In this paper, the semiconductor optical amplifier (SOA) is used with a Mach–Zehnder interferometer (MZI) forming an SOA-MZI structure which is used to perform the logic gates OR, and NOT. It is simulated at 10 Gbps, 20 Gbps, and 40 Gbps to extract simple design rules. Two binary input data signals are simulated at several bitrate 10 Gbps, 20 Gbps, and 40 Gbps. It is demonstrated that high data rate can be achieved with a specific injection current in SOA. SOAs required low injection current, which leads to a low value on the total power consumption of the gate. In addition, this work includes the study of the effect of the bit rate on the received power, minimum bit error rate (BER), and maximum quality factor (Q-factor). The logical output of the gate has an extinction ratio of more than 10 dB with good eye opening. The output of the OR, NOT gates shows error-free operation at different bit rate with a clear eye opening.
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Index Terms

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Keywords

SOA, XPM, FWM, XGM, injection current.