HIGH VOLTAGE SOLAR MODULES

BACKGROUND

[0001] Photovoltaic (PV) cells, commonly known as solar cells, are well known devices for conversion of solar radiation into electrical energy. Generally, solar radiation impinging on the surface of, and entering into, the substrate of a solar cell creates electron and hole pairs in the bulk of the substrate. The electron and hole pairs migrate to p-doped and n-doped regions in the substrate, thereby creating a voltage differential between the doped regions. The doped regions are connected to the conductive regions on the solar cell to direct an electrical current from the cell to an external circuit. When PV cells are combined in an array such as a PV module, the electrical energy collected from all of the PV cells can provide power with a certain voltage and current.

BRIEF DESCRIPTION OF THE DRAWINGS

[0002] Figure 1 illustrates a cross-sectional view of a solar cell prior to singulation to form physically separated sub-cells, in accordance with some embodiments.

[0003] Figure 2 illustrates a cross-sectional view of a solar cell subsequent to singulation to form physically separated sub-cells, in accordance with some embodiments.

[0004] Figure 3 illustrates a cross-sections view of a portion of a pair of singulated sub-cells using metal as a back-stop for cell singulation, in accordance with some embodiments.

[0005] Figure 4 illustrates a cross-sections view of a portion of a pair of singulated sub-cells using a buffer material as a back-stop for cell singulation, in accordance with some embodiments.

[0006] Figures 5-9 illustrate plan views of various example solar cells, from the metallization side of the respective solar cell, which have been diced into sub-cells, in accordance with some embodiments.

[0007] Figure 10 illustrates an example high voltage PV module, according to some embodiments.

[0008] Figure 11 illustrates a block diagram of a system that includes a high voltage module and boost-less voltage conversion device, according to some embodiments.

[0009] Figures 12a-12c illustrate example performance for example 96-cell high voltage modules, according to some embodiments.

[0010] Figures 13a-13d illustrate example shading scenarios for example 96-cell high voltage modules.

[0011] Figures 14a-14c illustrate example performance for example 60-cell high voltage modules, according to some embodiments

SUMMARY

[0011a] According to an aspect, a photovoltaic module is provided, comprising a high voltage photovoltaic laminate that includes a plurality of high voltage photovoltaic cells, wherein each of the

plurality of high voltage photovoltaic cells includes a plurality of sub-cells; and a boost-less voltage conversion device configured to convert a first voltage from the high voltage photovoltaic laminate to a second voltage.

[0011b] According to an aspect, a photovoltaic system is provided, comprising a first high voltage photovoltaic module; and a first boost-less microinverter coupled to the first high voltage photovoltaic module, wherein the first boost-less microinverter is configured to convert a direct current (DC) voltage to an alternating current (AC) voltage, wherein the first boost-less microinverter is coupled to a second boost-less microinverter that is coupled to a second high voltage photovoltaic module.

[0011c] According to an aspect, a junction box is provided, comprising a housing coupled to a photovoltaic laminate; and a boost-less microinverter within the housing, wherein the microinverter is configured to convert a direct current (DC) voltage to an alternating current (AC) voltage.

DETAILED DESCRIPTION

[0012] The following detailed description is merely illustrative in nature and is not intended