



1 Production of a shingle module in matrix technique with pSPEER solar cells at Module-TEC, Fraunhofer ISE.

2 Shingled positioning of cells in a pre-structured EVA foil ("SlimLine", patent pending).

3 Electroluminescence image of a shingle solar cell module in matrix layout.

INCREASED EFFICIENCY WITH BIFACIAL SHINGLE MODULES

In shingle modules rectangular cells are connected by edge overlap, an arrangement similar to roof tiles. The power output of shingle modules is increased by

- significantly enhancing the active cell area within the module,
- decreasing shading and soiling losses,
- reducing interconnection losses.

Highest Efficiency with pSPEER and Matrix Technology

The efficiency of a bifacial shingle module is increased by 30% compared to common modules, reaching a power output of 240 W/m² at 10% rear irradiance. To manufacture bifacial shingle solar modules with such a high power output, the "p-type Silicon shingled Passivated Edge, Emitter and Rear (pSPEER)" solar cell concept of Fraunhofer ISE is applied. The pSPEER cells are based on the Passivated Emitter and Rear Cell (PERC) approach and include a passivated edge. The module design features a combination of series and parallel connections

for each cell to significantly reduce losses when parts of the module surface are shaded or soiled.

Process Simplification with "SlimLine" Production Method

Cell positioning is supported by a pre-structured EVA foil. Terrace steps are formed, which serve for a precise definition of lateral cell position, overlap and step height. By this method, a soldering step or curing of electrically conductive adhesives can be performed during lamination and thereby reduces the number of required process steps for module production. The "SlimLine" production process has been patented by Fraunhofer ISE.

Our Services

- development support for shingle cell and module
- shingle module prototyping
- detailed assessment of adhesive joints
- comprehensive reliability analysis

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