

Speed and efficiency of the PIN homojunction photodiodes on InGaAs/InP heterostructures

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Abstract

In this paper we present the optimization of a PIN photodiode on A/sup III/B/sup V/ heterostructure and technological processing for a high speed operation over a large spectral range (0.8-1.6) /spl mu/m. A theoretical analysis was made taking into account the dependence of quantum efficiency and speed of response on epitaxial layers parameters of an InP/In/sub 0.53/Ga/sub 0.47/As/InP photodiode with absorption region separated from the p/sup +/n junction. The optimum values for structure parameters were determined for a quantum efficiency over 85% on 1.3-1.6 /spl mu/m spectral range and for a fast response limited by the junction capacity. The technological processing of this type of structure by Cl-VPE epitaxial growth and Zn diffusion in InP layer led to photodiodes with responsivity of 0.7 A/W at 1.3 /spl mu/m and 0.3 A/W at 0.82 /spl mu/m, a rise time of 150 ps and a capacity of 1.2 pF.