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Carey et al.

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(54) **METHOD OF FABRICATION OF A SUPPORT STRUCTURE FOR A SEMICONDUCTOR DEVICE**

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See application file for complete search history.

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(57) **ABSTRACT**

A method of fabricating a semiconductor device is described. In this method, a starting substrate of sufficient thickness is selected that has the required defect density levels, which may result in an undesirable doping level. Then a semiconductor layer having a desired doping level is formed on the starting substrate. The resulting semiconductor layer has the required defect density and doping levels for the final product application. After active components, electrical conductors, and any other needed structures are formed on the semiconductor layer, the starting substrate is removed leaving a desired thickness of the semiconductor layer. In a VECSEL application, the active components can be a gain cavity, where the semiconductor layer has the necessary defect density and doping levels to maximize wall plug efficiency (WPE). In one embodiment, the doping of the semiconductor layer is not uniform. For example, a majority of the layer is doped at a low level and the remainder is doped at a much higher level. This can result in improved WPE at particular thicknesses for the higher doped material.

36 Claims, 9 Drawing Sheets

