>
<td>Ceramic</td>
<td>7.45</td>
<td>65</td>
<td>30</td>
<td>50</td>
<td>0.55</td>
<td>400-1100</td>
<td>925</td>
<td>1.8 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP8440H</td>
<td>8 mm ceramic</td>
<td>5.16</td>
<td>30</td>
<td>15</td>
<td>15</td>
<td>0.55</td>
<td>400-1150</td>
<td>925</td>
<td>1.3 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP8551H</td>
<td>Mini-DIP</td>
<td>7.45</td>
<td>50</td>
<td>30</td>
<td>50</td>
<td>0.55</td>
<td>400-1100</td>
<td>925</td>
<td>1.8 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP8651H</td>
<td>Mini-DIP IRT</td>
<td>7.45</td>
<td>35</td>
<td>30</td>
<td>50</td>
<td>0.55</td>
<td>725-1150</td>
<td>925</td>
<td>2.0 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP8740_TRH</td>
<td>SMT clear plastic</td>
<td>5.269</td>
<td>75</td>
<td>20</td>
<td>50</td>
<td>0.6</td>
<td>400-1150</td>
<td>925</td>
<td>2.0 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP8840_TRH</td>
<td>SMT IRT</td>
<td>5.269</td>
<td>50</td>
<td>20</td>
<td>50</td>
<td>0.6</td>
<td>725-1150</td>
<td>925</td>
<td>2.0 x 10&lt;sup&gt;-13&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP9412H</td>
<td>6 mm ceramic</td>
<td>1.6</td>
<td>10</td>
<td>7</td>
<td>6</td>
<td>0.55</td>
<td>400-1150</td>
<td>925</td>
<td>8.7 x 10&lt;sup&gt;-14&lt;/sup&gt;</td>
</tr>
<tr>
<td>VTP9812FH</td>
<td>T-1¾ flat</td>
<td>1.548</td>
<td>0.7</td>
<td>10</td>
<td>18</td>
<td>0.034</td>
<td>400-700</td>
<td>580</td>
<td>-</td>
</tr>
<tr>
<td>SR10SPD 880-0.9</td>
<td>SMT</td>
<td>0.73</td>
<td>-</td>
<td>0.01</td>
<td>-</td>
<td>-</td>
<td>820-935</td>
<td>890</td>
<td>-</td>
</tr>
</tbody>
</table>

*typical characteristic curves @ 25 °C (unless otherwise noted)
## Silicon Photodiodes – VTD Series

### Product Description
The VTD series are photodiodes which have been used in many applications as replacement for competitive devices.

### Applications
- Pulse oximetry
- Automotive
- Surface mount assembly process

### Features and Benefits
- Alternate source for industry standard photodiodes
- Surface mount package available
- Available in package with integrated IR filtering
- Large area PIN available on ceramic package
- RoHs compliant

### Symbol | Industry Equivalent | Package | Active Area | Short Circuit Current | Dark Current | Junction Capacitance | Radiometric Sensitivity @ λmax | Spectral Range | Peak Wavelength | Noise Equivalent Power
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
VTD31AH | CLD31AA | Ceramic | 16.73 | 150 @ 5 mW/cm², 2850 K | 50 | 0.50 | 0.55 | 400-1150 | 860 | -
VTD34H | BPW34 | Mini dip | 7.45 | 50 @ 1000 Lux, 2850 K | 30 | 0.060 | 0.60 | 400-1100 | 900 | 4.8 x 10⁻¹⁴
VTD34FH | BPW34F | Mini dip | 7.45 | 15 @ 0.5 mW/cm², 940 nm | 30 | 0.060 | 0.60 | 725-1150 | 940 | 4.8 x 10⁻¹⁴
VTD34SMH | BPW34F | SMT | 7.45 | 50 @ 1000 Lux, 2850 K | 30 | 0.025 | 0.60 | 400-1100 | 900 | 4.8 x 10⁻¹⁴
VTD205H | SFH205 | TO-92 | 7.41 | 15 @ 0.5 mW/cm², 940 nm | 30 | 0.072 | 0.60 | 800-1100 | 925 | -
VTD205KH | SFH205K | TO-92 | 7.41 | 50 @ 1000 Lux, 2850 K | 30 | 0.072 | 0.60 | 400-1100 | 925 | -
VTD206H | SFH206 | TO-92 | 7.41 | 15 @ 0.5 mW/cm², 940 nm | 30 | 0.072 | 0.60 | 750-1100 | 925 | -
VTD206KH | SFH206K | TO-92 | 7.41 | 50 @ 1000 Lux, 2850 K | 30 | 0.072 | 0.60 | 400-1100 | 925 | -
VTH2090H | S1723-04 | Black ceramic | 84.64 | 65 @ 100 Lux | 10 | 0.070 | 0.60 | 400-1100 | 960 | -
Silicon Photodiodes – VTB Series – Ultra High Dark Resistance

Product Description
This series of P on N silicon planar photodiodes have been designed for optimum response through the visible part of the spectrum. Units with UV transmitting windows also exhibit excellent response in the UV. “B” series units have a built-in infrared rejection filter for applications requiring a response approximating the human eye. Photodiodes made with the VTB process are primarily intended to be used in photovoltaic mode but may be used with a small reverse bias. All photodiodes in this series exhibit very high shunt resistance. This characteristic leads to very low offsets when used in high gain trans-impedance op-amps circuits.

Applications
• Ambient light sensing
• UV and blue light sensing
• Flame monitoring
• Light meters
• Photometry

Features and Benefits
• UV to IR spectral range
• Integral IR rejection filters available
• Response @ 365 nm, 0.14 A/W typical
• Response @ 220 nm, 0.06 A/W typical with UV window
• 1 to 2% linearity over 7 to 9 decades
• Very low dark current
• High shunt resistance
• RoHs compliant
### Silicon Photodiodes – VTB Series – Ultra High Dark Resistance

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Package</th>
<th>Active Area</th>
<th>Short Circuit Current</th>
<th>Dark Current</th>
<th>Junction Capacitance</th>
<th>Radiometric Sensitivity</th>
<th>Spectral Range</th>
<th>Peak Wavelength</th>
<th>Noise Equivalent Power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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**Figure 1**

**Package Drawing – VTB Series – Flat Sidelooker Package**
Silicon Photodiodes – VTB Series – Ultra High Dark Resistance

Figure 2
Package Drawing – VTB Series – TO-46 Package

Figure 3
Package Drawing – VTB Series – TO-5 Package

Figure 4
Package Drawing – VTB Series – 8mm Ceramic Package

Figure 5
Package Drawing – VTB Series – TO-46 Lensed

Figure 6
Package Drawing – VTB Series – Ceramic Package

Figure 7
Package Drawing – VTB Series – TO-8 Package
Absolute Spectral Response

Radiometric Sensitivity (A/W)

Graph 1

Absolute Spectral Response “B” Series (Filtered)

Radiometric Sensitivity (A/W)

Graph 2

Relative Short Circuit Current vs. Illumination

Graph 5

Relative Current or Resistance vs. Temperature (Referred to 25°C)

Graph 3

Relative Junction Capacitance vs. Voltage (Referred to Zero Bias)

Graph 4

Rise/Fall Times – Non Standard

Graph 6
PHOTO-TRANSISTORS FOR INDUSTRIAL AND COMMERCIAL APPLICATIONS

Phototransistors – VTT Series – CR Series

Applications
- Coin counters
- Position sensors
- Remote controllers
- Ambient light sensing
- Street light switching
- Oil burner flame monitoring
- Safety shields
- Margin control-printers
- Monitor paper position and stack height

Features and Benefits
- Low cost visible and near IR photo detection
- Low dark current
- Available in package with integrated visible filtering
- Available in package with integrated IR filtering
- Available in a wide range of packages
- RoHs compliant

Product Description
Phototransistors are photodiode-amplifier combinations integrated within a single silicon chip. The phototransistor can be viewed as a photodiode whose output current is fed into the base of a conventional transistor. These photodiode-amplifier combinations are put together to overcome the major limitation of photodiodes: unity gain. The typical gain of a phototransistor can range from 100 to over 1500. Many applications demand a greater output than can be generated by a photodiode alone. Even though the signal of a photodiode can be amplified through external circuitry (operational amplifier for example) this is not always cost effective. In such cases, phototransistors provide a lower cost alternative.

CR50TE
- Surface mounting device
- Solid state ceramic chip
- High thermal conductivity
- Special type (CR50TE-DLF) with daylight filter on request

Package Drawing – VTT Series – T-1¾ Package
## Phototransistors – VTT Series – CR Series

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<th>Dark Current @ VCE = 10 V</th>
<th>Collector Breakdown @ IC = 100 µA, VCEO = 0 V</th>
<th>Emitter Breakdown @ IC = 100 µA, VCEO = 0 V</th>
<th>Saturation Voltage @ IC = 100 µA, RL = 100 Ω</th>
<th>Rise/Fall Time IC = 1.0 mA</th>
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<td>0.63</td>
<td>1.0</td>
<td>20 @ 20 V</td>
<td>100</td>
<td>30</td>
<td>6.0</td>
<td>0.40</td>
<td>5.0</td>
<td>±15</td>
</tr>
<tr>
<td>VTT1116H</td>
<td>TO-46 lensed</td>
<td>0.63</td>
<td>2.0</td>
<td>20 @ 20 V</td>
<td>100</td>
<td>30</td>
<td>4.0</td>
<td>8.0</td>
<td>±15</td>
<td>400-1050</td>
</tr>
<tr>
<td>VTT1117H</td>
<td>TO-46 lensed</td>
<td>0.63</td>
<td>4.0</td>
<td>20 @ 20 V</td>
<td>100</td>
<td>30</td>
<td>4.0</td>
<td>8.0</td>
<td>±15</td>
<td>400-1050</td>
</tr>
<tr>
<td>VTT9812FH</td>
<td>Ceramic SMD (A2)</td>
<td>0.18</td>
<td>0.10</td>
<td>0.3 @ IC = 2 mA</td>
<td>0.10</td>
<td>0.3</td>
<td>0.10</td>
<td>0.3</td>
<td>±56</td>
<td>450-700</td>
</tr>
</tbody>
</table>

### Figures

**Figure 2**

Package Drawing – VTT Series – T-1 Package

**Figure 3**

Package Drawing – VTT Series – TO-46 Package
Infrared Switches – VTR – VTL Series

Applications
- Coin counters
- Paper-presence detection in copiers and printers
- Toner density control in copiers and printers
- Object sensing
- Distance detection
- Position sensing
- Rotational speed

Features and Benefits
- Fully integrated emitter and detector assembly
- Contains no mechanical parts to wear-out
- Provides non-contact object sensing
- Low power consumption
- Small size
- Low cost
- RoHs compliant

Product Description
PerkinElmer’s optoswitches are ideal for non-contact sensing applications. They consist of an emitter and a detector integrated in a plastic housing. The emitter is an IR LED while the detector is either a phototransistor or a photodarlington. These optoswitches are available either in transmissive or reflective configuration.

Product Table

### VTR Series Reflective Optoswitch

<table>
<thead>
<tr>
<th>Symbol, Unit</th>
<th>Test Conditions</th>
<th>Output Element Detector Device</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VTR16D1H</td>
<td>0.3 mA, 0.5 mA, 5 V, 2.5 mm</td>
</tr>
<tr>
<td></td>
<td>VTR17D1H</td>
<td>0.3 mA, 0.5 mA, 5 V, 2.5 mm</td>
</tr>
<tr>
<td></td>
<td>VTR24F1H</td>
<td>6.0 mA, 0.15 mA, 50.8 mm</td>
</tr>
</tbody>
</table>

### VTL11D Series Transmissive Optoswitch

<table>
<thead>
<tr>
<th>Symbol, Unit</th>
<th>Test Conditions</th>
<th>Test Conditions</th>
<th>Aperture Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VTL11D1H</td>
<td>0.5 mA, 0.15 mA, 5 V, 200</td>
<td>Emitter: None, Detector: None</td>
</tr>
<tr>
<td></td>
<td>VTL11D2H</td>
<td>0.6 mA, 0.15 mA, 200</td>
<td>Emitter: None, Detector: None</td>
</tr>
<tr>
<td></td>
<td>VTL11D3H</td>
<td>2 mA, 0.15 mA, 200</td>
<td>Emitter: None, Detector: None</td>
</tr>
<tr>
<td></td>
<td>VTL11D4H</td>
<td>2.5 mA, 0.25 mA, 200</td>
<td>Emitter: None, Detector: None</td>
</tr>
</tbody>
</table>

### VTL23DxA Series Transmissive Optoswitch

<table>
<thead>
<tr>
<th>Symbol, Unit</th>
<th>Test Conditions</th>
<th>Test Conditions</th>
<th>Aperture Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VTL23D0A21H</td>
<td>0.2 mA, 0.2 mA, 200</td>
<td>Emitter: 0.50 mm, Detector: 0.25 mm</td>
</tr>
<tr>
<td></td>
<td>VTL23D0A22H</td>
<td>0.2 mA, 0.2 mA, 200</td>
<td>Emitter: 0.50 mm, Detector: 0.25 mm</td>
</tr>
<tr>
<td></td>
<td>VTL23D1A00H</td>
<td>0.5 mA, 0.4 mA, 200</td>
<td>Emitter: 1.0 mm, Detector: 1.0 mm</td>
</tr>
<tr>
<td></td>
<td>VTL23D1A02H</td>
<td>0.5 mA, 0.4 mA, 200</td>
<td>Emitter: 1.0 mm, Detector: 1.0 mm</td>
</tr>
<tr>
<td></td>
<td>VTL23D2A00H</td>
<td>2.5 mA, 0.4 mA, 200</td>
<td>Emitter: 1.0 mm, Detector: 1.0 mm</td>
</tr>
<tr>
<td></td>
<td>VTL23D3A00H</td>
<td>1.0 mA, 0.8 mA, 200</td>
<td>Emitter: 1.0 mm, Detector: 1.0 mm</td>
</tr>
</tbody>
</table>
**Product Description**

Pulsed semiconductor lasers in the near IR are commonly used for long distance time-of-flight or phase-shift range finder systems. PerkinElmer offers a broad range of suited pulsed 905 nm lasers. Lasers designs include multi cavity monolithic structures with up to 4 active areas per chip resulting in up to 100 W of peak optical output power. Physical stacking of laser chips resulting in up to 300 W of peak optical output power. Chip on board assemblies are available for hybrid integration. A selection of 6 metal, hermetically sealed package types are available for harsh environment applications. A molded epoxy resin TO-18 type package is available for high-volume applications.

Critical parameters are pulse-width and rise/fall times. The pulse width may be reduced allowing for increased current drive and resulting in higher peak optical power. Quantum well laser design offers rise and fall times of < 1 ns however the drive circuit lay out and package inductance play the greater role and should be designed accordingly. PerkinElmer offers a variety of package types with different inductive values to assist to this end.

Our core competencies include: MOVPE wafer growth; wafer processing of the grown GaAs wafers; assembly using either epoxy or solder die attach; epoxy encapsulation of lasers mounted on lead frame; hermetically sealer product qualification to MIL STD and custom requirements.

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**PGA Pulsed Laser Family Selection Table, Typ. Wavelength 905 nm, 5 mm Spectral Width**

<table>
<thead>
<tr>
<th>Device Code</th>
<th>Description</th>
<th># of Chips</th>
<th>Total # of Emitting Stripes</th>
<th>Emitting Area Width µm</th>
<th>Height µm</th>
<th>Typical Peak Power at 10A, 100 ns W</th>
<th>Typical Peak Power at 30A, 100 ns W</th>
<th>Beam Spread Parallel to Junction (FWHM) °</th>
<th>Beam Spread Perpendicular to Junction (FWHM) °</th>
<th>Typical Temperature Coefficient nm/°C</th>
<th>Preferred Packages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pgaex1s03h</td>
<td>Pgaex1s09h</td>
<td>1</td>
<td>1</td>
<td>75</td>
<td>1</td>
<td>8w</td>
<td>30w</td>
<td>10</td>
<td>10</td>
<td>0.25</td>
<td>✓</td>
</tr>
<tr>
<td>Dpgae1s03h</td>
<td>Dpgae1s09h</td>
<td>1</td>
<td>2</td>
<td>75</td>
<td>5</td>
<td>15w</td>
<td>50w</td>
<td>10</td>
<td>10</td>
<td>0.25</td>
<td>✓</td>
</tr>
<tr>
<td>Tpgaex1s03h</td>
<td>Tpgaex1s09h</td>
<td>1</td>
<td>3</td>
<td>75</td>
<td>10</td>
<td>23w</td>
<td>75w</td>
<td>10</td>
<td>10</td>
<td>0.25</td>
<td>✓</td>
</tr>
<tr>
<td>Qpgaex1s03h</td>
<td>Qpgaex1s09h</td>
<td>1</td>
<td>4</td>
<td>75</td>
<td>15</td>
<td>33w</td>
<td>100w</td>
<td>10</td>
<td>10</td>
<td>0.25</td>
<td>✓</td>
</tr>
</tbody>
</table>

---

**Applications**

- Range finders
- Safety light curtains
- Adaptive cruise control
- Laser therapy

**Features and Benefits**

- Multi cavity lasers concentrate emitting source size
- Quantum well structure
- High peak pulsed power into aperture
- Excellent power stability with temperature
Peak Radiant Intensity vs. Temperature

Graph 1

Radiant Intensity vs. F Number

Graph 2

Relative Radiant Intensity (%)

Temperature (Degrees)

Relative Radiant Intensity (%)

F Number

Graph 3

Spectral Plot Distribution

Graph 4

Relative Radiant Intensity (%)

Wavelength (nm)

Relative Radiant Intensity (%)

Pulse Width at FWHM (ns)

Graph 5

Safe Operation Region (Plastic Encaps.)

Graph 6

Center Wavelength vs. Temperature

Relative Radiant Intensity (%)

Center Wavelength (nm)

Safe operating region

Safe operating region

QP6EW currently being verified.

Figure 1

Package Drawing

Pin out
1. LD Anode (+),
2. LD Cathode (-) Case,
Inductance 5.2 nH

Package S (TO-18)
Pulsed Laser Diodes – PGA – PGEW Series

Figure 2
Package W (TO-18 Plastic)

Pin out
1. LD Anode (+),
2. LD Cathode (-),
3. Inductance 5.0 nH

Figure 3
Housing / Package Drawing • Laser Chip on Board

Pin out
1. LD Cathode (-) chip bottom,
2. LD Anode (+) chip top,
3. Inductance 1.6 nH

Figure 4
Package Drawing

Pin out
1. LD Anode (+),
2. LD Cathode (-) Case,
3. Inductance 12 nH

Figure 5
Package Drawing

Pin out
1. LD Anode (+),
2. NC,
3. LD Cathode (-) Case,
4. Inductance 6.8 nH

Figure 6
Housing / Package Drawing • TO-18 “W” Plastic Package (1S Devices Only)

Pin out
1. (Fig Flat)
LD Anode (+),
2. LD Cathode (-),
Inductance 5.0 nH
Product Description

IREDs are solid state light sources emitting in the near infrared part of the spectrum. The emission wavelength is closely matched to the response peak of silicon photodiodes and phototransistors. The product line provides a broad range of mounting lens and power output options. Both end and side radiating cases are available. Wide arrays of emission beam profiles are available. Devices may be operated in either CW or pulsed operating modes.

IREDs can be combined with PerkinElmer detectors or phototransistors in integrated assemblies for optoisolators, optical switches and retro sensors. Optical isolators are useful when electrical isolation is required, for example to transmit control logic signals to high power switching circuits (which can be noisy). In an optical switch an object is detected when it passes between the IRED and detector/phototransistor, for example a coin counter. In a retro sensor an object is detected when the IRED emitted beam is reflected onto the detector/photodetector. The retro sensor is used in applications where the object changes the reflectance, for example detecting the end of a plywood sheet or other manufactured material.

Our core competencies include: LPE wafer growth; wafer processing of the grown GaAs wafers; assembly using either epoxy die attach; epoxy encapsulation of the IRED LEDs on lead frame; hermetically sealed package.
Infrared Emitting Diodes (IREDS) – VTE

**Figure 1**

**On Axis Rel. Irradiance T-1/Lateral Packages**

- Graph 1: On Axis Relative Irradiance
  - Detector – Emitter Spacing (mm)
  - Relative Output (%)
  - VTE108X - VTE2181 / VTE2185 - VTE116X

**Figure 2**

**Housing / Package Drawing – VTE1291**

- VTE1291H
- Narrow beam angle T-1¾ bullet package

**Figure 3**

**Housing / Package Drawing – VTE7172**

- VTE7172H
- Molded lateral package

**Housing / Package Drawing – VTE1113H**

- VTE1113H
- TO-46 lensed cap