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Mitsubishi Electric Develops New Optical Transmission Devices for Next Generation 100 Gb Ethernet Applications

Tokyo, March 11, 2010 – Mitsubishi Electric Corporation (TOKYO: 6503) announced today that it has developed transmission devices featuring the world's top-level characteristics for super high-speed, 100 Gb Ethernet applications that multiplex four wavelength channels of 25 Gbps-speed optical signals in parallel. Of the two devices, the high speed direct modulation-distributed feed back (DFB) laser diode, which is incorporated in devices that send out optical signals, features modulated waveforms of 25 Gbps. The photo diode array, which is incorporated in receiver modules, has a leading-edge responsivity of 0.88 amperes per watt (A/W). Part of these development achievements stem from a government project called "R&D on High-speed Optical Transport System Technologies (High-Speed Low-power-consumption Optical Transport Technology for Ethernet)" overseen by the Ministry of Internal Affairs and Communications in Japan.

Background

Transmission volume over optical communication networks is rapidly increasing. To respond to this increase, the IEEE is expected to set a standard for 100 Gb Ethernet (100GbE) in June 2010, which will increase the maximum transmission speed from the current 10 Gbps Ethernet standard. Specifically, within transmission distances of 100 meters to 10 kilometers, such as between local data centers and inside buildings, a standard called "100GBASE-LR4" is being considered as a method to transmit data at 100 Gbps by wavelength multiplexing four channels of 1.3 micrometer-wavelength 25 Gbps signals in parallel. To send and receive these optical signals, each end requires four optical semiconductor chips that operate at 25 Gbps: four DFB laser diodes to send optical signals and four photo diodes to receive these signals.

Product Features

1) Achieves direct modulation eye diagrams with high mask margin of 26 % or more, at a low power consumption of 0.1 W or less

There is demand for 25 Gbps direct modulation DFB laser diodes that can be operated directly by modulation signals and therefore do not require external modulation devices, which can in turn lead to

lower energy consumption and lower transmission equipment costs. It was difficult until now, however, to raise the speed to as fast as 25 Gbps because at high speed, the mask margin, an index that shows the quality of modulation waveforms (eye diagrams), becomes lower.

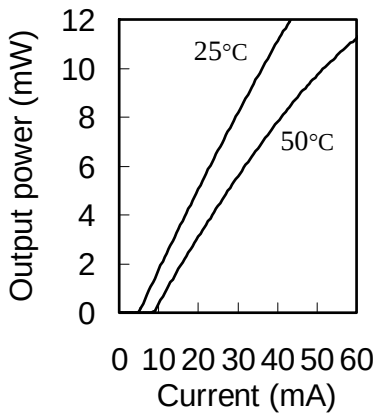
The active layer of the newly developed laser diode, where laser beams are made, incorporates a buried active layer structure using AlGaInAs. The laser diode also has an active layer with a short cavity, and by keeping down the density of the operational current, as well as by inhibiting the electrons in the active layer from dispersing at high temperature, Mitsubishi Electric achieved low energy consumption and a world-leading level of quality in eye diagrams. Even at a very high operating temperature of 50 degrees C and low average current of 45 mA, the newly developed laser diode can achieve an optical output of 9 dBm and a high mask margin of 26% or more. As a result, this device will enable up to 10 kilometers of transmission under the 100GBASE-LR4 standard with low energy consumption of 0.1 W or less.

2) <u>Four 25 Gbps photo diodes with high responsivity of 0.88 A/W integrated in one array chip</u>

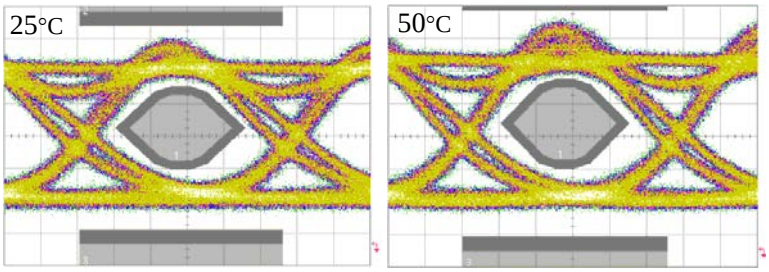
There is a tradeoff between gaining high speed by making optical absorption layers thinner and achieving high responsivity in photo diodes, which made it difficult to gain sufficient responsivity at a very high speed of 25 Gbps. The photo diode developed by Mitsubishi Electric has a new highly reflective mirror at the bottom of its optical absorption layer, which reflects the signal light so that the light will go through the thin absorption layers twice to be converted into electrical signals. Through this design, Mitsubishi Electric was able to achieve high speed operation of up to 25 Gbps, with a top-level high responsivity of 0.88 A/W. Integration of four photo diodes into one array chip helps reduce the size of the receiver modules to less than three cc, which is one third in volume compared to the total volume of four discrete photo diode modules.

<u>Other Features</u>

Characteristics of 25 Gbps DFB laser diodes



I-L characteristics

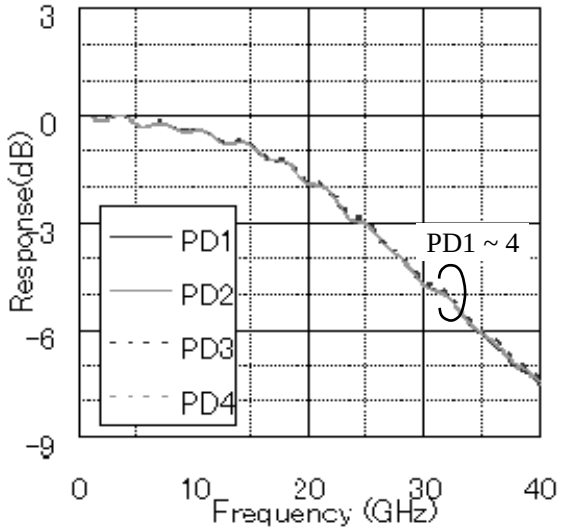


Current : 30mA (ave.)
Mask margin : 28%

Current : 45mA (ave.)
Mask margin : 26%

25 Gbps eye diagrams

Characteristics of 25 Gbps photo diodes array



Frequency response

About Mitsubishi Electric

With over 85 years of experience in providing reliable, high-quality products to both corporate clients and general consumers all over the world, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. The company recorded consolidated group sales of 3,665.1 billion yen (US$ 37.4 billion*) in the fiscal year ended March 31, 2009. For more information visit http://global.mitsubishielectric.com

*At an exchange rate of 98 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2009.

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