AN IMPROVED PHOTODETECTOR AND DEVICE EMPLOYING THE PHOTODETECTOR FOR CONVERTING AN OPTICAL SIGNAL INTO AN ELECTRICAL SIGNAL

ABSTRACT OF THE DISCLOSURE

An anti-reflective coating having a composite layer of silicon nitride and silicon dioxide may be formed over the entire photosensitive region of the photodetector to minimize the amount of reflection. The composite layer comprises a silicon nitride layer and a dielectric layer contiguous to the silicon nitride layer. The anti-reflective coating may be formed in a CMOS process for fabricating the PN junction in the photodiode and CMOS devices for amplifying the photodetector signal, where the polysilicon gate layer is used as a etch stop. The P+ or N+ material in the PN junction of the photodiode has a distributed design where two portions of the region are separated by a distance in the range of Xd to 2Xd, where Xd is the one-sided junction depletion width, to enhance the electric field and to reduce the distance traveled by the carriers for enhancing bandwidth. A heavily doped region of the opposite type may be added between the two portions to further enhance the electric field. A mask is used to shield a portion of the substrate in which the photodetector region has been or is to be formed when other portions of the substrate region are implanted with a dopant to adjust at least one of the threshold voltages of the other portions. The mask prevents the photodetector region from being affected by such implant.

Fig. 4A