

Panasonic



Solar City, UK

SolarBarn Ltd, UK

Go Green Systems, UK

ETECH, Austria

Sunny times ahead!

With HIT[®] solar modules

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Panasonic[®]

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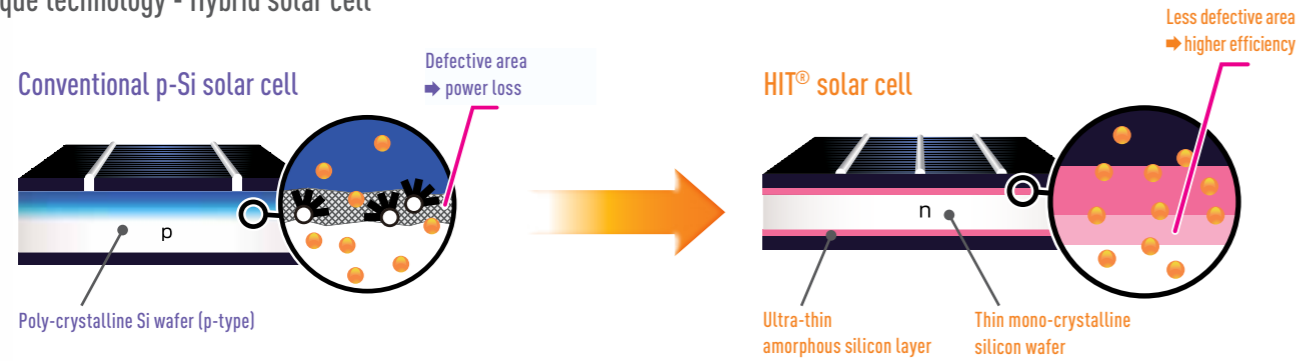
HIT[®]

Photovoltaic Module

Unique technology and higher performance

Benefit 1: Unique technology

Unique technology - Hybrid solar cell



The HIT[®] solar cell is a hybrid solar cell that combines ultra-thin amorphous silicon and high-efficiency mono-crystalline silicon in a layered construction, which has been achieved by using Panasonic's proprietary technology. The i-type amorphous silicon layers are positioned in the HIT[®] solar cell between the crystalline silicon wafer and p- and n-type amorphous silicon layers. Compared to conventional crystalline silicon solar cells, the HIT[®] structure can minimize the defective area in solar cells and power loss is significantly reduced.

24.7%: A world record at R&D stage targeting cost reduction

We are continuously improving the optical and electrical properties of each material such as the a-Si and TCO layers and the metal grid electrode to raise the conversion efficiency. As a result, we have achieved a record conversion efficiency of 24.7% at research level, using our HIT[®] solar cell at 98 μm thickness. The rate is at the moment the world's highest for any crystalline silicon-based solar cell of practical size (100 cm² and above).

In addition, there are some possibilities for raising the conversion efficiency further, and we are aiming to achieve a conversion efficiency of 25% at the R&D stage in the future.

We strive every day for solving issues in order to transfer knowledge from R&D to mass production. Our high-efficiency solar cells are daily assembled in our own product lines.

IEEE Corporate Innovation Award for unique HIT[®] Solar Technology

Panasonic's HIT[®] solar technology was recognized by the IEEE (Institute of Electrical and Electronics Engineers) for its outstanding and exemplary contributions that have resulted in major advancement of the arts and science of electro technology. The IEEE Corporate Innovation Award, established in 1985, recognizes outstanding and exemplary contributions by an industrial entity, government or academic organization, or other corporate body.

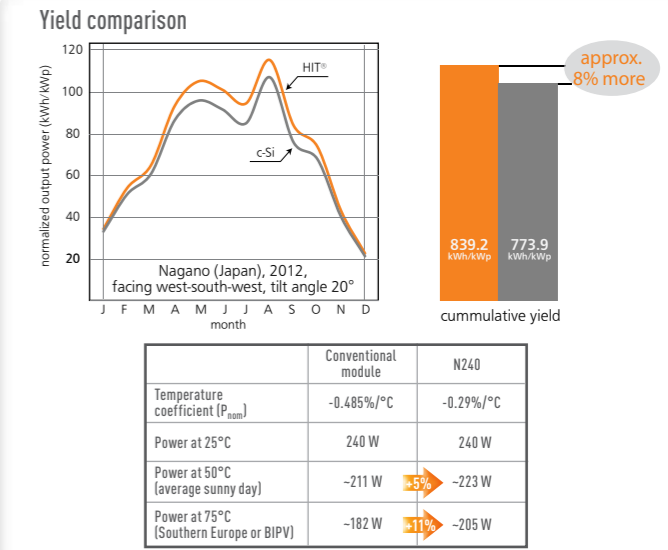
Benefit 2: Higher performance

High efficiency even at high temperatures due to a very low temperature coefficient

As temperatures rise, HIT[®] solar modules will produce up to 10% more electricity (kWh) than conventional solar modules at the same operating temperature.

By improving the heterojunction between the mono crystalline wafer and the thin layers of amorphous silicon, we have achieved a higher open-circuit voltage (Voc) of over 700mV.

This lower temperature coefficient of only -0.29%/°C is comparable to that of amorphous silicon solar cells. In addition, HIT[®] modules have high voltage as soon as irradiation sets in and this feature contributes to the annual power yield.

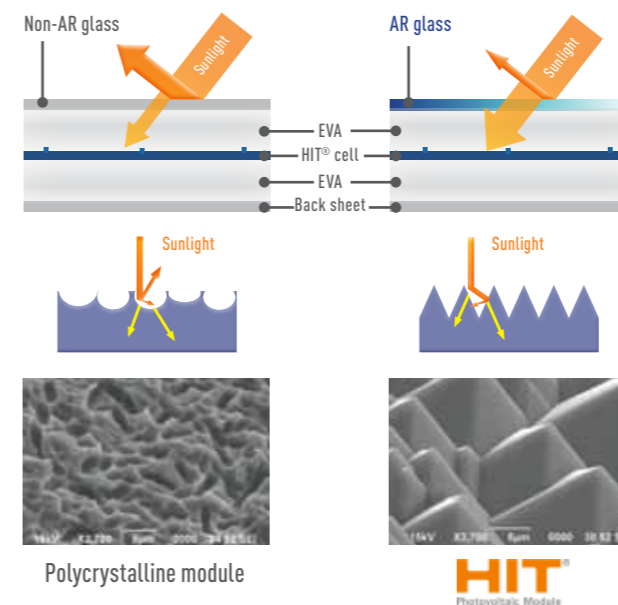


More light = more power

Excellent low light performance due to pyramid texture & anti-reflexion glass

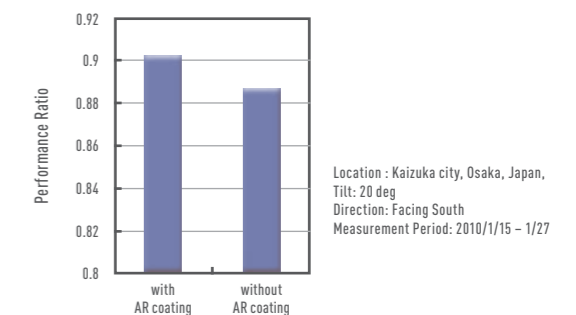
Thanks to the anti-reflection glass used for this module, more sunlight reaches the cells. This effect is especially noticeable in the morning and in the evening, when the sun is at a low position as well as when it is cloudy. As a result, the increased specific yield improves the conversion efficiency throughout the year.

Comparison of non-anti-reflection-glass and anti-reflection-glass

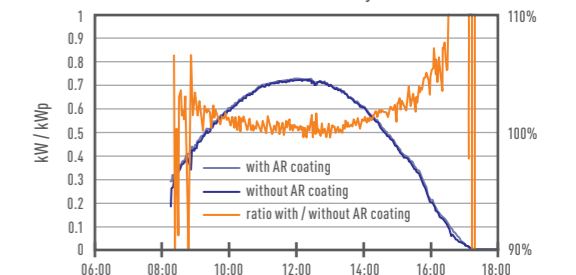


The pyramid texture of the HIT[®] modules allows the sunlight once entered to be reflected several times inside the cell, leading to a higher absorption of sunlight and a higher power output.

Performance ratio (AR coating vs. without AR coating)



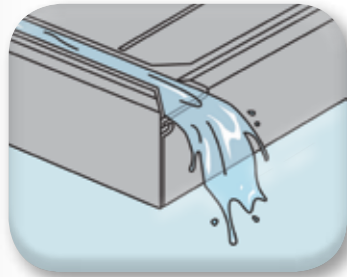
Performance ratio on a fine weather day (2010/1/17)



AR coated modules generated 1.7% more energy than non-AR coating module. This is mainly due to the positive effect of the coating when the sunlight's incidence angle is very low (in the morning/evening).

Highest quality and reliability

Benefit 3: Highest quality



Water drainage frame

We improved our frame by adding water drainage corners. Usually, small amounts of rain water stay on the module which leave dirt and water stains. The water drainage corners allow water to flow off of the module surface. This avoids not only water accumulation, but also water stains after drying. Even in low-angle installations, water drainage corners keep the module clean.

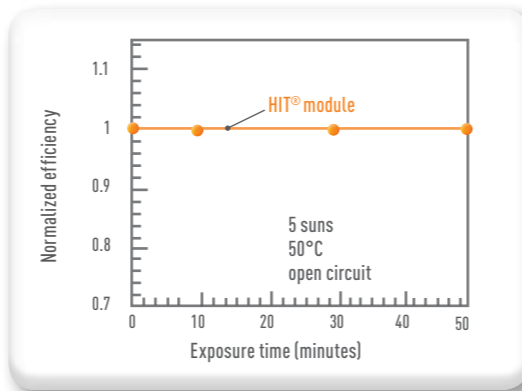


Low long-term degradation thanks to:

- No light soaking

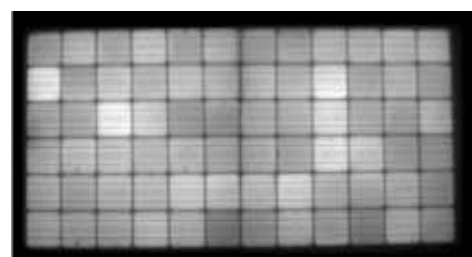
HIT[®] cells use only n-type silicon which has no light-soaking effect. Contrary to amorphous silicon solar cells that can lose up to 30% due to the LID*, our modules have no degradation. After 5 hours' soaking at 5 suns**, no degradation was observed in the HIT[®] solar cell. This is due to the fact that the amorphous silicon layers are very thin and do not contribute much to the power generation, but act instead as effective conductors.

* Light-Induced Degradation: efficiency loss in the first hundred hours of light soak
 ** 5000W/m²

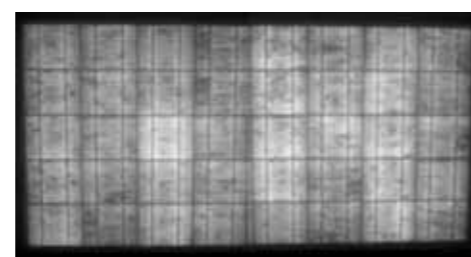


- Less prone to micro cracks

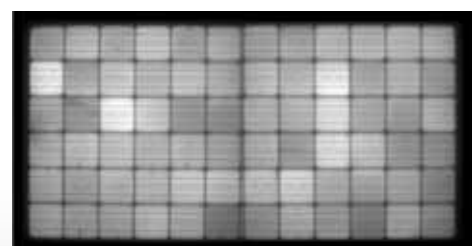
The symmetrical structure of HIT[®] cells can suppress both thermal and mechanical stress. Even after straining the module with 5400 Pa there are almost no changes when inspected with electroluminescence. Electroluminescence is an imaging measurement process that allows you to peer directly into the cells of a solar module and locate potential defects that could have a negative impact on power as well as a module's lifespan.



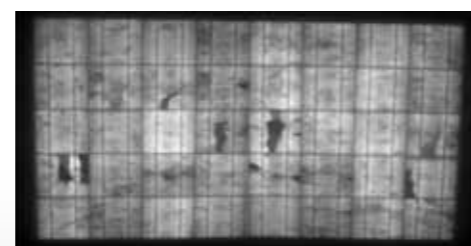
HIT[®] module



Poly module



HIT[®] module after being strained with 5400 Pa: almost no changes

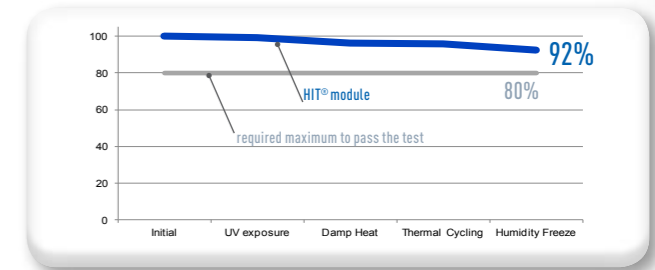


Poly module after being strained with 5400 Pa: significant damages

Benefit 4: Reliability

TÜV long term sequential test

As the total amount of solar modules increase in the field, a more accurate approximation of long-term reliability for power output under real outdoor operation is needed. The TÜV Rheinland Long-Term Sequential Test method proposes to simultaneously evaluate multiple stresses on two identical PV modules that are submitted to multiple stresses sequentially. The modules undergo multiple stress tests one after another instead of the usual certification testing case (for IEC 61215) where each module has one stress test only. Our HIT[®] module VBHN240SE10 passed this test in 2013. It maintained a constant level of performance after 1000 hours of UV exposure, 2000 hours of damp heat testing and 400 cycles of thermal cycling testing and four 10-cycle test blocks of humidity freeze testing. This gives a very important advantage to HIT[®] for energy yield estimations and bankability comparisons.



Certifications to ensure safety

As a leading company, we are certified by the most prestigious bodies. Our modules are in compliance with national regulations in terms of fire safety requirements.



JET: Japan Electricity Safety & Environment Technology Laboratories

1963: Founded as Japan Electrical Testing Laboratories of Japan Electric Association, taking over the testing service from national electrical testing laboratories. Designated by the government as an authorized testing body based on the Electrical Appliance and Material Control Law.



1999: Accepted by the IECEE as an NCB (National Certification Body) of Japan based on the IECEE-CB Scheme.

Fire resistance

Italy: The Italian Ministry of the Interior requires class 2 as a minimum classification for all photovoltaic modules (according to UNI 9177). In case of class 2, additional certification regarding the fire spread properties of the surrounding roof materials must also be provided. HIT[®] modules gained Italian fire resistance CLASS 1 certification.



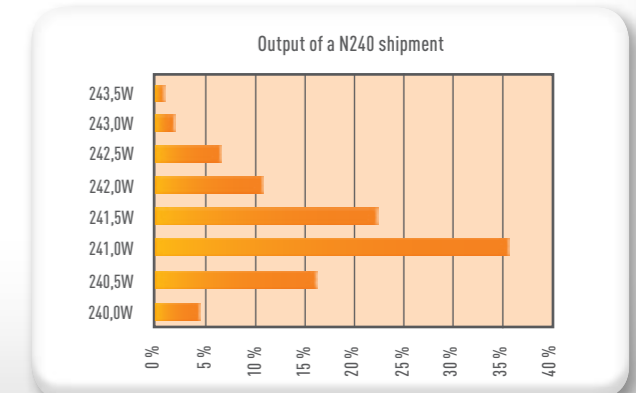
Germany: Photovoltaic modules in Germany fall under the construction legislation. Manufacturers are obliged to certify normal inflammability. Based on DIN EN ISO 11925-2:2011, HIT[®] modules meet the specification of the normal flammability according to DIN EN 13501-1, Class E.



Power guarantee

Each module is measured at our production site before delivery. We guarantee that our customers will produce 100% of the rated power (or more) at the time of purchase, enabling owners to generate more electricity (kWh) per rated Watt and quicken their return on investment. In addition, every module is marked with a unique serial number which can track the module all along its lifetime.

On the right you can see the output values of an exemplary shipment of our N240 modules in November 2012. The minimum output is 240W, and most of the modules deliver even 241W or 241,5W.



Service oriented and eco-friendly

Service oriented

Our history

SANYO started the development of amorphous silicon solar cells in 1975, over 37 years ago. Since then, thanks to our constant efforts in Research and Development, many innovative products were developed and commercialized. We have achieved best quality and reliability levels through long experience and continuous improvement because our modules are designed to last for decades. SANYO became a full subsidiary of the Panasonic Group in 2011, adopting the Panasonic brand name in 2012.

Panasonic Solar Premium Installer Program

We would like to make sure that your Panasonic HIT® installation is done by an experienced installer. On our website you can find one of our recommended Panasonic Solar Premium Installers in your area. Just enter your postal code or town and get directly in contact with them.

Our Panasonic Solar Premium Installers get direct support from us in terms of marketing material.

www.eu-solar.panasonic.net/en/service/how-to-find-an-installer/



Eco-friendly

The WEEE Directive

The WEEE Directive regulates the appropriate treatment of end-of-life products and requires that manufacturers and importers of electronic and electrical equipment ensure the take-back and recycling of their discarded end-of-life products in Europe. The first and original (2002/96) WEEE Directive dates from 27 January 2003 and was amended in 2003 and 2008. In 2012, PV solar modules fell under the scope of the WEEE Directive. Meeting the requirements of the WEEE Directive is not optional. Every manufacturer and/or importer of electronic and electrical equipment has to comply with the national WEEE laws of the countries he is operating in. To learn more about the WEEE Directive, visit the official website of the European Commission:

<http://ec.europa.eu/environment/waste/weee>



PV Cycle

We joined PV Cycle at its creation in 2007. This voluntary agreement commits us to a take-back and recycling programme for end-of-life-modules and to take responsibility for solar modules throughout their entire value chain.



RoHS compliant

Even though not mandatory for solar panels, our products comply with the directive restricting of the use of certain hazardous substances in electrical and electronic equipment 2002/95/EC.

This directive restricts the use of hazardous materials, such as lead, cadmium and mercury, used in the manufacture of electronic and electrical equipment.



Installation examples

Commercial installations

Factory building in Burdur, Turkey
500 kW on-roof system



Source: Seiso

Small roof installations

Residential installation on very limited roof-space in the UK
1.9 kW on-roof system



Source: Panasonic Solar

Aesthetic installations

Residential installation in Lasne, Belgium
4.7 kW on-roof system with black modules



Source: Sunswitch, Panasonic Solar Premium Installer Belgium

Special applications

Installation on a house boat prototype, part of the Urdaimonia Project in the UK
2 kW on-boat system



Source: Enviko, Panasonic Solar Premium Installer UK