

## Ultrafast Transistor Laser Containing Graded Index Separate Confinement Heterostructure

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**Abstract :** Ultrafast transistor laser investigated here has the graded index separate confinement heterostructure (GRIN-SCH) in its base region. Resonance-free optical frequency response with -3dB bandwidth of more than 26 GHz has been achieved for a single quantum well transistor laser by using graded index layers of  $\text{Al}\xi\text{Ga}1-\xi\text{As}$  ( $\xi: 0.1 \rightarrow 0$ ) on the left side of the quantum well and  $\text{Al}\xi\text{Ga}1-\xi\text{As}$  ( $\xi: 0.05 \rightarrow 0$ ) in the right side of quantum well. All required parameters, including quantum well and base transit time, optical confinement factor and spontaneous recombination lifetime, have been calculated using a self-consistent charge control model.

**Keywords :** transistor laser, ultrafast, GRIN-SCH, -3db optical bandwidth,  $\text{Al}\xi\text{Ga}1-\xi\text{As}$

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