

## **Ricoh develops new semiconductor laser, the High-Power VCSEL Module**

*For use in laser ignition, laser processing machines, and  
sensing applications*

**TOKYO, July 07, 2016** – Ricoh today announced that it has developed the High-Power VCSEL Module, an 808 nm range high-power fiber coupled semiconductor laser that can also be used in applications such as engine ignition.

The High-Power VCSEL Module incorporates three technological advances, namely high output performance, compact size and wavelength stability in variable temperatures. Ricoh has developed new applications that use VCSEL (Vertical-Cavity Surface-Emitting Laser<sup>\*1</sup>) technology, including as a light source for its production printers currently available on the market.

With this latest development, Ricoh has increased the luminescence efficiency of the VCSEL elements. It has also achieved large-scale integration of the light-emitting channels and together they significantly boost the output power of the laser array. Furthermore, by improving the heat dissipation of the overall module, it is now capable of delivering the high energy output needed by the light source of the laser crystal in a laser ignition plug head. This type of plug head has been attracting attention as a means of igniting gas engines for power generation used in cogeneration systems and other equipment<sup>\*2</sup> (Quasi-continuous-wave (QCW) operation: 200W).

### **Technological advantages of the High-Power VCSEL Module**

- High output performance  
The standalone output of the VCSEL array is 310W, and with the fiber output module output is 200W, achieving unprecedented high output for a fiber coupled VCSEL module<sup>\*3</sup>.
- Compact size using MLA mounting technology  
The VCSEL module uses a VCSEL array with a large number of light-emitting channels on its surface, along with a micro lens array (MLA) that integrates lenses corresponding to each light-emitting channel on a single chip. As a result, the VCSEL module is more compact as it has fewer components when compared with modules using conventional edge-emitting type lasers.
- Wavelength stability in variable temperatures  
Due to its structure, VCSEL features exceptional wavelength stability in variable

temperatures, offering around ten times the thermal stability in wavelength compared with conventional edge-emitting type lasers. In solid-state laser excitation used in applications such as the laser crystals of laser ignition plug heads, the wavelength stability of the excitation light is vital to achieving stable output. As a result of the aforementioned wavelength stability, a precision temperature control unit is not required, allowing a significant reduction in size of the VCSEL module.

In addition to these technological advantages, Ricoh is able to combine its unique optical technologies to supply laser devices and modules for a wide range of applications.

Ricoh is also looking to expand into applications such as laser processing machines, surface treatment processing such as laser patterning, non-thermal processing and sensing, as well as the development of other applications.

\*1 VCSEL is a type of semiconductor laser device known as a surface-emitting laser. Compared with conventional edge-emitting semiconductor laser elements, VCSEL devices are easier to manufacture, handle and install. VCSEL devices benefit from increased reliability, because there are no malfunctions caused by damage to the surface by the laser beam, even in high output operation.

\*2 This development has received partial assistance under the Program for Strategic Innovative Energy Saving Technology run by the New Energy and Industrial Technology Development Organisation (NEDO).

\*3 Drive Conditions: pulse width: 500 $\mu$ s, repetition cycle: 20Hz.



Left: High-Power VCSEL Module with fiber and air-cooling device

Right: High-Power VCSEL Module

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Headquartered in Tokyo, Ricoh Group operates in approximately 200 countries and regions. In the financial year ending March 2016, Ricoh Group had worldwide sales of 2,209 billion yen (approx. 19.6 billion USD).

For further information, please visit **[www.ricoh.com](http://www.ricoh.com)**

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