TO 패키지를 사용한 10Gbps 광수신기 모듈

10Gbps Optical Receiver Module using a novel TO Package

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Abstract We discussed the main issues of 10GHz Receiver packaging. High frequency structure simulations and circuit simulations for TO-CANs led to a new design for 10GHz optical receiver module packaging. The simulation results were compared to the measured laboratory data. The proposed package has low cost and easy manufacture process for mass production. Using this package, we had a good optical to electrical conversion (OE) characteristic at a data rate of 10Gbps.

The growing demand for high-speed digital communication services has made fiber optic data transmission a necessity for long range telecommunication applications as well as for high capacity backbones of local area networks. As telecommunication and data-communication networks continue to merge, the demand for high transmission capacity for data-communication application is increasing. Once the standardization process for 10Gigabit Ethernet is finalized, data rates will move up to 10Gbps.

For data-communication applications in particular, the cost of the optical transmission equipment is a critical issue. Here, opto-electronic integration offers great benefit for cost reduction, although it has not yet been developed to the same extent as electronic integration. A further cost factor of an opto-electronic module is packaging. [1,2] So far, high performance and expensive butterfly modules have been used for high-speed transmitters and receivers. [3,4]

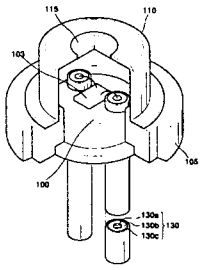
Package parasitic and severe impedance discontinuities, inherent in the TO46, impose strict frequency limitations and dramatically effect the integrity of the electrical signals. Because electrical waveform control is essential for proper high-speed signal transmission, these high frequency performance problems must be identified and overcome. In this paper, we present an optical receiver module with a multi mode fiber receptacle. MSM PD and preamplifier were packaged into a new TO46 housing with coaxial leads, thus it has low cost potential.

To obtain high-speed, stable operation and easy alignment, the following three items were considered. The first was to adopt a Photo Diode (PD) with low parasitic capacitance and large active area. For this purpose Metal-Semiconductor-Metal (MSM) PD was chosen as a detector because, due to its characteristic of structure configuration, it has low parasitic capacitance than PIN PD at the same size of active window.

The second consideration was to give a wide bandwidth to the electrical signal transmission line from the lead

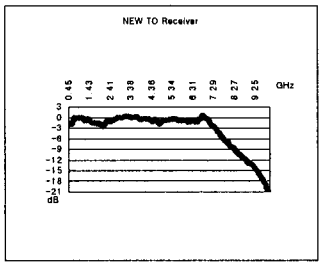
pins to the output pins of Trans-Impedance Amplifier (TIA). For this purpose, the module configuration was newly designed to maintain 50ohm impedance on the signal transmission line throughout the package. We used micro coaxial lead pins with 50ohm characteristic impedance instead of original lead pins. The transmission performance of new TO package was simulated using high frequency structure simulator (HFSS) and measured.

The third consideration was to make the parasitic impedance of the module small in order to stabilize the high-frequency performance. To achieve this, we used a micro sub PCB with signal patterns and ground at the part of the base plane of the TO package. By mounting the PD chip on the micro sub PCB as close as to TIA, and giving a ground potential to the plate, the ground of the TIA chip was directly connected to the case ground. This helps stabilize the high-frequency performance because it avoids unfavorable parasitic impedance at the ground connection. It also helps to diffuse heat generated from the TIA chip to the ground.

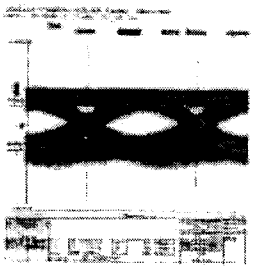


[Fig. 1]

[Fig. 2]



[Fig. 3]



[Fig. 4]

[Fig. 1] New invented TO Package with coaxial leads

[Fig. 2] Optical Receiver Module using new TO Package

[Fig. 3] Frequency Response of Receiver Module

[Fig. 4] Eye Diagram of Receiver Output at 10Gbps

REFERENCE

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