

# Abstract

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## **SOA Gain SOA Gain Uniformity Improvement Employing a Non-Uniform Biasing Technique for Ultra-High Speed Optical Routers**

In this paper, we propose a non-uniform biasing technique to improve the uniformity of the semiconductor optical amplifier (SOA) gain for ultra-high speed applications. In ultra-high speed applications, rapid gain recovery of the SOA is necessary to minimize the gain standard deviation and thus reducing system power penalties. A triangular shape biasing current is used in order to accelerate the SOA gain recovery while reducing the gain standard deviation. The effect of the non-uniform bias current on the SOA gain is investigated. The SOA is modeled using a segmentation method and the detailed theoretical analysis for the model is presented. The SOA gain and the output gain profiles achieved when injected with a burst of input Gaussian pulses for the non-uniform and the corresponding uniform techniques are also investigated. The operation principle is simulated and results show the boundaries and requirements in order to achieve the desired SOA bit rate for a range of different input powers. A reduction (at 1 mW input power) of 1.5 dB, 0.3 dB and 0.1 dB in the gain standard deviation is achieved for the input data rates of 10, 20 and 40 Gb/s, respectively.