Active Components
Product Guide

Laser and Detectors for Communication and Sensing Applications
With over 100 million optical products operating in the world today, Finisar is the leading supplier of active devices for data and telecommunications systems. The uniquely vertically integrated infrastructure, which incorporates both on and off-shore design and manufacturing sites, enables Finisar to provide the best value with the lowest total cost for the optical sensing markets.

Finisar has an unmatched reputation in the industry for:

- Field Proven Reliability
- Excellent On Time Delivery
- Custom and Standard Products
- Globally Integrated Design and Manufacturing
- High Volume Manufacturing
- RoHS Compliance for all Products
- Global Sales Team
- Extensive Patent Protection

**Multimode VCSELs**

Multimode VCSELs are the workhorse of most short reach optical communication networks today. This VCSEL is preferred in applications concerned with optical power, high efficiency and narrow beam divergence. This is arguably the most reliable laser ever produced. Custom devices can operate at temperatures in excess of 150°C and emit power in excess of 200mW.

**Singlemode VCSELs**

Singlemode VCSELs are the ideal source when perfect Gaussian beam shape is required. The emission is at a single optical wavelength making it well suited for applications in gas and chemical sensing and coherent encoders. Specific wavelengths can be targeted from 700nm to 1000nm.

**Fabry-Perot Edge Emitting Lasers**

FP lasers are a popular choice for medium distance optical interconnects on single mode optical fiber. The proprietary InGaAlAs ridge waveguide structure offers both high optical power and a broad operating temperature range. These lasers are ideal for use in night vision illumination.

**Distributed Feedback Lasers**

DFB lasers offer the combination of single optical emission wavelength and high optical power. The lasers can be targeted at wavelengths ranging from 1200nm to 1600nm, and are an attractive source for some gas and chemical sensing applications.

Finisar manufactures GaAs based devices in its own state-of-the-art facility in Allen, TX, while InP based devices are manufactured in its own world class facility in Fremont, CA. In addition to capabilities in the U.S., Finisar maintains a vertically integrated global presence with packaging of its optical components at internal factories in Ipoh, Malaysia and Shanghai, China.
Reflective Sensors
When combined with a phototransistor, Finisar’s 850nm VCSELs make the ideal reflective sensor for industrial and consumer applications. These VCSELs are available in a surface mount or lensed hermetic package.

The dome lensed reflective sensor (HVS6003-001) has a SNR of >20dB, while the small scale surface mount package (HVS6003-002) with daylight filtering is ideal for PCB mounted systems. In printer applications such as printed line detection (left figure) and edge detection (right figure), these sensors offer greater resolution, sensing distance and speed over LEDs while operating at lower power.

Absorption, Transmission, and Scattering Sensors
Multimode lasers are particularly effective at measuring scattering in applications such as turbidity sensors which are used in many modern appliances and water purification systems. Polarization and coherence of the laser provide even more information (e.g. particulate size) increasing the application functionality.

Single frequency lasers such as Finisar’s VCSELs and DFBs are ideal optical sources to measure the presence of certain chemicals and gases. For example, VCSELs can be made to emit at 763nm, an absorption wavelength for Oxygen molecules. The ability to sense the presence and amount of Oxygen is important in medical applications such as respiratory monitoring, as well as insuring an inert atmosphere to prevent combustion of materials such as jet engine fuel.

One example of a wavelength sensor is the acetylene cell manufactured at Finisar’s Shanghai location. The cell is used as a wavelength calibration standard for fiber optic systems. A typical absorption spectrum of the acetylene cell is shown in the figure below.
High Power Lasers
Densely packed VCSEL arrays can be made to emit extremely high optical powers, well in excess of 200mW at very high efficiencies. Pulsing a VCSEL with short electrical pulses allows for much higher optical power emission, up to 10 times the DC limits.

High Temperature
By developing devices with an extended $T_0$ point, Finisar is able to offer VCSELs for high temperature applications. With excellent performance and reliability above 150°C these VCSELs are ideal for sensors in harsh environments.

Velocity Sensing
Finisar has developed a unique VCSEL and Integrated Photodiode structure (VIP) that is ideal for laser self mixing and laser Doppler measurement devices. The laser is optimized for sensitivity to feedback, and because the photodiode is located under the VCSEL, it is automatically shielded from ambient light noise. These devices are useful in measuring velocity in applications such as thread and paper speed.

Products and Features In Development
- 780nm VCSEL
- 980nm VCSEL
- Integrated lens technology
- Remote power
- Flip chip compatibility
- Paper edge detection sensor
- Displacement sensor
- Turbidity sensor
Standard Package Solutions

TO Can
The base component option for multimode VCSELs is the hermetic can which offers superb environmental protection and can be easily mounted in a coaxial lensing system.

For singlemode applications the TO Can is fitted with an ultra-flat sapphire glass window to prevent wave front aberrations.

Lensed TO Can
The glass drop-formed lens focuses the VCSEL beam to a spot 35mm from the device, increasing the resolution of the reflective sensor component and standard multimode VCSEL.

Surface Mount
The leadframe based surface mount option for Finisar’s reflective sensor includes a dual cavity package with a mechanical barrier between the VCSEL and phototransistor. Furthermore, the filling epoxy incorporates a daylight filtering dye. The standard package does not contain a lens and offers an optical beam divergence of 24° typical. External lensing can be added if required.
Custom Packaging Capability

Finisar offers a wide variety of custom packaging capabilities. In house expertise in optical, mechanical and electrical design ensures that products are suited for high volume manufacturing and low total cost.

Custom packaging options available from Finisar include:

(A) Custom VCSEL chip on board with control electronics;
(B) VCSEL in a TO can with control electronics;
(C) Complete sensor PCB with a laser in a TO can package mounted to the board;
(D) VCSEL and custom IC in a plastic leadframe package;
(E) VCSEL and custom optical component mounted on a PCB;
(F) Custom 4x4 element VCSEL array with individual addressing;
(G) VCSEL and control ICs in a transfer molded plastic lead frame;
(H) VCSEL and control circuits in a custom ceramic package; and
(I) VCSEL placed on a Silicon photodiode.
## Opto-Electrical Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>VCSELs</th>
<th>1310nm Lasers</th>
<th>850nm Reflective Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optical Output</strong></td>
<td>780nm, 800nm, 825nm, 850nm, 910nm</td>
<td>10mW @ 30mA</td>
<td>2mW @ 7mA</td>
</tr>
<tr>
<td><strong>Slope Efficiency</strong></td>
<td>0.4mW/mA</td>
<td>0.5A/W</td>
<td>0.4mW/mA</td>
</tr>
<tr>
<td><strong>Continuous Current</strong></td>
<td>12mA</td>
<td>100mA</td>
<td>15mA</td>
</tr>
<tr>
<td><strong>Threshold Current</strong></td>
<td>2mA</td>
<td>10mA</td>
<td>1.8mA</td>
</tr>
<tr>
<td><strong>Spectral Width (RMS)</strong></td>
<td>0.85nm (max)</td>
<td>2nm</td>
<td>0.85nm (max)</td>
</tr>
<tr>
<td><strong>Laser forward Voltage</strong></td>
<td>1.8V</td>
<td>1.2V</td>
<td>1.8V</td>
</tr>
<tr>
<td><strong>Series Resistance</strong></td>
<td>35 Ohm</td>
<td>5 Ohms</td>
<td>35 Ohm</td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>-40°C to +100°C</td>
<td>-40°C to +100°C</td>
<td>-40°C to +100°C</td>
</tr>
<tr>
<td><strong>Operating</strong></td>
<td>-40°C to 85°C</td>
<td>0°C to 70°C</td>
<td>0°C to 85°C</td>
</tr>
</tbody>
</table>

### Product Selection Matrix

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Chip</th>
<th>TO Can</th>
<th>TO Dome Lens</th>
<th>Surface Mount</th>
</tr>
</thead>
<tbody>
<tr>
<td>SV3638-001</td>
<td>VCSEL</td>
<td>Multimode</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SV3639-001</td>
<td>VCSEL</td>
<td>Singlemode</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SV5637-001</td>
<td>VCSEL</td>
<td>Multimode</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>HVS6003-001</td>
<td>Reflective Sensor</td>
<td>Multimode + photo transistor</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVS6003-002</td>
<td>Reflective Sensor</td>
<td>Multimode + photo transistor</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVS6003-003</td>
<td>VCSEL</td>
<td>High Temperature</td>
<td></td>
<td>X</td>
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<tr>
<td>HVS7000-xxx</td>
<td>High Power VCSEL</td>
<td>VCSEL Array</td>
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<tr>
<td>FP-1310-4I-TO</td>
<td>FP Laser</td>
<td>1310nm</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DFB-1310-4I-TO</td>
<td>DFB Laser</td>
<td>1310nm</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
About Finisar

Finisar Corporation is a global technology leader in optical communications components and subsystems. These products enable high-speed voice, video and data communications for networking, storage, wireless, and cable TV applications. Over the past two decades, Finisar has provided critical breakthroughs in optics technologies and has supplied system manufacturers with the production volumes needed to meet the exploding demand for network bandwidth and storage. Finisar’s industry-leading optical products include transceivers/transponders, active cables, WSS ROADMs, optical instruments, and active and passive components.

With over 7,000 employees, Finisar has sales, channel, and support offices worldwide. Corporate headquarters are located in Sunnyvale, California (USA), with product development and manufacturing facilities located in California, Pennsylvania and Texas (USA), Australia, China, Denmark, Israel, Korea, Malaysia, Singapore and Sweden.