LED

Rich variety of light emitters for wide range of applications

- Surface mount type LED L12509-0155G
- Surface mount type LED with lens L14096-0085GL
- Mid infrared LED L15893-0330M

HAMAMATSU PHOTONICS K.K.
LEDs are opto-semiconductors that convert electrical energy into light energy. LEDs offer the advantages of low cost and a long service life compared to laser diodes (LDs).

LEDs are grouped into visible LEDs and invisible LEDs. Visible LEDs are mainly used for display or illumination, where LEDs are used individually. Invisible LEDs, however, are mainly used with photosensors such as photodiodes or CMOS image sensors.

Hamamatsu provides various LEDs from red to mid infrared range, which are mainly used in combination with photosensors. Based on crystal growth technology and process technology supporting numerous compound semiconductor materials, we provide a product lineup that covers various wavelengths. The products feature high quality and high reliability backed by strictly controlled assembly process and inspection process.
### Features of Hamamatsu LEDs

#### Product lineup that covers a wide variety of wavelengths

<table>
<thead>
<tr>
<th>Product</th>
<th>Peak emission wavelength</th>
<th>Main applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red LED</td>
<td>650 to 700 nm</td>
<td>Optical switch, PDF data communication, barcode reader</td>
</tr>
<tr>
<td>Near infrared LED</td>
<td>830 to 945 nm</td>
<td>Optical encoder, optical communication (optical fiber communication, FSO), optical switch</td>
</tr>
<tr>
<td></td>
<td>1.2 to 1.55 μm</td>
<td>Moisture measurement, analysis, near infrared lighting</td>
</tr>
<tr>
<td>Mid infrared LED</td>
<td>3.3 to 4.3 μm</td>
<td>Gas detection</td>
</tr>
</tbody>
</table>

#### Wide variety of packages

<table>
<thead>
<tr>
<th>Package type</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal</td>
<td>High reliability</td>
</tr>
<tr>
<td>Plastic</td>
<td>Low cost</td>
</tr>
<tr>
<td>Surface mount type</td>
<td>Compact, thin case</td>
</tr>
<tr>
<td>With lens</td>
<td>Narrow directivity</td>
</tr>
<tr>
<td>For high output</td>
<td>High heat radiation</td>
</tr>
</tbody>
</table>

#### Custom devices available

In addition to packaging, lens design, and multi-element design, custom specifications such as wavelength changes that require new epitaxial wafer crystal growth are also available.

- Thin-film crystal growth under ultra-high vacuum in MBE equipment
- Thin-film crystal growth with MOCVD equipment
Hamamatsu Photonics offers various packages of LEDs that support different wavelengths and light outputs.

**Wide-ranging product lineup**

<table>
<thead>
<tr>
<th>Wavelength (nm)</th>
<th>Radiant flux (mW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>0.1</td>
</tr>
<tr>
<td>800</td>
<td>1</td>
</tr>
<tr>
<td>1000</td>
<td>10</td>
</tr>
<tr>
<td>2500</td>
<td>100</td>
</tr>
<tr>
<td>4500</td>
<td>4500</td>
</tr>
</tbody>
</table>

**Applicable photosensor**

- Si photodiode
- InGaAs PIN photodiode
- InAsSb photovoltaic detector

Note: For details on directivity, see pages 9 and 10.
Application examples

**VICS**

Light emitting/receiving modules with built-in LEDs and a photosensor are embedded in VICS (Vehicle Information and Communication System) in-vehicle devices.

**Optical communication**

LEDs are used for POF (plastic optical fiber) communications and FSO (free space optics).

**Skin moisture measurement**

Compact near infrared LEDs are used for measuring skin moisture levels.

**Encoders**

Optical transmission encoders require a collimated LED to achieve high accuracy.

**Lighting for infrared cameras**

Infrared LEDs with large output are used as light sources for infrared camera imaging. These LEDs are arranged around the camera.

**Gas detection**

Mid infrared LEDs are used for CO2 density measurements in plant factories.
**Selection guide**

Red LEDs have a peak emission wavelength in the 660 to 700 nm range. They are used in a wide range of applications including optical switches, POF data communication, and barcode readers. Various types are available including a type with a reflector (cavity) on the metal base to increase the irradiance, a type with lens featuring narrow directivity, and a type that can irradiate over a wide range without a reflector.

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Peak emission wavelength (nm)</th>
<th>Spectral half width (nm)</th>
<th>Emission area (mm)</th>
<th>Radiant flux (mW)</th>
<th>Forward voltage (V)</th>
<th>Cutoff frequency (MHz)</th>
<th>Measurement condition</th>
<th>Photo</th>
<th>Directivity</th>
<th>Features</th>
<th>Application examples</th>
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</thead>
<tbody>
<tr>
<td>L10762</td>
<td>660</td>
<td>15</td>
<td>φ0.4</td>
<td>1.0*</td>
<td>1.9</td>
<td>70</td>
<td></td>
<td>8</td>
<td>High fiber end output</td>
<td>POF data communication</td>
<td></td>
</tr>
<tr>
<td>L11767</td>
<td>18</td>
<td>18</td>
<td>0.31</td>
<td>13</td>
<td>2.1</td>
<td>6</td>
<td>20</td>
<td>1</td>
<td>High output, wide directivity</td>
<td>Optical switches</td>
<td></td>
</tr>
<tr>
<td>L11767-0066L</td>
<td></td>
<td>4.65</td>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>High reliability, narrow directivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L6108</td>
<td>670</td>
<td>25</td>
<td>0.25</td>
<td>5.5</td>
<td>1.8</td>
<td>5</td>
<td>20</td>
<td>1</td>
<td>High output, wide directivity</td>
<td>Optical switches</td>
<td></td>
</tr>
<tr>
<td>L6112</td>
<td>670</td>
<td>25</td>
<td>1.15</td>
<td></td>
<td>2.5</td>
<td>5</td>
<td>20</td>
<td>2</td>
<td>High output</td>
<td></td>
<td>Optical switches</td>
</tr>
<tr>
<td>L6112-01</td>
<td></td>
<td>4.65</td>
<td></td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
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<td>High reliability, narrow directivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L6112-02</td>
<td></td>
<td>1.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>L10363</td>
<td>700</td>
<td>20</td>
<td>4.65</td>
<td>1.4</td>
<td>1.7</td>
<td>5</td>
<td>20</td>
<td>5</td>
<td>High reliability, narrow directivity</td>
<td>Optical switches</td>
<td></td>
</tr>
</tbody>
</table>

*1: POF core diameter=ϕ1 mm, length=1 m, Z (distance between the cap surface and the fiber end)=0.3 mm
These near infrared LEDs have a peak emission wavelength in the 830 to 945 nm range. They are used in a wide range of applications including optical switches, optical fiber communication, FSO, optical rangefinders, near infrared lighting, and encoders. A wide product lineup (high output, high-speed response, superior collimation, current confinement type with mini light spot, high reliability type for in-vehicle applications, etc.) is available.

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Peak emission wavelength (nm)</th>
<th>Spectral half width (nm)</th>
<th>Emission area (mm)</th>
<th>Radiant flux (mW)</th>
<th>Forward voltage (V)</th>
<th>Cutoff frequency (MHz)</th>
<th>Measurement condition</th>
<th>Directivity (P9, 10)</th>
<th>Features</th>
<th>Application examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>L14336-0083R</td>
<td>830</td>
<td>40</td>
<td>φ0.75</td>
<td>16</td>
<td>1.5</td>
<td>20</td>
<td>50</td>
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<td>② High output</td>
<td>Optical switches</td>
</tr>
<tr>
<td>L11913</td>
<td>25</td>
<td>4.65</td>
<td>3.4</td>
<td>1.45</td>
<td>20</td>
<td>50</td>
<td>☀️</td>
<td>⑥ High reliability, superior collimation</td>
<td>Encoders</td>
<td></td>
</tr>
<tr>
<td>L13141-0085K</td>
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<td>2.8</td>
<td>1.7</td>
<td>25</td>
<td>50</td>
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<td>⑦ Wide directivity, current confinement type</td>
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<td>L13142-0085K</td>
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<td>3</td>
<td>1.7</td>
<td>25</td>
<td>50</td>
<td>☀️</td>
<td>⑧ Narrow directivity, current confinement type</td>
<td>Optical switches</td>
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<td>3</td>
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<td>☀️</td>
<td>⑥ Narrow directivity, current confinement type</td>
<td>Optical switches</td>
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<tr>
<td>L13814-0085K</td>
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<td>0.05</td>
<td>2</td>
<td>1.9</td>
<td>25</td>
<td>50</td>
<td>☀️</td>
<td>⑦ Current confinement type, mini light spot</td>
<td>Optical switches</td>
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</tr>
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<td>L14096-0085GL</td>
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<td>1.4</td>
<td>23</td>
<td>1.9</td>
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<td>⑤ High output, narrow directivity</td>
<td>Optical switches</td>
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<tr>
<td>L14337-0085R</td>
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<td>0.75</td>
<td>13</td>
<td>1.5</td>
<td>25</td>
<td>50</td>
<td>☀️</td>
<td>② High output, high-speed response</td>
<td>Optical switches</td>
<td></td>
</tr>
<tr>
<td>L8013</td>
<td>☀️1.15</td>
<td>45 μW</td>
<td>1.45</td>
<td>20</td>
<td>50</td>
<td>☀️</td>
<td>⑦ Easy fiber alignment</td>
<td>POF data communication</td>
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<tr>
<td>L9337</td>
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<td>23</td>
<td>1.42</td>
<td>40</td>
<td>50</td>
<td>☀️</td>
<td>② High output</td>
<td>Optical switches</td>
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<td></td>
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<td>L9337-01</td>
<td>☀️4.65</td>
<td>13</td>
<td>1.42</td>
<td>40</td>
<td>50</td>
<td>☀️</td>
<td>⑤ High reliability, narrow directivity</td>
<td>Optical switches</td>
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<td>L9337-02</td>
<td>☀️0.75</td>
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<td>1.42</td>
<td>40</td>
<td>50</td>
<td>☀️</td>
<td>③ High reliability, wide directivity</td>
<td>Optical switches</td>
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<td></td>
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<td>L9437</td>
<td>☀️4.65</td>
<td>1.6</td>
<td>1.5</td>
<td>30</td>
<td>50</td>
<td>☀️</td>
<td>⑥ High reliability, superior collimation</td>
<td>Encoders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L9725-01</td>
<td>☀️2.4</td>
<td>13</td>
<td>1.45</td>
<td>40</td>
<td>50</td>
<td>☀️</td>
<td>④ High output, surface mount type</td>
<td>In-vehicle</td>
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<tr>
<td>L10843</td>
<td>☀️0.39</td>
<td>23</td>
<td>1.45</td>
<td>50</td>
<td>50</td>
<td>☀️</td>
<td>① High output, wide directivity</td>
<td>Optical switches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L11368-01</td>
<td>☀️1.7</td>
<td>65 μW</td>
<td>1.45</td>
<td>50</td>
<td>50</td>
<td>☀️</td>
<td>④ Current confinement type</td>
<td>Optical communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L12170</td>
<td>☀️5.0</td>
<td>80</td>
<td>1.45</td>
<td>40</td>
<td>200</td>
<td>☀️</td>
<td>⑨ Large current, high output, narrow directivity</td>
<td>Near infrared lighting</td>
<td></td>
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</tr>
<tr>
<td>L12171-0087G</td>
<td>45</td>
<td>0.24</td>
<td>18</td>
<td>1.55</td>
<td>40</td>
<td>3000</td>
<td>☀️</td>
<td>⑩ Surface mount type, compact</td>
<td>Optical switches</td>
<td></td>
</tr>
<tr>
<td>L12756</td>
<td>☀️3.0</td>
<td>23</td>
<td>1.5</td>
<td>15</td>
<td>40</td>
<td>☀️</td>
<td>⑩ High output, narrow directivity</td>
<td>Near infrared lighting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L14097-0094GL</td>
<td>940</td>
<td>40</td>
<td>φ1.4</td>
<td>60</td>
<td>2.5</td>
<td>10</td>
<td>50</td>
<td>☀️</td>
<td>⑩ Large current, High output</td>
<td>Near infrared lighting</td>
</tr>
<tr>
<td>L9338</td>
<td>945</td>
<td>60</td>
<td>φ0.75</td>
<td>15</td>
<td>1.34</td>
<td>10</td>
<td>50</td>
<td>☀️</td>
<td>② High output</td>
<td>Optical switches</td>
</tr>
<tr>
<td>L9726</td>
<td>☀️2.4</td>
<td>13</td>
<td>1.35</td>
<td>50</td>
<td>50</td>
<td>☀️</td>
<td>① High output, surface mount type</td>
<td>In-vehicle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*2: light output  *3: PCF200 fiber end output  *4: GI50 fiber end output  *5: Pulse value=10 μs, duty ratio=1%
### Near infrared LED (1.2 to 1.55 μm)

These high output near infrared LEDs have a peak emission wavelength at 1 μm or higher. 1.2 μm, 1.3 μm, 1.45 μm, and 1.55 μm peak emission wavelength types are available. They are used for moisture measurements, analysis, near infrared lighting, and so on. Various packages (metal package, with lens, bullet-shaped) are available.

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Peak emission wavelength (nm)</th>
<th>Spectral half width (nm)</th>
<th>Emission area (mm)</th>
<th>Radiant flux (mW)</th>
<th>Forward voltage (V)</th>
<th>Cutoff frequency (MHz)</th>
<th>Measurement condition</th>
<th>Photo</th>
<th>Directivity (P.9, 10)</th>
<th>Features</th>
<th>Application examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>L13072-0120K</td>
<td>1200</td>
<td>80</td>
<td>φ1.15</td>
<td>2.2</td>
<td>1.1</td>
<td>15</td>
<td>50</td>
<td></td>
<td></td>
<td>High reliability, high output</td>
<td>Analysis, near infrared lighting</td>
</tr>
<tr>
<td>L13072-0120L</td>
<td>1200</td>
<td>80</td>
<td>φ4.65</td>
<td>3.2</td>
<td>1.1</td>
<td>15</td>
<td>50</td>
<td></td>
<td></td>
<td>High output, narrow directivity</td>
<td></td>
</tr>
<tr>
<td>L13072-0120P</td>
<td>1300</td>
<td>90</td>
<td>φ3.0</td>
<td>5</td>
<td>1</td>
<td>15</td>
<td>50</td>
<td></td>
<td></td>
<td>High reliability, high output</td>
<td>Analysis, near infrared lighting</td>
</tr>
<tr>
<td>L12771</td>
<td>1300</td>
<td>90</td>
<td>φ1.15</td>
<td>2.8</td>
<td>1</td>
<td>15</td>
<td>50</td>
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<td>High reliability, high output</td>
<td>Analysis, near infrared lighting</td>
</tr>
<tr>
<td>L12771-01</td>
<td>1300</td>
<td>90</td>
<td>φ4.65</td>
<td>3.1</td>
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<td></td>
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<td>High output</td>
<td></td>
</tr>
<tr>
<td>L10660</td>
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<td>120</td>
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<td>2.4</td>
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<td>15</td>
<td>50</td>
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<td></td>
<td>High reliability</td>
<td></td>
</tr>
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<td>L10660-01</td>
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<td>120</td>
<td>φ4.65</td>
<td>2.8</td>
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<td></td>
<td>High reliability</td>
<td>Moisture measurement, near infrared lighting</td>
</tr>
<tr>
<td>L13895-0145P</td>
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<td>120</td>
<td>φ3.0</td>
<td>5</td>
<td>0.9</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td>High output</td>
<td></td>
</tr>
<tr>
<td>L13895-0145G</td>
<td>1550</td>
<td>120</td>
<td>φ0.31</td>
<td>4</td>
<td>0.9</td>
<td>10</td>
<td>10</td>
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<td></td>
<td>Surface mount type, compact</td>
<td></td>
</tr>
<tr>
<td>L12509-0155K</td>
<td>1550</td>
<td>120</td>
<td>φ1.15</td>
<td>1.9</td>
<td>0.8</td>
<td>15</td>
<td>50</td>
<td></td>
<td></td>
<td>High reliability, high output</td>
<td>Analysis, near infrared lighting</td>
</tr>
<tr>
<td>L12509-0155L</td>
<td>1550</td>
<td>120</td>
<td>φ4.65</td>
<td>2.7</td>
<td></td>
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<td>1550</td>
<td>120</td>
<td>φ3.0</td>
<td>3.8</td>
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<td></td>
<td>High output</td>
<td></td>
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<tr>
<td>L12509-0155G</td>
<td>1550</td>
<td>120</td>
<td>φ0.31</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Surface mount type, compact</td>
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</table>
**Mid infrared LED**

Mid infrared LEDs with peak emission wavelengths in the middle infrared region (3.3 μm, 3.9 μm, 4.3 μm) feature high output and are used for gas detection. They are used in combination with quantum type detectors such as InAsSb photovoltaic detectors.

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Peak emission wavelength (nm)</th>
<th>Spectral half width (nm)</th>
<th>Emission area (mm)</th>
<th>Radiant flux (mW)</th>
<th>Forward voltage (V)</th>
<th>Rise time max. (μs)</th>
<th>Measurement condition</th>
<th>Photo</th>
<th>Directivity (P9, 10)</th>
<th>Features</th>
<th>Application examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>L15893-0330M</td>
<td>3300</td>
<td>400</td>
<td>0.67 × 0.77</td>
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<td>2.7</td>
<td>80</td>
<td>QCW mode</td>
<td>80</td>
<td>1</td>
<td>High output</td>
<td>Methane detection</td>
</tr>
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<td>L13771-0330C</td>
<td>300</td>
<td>100</td>
<td>0.25</td>
<td>2.1</td>
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<td>50</td>
<td></td>
<td>50</td>
<td></td>
<td>High output</td>
<td>Reference light source for gas detection</td>
</tr>
<tr>
<td>L15894-0390M</td>
<td>3900</td>
<td>600</td>
<td>0.67 × 0.77</td>
<td>1.7</td>
<td>2.2</td>
<td>80</td>
<td></td>
<td>80</td>
<td>1</td>
<td>High output</td>
<td>Methane detection</td>
</tr>
<tr>
<td>L13454-0390C</td>
<td>500</td>
<td>100</td>
<td>0.2</td>
<td>1.7</td>
<td></td>
<td>50</td>
<td></td>
<td>50</td>
<td></td>
<td>High output</td>
<td>CO₂ detection</td>
</tr>
<tr>
<td>L15895-0430M</td>
<td>4300</td>
<td>1000</td>
<td>0.67 × 0.77</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td>High output</td>
<td></td>
</tr>
<tr>
<td>L13201-0430C</td>
<td>700</td>
<td>1000</td>
<td>0.2</td>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
<td>700</td>
<td></td>
<td>High output</td>
<td></td>
</tr>
</tbody>
</table>

**LED array (2-chip type)**

This LED array incorporates a 670 nm red LED chip and an 870 nm near infrared LED chip. It is provided in a surface mount type, compact package (3.5 × 2.8 × 1.8 mm) and is suitable for optical switch light sources.

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Peak emission wavelength (nm)</th>
<th>Spectral half width (nm)</th>
<th>Radiant flux (mW)</th>
<th>Forward voltage (V)</th>
<th>Cutoff frequency (MHz)</th>
<th>Measurement condition</th>
<th>Photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>L10922</td>
<td>670</td>
<td>25</td>
<td>4</td>
<td>1.8</td>
<td>3</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>870</td>
<td>45</td>
<td>18</td>
<td>1.47</td>
<td>40</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

**Light emitting/receiving module**

This VICS in-vehicle module employs six 870 nm LED chips and one Si photodiode in a plastic package.

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Peak emission wavelength (nm)</th>
<th>Spectral half width (nm)</th>
<th>Pulse radiant intensity*¹ (mW/sr)</th>
<th>Pulse forward voltage*¹ (V)</th>
<th>Cutoff frequency (MHz)</th>
<th>Measurement condition</th>
<th>Photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>P12793</td>
<td>870*²</td>
<td>45*²</td>
<td>1550</td>
<td>6.7</td>
<td>15</td>
<td>900</td>
<td></td>
</tr>
</tbody>
</table>

*¹: 64 kHz, duty ratio=50%, 4 ms ON, average peak value during pulse operation  
*²: Ir=100 mA

**SIP type LED**

These LEDs are provided in a compact, plastic package with the LED chip molded in transparent resin and with a lens.

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Peak emission wavelength (nm)</th>
<th>Spectral half width (nm)</th>
<th>Radiant flux (mW)</th>
<th>Forward voltage (V)</th>
<th>Measurement condition</th>
<th>Features</th>
<th>Photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>L10881</td>
<td>650</td>
<td>25 max.</td>
<td>-4.5 dBm³</td>
<td>1.9</td>
<td>20</td>
<td>High output for 156 Mbps optical link</td>
<td></td>
</tr>
<tr>
<td>L5276</td>
<td>880</td>
<td>50</td>
<td>2.2</td>
<td>1.3</td>
<td>20</td>
<td>For optical switches</td>
<td></td>
</tr>
<tr>
<td>L6286</td>
<td>940</td>
<td>45</td>
<td>0.8*⁴</td>
<td>1.25</td>
<td>20</td>
<td>For encoders</td>
<td></td>
</tr>
<tr>
<td>L6895-10</td>
<td>940</td>
<td>60</td>
<td>1.2*⁴</td>
<td>1.25</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*³: fiber coupled optical power  
*⁴: minimum value
Directivity (typical examples)

The directivities of the representative products for each type of package are provided below. The directivity may vary to some degree between individual products. For the directivity of individual products, refer to the datasheet.

1. Resin potted type (no reflector)

   ![Resin potted type (no reflector)](image1)

2. Resin potted type (with reflector)

   ![Resin potted type (with reflector)](image2)

3. Flat cap

   ![Flat cap](image3)

4. With mini lens

   ![With mini lens](image4)

5. With lens

   ![With lens](image5)

6. With lens (high collimation)

   ![With lens (high collimation)](image6)

7. Low-profile flat cap

   ![Low-profile flat cap](image7)

8. With ball lens

   ![With ball lens](image8)
Plastic package

Bullet-shaped (ϕ5 mm)

Bullet-shaped (ϕ3 mm)

Surface mount type

COB (chip-on-board)

COB with lens

COB with lens (high output)

Premolded type

Ceramic type

(Typ. Ta=25 °C)

(Typ. Ta=25 °C)

(Typ. Ta=25 °C, distance between LED and photodiode: 3 cm)
Opto-semiconductors
- Si photodiodes
- APD
- MPPC
- Photo IC
- Image sensors
- PSD
- Infrared detectors
- LED
- Optical communication devices
- Automotive devices
- X-ray flat panel sensors
- Mini-spectrometers
- Opto-semiconductor modules

Electron Tubes
- Photomultiplier tubes
- Photomultiplier tube modules
- Microchannel plates
- Image intensifiers
- Xenon lamps / Mercury-xenon lamps
- Deuterium lamps
- Light source applied products
- Laser applied products
- Microfocus X-ray sources
- X-ray imaging devices

Imaging and Processing Systems
- Cameras / Image processing measuring systems
- X-ray products
- Life science systems
- Medical systems
- Semiconductor failure analysis systems
- FPD / LED characteristic evaluation systems
- Spectroscopic and optical measurement systems

Laser Products
- Semiconductor lasers
- Applied products of semiconductor lasers
- Solid state lasers

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