

Furukawa Electric Announces Commencement of Mass Production of FOL1439 Series Pump Source Lasers for Raman Amplifiers

High Output Power and Low Electrical Power Consumption

OFC 2019, Booth 2639, San Diego, California, March 5, 2019 - Furukawa Electric Co., Ltd. has started mass production of the FOL1439 series high-output, low power consumption 1480 nm band pump light source lasers. These are key devices for use in Raman amplifiers, demand for which is expected to increase as the telecommunications industry begins the full-scale adoption of ultra-high-speed optical communications at 400 gigabits per second (Gbps). Furthermore, Furukawa Electric has developed the FRL1440 series, which makes pumping possible with even higher outputs and lower power consumption.

The newly developed FRL1440 series will be exhibited at OFC/NFOEC 2019, the world's largest international communications conference and exhibition event that will be held from March 5 – 7, 2019 in San Diego, California.

Background

There has been a dramatic increase in communications traffic in recent years as a result of the expansion of wireless backbones due to the spread of smartphones and the rapid growth of cloud computing, video streaming and social networks.

Ultra-high-speed optical transmission such as 100 Gbps will be increasingly adopted from now on to support this increase in traffic. In order to improve the optical signal to noise ratio (OSNR)^(Note 1) in this high-speed transmission, it is expected that there will be increased demand for Raman amplifiers^(Note 2), which have excellent noise properties. Raman amplifiers use a 1400-1500 nm pump laser as an excitation light source. To achieve even higher performance, there are demands for higher optical output power and lower electrical power consumption.

For applications such as these, Furukawa Electric has recently begun the mass production of the new FOL1439 series, which has outstanding high optical output and low electrical power

consumption characteristics. We have also developed the FRL1440 series for pumping with even higher optical output and lower electrical power consumption.

Product Description

The important characteristics of these products are a high optical output and a low electrical power consumption. In order to achieve this, Furukawa Electric has InP (Indium Phosphide) optical semiconductor chip manufacturing technology and high-accuracy packaging technology that the company has been developing for more than 25 years. In order to realize these new products, Furukawa Electric developed an innovative, high-output chip structure and technology to efficiently couple the light output in the optical fiber, while also designing the optimal heat dissipation for the new chip.

Compared with the previous product (FOL1437 series when output is 500 mW), the reduction in the electrical power consumed is 33% on the FOL1439 series and 45% on the FRL1440 series.

Furthermore, high optical output operation can also be supported as the FOL1439 series has a maximum optical output up to 600mW ($T_{case} = 70^{\circ}C$) and the FRL1440 has a maximum optical output up to 620mW ($T_{case} = 70^{\circ}C$).

As it is expected that there will be requirements for even higher output and lower power consumption characteristics in the future, Furukawa Electric will continue to aim for even higher performance enhancements based on the technology in these products.

Comparison of Specifications (Typical Spec, Comparison to C-band)

	Specifications of new products			Specifications of conventional product
Type name	FOL1440 Series		FOL1439 Series	FOL1437 Series
Optical output (mW)	600	500	500	500
Power consumption (W)	Max 10	Max 7.5	Max 9	Max 13.5
Driving conditions	EOL ^(Note 4) , T _s = 35°C, T _c = 70°C			
Wavelength (nm)	1420 - 1465 nm			
Wavelength accuracy (nm)	± 1.5 nm			

Future Development

Mass production of the FRL1440 series is scheduled to begin in the second half of FY2019 (Oct. 2019-Mar. 2020). Furthermore, we will also extend the technology developed for this product to other products. This will include its application to the pump excitation light source for L-band Raman amplifiers. For those products, restrictions due to the material properties make high output and low power consumption pumping more difficult to achieve than for C-band products. In addition, we will apply the technology to pump light source lasers for EDFA^(Note 3).

Explanation of Terms

(Note 1) Optical Signal to Noise Ratio (OSNR): This is defined as the ratio of the optical signal power to the optical noise power. It is an extremely important factor in the maintenance of transmitted signal quality.

(Note 2) Raman amplifier: When pumping light is injected into a fiber, Raman scattering occurs in a wavelength region approximately 100 nanometers longer than the excitation light wavelength. When signal light exists in this scattered light region, stimulated emission occurs and the light is amplified, and can be used as an amplifier. Although the excitation efficiency is lower than that of an EDFA^(Note 3), Raman amplifiers have a wider band, and amplification is possible within an arbitrary wavelength region.

(Note 3) EDFA: Abbreviation for Erbium Doped Fiber Amplifier. An EDFA is an optical amplifier in which erbium is added to the core of an optical fiber. These are currently used widely in wavelength division multiplexing (WDM) systems. Wavelengths around 1550 nanometers can be amplified with pumping light of 980 nanometers or 1480 nanometers.

(Note 4) EOL: Abbreviation for End of Life. This is the life span of a product.

About Furukawa Electric Company, Ltd.

Furukawa Electric Co., Ltd. (www.furukawa.co.jp/english) is an \$11 billion global leader in the design, manufacture and supply of fiber optic products, network products, electronics components, power cables, nonferrous metals, and other advanced technology products. Headquartered in Tokyo, Japan, Furukawa operates production facilities on five continents around the globe, including OFS in the USA, Europe, Morocco, and China.

About OFS

OFS is a world-leading designer, manufacturer and provider of optical fiber, fiber optic cable, connectivity, fiber-to-the-subscriber (FTTx) and specialty fiber optic products. We put our development and manufacturing resources to work creating solutions for applications in such areas as telecommunications, medicine, industrial automation, sensing, aerospace, defense and energy. We provide reliable, cost-effective fiber optic solutions that help our customers meet the needs of consumers and businesses today and into the future.

Headquartered in Norcross (near Atlanta) Georgia, U.S.A., OFS is a global provider with facilities in China, Denmark, Germany, Morocco, Russia and the United States. OFS is part of Furukawa Electric Company, a multi-billion-dollar leader in optical communications.

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