



Solar Panels for Recreation and Small-Scale Installations.
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What Are the Different Types of Solar Panels?

The most popular types of solar panels you will encounter when shopping for a solar system.

Panel	Upside	Downside
Monocrystalline	Most efficient	Most expensive
Polycrystalline	Mid-range prices	Shorter lifespan
Thin-Film	Lowest prices	Least efficient

Monocrystalline Panels

Monocrystalline solar panels are one of the most popular solar panel choices. This type of panel currently features the **highest efficiency rate**, at an average of 24%, and its average lifespan of 25 to 40 years is longer than other solar panels.



Monocrystalline solar cells follow a manufacturing process that creates a pure, nontoxic, and stable silicon ingot. This monocrystalline silicon is then sliced from the ingot to create a silicon wafer. This process results in a highly efficient and eco-friendly product.

Mono panels, as they are often called, feature a dark-black color, making it easier for them to blend into a home's color scheme and design. For example, if you are interested in solar shingles or a solar roof, you will most likely choose monocrystalline panels.

Polycrystalline Panels

Polycrystalline solar panels are made from different silicon crystals instead of one. Silicon fragments are melted and poured into a mold, **leading to limited waste** in producing polycrystalline solar cells.



However, because they use less pure silicon, they are less efficient than monocrystalline panels. These panels average around 20% in efficiency ratings. Other downsides to polycrystalline include a lower heat tolerance and a shorter average lifespan of 25 to 35 years.

You can recognize polycrystalline panels by their blue color. You'll need a larger roof if you opt for polycrystalline solar panels, as they require more space than monocrystalline.

Thin-Film Panels

Thin-film panels are a newer type of solar panel used less often for homes than mono- and polycrystalline. Thin-film solar panels are less efficient, at an average efficiency rate of 19%, and last between 10 and 20 years.



Thin-film panels get their name from the thin layers of semiconductor materials used in them. Materials include silicon, cadmium telluride, and copper indium gallium selenide. These materials are rolled out as a film on a surface. Companies often sell thin-film panels in standardized sizes of 60-, 72-, and 96-cell counts.

Thin-film panels are entirely black, flat, and flexible in shape and size and **have the sleekest appearance** among the three types of panels. However, because they are far less efficient, you need many more to generate enough power for your home. However, companies typically sell them at a [lower cost](#).

There are three types of thin-film panels:

- **Amorphous silicon (a-Si):** The silicon in this type of solar panel is not structured on the molecular level as it is with mono- or polycrystalline panels. This design causes a-Si cells to have a rather low-efficiency rate. This thin-film solar panel is better suited for smaller homes or projects, such as a solar-powered workshop.
- **Cadmium telluride (CdTe):** CdTe has the lowest carbon footprint, water requirement, and energy payback time of all solar panel types. However, CdTe releases toxic cells if inhaled or ingested. This issue makes recycling them an expensive and complicated ordeal.
- **Copper indium gallium selenide (CIGS):** CIGS panels use layers of copper, indium, gallium, and selenium on glass or plastic. Combining these materials results in the highest efficiency among thin-film panels, but it still lacks efficiency compared to crystalline silicon panels.

How Do Solar Panels Work?

A solar panel is a device that collects energy from the sun and converts it into electricity through another device called an inverter.

Individual solar cells make up solar panels. Each solar cell is made from layers of silicon. These silicon layers create an electrical field from the electrons inside the solar panel, resulting in direct current (DC). This conversion of electrons from solar power to electricity is called photovoltaics.

DC power then passes through the inverter within the solar power system and becomes alternate current (AC) power. AC electricity powers your home's electrical system and home appliances.

Compare the Types of Solar Panels

Type	Monocrystalline	Polycrystalline	Thin Film
Efficiency Rating	24%	20%	19%
Color	Black	Blue	Depends on the material used
Lifespan	25–40 years	25–35 years	10–20 years
Upsides	Most efficient; Highest power capacity	Middle-ground option	Most cost-efficient; Portable
Downsides	Most costly	Requires more space; Lower heat tolerance	Least efficient; Shortest lifespan

Other Factors to Consider

A few other factors might influence which type of solar panel is best for your home:

- **Temperature:** Monocrystalline and polycrystalline panels have peak efficiency between 59°F and 95°F. Regions with high temperatures during the summer that may cause a solar panel to reach an internal temperature of more than 100°F may see a decrease in efficiency levels.
- **Light-Induced Degradation (LID):** LID refers to a metric of performance loss that occurs with crystalline panels during the first few hours of sunlight exposure. The sunlight reacts with oxygen left over from the manufacturing process, affecting silicon. LID tends to range from 1% to 3% in efficiency loss.
- **Fire rating:** [International Building Codes](#) require solar panels to match their roof's fire rating to ensure that the panels do not accelerate the spread of flames. You will see that different panels come with a fire rating ranging from Class A to Class C. Class A provides the most protection in a fire, as flames cannot spread more than six feet. Class B ensures flame spread does not exceed eight feet, and Class C ensures flames do not spread beyond 13 feet.
- **Hail:** Crystalline panels are better for areas that might experience heavy hail as they can withstand hail hitting at speeds of up to 50 mph. Thin-film solar panels are not ideal for hail, given their thin design.
- **Hurricanes:** There is no formal classification or rating system for hurricanes and solar panels. Overall, a solar system that uses fasteners, through-bolting modules, or a three-frame rail system is better suited for homes that might experience a hurricane or tropical storm.

Recommendation

Overall, monocrystalline panels are the [best solar panel option](#) for residential solar on the market today. However, you may want to consider polycrystalline or thin-film solar panels, depending on the size of your solar system and other needs. For example, if you have a lot of space and want to be cost-efficient, you might install lower efficiency but more affordable polycrystalline panels with an up-front purchase of the system. Similarly, thin-film may be a viable option if you want to use solar energy for a small edifice.