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| **Title:** | Techniques of Minimizing Parasitics for the Enhancement of Modulation Bandwidth of an Oxide-Confined VCSEL | | | |
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| **Published Conference Name:** | 6th International Conference on Electrical & Computer Engineering (ICECE 2010) | | | |
| **Type of Publication:** | International Conference | | | |
|  |  | |  |  |
| **Publisher:** | IEEE | | | |
| **Publication Date:** | 24 January 2011 | | | |
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| **DOI:** | [10.1109/ICELCE.2010.5700538](https://doi.org/10.1109/ICELCE.2010.5700538) | | | |
| **URL:** | https://ieeexplore.ieee.org/document/5700538 | | | |
| **Other Related Info.:** |  | | | |
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| **Abstract:** |  |
| In this work, three different structures of a VCSEL e.g., (i) without any confinement, (ii) with oxide confinement and (iii) with oxide implantation have been investigated with the aim of improving the modulation performance. At first, same radius has been considered for both the active region and the oxide layer. For 3 mA injection current, a high modulation bandwidth is obtained for a VCSEL without any confinement compared to the above mentioned other two structures. Due to additional pole in the oxide-confined VCSEL the roll-off of the response curve increases and because of high parasitics the modulation bandwidth decreases. The parasitics of an oxide-confined VCSEL have been minimized by considering proton implantation in addition to the oxide layer. It is observed that due to such modification in the structure the modulation bandwidth of such a VCSEL increases. Next, for the same aperture radius the effect of variation of injection current on the modulation performance for the above mentioned three different structures of a VCSEL have been investigated with the aim of minimizing the parasitics for the enhancement of modulation bandwidth. It is found that with the increase of injection current the modulation bandwidth of a VCSEL increases by minimizing the parasitics. At 5.65μm aperture radius of an oxide-confined VCSEL a maximum modulation bandwidth of 9.5 GHz is obtained at an injection current value of 9 mA. In addition to this, the parasitics are also minimized by decreasing the radius of the oxide aperture of an oxide-confined VCSEL. A maximum modulation bandwidth of 10 GHz is obtained for an oxide-confined VCSEL by decreasing the oxide aperture radius up to 3μm at a value of injection current of 2.5 mA only. | |