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**mitsubishi electric develops 10 Gbps low noise  
avalanche photodiode capable of 80 km transmission  
and optical sub-assembly**

**Tokyo, September 13, 2005** – Mitsubishi Electric Corporation (President and CEO: Tamotsu Nomakuchi) announced today its successful development of an avalanche photodiode (APD) for use in high sensitivity optical receivers in fiber optic communications. The avalanche photodiode was mounted on a XMD MSA<sup>1</sup> compatible Receiver Optical Sub Assembly (ROSA), and this new construction is capable of 10Gbps<sup>2</sup>-80km transmissions with low noise and the world's highest reliability while also increasing compatibility. Mitsubishi Electric will make a presentation of this development at the 31<sup>st</sup> European Conference on Optical Communications (ECOC 2005) on September 25-29 in Glasgow, UK.

<sup>1</sup> A multi source agreement that established compatible sources of optical modules for use in the XFP transceiver.

<sup>2</sup> Equivalent to transfer of about 1.8 Compact Disks of data in one second

Model name	Application	Characteristics
10Gbps Aluminum Indium Arsenic Avalanche Photodiode	High-sensitivity optical receiver for long distance and metropolitan-area network communications	-Excess noise factor: 3 at M=10 (Enabling 80km transmission) -High reliability -Incident injection
10Gbps Avalanche Photodiode ROSA	Small-form-factor optical transceivers (XFP <sup>3</sup> ) for long distance application	-High input sensitivity: less than -28dBm -XMD MSA compatible -High reliability

<sup>3</sup> A standard specification that is similar to OC-192, ITU-TG.709, 10Gbps fiber channel, etc. Used in efforts to realize a standard for optical transceivers, and smaller and less energy consuming than other optical transceiver standards

With sharp increases in Internet traffic in recent years, XFP, small optical transceivers that comply with the 10Gbps transmission standard specification, have been used to increase transmission capacity in urban mid- and long-distance trunk lines. A way has been sought to increase performance of the light emission and receiving element mounted on the optical transceiver in order to extend transmission of the current 40-80 km range as well as reduce the number of broadcasting optical amplifiers and reducing construction cost of fiber optic networks. Mitsubishi Electric in April released a sample of the ML9xx41, an electro absorption modulator integrated laser diode capable of high quality communication at high optical output.

For long distance communications, however, it was necessary to develop an avalanche photo diode that reduces noise up to 40% over previous models so that even very weak signals can be received by the light-receiving element. With this model, we have developed a new planar construction giving it low noise characteristics as well as the world's highest level of reliability. We have also mounted a small light module (ROSA) to the light-receiving element, which can be easily attached to small optical transceivers like XFP

### **Applications**

Mitsubishi's new Avalanche Photodiode is suitable for small-form-factor optical transceivers (XFP) as well as small form factor 300-pin optical transponders, enabling cost-effective 10Gbps optical links for long distance and metropolitan-area applications with high board density. Combining the high-power electroabsorption modulator integrated Laser Diode (EAM-LD: ML9xx41) and this high-sensitivity avalanche photodiode based optical receiver extends link budget, and enables amplifier-free low-cost 80km optical links with a large loss margin.

### **Main characteristics**

#### ***1) High reliability and low interference***

The new avalanche photodiode utilizes Aluminum Indium Arsenic (AlInAs), which has low noise amplification properties, in the multiplication layer. A new planer structure has been developed to prevent edge breakdown, caused by local electrostatic accumulation, degrading reliability noise characteristics and creating abnormal background noise. This has reduced background noise by approximately 40 % compared with our previous models, improving sensitivity by 2dB(=1.6 times). Its extrapolated MTTF (mean time to failure) is up to  $10^8$  hours, giving it the world's highest level of reliability. With attaching of ROSA to the element, we are also able to achieve sensitivity of below -28dBm.

#### ***2) New Structure leads to possible cost reductions.***

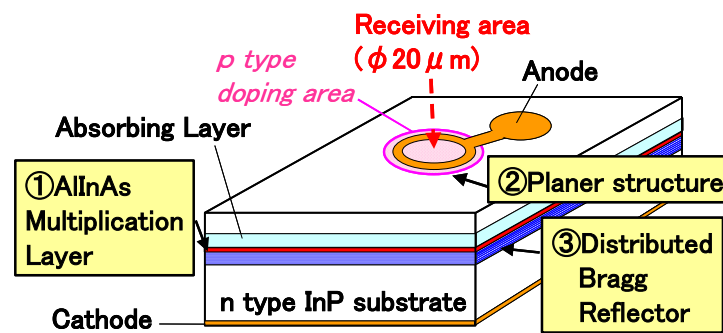
The new avalanche photodiode employs a top-surface incident structure that enables cost-effective assembling.

Most APDs use a below-surface incident structure, in which the chip receives light from below the surface.

To put the chip on the surface required either a special component or technology. Worse, top surface incident structure has low sensitivity. However, we used a surface incident structure that increases sensitivity by adopting a multi-reflective layer that was already in use by our company. This allows for simple integration of the light module and chip mounting, and making potential for lower cost light modules.

### 3) Compatibility

We have increased interface compatibility by developing a ROSA that complies with XMD MSA specifications. XMD MSA sets the electric and mechanical interface for XFP's and other modules mounted to small optical transceivers, and uses a flexible substrate on its electrical terminal. The ROSA we have developed uses a small TO-CAN, allowing ample space to be mounted on optical transceivers.



ROSA external view

### **About Mitsubishi Electric**

With over 80 years of experience in providing reliable, high-quality products to both corporate clients and general consumers all over the world, Mitsubishi Electric Corporation (TSE: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 3,410 billion yen (US\$ 31.9billion\*) in the fiscal year ended March 31, 2005. For more information visit <http://global.mitsubishielectric.com>

\*At an exchange rate of 107 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2005.