

The effect of temperature on the operation of quantum well laser: A simulation study based on three-level rate equations

Abstract

A temperature-dependent quantum well laser equivalent circuit model based on three-level rate equations is presented. The model is simulated using an ORCAD PSPICE circuit simulator. The characteristic properties such as threshold current, delay, and frequency response are simulated and compared with the available results. Included are temperature effect, leakage current, and heat dissipation effect on the chip. Threshold current increases, whereas turn on delay and optical output decrease with increasing temperature. An increase in temperature also reduces the operating frequency and resonance peak shifts to higher frequency. It is also observed that the modulation response of a QW laser with shorter separate confinement heterostructure region is more sensitive to the temperature variation.