

Fast-Response Burst-Mode APD-ROSA Using Reset Signal for 1G/10G-EPON

We have developed a 1G/10G dual-rate burst-mode avalanche photodiode receiver optical subassembly (APD-ROSA) for the next generation of access network systems (10G-EPON). The response time of the burst-mode receiver is 230 ns, which meets the requirements of the IEEE802.3av standard.

A 10 gigabit ethernet passive optical network (10G-EPON) system is attracting attention for the next-generation of access network systems. A 10G-EPON system that can coexist with the presently installed GE-PON system is a solution for smooth migration from the GE-PON to 10G-EPON. A key component of such a system is a 10-Gbit/s burst-mode receiver that can operate at both 1 and 10 Gbit/s.

Figure 1 shows a photograph and a block diagram of our developed avalanche photodiode receiver optical subassembly (APD-ROSA). A 10-Gbit/s InP/InGaAs APD is connected to a SiGe-BiCMOS transimpedance amplifier (TIA). A reset signal fed to the TIA initializes the state of the TIA every incoming burst optical signal, thus allowing a quick response to the burst signals. The waveforms input to the APD-ROSA and output from the one are shown in Figure 2. After a strong optical burst signal, the response waveform is observed from the head of a following weak optical

burst signal. To evaluate the response time of a receiver using the APD-ROSA and a limiting amplifier, we measured the sensitivity on the payload as a function of preamble length. The sensitivity was measured after the burst signal with an average optical power of -6 dBm. From the measurements, we confirmed that the sensitivity of the APD-ROSA only started to degrade when the preamble length was shorter than 230 ns.

Figure 3 shows the bit error rate (BER) performance for 1G and 10G burst optical signals. The preamble length was 230 ns and the payload length was 100 μs. The sensitivity of -28.7 dBm (BER=10⁻³) at 10.3125 Gbit/s and -29.9 dBm (BER=10⁻¹²) at 1.25 Gbit/s were obtained at 25°C for a TIA supply voltage of 3.3 V. For each data rate, the variation in the sensitivity against the supply voltage is very small. We also confirmed the stable operation in sensitivity for a 10G burst signal for 0 and 85°C.

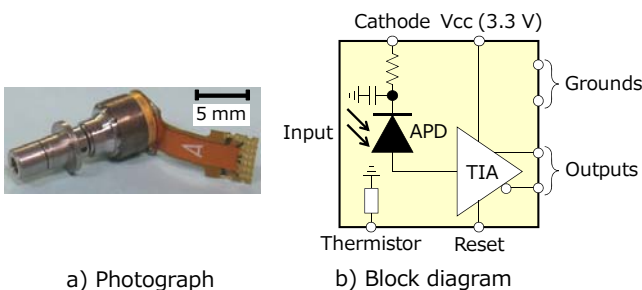


Fig.1 Schematic of our APD-ROSA.

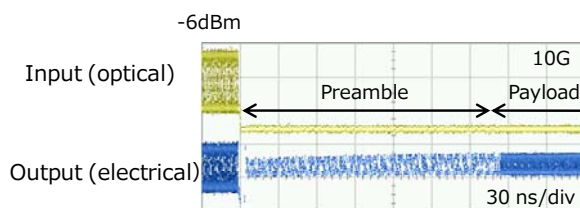


Fig.2 Input (optical) and output (electrical) waveforms.

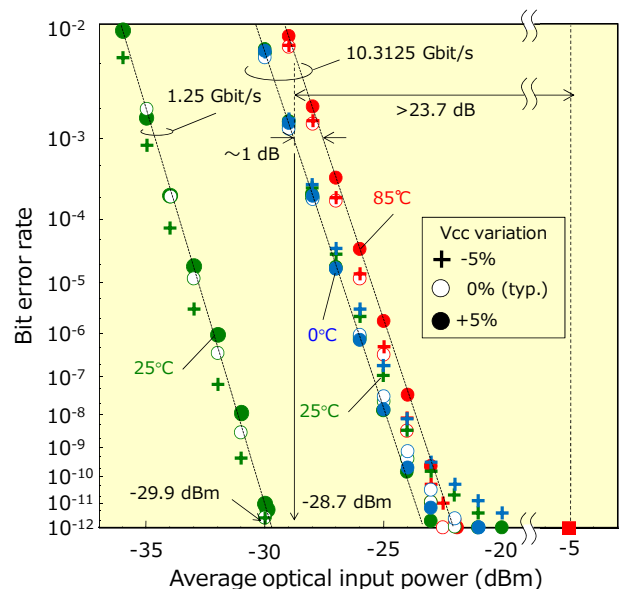


Fig.3 BER performance of the APD-ROSA.