BCBJ solar cells may be prevalent when the cell architecture has metal of one polarity over diffusions of another polarity.

[0005] To compete with other energy sources available on the market, solar cells not only have to be efficient but also fabricated at relatively low cost and high yield. Embodiments of the present invention pertain to novel solar cell fabrication processes and structures that reduce the cost of solar cell fabrication and improve solar cell reliability.

BRIEF SUMMARY

[0005a] According to a first aspect of the invention, a process of fabricating a solar cell is described, the process comprising removing a non-uniform film that covers a backside surface of a plurality of P-type and N-type diffusion regions to expose the backside surface of the plurality of P-type and N-type diffusion regions; after removing the non-uniform film, forming a dielectric stack comprising a plurality of dielectric layers on the backside surface of the plurality of P-type and N-type diffusion regions; using a laser to form a plurality of contact holes through the dielectric stack, each contact hole in the plurality of contact holes exposing a surface of a corresponding P-type or N-type diffusion region in the plurality of P-type and N-type diffusion regions; and forming a metal contact in each of the plurality of contact holes to form an electrical connection to an exposed surface of each of the plurality of P-type and N-type diffusion regions.

[0006] In one embodiment, contact holes of solar cells are formed by laser ablation to accommodate various solar cell designs. Use of a laser to form the contact holes is facilitated by replacing films formed on the diffusion regions with a film that has substantially uniform thickness. The film thickness as absorption may be tailored to match laser parameters. Dopant depth underneath contact holes may be controlled to increase the laser ablation process margins. The laser configuration may be tailored to form contact holes through dielectric films of varying thicknesses.

[0007] These and other features of the present invention will be readily apparent to persons of ordinary skill in the art upon reading the entirety of this disclosure, which includes the accompanying drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] A more complete understanding of the subject matter disclosed herein may be derived by referring to the detailed description and claims when considered in conjunction with the following figures, wherein like reference numbers refer to similar elements throughout the figures. The figures are not drawn to scale.

[0009] FIG. 1 schematically shows an example BCBJ solar cell with metal contacts that are formed over opposite polarity diffusion regions.

[0010] FIG. 2 shows a top view of the solar cell of FIG. 1.

[0011] FIG. 3 shows a cross-section of the solar cell of FIG. 1 taken at section A-A of FIG. 2.

[0012] FIGS. 4-6 show cross-sections of a solar cell being fabricated in accordance with an embodiment of the present invention.

[0013] FIG. 7 shows another top view of the solar cell of FIG. 1.