

Hitachi Develops the World's Smallest 40-Gbit/s Optical Transmitter
--Realized by the Hybrid Integration of a Record-breaking Low-voltage (0.7 V)
Semiconductor Optical-modulator Chip on a Driver-IC Chip--

Tokyo, September 29, 2003—Hitachi, Ltd. (TSE: 6501) today announced that it has developed the world's smallest 40-Gbit/s optical transmitter. It has a chip size of 2.4 x 1.9 mm and is intended for the use in ever-growing metropolitan optical networks. It is made possible by the combination of Hitachi's unique and revolutionary "low-impedance driving technique" and "hybrid-integration technique", which are the significant breakthroughs in regards to drastically reducing the size and power consumption of future high-speed optical transmitters. This work has been supported by the Telecommunications Advancement Organization (TAO) of Japan.

With the rapid and widespread diffusion of the Internet and broadband access, the need for higher metropolitan communication capacity is expected to continue its sharp increase. To accommodate future enormous traffic volumes, the amount of communication equipment such as internet routers must be increased; thus, reducing the size and power consumption of next-generation high-speed optical transmitter*¹⁾ is in urgent need. Accordingly, Hitachi, Ltd. has developed the technologies for realizing small-size and low-power 40-Gbit/s optical transmitters.

The chip size of the prototype 40-Gbit/s hybrid-integrated transmitter is only 2.4 x 1.9 mm, and the driving voltage for a semiconductor electro-absorption (EA) optical modulator in the transmitter is 0.7 V, which is one third of the previously reported value. Both size and voltage are world records for 40-Gbit/s-class optical transmitters.

The newly developed techniques are summarized below.

(1)Hybrid integration for realizing an unprecedented small-size optical transmitter

The optical modulator chip is mounted directly on the driver IC chip by means of a hybrid-integration technique in order to reduce transmitter size and also to eliminate the need for

impedance matching between the two chips. The effect of the driver IC heat on the optical modulator is alleviated by a low-power consumption design.

(2)Low-impedance drive for reducing power consumption

Since impedance matching is no longer needed, because hybrid integration is used, a low-impedance drive technique with a very low output impedance is adopted in order to break the CR-limit barrier, which limits the maximum operating frequency by the charging and discharging time of an optical modulator's capacitance in conventional designs. A low-voltage optical modulator with larger capacitance can thus now be used to significantly reduce power consumption.

Hitachi plans to continue to develop technologies needed for ultra-compact high-speed optical transmitters, including optimization of IC and device structures with improved reliability. To significantly reduce the transmitter cost, Hitachi will, in the near future, try to replace the InP compound semiconductor driver IC with a SiGe driver IC.

The 40-Gbit/s optical transmitter was presented in ECOC 2003 (29th European Conference on Optical Communication 2003, held from September 21, 2003) on September 24, 2003.

Note:

*1) High-speed and small-size optical transmitters at 40 Gbit/s or beyond may experience problems regarding the maximum operating frequency of semiconductor electro-absorption optical modulators. Namely, it is limited by the CR-limit, which is determined by the output impedance R of the driver IC and the capacitance C of the optical modulator. To reduce the modulator capacitance, the modulator length should be shortened; however, doing so will also reduce optical-modulation efficiency. A conventional design thus requires a high driving voltage of more than 2 V to compensate the shorter length, which consequently results in very high power consumption.

About Hitachi, Ltd.

Hitachi, Ltd. (NYSE:HIT), headquartered in Tokyo, Japan, is a leading global electrics company, with approximately 340,000 employees worldwide. Fiscal 2002 (ended March 31, 2003) consolidated sales totaled 8,191.7 billion yen (\$68.3 billion). The company offers a wide range of systems, products and services in market sectors, including information systems, electric devices, power and industrial systems, consumer products, materials and financial services. For more information on Hitachi, please visit the company's website at <http://www.hitachi.com>.

Information contained in this news release is current as of the date of the press announcement, but may be subject to change without prior notice.
