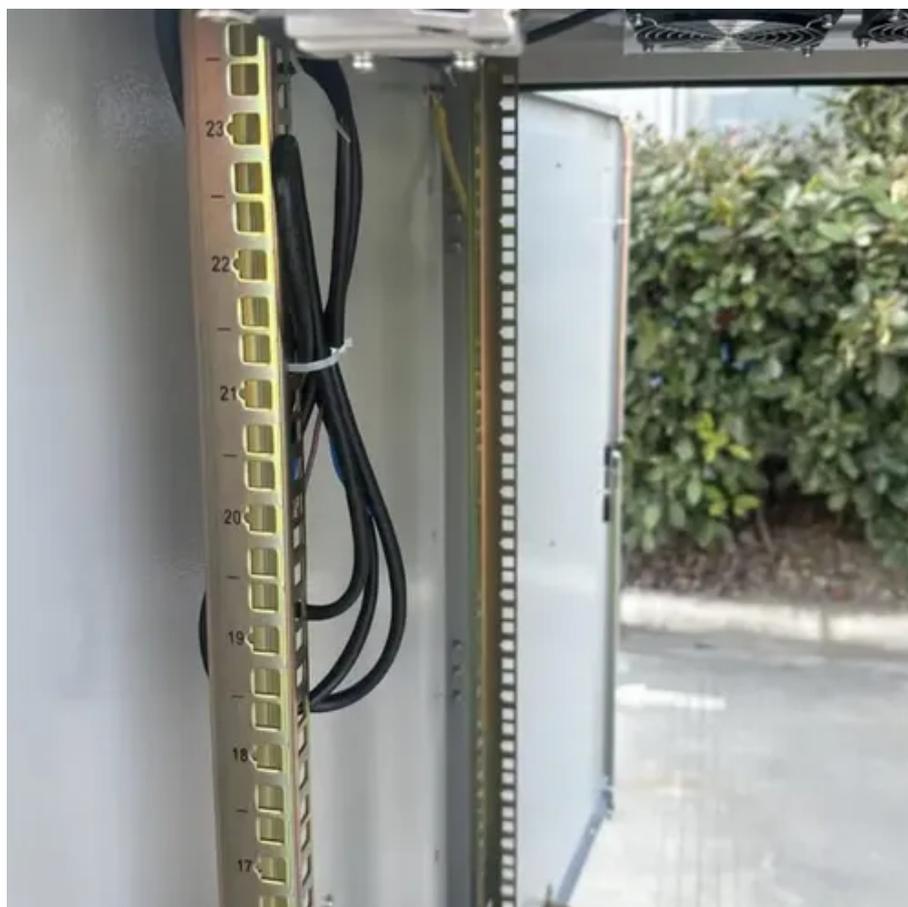




# Heterojunction modules are on par with PERC modules





## Overview

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SHJ has the highest efficiency amongst crystalline silicon solar cells in both laboratory (world record efficiency) and commercial production (average efficiency). In 2023, the average efficiency for commercial SHJ cells was 25.0%, compared with 24.9% for n-type TOPCon and 23.3% for p-type PERC. The high efficiency is owed mostly to very high open-circuit voltages—consistently over 700 mV—as a result of excellent surface passivation. Since 2023, SHJ bottom cells in Per.

HJT cells, which combine monocrystalline silicon and amorphous layers, showed a 1.88% higher efficiency and a 3% to 6% increase in energy yield compared to PERC cells. This study also examines the effects of irradiance and temperature on performance using experiment field data.

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This study compares the widely used passivated emitter and rear contact (PERC) cells with advanced heterojunction technology (HJT) cells. Conducted in Lisbon during August 2022, this research evaluates the energy yield of PV installations over 400 W under challenging summer conditions. HJT cells.

An unmetallised heterojunction solar cell precursor. The blue colour arises from the dual-purpose Indium tin oxide anti-reflective coating, which also enhances emitter conduction. Heterojunction solar cells (HJT), variously known as Silicon heterojunctions (SHJ) or Heterojunction with Intrinsic.

How many systems with high-efficiency modules?

1. Local sensor(s) 2. Clearsky 3. Satellite CS. Jiang et al., PVSC 2020 Hydrogen (H) redistribution in SHJ?

This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of.

Cell and module choices in 2025 center on three names: PERC, TOPCon, and HJT. Each offers different trade-offs on efficiency, heat loss, degradation, and



bankability. This 2025 solar module guide turns data and field experience into clear picks for sites that need reliable yield and solid long-term.

Enerco visualizes a sustainable, connected and an automated world for a better planet and a better human-race through Energy Conservation and Renewable Energy, Industry 4.0 Digital Transformation and Intelligent Automation. Sustainable development through use of advanced technology is now a reality. What is the difference between PERC and SHJ cells?

Compared to PERC, conventional SHJ cells often suffer from poor with values rarely exceeding  $40 \text{ mA/cm}^2$ , as some light is parasitically absorbed in the front amorphous silicon layers due to its high absorption coefficient. By removing the need for the front metal contact, as well as the front amorphous silicon contact, can be recovered.

What is PERC (passivated emitter & rear cell)?

For broader reference on PV technology basics, see the DOE's Solar Energy topic hub and the EIA for market data. PERC (Passivated Emitter and Rear Cell) improved on BSF cells with rear-side passivation. You get mature supply, low upfront cost, and wide inverter compatibility. Typical traits:

What are heterojunction solar cells (HJT)?

Heterojunction solar cells (HJT), variously known as Silicon heterojunctions (SHJ) or Heterojunction with Intrinsic Thin Layer (HIT), are a family of photovoltaic cell technologies based on a heterojunction formed between semiconductors with dissimilar band gaps.

Are PERC modules safe?

PERC modules stay relevant for tight budgets and standard climates. TOPCon modules are the safe default in most sites thanks to higher efficiency, better heat behavior, and strong bifacial response.



## Heterojunction modules are on par with PERC modules



### Early degradation of silicon heterojunction PV modules installed ...

We present our latest findings on the early degradation of photovoltaic (PV) silicon heterojunction (HJT) modules installed in harsh desert climates for about two and half years.

### [Ultimate Guide to PERC, TOPCon, and HJT Modules for 2025](#)

Cell and module choices in 2025 center on three names: PERC, TOPCon, and HJT. Each offers different trade-offs on efficiency, heat loss, degradation, and bankability.



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### 27%-efficiency silicon heterojunction cell with 98.6% cell-to ...

Achieving efficiency by approaching the theoretical limit in silicon heterojunction solar cells remains challenging.



## Heterojunction solar cell

[Overview](#)[Advantages](#)[History](#)[Disadvantages](#)[Structure](#)[Loss mechanisms](#)[Glossary](#)

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## Heterojunction solar cell

From lab testing and supplier datasheet surveys, modules fabricated with SHJ cells consistently measure an equal or lower temperature coefficient (i.e. the decrease in efficiency is less ...



## [Solar PV Technology Comparison \(Mono PERC vs ...](#)

This report provides a comprehensive comparison of four prominent PV solar module technologies: Mono PERC (Passivated Emitter and Rear Cell), ...



## Heterojunction Technology vs. Passivated Emitter and Rear ...

Renewable energy is essential for reducing fossil fuel dependence and achieving carbon neutrality by 2050. This study compares the widely used passivated emitter and rear ...



## Silicon Heterojunction Field Performance

Initial light-induced changes can be seen in Pmax  
Control modules are stable  
One module degrading, the rest appears w/in uncertainty

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## Solar PV Technology Comparison (Mono PERC vs HJT vs CdTe ...



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### **Cost-efficiency potential of solar energy on a global scale: Case**

This originates from the simple fact that the lower energy yield in the PERC module, relative to the SHJ module, is compensated by the lower system cost of the PERC system, ...

### **Comparative Analysis of Energy Yield between PERC and HJT Modules**

The heterojunction (HJT) solar cells based on the integration of monocrystalline silicon and amorphous crystalline layers provide a remarkable improvement in te



### **Comparative Analysis of Energy Yield between PERC and HJT ...**



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