Glint Solar

The Only Guide You Need to Choose Solar Panels

Everything You Need to Know to Pick the Right PV Modules for Your Utility-Scale Solar Projects

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STOP GUESSING, START WINNING WITH THE RIGHT SOLAR MODULES

Selecting the right PV modules can make or break your solar project. With so many technical specs, trends, and options to sort through, it's easy to get stuck in analysis paralysis—or worse, make a costly mistake.

But you don't have to be a PV expert to make smart, confident decisions.

This guide is your shortcut to mastering PV modules—what they are, how they work, and how to pick the best one for your project's specific needs.

Who is this guide for:

- Utility-scale solar developers looking to select PV modules that deliver maximum performance and ROI.
- Project teams tasked with evaluating modules for their site conditions but want a straightforward way to understand the specs.
- Decision-makers who need clear insights to evaluate modules and stay on top of market trends.

What you'll get:

- Clarity: Understand how PV modules work and decode datasheet terms like an expert.
- Comparison tools: Use our cheatsheet to choose the best modules for your project's needs.
- Market trends: Stay ahead with the latest on different module types and their prices.
- Confidence: Make smart, informed decisions that drive project success.

Why it matters:

This guide helps you avoid lower energy yields, increased cost, and stakeholder frustration by giving you the tools to select modules with reliable performance and maximum ROI.

Ready to level up your solar projects? Let's dive in.

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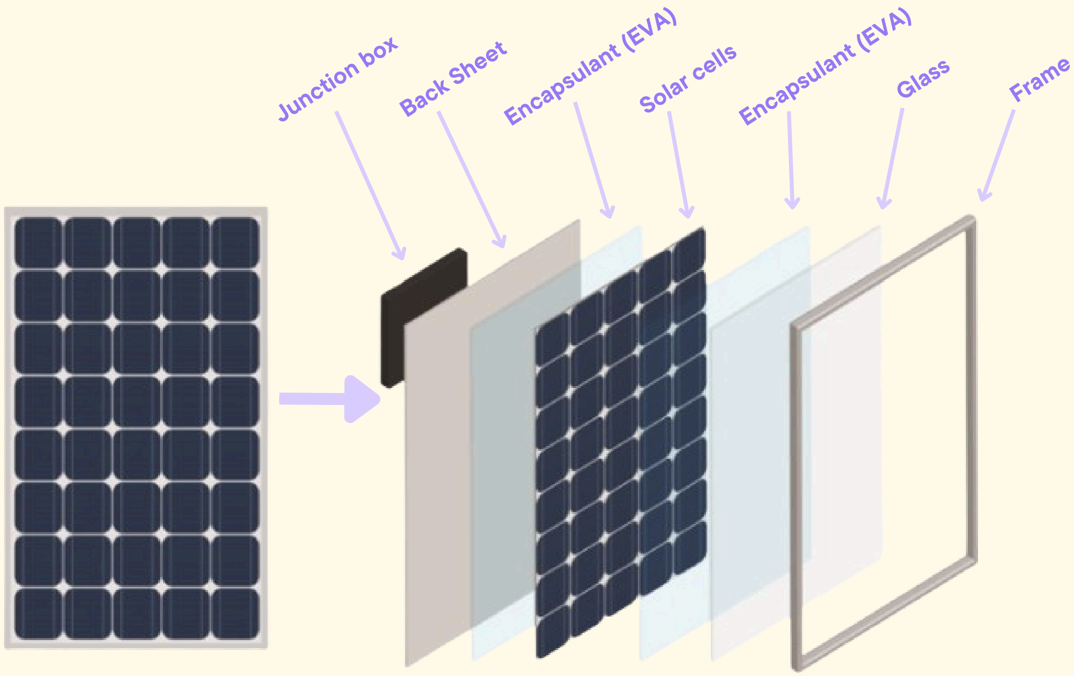
WHAT'S INSIDE A SOLAR CELL?

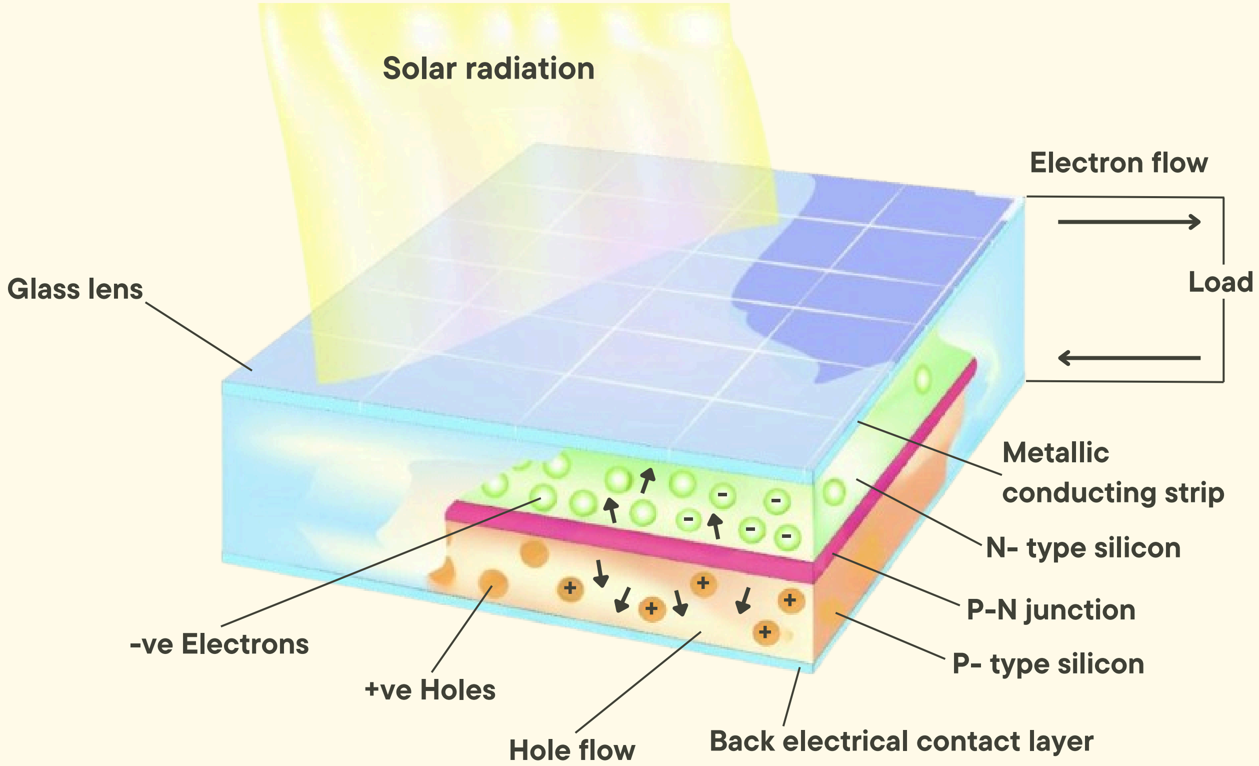
So, let's start with the basics and break down the parts of a PV cell. Check out the diagram and table below:



Junction box	A weatherproof box on the panel's back that connects the solar cells' electrical outputs.
Back sheet	Protects the module from moisture, UV radiation, and environmental damage, providing insulation and support. Transparent back sheets are used in bifacial modules.
Encapsulant	A clear material that cushions solar cells, resists moisture, absorbs shocks, and provides UV protection.
Solar cells	Semiconductor components that convert sunlight into DC electricity via the photovoltaic effect. Usually made of silicon and arranged in series or parallel.
Glass	Transparent tempered glass (3-4 mm) that shields solar cells from weather, dirt, and impacts while allowing sunlight to pass through.
Frame	A durable, corrosion-resistant anodized aluminum frame that's easy to install.

HOW PV MODULES REALLY WORK

A solar cell—also called a photovoltaic cell—turns sunlight directly into electricity through the photovoltaic effect. It's that simple. Check out the diagram below to see how it all comes together.



Light absorption

Solar cells are made of semiconductor materials, typically silicon. When sunlight hits the surface of the solar cell, the energy from the light (photons) is absorbed by the semiconductor material.

Electron excitation

The absorbed light energy excites electrons in the semiconductor. In their normal state, electrons in the silicon atoms stay bound within the atomic structure. But when photons strike the material, they transfer their energy to these electrons, giving them enough energy to break free from their atoms.

This process creates electron-hole pairs: the electron gets knocked loose, and the space it left behind is a "hole" (a positive charge).

HOW PV MODULES REALLY WORK

Electric field generation

Solar cells work by creating an internal electric field. This field is created by layering two different types of silicon together:

- n-type silicon (negative) is doped with phosphorus to add extra electrons (these are the charged particles that move).
- p-type silicon (positive) is doped with boron, creating holes (spaces that act like positive charges).

When these two types of silicon meet, they form a p-n junction which helps separate the free electrons and holes.

Separation of charges

The electric field at the p-n junction drives the free electrons towards the n-type side and the holes towards the p-type side. This movement of electrons and holes creates a flow of electric current.

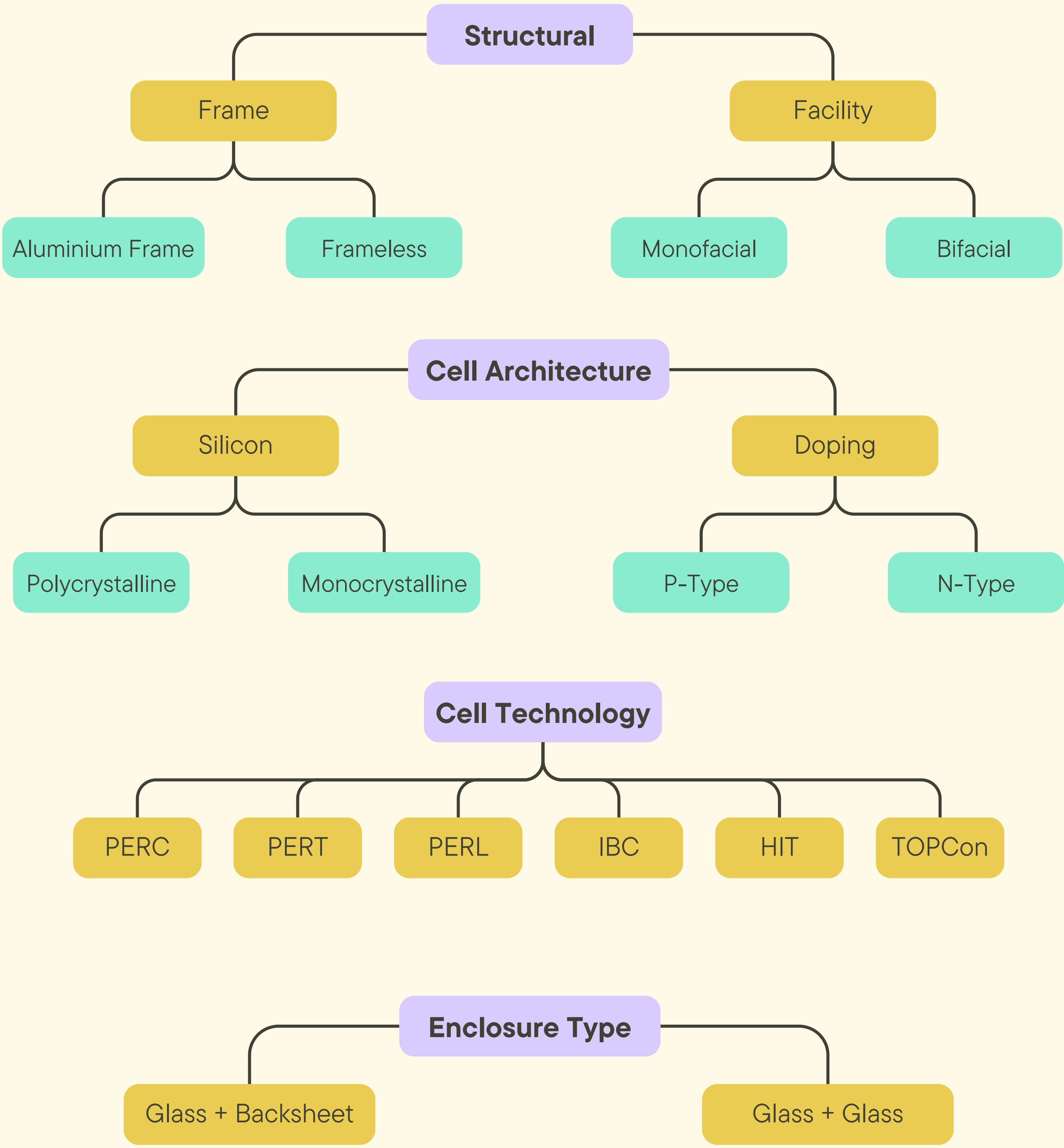
Current flow

When a circuit is connected to the solar cell (like wiring it to a light or a battery), the free electrons flow through the circuit creating an electrical current. This current is what powers electrical devices, turning sunlight into usable energy.

In summary, a solar cell works by capturing the energy from sunlight, generating electron-hole pairs, and using an electric field to create a flow of electrons, which we then use as electricity.

PV MODULES 101: TYPE, TECHNOLOGY, AND MATERIALS

Solar PV modules (or panels) come in different shapes and sizes, each designed with specific technologies, materials, and structures in mind. This section breaks down the core components and classifications, giving you the clarity to choose the right module for your projects.



DEFINING PV MODULES TYPES

Aluminum Frame	These panels come with a sturdy aluminum frame that gives them the structure and rigidity to withstand the elements. Framed modules are the industry standard—easier to handle and cheaper to install due to their compatibility with standard mounting systems. Perfect for those looking for reliable performance without the extra hassle.
Frameless	Frameless panels skip the typical aluminum frame, opting instead for a more streamlined design with tempered glass on both sides (glass-on-glass) or a combination of glass on the front with another backing material. These panels are perfect for Building-Integrated Photovoltaics (BIPV), where aesthetics and seamless integration with building materials are key.
Monofacial	These panels generate electricity from only one side (the front). The back of the panel is usually covered with an opaque material, such as a plastic backsheet, which prevents light from reaching the rear side.
Bifacial	These panels generate electricity from both the front and the back. The backside uses transparent materials (usually glass) that let sunlight pass through, bouncing off surfaces beneath and reflecting back into the panel. This can increase energy output by 5% to 30%, depending on the surface reflectivity (albedo) and how high the panels are mounted.
Polycrystalline	These cells are made by fusing several silicon fragments together, giving them their signature bluish tint. These panels typically deliver lower efficiency than their monocrystalline counterparts.
Monocrystalline	These cells are sliced from a single, pure silicon crystal, giving them that sleek, dark black look—and more importantly, superior efficiency. When it comes to performance, monocrystalline panels outshine the competition, especially in low-light conditions. If you want more power with less sunlight, this is the panel type to choose.
P-Type	They're made of silicone with boron atoms infused to give the cell a positive charge (hence, "P" type). The top layer of the silicone wafer is then treated with phosphorus (creating the N-type layer), which forms a p-n junction that lets electricity flow.
N-Type	N-type cells are the flip side of P-type cells. Instead of a silicon base infused with boron (like P-types), N-types use phosphorus to create a negative charge. The top layer of N-type cells is infused with boron to form the p-n junction, essentially creating the balance between positive and negative charges that makes the solar cell work.

DEFINING PV MODULES TYPES

PERC (P-Type)	Passivated Emitter Rear Cells have a passivated rear surface where a dielectric layer is added to the rear side. This layer reflects unabsorbed light back into the cell, thus ensuring more light is captured and converted into electricity.
PERT	Passivated Emitter and Rear Technology cells, like PERC, also have a passivated rear side. However, unlike PERC, the rear side is totally diffused (fully doped), meaning the entire rear surface is optimized for charge collection. This reduces energy loss and makes the panel work more efficiently, giving you more power for the same amount of sunlight.
PERL	Passivated Emitter, Rear Locally diffused cells PERL cells are an advanced upgrade to traditional PERC cells, designed to maximize energy conversion efficiency. The rear side of the cell features locally diffused contacts, meaning rather than doping the entire rear surface, only specific areas are treated to create pathways for electrons to flow. This targeted approach optimizes the cell's performance, squeezing out more energy from the same space.
IBC	Interdigitated Back Contact - The electrical contacts (metal fingers) are placed on the rear side of the cell instead of the front. This design eliminates shading on the front surface, allowing for more sunlight to be absorbed by the active area of the cell
HIT	Heterojunction with Intrinsic Thin layer cells are a type of photovoltaic technology that combines features of both crystalline silicon and thin-film solar cells to achieve high efficiency and excellent performance. The structure typically includes a p-type crystalline silicon substrate, an intrinsic amorphous silicon layer, and n-type amorphous silicon on top, allowing for efficient electron and hole separation.
TOPCon	Tunnel Oxide Passivated Contact - Consists of a silicon wafer (typically mono-crystalline) with a thin tunnel oxide layer that is passivated, improving surface recombination and allowing better electron flow.
Glass + Backsheet	Panel where the front surface is made of glass and the back surface is made of a polymer material known as a backsheet. The polymer backsheet can be less durable than glass and may be more susceptible to environmental stressors like UV degradation, moisture ingress, and mechanical damage over time.
Glass + Glass	These are solar panels where both the front and rear surfaces are made of glass. The dual glass layer helps reduce temperature fluctuations inside the module, which can improve performance and reduce the risk of hot spots. High-quality glass used in these modules often has better light transmission properties, allowing more sunlight to reach the solar cells, potentially increasing energy output.

CRACKING SOLAR CELL TECH: SIMPLE TABLES, BIG INSIGHTS

Solar cell technology can seem overwhelming with its extensive range of specifications and performance metrics. But don't worry — we've made it easy for you.

In the following sections, we've distilled this complex information into clear, straightforward tables that outline the key features and performance indicators for each type of solar cell technology. These tables provide a simple, accessible way to compare and understand the various technologies, helping you make informed decisions without the confusion.

This section is designed to give you the insights you need to confidently navigate solar cell tech and choose the right options for your projects. 👇

PERC

Feature/Type	PERC
Structure	Crystalline silicon with a passivated rear surface
Efficiency	Up to 22%
Temperature Coefficient	Moderate (around -0.4%/°C)
Cost	Moderate
Degradation	Moderate degradation
Light Absorption	Improved rear surface absorbs more light
Manufacturing Complexity	Moderate complexity
Typical Applications	Residential and commercial systems
Aesthetic Appeal	Generally sleek and modern
Market Adoption	Widely adopted

Check out Trina Solar's PERC module here.

PERT

Feature/Type	PERT
Structure	Similar to PERC but with a fully diffused rear layer
Efficiency	Up to 24%
Temperature Coefficient	Improved (lower temperature coefficients)
Cost	Higher than PERC due to additional processing
Degradation	Lower degradation compared to PERC
Light Absorption	Enhanced rear-side light absorption
Manufacturing Complexity	Higher complexity due to fully diffused rear
Typical Applications	Utility-scale projects, residential installations
Aesthetic Appeal	Similar to PERC, can be visually appealing
Market Adoption	Gaining popularity, especially in high-efficiency segments

Check out Trina Solar's PERT module here.

PERL

Feature/Type	PERL
Structure	Passivated rear surface with local contacts
Efficiency	Up to 24%
Temperature Coefficient	Moderate (around -0.3%/°C)
Cost	Higher than PERC due to complex design
Degradation	Very low degradation due to local contact design
Light Absorption	Effective light absorption with local contacts
Manufacturing Complexity	Higher complexity due to local contact design
Typical Applications	High-efficiency applications
Aesthetic Appeal	Less common aesthetically
Market Adoption	Less common but increasing interest

Check out Hyundai's PERL module here.

HIT

Feature/Type	HIT
Structure	Thin layers of amorphous silicon on both sides of crystalline silicon
Efficiency	Up to 26%
Temperature Coefficient	Excellent (around -0.25%/°C)
Cost	Higher due to advanced manufacturing processes
Degradation	Minimal degradation over time
Light Absorption	Excellent light absorption on both sides
Manufacturing Complexity	High complexity due to multi-layer structure
Typical Applications	Residential, commercial, and specialized applications
Market Adoption	Increasing due to high efficiency

Check out Risen Energy's HIT module here.

TOPCon

Feature/Type	TOPCon
Structure	Monocrystalline silicon wafer with a thin tunnel oxide layer and passivated rear contact.
Efficiency	Achieves efficiencies over 26% in lab conditions; commercially available products around 24%.
Temperature Coefficient	Generally favorable; performs well in higher temperatures compared to traditional silicon cells.
Cost	Lower production costs compared to HJT; can be integrated into existing PERC production lines.
Degradation	Good resistance to light-induced degradation (LID) and potential-induced degradation (PID).
Light Absorption	High light absorption due to optimized design; performs well in various lighting conditions, including low light.
Manufacturing Complexity	More complex than traditional cells but simpler than HJT; modifications required for existing PERC lines.
Typical Applications	Utility-scale solar installations, residential solar projects, and commercial applications.
Aesthetic Appeal	Generally similar in appearance to conventional solar panels; options available for all-black designs.
Market Adoption	Growing rapidly; increasingly adopted by manufacturers due to high efficiency and competitive costs.

Check out Trina Solar's TOPCon module here.

THE ARCHITECTURE INSIDE YOUR SOLAR PANELS

Cell architecture may seem tricky at first, so let's make it simple: There are two main types of solar panel cell designs: monocrystalline and polycrystalline. Each has its own strengths and weaknesses, and understanding the differences can help you choose the best module for your project's specific needs, conditions, and budget.

Check out the tables below to learn how they compare:

Feature	**Monocrystalline Solar Panels**
Material	Made from a single crystal structure of silicon
Efficiency	Typically 15-22%
Space Efficiency	Higher; more power per square meter
Temperature Coefficient	Better performance in high temperatures (around -0.3%/°C)
Lifespan	Generally longer (25-30 years)
Cost	Generally more expensive per watt
Appearance	Uniform dark color; sleek and modern design
Production Process	More energy-intensive, complex manufacturing
Performance in Low Light	Better performance in low-light conditions
Degradation Rate	Lower degradation rate over time
Typical Applications	Residential rooftops, commercial, limited space, and high-efficiency projects

CELL ARCHITECTURE DEFINITIONS

Feature	**Polycrystalline Solar Panels**
Material	Made from multiple silicon crystals melted together
Efficiency	Typically 13-18%
Space Efficiency	Lower; requires more space for the same output
Temperature Coefficient	Moderate performance in high temperatures (around -0.4%/°C)
Lifespan	Typically shorter (20-25 years)
Cost	More cost-effective and affordable
Appearance	Bluish hue with a speckled appearance
Production Process	Simpler and less energy-intensive process
Performance in Low Light	Moderate performance in low-light conditions
Degradation Rate	Slightly higher degradation rate
Typical Applications	Large-scale installations and where cost is a major factor

THE ROLE OF DOPING IN SOLAR CELLS - P-TYPE

Let's talk doping styles. This process is what creates the p-n junction in a solar cell—without it, there's no conversion of sunlight into electricity. Doping fine-tunes the cell's electrical properties, enabling it to generate and direct current efficiently. Understanding doping helps you pick the right modules for maximum performance.

Feature	P-Type Semiconductor
Doping Material	Doped with elements that have fewer valence electrons (e.g., Boron)
Charge Carriers	Majority carriers are holes (positive charge)
Electrical Conductivity	Conductivity is generally lower than N-type
Energy Band Diagram	Fewer electrons in the valence band, creating holes
Solar Cell Efficiency	Typically less efficient than N-type solar cells
Temperature Sensitivity	More susceptible to performance degradation at high temperatures
Lifespan and Stability	May experience greater degradation over time
Cost of Production	Generally less expensive to produce
Common Applications	Used in most traditional solar cells
Recombination Rates	Higher recombination rates can reduce efficiency

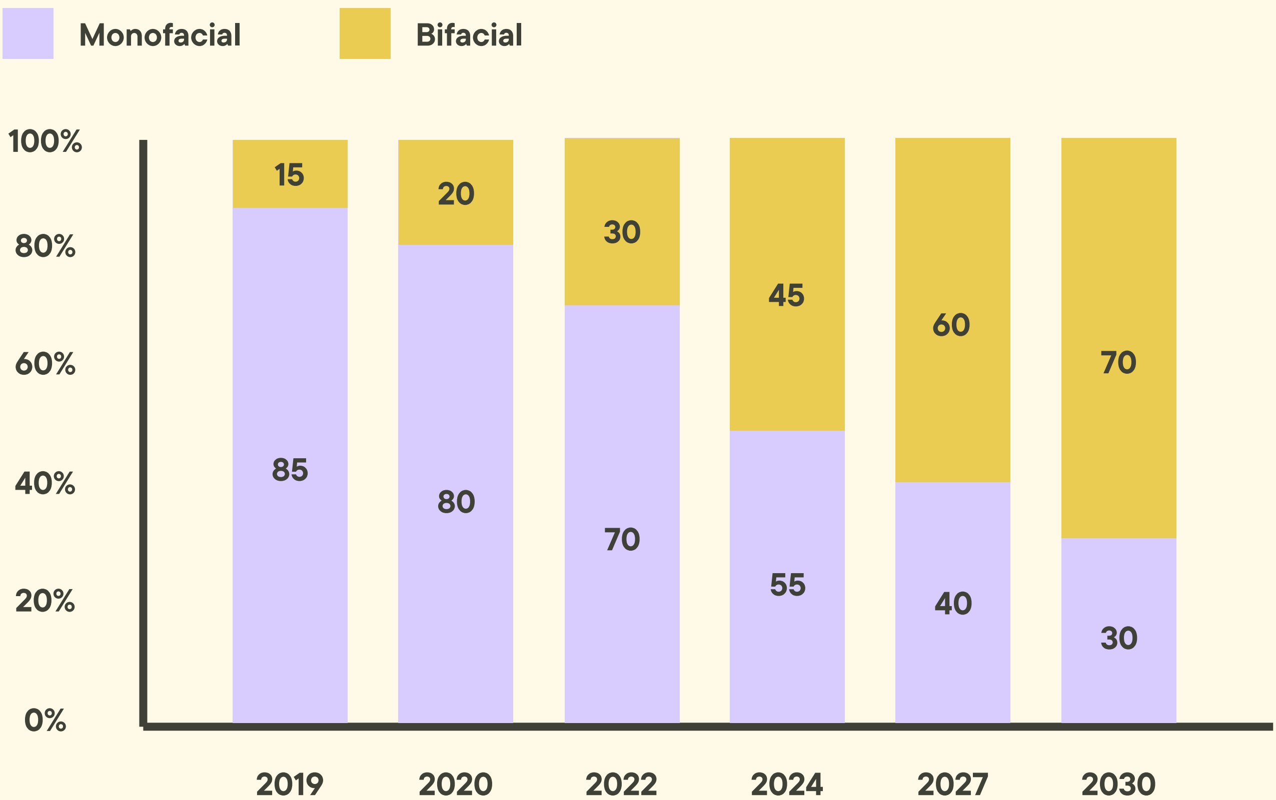
THE ROLE OF DOPING IN SOLAR CELLS - N-TYPE

Feature	N-Type Semiconductor
Doping Material	Doped with elements that have more valence electrons (e.g., Phosphorus)
Charge Carriers	Majority carriers are electrons (negative charge)
Electrical Conductivity	Generally higher conductivity than P-type
Energy Band Diagram	Extra electrons in the conduction band
Solar Cell Efficiency	Often more efficient due to lower recombination rates
Temperature Sensitivity	Better performance and stability at high temperatures
Lifespan and Stability	Typically has lower degradation rates over time
Cost of Production	May be slightly more expensive due to additional processing
Common Applications	Used in high-efficiency solar cells (e.g., N-type PERC, HJT)
Recombination Rates	Lower recombination rates lead to better performance

SOLAR TRENDS YOU CAN'T IGNORE

The market for solar modules in large-scale projects is rapidly evolving, driven by technological advancements, cost reductions, and a strong push for renewable energy. With a focus on efficiency, sustainability, and integration with storage solutions, the solar industry is well-positioned for continued growth in the coming years.

Monofacial vs Bifacial Solar Cells in the World Market



Forecast of the worldwide market shared for bifacial solar cell technology according to the International Technology Roadmap for Photovoltaic (ITRPV) – 11th Ed., April 2020

P-TYPE AND N-TYPE TRENDS

P-Type Solar Cells

Continued relevance - P-type cells will likely remain relevant, particularly in cost-sensitive markets where price is a significant consideration. Their established manufacturing processes will continue to benefit from economies of scale.

Incremental improvements - While they may not lead the efficiency race, P-type technologies will see incremental improvements through innovations like bifacial designs and better surface passivation techniques.

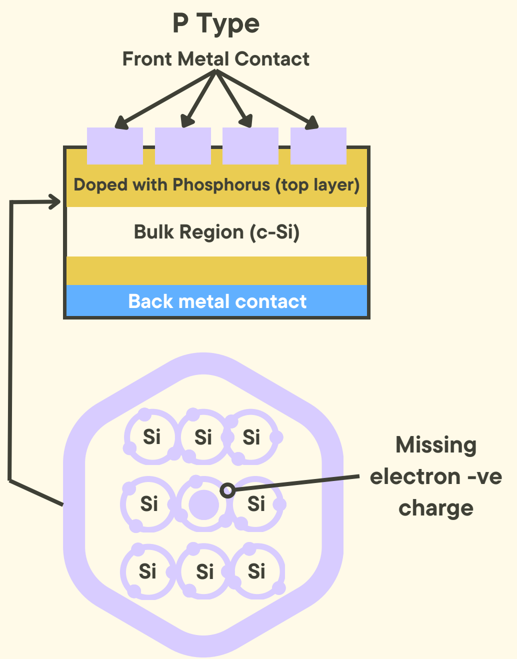
N-Type Solar Cells

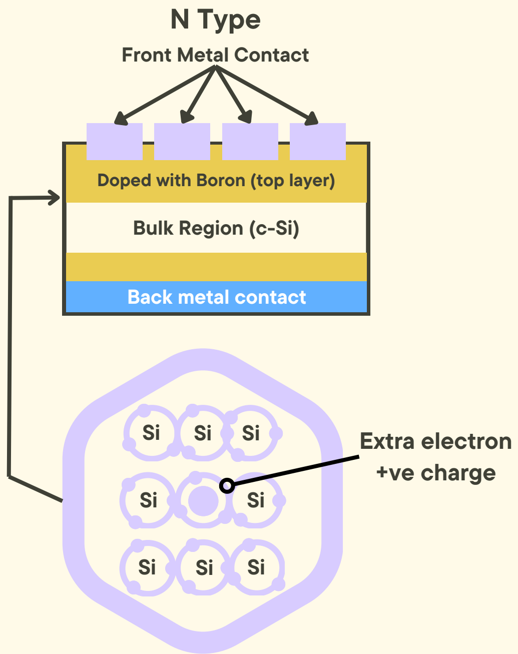
Rapid growth - N-type technologies are expected to see rapid growth as manufacturers focus on high-efficiency solar cells to meet increasing energy demands and sustainability goals.

Market diversification - As production costs decline and efficiency improves, N-type solar cells may become more mainstream, catering to both residential and utility-scale applications.

Innovation in materials - Continued research into new materials and technologies, such as perovskite tandem cells, may provide a significant boost to the N-type segment, enhancing efficiency and lowering costs.

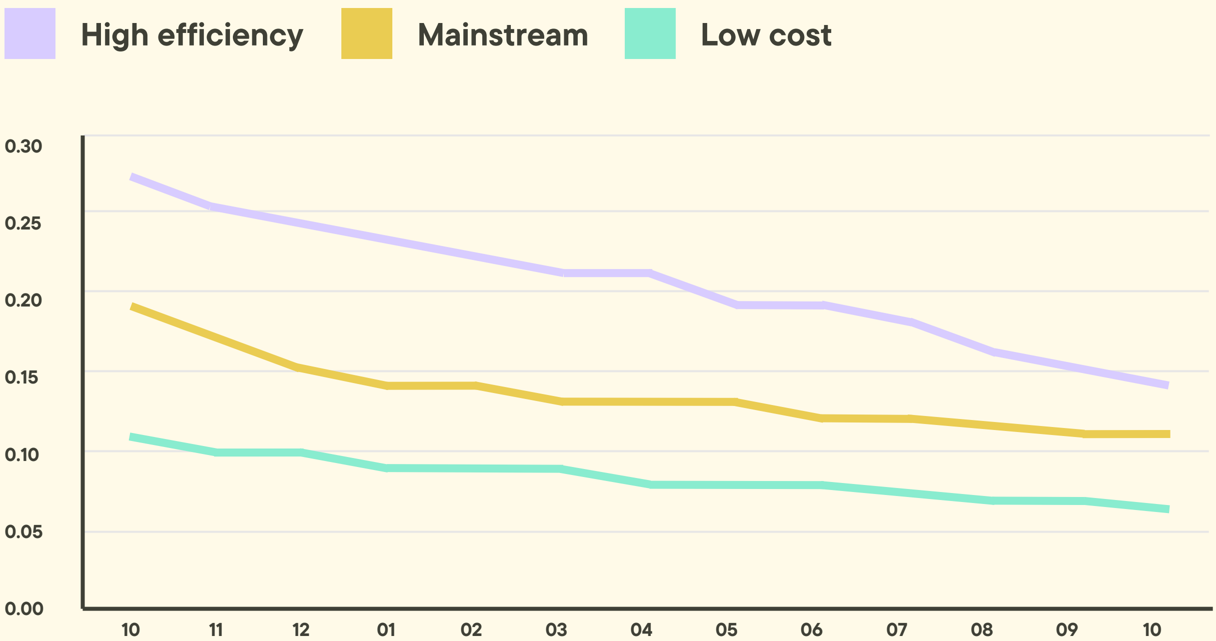
P-type solar cells dominate the market for their cost-effectiveness and established production, while N-type cells are gaining traction for their superior efficiency and innovation potential. As the industry shifts toward higher efficiency and sustainability, N-type technologies may take the lead, but P-type cells will remain crucial for cost-sensitive applications.





https://risenenergy.com.au/n-type-panels-five-facts-you-need-to-know/

PRICE TRENDS FOR PV MODULES



Price trend for solar modules by month from September 2023 to September 2024 per category according to PV Xchange. (The prices shown reflect the average offer prices for duty paid goods on the European spot market).

Module class	**€ / Wp**	**Trend since August 2024**	**Trend since January 2024**	**Description**
High Efficiency	0.15	- 6.3% ↘	- 34.8% ↘	Crystalline modules with mono- or bifacial HJT, N-type/TOPCon or IBC (Back Contact) cells and combinations thereof, which have efficiencies higher than 22%.
Mainstream	0.11	- 4.3% ↘	- 21.4% ↘	Standard modules, typically with mono-crystalline cells (also TOPCon), which are mainly used in commercial PV systems and which have an efficiency of up to 22%.
Low Cost	0.07	0.0% →	- 22.2% ↘	Stock lasts, factory seconds, insolvency goods, used or low-out modules (crystalline), products with limited or no warranty which usually have no bankability.

HOW TO READ A PV MODULE DATASHEETS LIKE A PRO

When evaluating PV modules, one of the most valuable resources you'll encounter are datasheets. Think of it as the "fact sheet" for a solar panel, packed with all the essential details about its performance, reliability, and features.

While datasheets can seem technical, we've simplified them to help you easily pick out the key metrics that matter most. You don't need to be an engineer to compare modules and make decisions that work for your projects.

Let's walk through the Trina Solar Vertex N Datasheet to show you how it's done—no jargon, just the essentials.

Vertex N

BIFACIAL DUAL GLASS MODULE

Module model and feature

Product: TSM - NEG21C.20

Product Range: 670-695W

Module product number and power range

695W

MAXIMUM POWER OUTPUT

0 ≈ + 5W

POSITIVE POWER TOLERANCE

22.4%

MAXIMUM EFFICIENCY

High reliability

- Minimized micro-cracks with innovative non-destructive cutting technology.
- Ensured PID resistance through cell process and module material control.
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas.
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load.

High energy yield

- Excellent product bifaciality and low irradiation performance, validated by 3rd party.
- Extremely low 1% first year degradation and 0.4% annual power attenuation.
- The unique design provides optimized energy production under inter-row shading conditions.
- Lower temperature coefficient (-0.30%) and operating temperature.

READING DATASHEETS

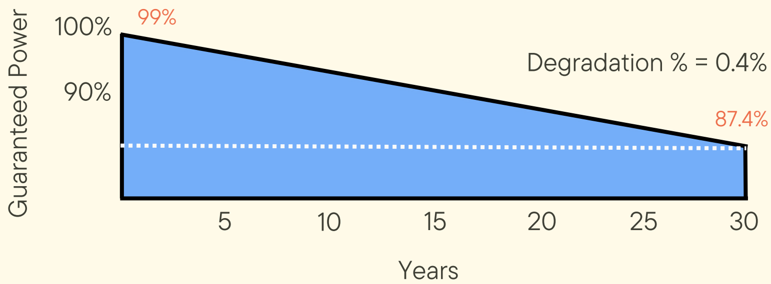
High customer value

- Lower LCOE (levelized cost of energy), reduced BOS (balance of system) cost, shorter payback time.
- Guaranteed first year and annual degradation.
- High module power; high string power and low voltage design.

High power up to 695W

- Up to 24% module efficiency with high density interconnect technology.
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection.

Trina Solar's Vertex Bifacial Dual Glass Performance Warranty



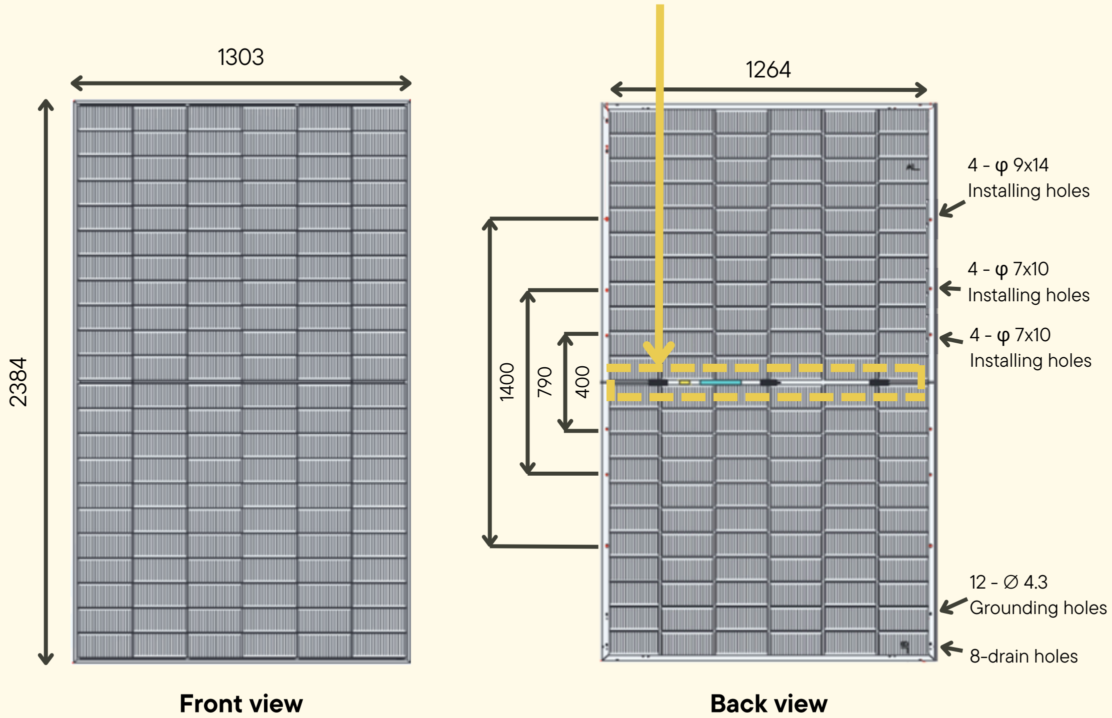
https://static.trinasolar.com/sites/default/files/Datasheet Vertex NEG21C.20 EN 2023 A web.pdf

You can see from the information above there's a wealth of knowledge that you can use to your advantage. For example, this datasheet tells us:

- The maximum power output, positive power tolerance and maximum efficiency. This is important to know when evaluating yield.
- There's key information about how these modules perform under harsher conditions.
- This solar module has a degradation of 0.4% over 30 years, giving you insight into the longevity of the module.

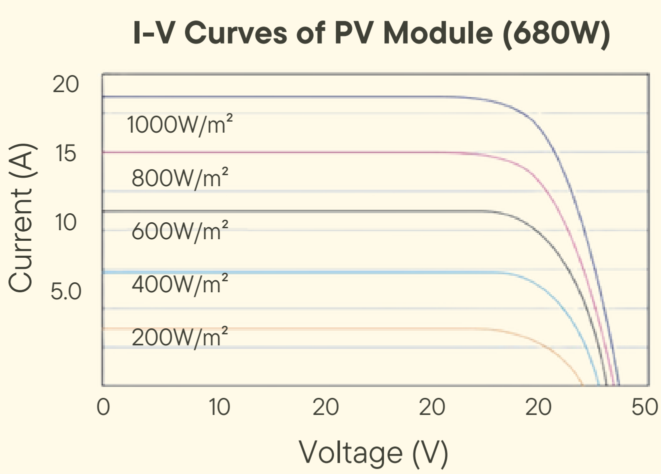
READING DATASHEETS

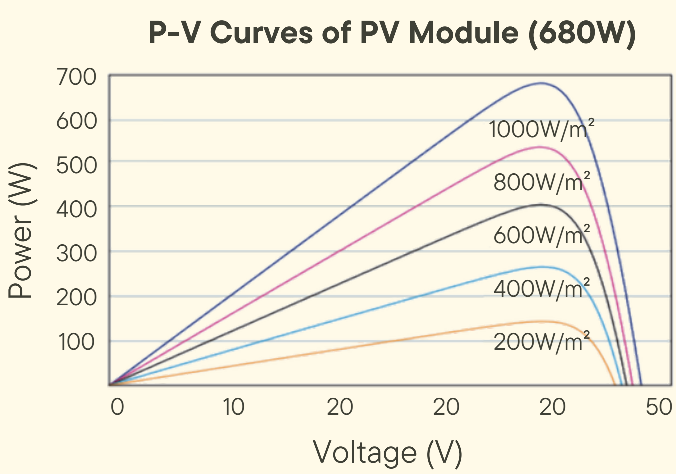
Datasheets typically include the dimensions of a PV module, which are important for understanding the module's size and the location of installation and grounding holes. If the diagram shows a half-cut module, split by a line, it means the module has two independent sections, which helps reduce shadow losses and improve overall efficiency. This is now a common feature in all new modules.



Dimensions of a PV module (mm)

The graphs below show Current and Power performance against voltage based on irradiation. This is useful because voltage output depends on the temperature, influencing which solar site you choose. The lower the temperature, the higher the voltage. In theory, that also means the perfect spot for a solar panel is at the top of Mount Everest (low temperature, high altitude for maximum irradiation) but we'd advise against trying to get that permit.





A series of performance tables are usually included in datasheets too. Below, we've highlighted the most important aspects of these tables that you would typically find useful when prospecting your solar sites.

Electrical Data (STC)

It represents the maximum power a module can produce under standard conditions. It's key for estimating energy output, designing system capacity, and evaluating financial returns accurately.

Peak Power (Watts - PmAx)	670	675	680	685	690	695
Power Tolerance (PMAx) (W)	0 ≈ + 5W					
Maximum Power Voltage (VMPP) (V)	39.2	39.4	39.6	39.8	40.1	40.3
Short Circuit Current (Isc) (A)	18.10	18.14	18.18	18.21	18.25	18.28
Module Efficiency (η) (%)	21.6	21.7	21.9	22.1	22.2	22.4

STC: Irradiance 1000w/m², Cell temperature 25 °C, Air mass AM1.5. *Measuring tolerance ±3%.

Electrical characteristic with different power bin (reference to 10% irradiance ratio)

Total Equivalent Power (PmAx) (Wp)	724	729	734	740	745	751
Maximum Power Voltage (VMPP) (V)	39.2	39.4	39.6	39.8	40.1	40.3
Maximum Power Current (IMPP) (A)	18.46	18.49	18.53	18.57	18.61	18.63
Open Circuit Voltage (Voc) (V)	47.0	47.2	47.4	47.7	47.9	48.3
Short Circuit Current (Isc) (A)	19.55	19.59	19.63	19.67	19.71	19.74
Irradiance ratio (rear/front)	10%					
Product Bifaciality	80 ± 5%					

This means the rear panel is 80% as efficient as the front panel, + or - 5%. This is important to know if the rear panel is facing a reflective surface like concrete or snow.

This shows the amount of sunlight the rear panel can capture from reflective surfaces in relation to the front panel. Of all the sunlight being captured, the rear panel can capture up to 10% from reflective surfaces.

Mechnical Data

Module dimensions let you compare surface area across different panels to see what fits your project best. Weight is a hidden cost driver. Heavier modules mean higher construction costs

Module Dimensions	2384 x 1303 x 33 mm (93.86 x 51.30 x 1.30 inches)
Weight	38.3 kg (84.4 lb)
Solar Cells	132 cells
No. of Cells	132
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated, Heat Strengthened Glass
Encapsulant Material	POE/EVA
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)
Frame	33 mm (1.30 inches) Anodized Aluminium Alloy
J-Box	IP68 rated
Cables	Photovoltaic Technology Cable 4.0 mm² (0.006 inches²), Portrait: 350/280 mm (13.78/11.02 inches); Length can be customized
Connector	MC4 EVO2 / TS4 Plus / TS4

Maximum ratings

Operational Temperature	-40°C to +85°C
Irradiance ratio (rear/front)	1500V DC
Maximum Fuse Rating	35A

Maximum system voltage is the highest DC voltage your solar array or components can safely handle. Here's why it matters:

- Higher voltage = more modules per string, meaning less cabling and lower costs.
- It also determines which inverter models you can use, directly impacting system design.

Temperature ratings

NOCT (Nominal Operating Cell Temperature)	43°C (± 2°C)
Temperature Coefficient of PMAX	-0.30 %/°C
Temperature Coefficient of Voc	-0.24 %/°C
Temperature Coefficient of Isc	0.04 %/°C

It's worth explaining the table above in more detail as the temperature ratings directly influence solar site selection.

- NOCT - This means that when the panel is operating under normal outdoor conditions (not in a lab), its temperature will stabilize around 43°C, even if the air temperature is lower (say 20°C). Solar panels naturally heat up when exposed to sunlight.

- Temperature Coefficient of PMAX - This refers to the maximum power output of the panel. For every degree Celsius above 25°C (the standard testing temperature), the power output decreases by 0.30% per degree. If the panel's power output is 300W at 25°C, and it heats up to 35°C (10°C higher), the power will drop to 291W because 300 × (10× − 0.003) = −9W.

- Temperature Coefficient of Voc - This is the open-circuit voltage, which is the voltage when the panel is not connected to a load. For every degree Celsius above 25°C, the voltage decreases by 0.24% per degree.

- Temperature Coefficient of Isc - This is the short-circuit current, which is the maximum current the panel can produce. For every degree Celsius above 25°C, the current increases slightly by 0.04% per degree.

To summarize - the higher the temperature, the lower the voltage power output.

PV PANEL COMPARISON CHEATSHEET

Finally, choosing the right PV module is crucial for optimizing your solar project performance.

Use the PV Panel Comparison Cheatsheet to easily compare modules, and leverage the formula on the right to calculate the power-to-surface ratio—helping you assess efficiency and maximize output per square meter.

Power/surface (W/m²) =

$$\frac{\text{Height x Width}}{\text{Module power}}$$

Base	Polycrystalline	Monocrystalline	Monocrystalline	Monocrystalline
Bifaciality	Monofacial	Bifacial	Bifacial	Bifacial
Cell technology	--	PERC	PERC	HJT
Doping	P-type	P-type	P-type	N-Type
Power (without bifacial gain) (W)	320	320	400	480
Height (m)	1.96	1.65	2.015	2.094
Width (m)	0.99	0.99	0.99	1.30
Surface (m²)	1.94	1.64	1.99	2.72
Power/surface (W/m²)	164.7	195.7	200.5	176.3
Weight	22.1	18.2	22.7	32
Temperature coefficient of Power % /C	-0.4	-0.38	-0.35	-0.24
LID %	2	2	2	1
Module degradation %	0.70	0.60	0.50	0.29
Liner Power Warranty	25	25	25	30

PV PANEL COMPARISON CHEATSHEET

Base	Polycrystalline	Monocrystalline	Monocrystalline	Monocrystalline
Bifaciality	Bifacial	Bifacial	Bifacial	Monofacial
Cell technology	PERC	HJT	IBC	--
Doping	P-type	N-Type	N-Type	N-Type
Power (without bifacial gain) (W)	550	600	600	625
Height (m)	2.279	2.279	2.279	2.465
Width (m)	1.13	1.13	1.13	1.13
Surface (m^2)	2.58	2.58	2.58	2.80
Power/surface (W/m^2)	212.8	232.2	232.2	223.6
Weight	28.6	32	27.5	30.6
Temperature coefficient of Power % /C	-0.35	-0.24	-0.24	-0.3
LID %	2	1	1	1
Module degradation %	0.53	0.29	0.38	0.40
Liner Power Warranty	25	30	25	25

PV PANEL COMPARISON CHEATSHEET

Base	Monocrystalline	Monocrystalline	Monocrystalline	Monocrystalline
Bifaciality	Bifacial	Bifacial	Bifacial	Bifacial
Cell technology	PERL	PERL	HJT	TOPCon
Doping	N-Type	N-Type	N-Type	N-Type
Power (without bifacial gain) (W)	700	720	720	720
Height (m)	2.384	2.384	2.384	2.384
Width (m)	1.30	1.30	1.30	1.30
Surface (m^2)	3.11	3.11	3.11	3.11
Power/surface (W/m^2)	225.3	231.8	231.8	231.8
Weight	36.5	38.3	38.7	38.5
Temperature coefficient of Power % /C	-0.3	-0.29	-0.26	-0.29
LID %	1	1	1	1
Module degradation %	0.40	0.39	0.36	0.39
Liner Power Warranty	25	25	30	30

PV PANEL COMPARISON CHEATSHEET

Base	Monocrystalline
Bifaciality	Bifacial
Cell technology	PERL
Doping	N-Type
Power (without bifacial gain) (W)	700
Height (m)	2.384
Width (m)	1.30
Surface (m^2)	3.11
Power/surface (W/m^2)	225.3
Weight	36.5
Temperature coefficient of Power % /C	-0.3
LID %	1
Module degradation %	0.40
Liner Power Warranty	25

Wrapping It Up: Time to Turn This Knowledge Into Action

You've learned the ins and outs of PV modules—how they work, what to look for, and how to compare them like a pro. Now, it's time to stop guessing and start making the right decisions with confidence.

Choosing the right module isn't just about picking a panel. It's about using the right tools to get you there faster and with more accuracy. And that's exactly where Glint Solar comes in.

With Glint Solar, you can take the insights from this guide and apply them instantly. Our platform simplifies site evaluations, automates preliminary designs, and lets you quickly select and analyze panel types to see how they perform under your site conditions—no complex tools or engineer delays.

- Choose from multiple panel types to see which best fits your project's specific needs
- Instantly analyze performance data in relation to your site conditions, taking the guesswork out of panel selection
- Streamline your workflows and keep all your project data in one place for faster decision-making and collaboration

Ready to make smarter solar decisions, faster?

Book a demo

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Speed-Up Your Utility-Scale Solar Projects to Permits

About Glint Solar

The Software Most Loved By Solar Developers Worldwide To:

3x

Triple project pipeline

10x

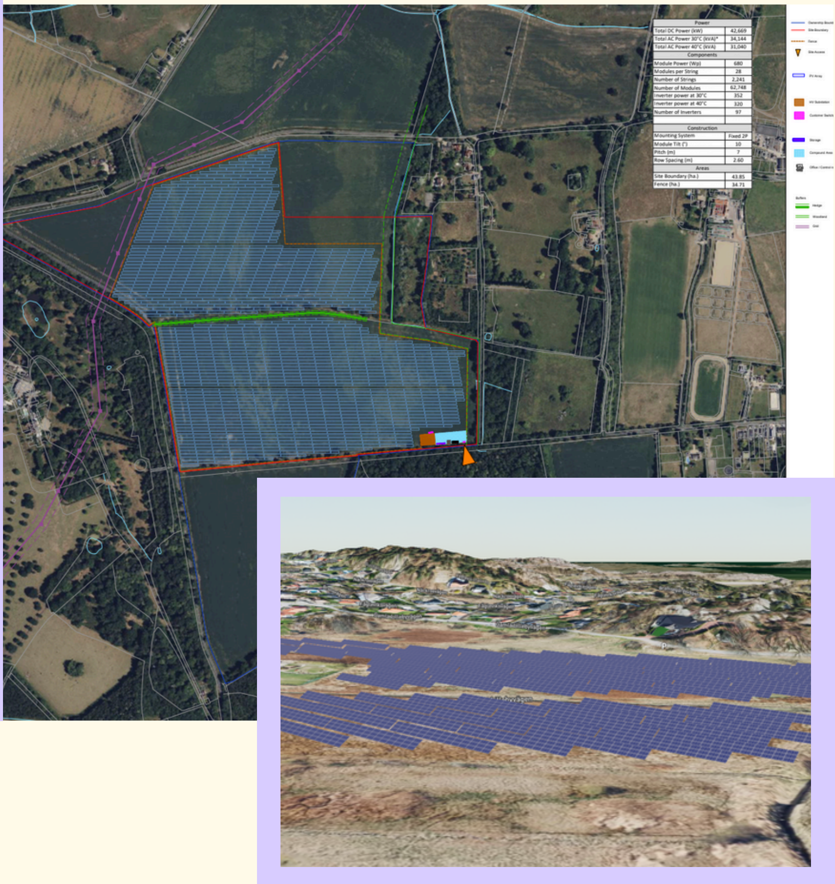
Unlock 10x faster layouts

30%

Boost project conversion rates

The all-in-one solar PV prospecting, pre-design, and analysis software. Tailor-made for utility-scale solar developers.

- Prospect top sites in clicks
- Create engineering-approved designs in minutes
- Assess multiple scenarios instantly
- Visualize projects in 3D
- Centralize data and decision-making
- Collaborate with stakeholders seamlessly



Glint Solar

Identify top solar sites. Design and collaborate.

A single hub to triple your greenfield project pipeline growth with unmatched ease. Tailor-made for utility-scale solar developers.

Thanks

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