SolarTech Universal

The world's most advanced cell connection technology

SmartWire Connection Technology

The world’s most advanced cell connection technology

Benefits

- Automated Production Process
- Superior Energy Production
- Industry Leading Warranty
- Remarkable Connection Durability
- Superior Temperature Coefficient

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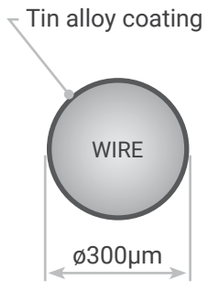
SOLARTECH UNIVERSAL

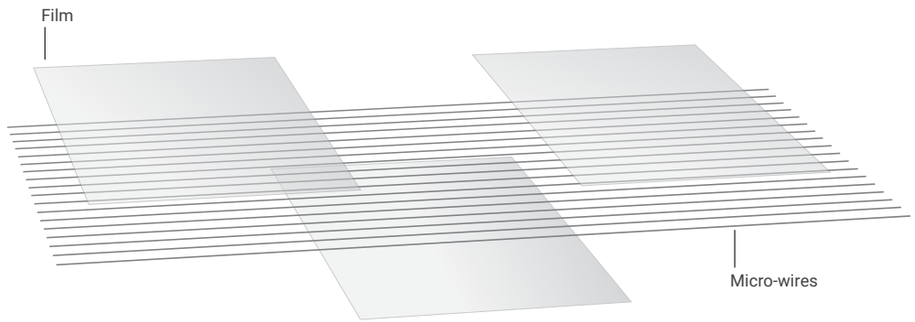
Introduction

SmartWire Connection Technology (SWCT®) is a revolutionary cell connection process for solar module manufacturing. Standard busbars are replaced by 18 micro-wires that gather energy more fluently and protect the cells. SWCT's superior performance results in advanced module efficiency while negative effects are significantly reduced. [1]



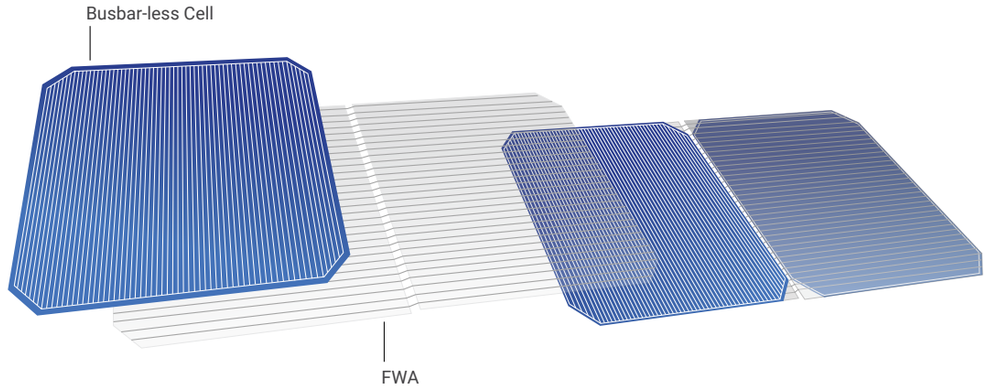
SWCT® is based on wire bonding, an interconnection method for semiconductors. The copper wires are coated with a low melting point alloy to be bonded with the cell, creating electrical contact points that gather the energy.[1][2]

Foil-Wire Assembly (FWA)



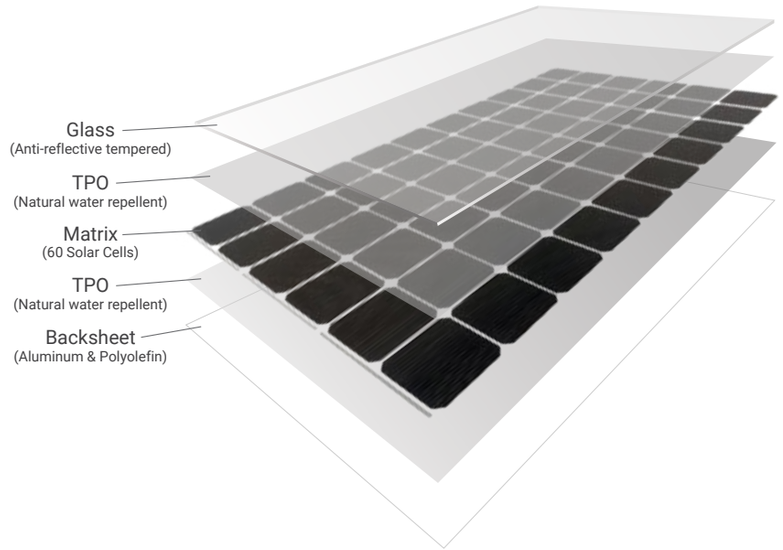
The 18 micro-wires are robotically positioned in parallel and held in place by a transparent foil in an over/under pattern. This foil-wire assembly (FWA) forms the electrical conductor, designed with surgical precision, to interconnect the solar cells and eliminate the need of busbars[2].

Working Principle



The solar cells are linked robotically with the FWA to form a cell string, eradicating the busbar to cell soldering process. The FWA interconnects the front side of a cell to the back side of the next cell, ensuring the proper connection from cell to cell.[2]

A 60 cell solar matrix is created by alternating 6 strings of 10 cells. The matrix is covered with encapsulant then placed between a sheet of glass and a backsheet.



GLASS: full tempered, AR coated, impact resistant, industry leading 94% transmittance.

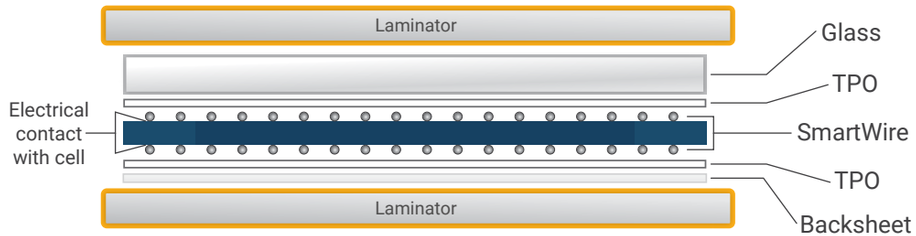
ENCAPSULANT: thermoplastic polyolefin (TPO) is a water repellant material that significantly reduces the effects of module corrosion.

CELL: SWT is compatible with multiple high-efficiency cell types, like mono-crystalline PERC and Heterojunction (bi-facial) cells.[1]

BACKSHEET: laminate consists of PET, aluminum, and polyolefin, allowing for protection against moisture and UV absorption.

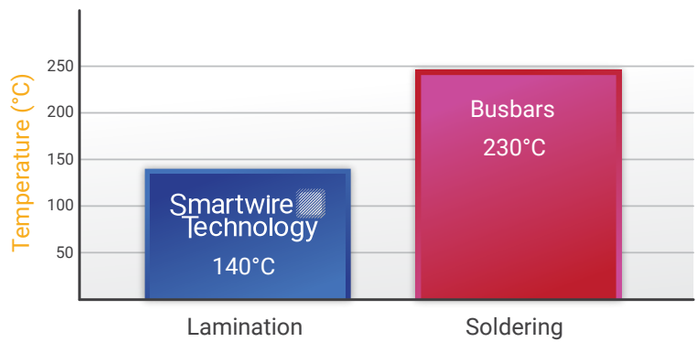
Working Principle

In order to protect the cell matrix from environmental influences, the individual layers are bonded together by vacuum pressure and heat, to form an ultra durable solar laminate. This lamination process also forms the electrical connections between the wires and the cell.[6]

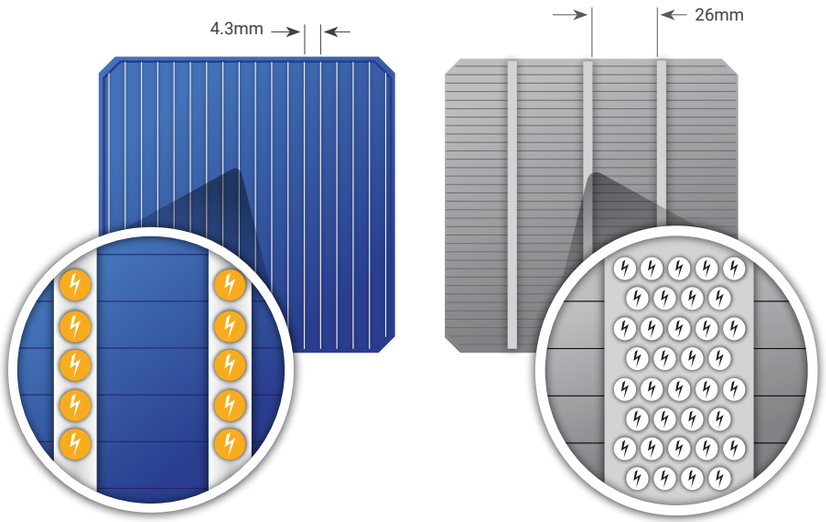


Electrical Connections

The SmartWire Connection Technology SWCT® to cell connection points are bonded at a lower temperature than the busbar soldering process. As a result, SWCT® induces less thermo-mechanical stress on the solar cell, significantly reducing the cell brittleness associated in busbar technology.[2]



The superior efficiency of SWCT® is driven by 18 micro-wires that form a dense grid of up to 2,660 contact points on the solar cell. This structure allows electrons to travel a shorter distance in order to be collected, thus reducing resistive losses. [1]



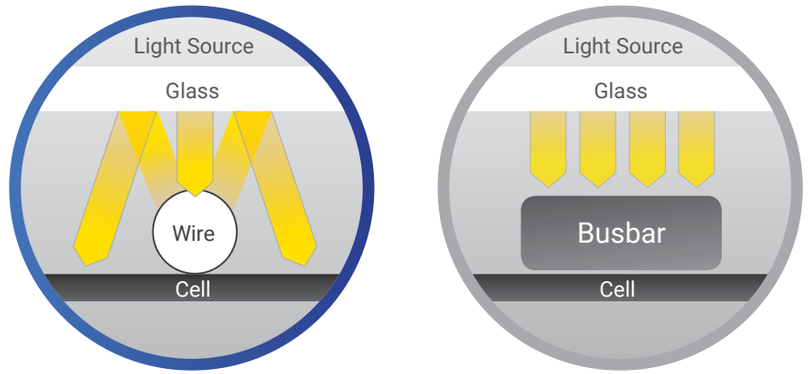
SmartWire
Lower Resistance = More Electricity

Busbar
Higher Resistance = Less Electricity

The lower resistance enables the extraction of more power from each individual finger, thereby increasing the power density when compared to traditional busbar panels.[1]

Finger: horizontal printed pathway that collects the current generated in the solar cell.
Finger length: distance between two vertical collection pathways

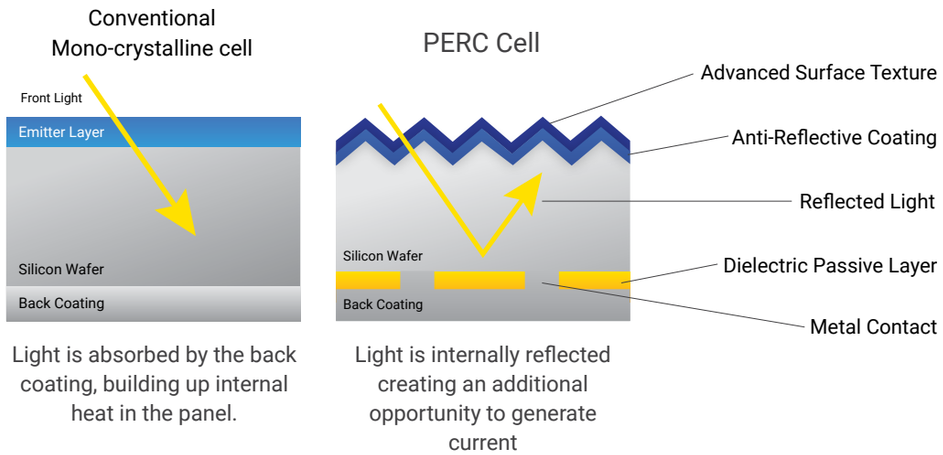
The round shape of the micro-wire introduces a light trapping effect which reduces the shading by 25% compared to busbar technology.[1][3]



Optical shading is calculated as the ratio of the width of the wire or busbar to the cell length. Comparison of the dimensions of SWCT® and busbar.[1]

Contacting scheme	Wire Diameter [mm]	Width [mm]	Cross-section [mm2]	Finger Length [mm]	Optical shading [%]
3 busbars		4.5	0.68	26.0	2.9%
5 busbars		5	0.75	15.6	3.2%
12 wires	0.2	2.4	0.38	6.5	1.2%
18 wires	0.2	3.6	0.57	4.3	1.7%
22 wires	0.2	4	0.69	3.5	1.9%
30 wires	0.2	6	0.94	2.6	2.9%
38 wires	0.2	7.6	1.19	2.1	3.7%
18 wires	0.3	5.4	1.27	4.3	2.6%

Passivated Emitter Rear Contact (PERC) is an advanced mono-crystalline cell that captures more energy by adding an extra layer between the silicon and the back coating. This special layer creates an efficient internal reflectivity, while preventing electrons from recombining and blocking the free flow of energy.[7]

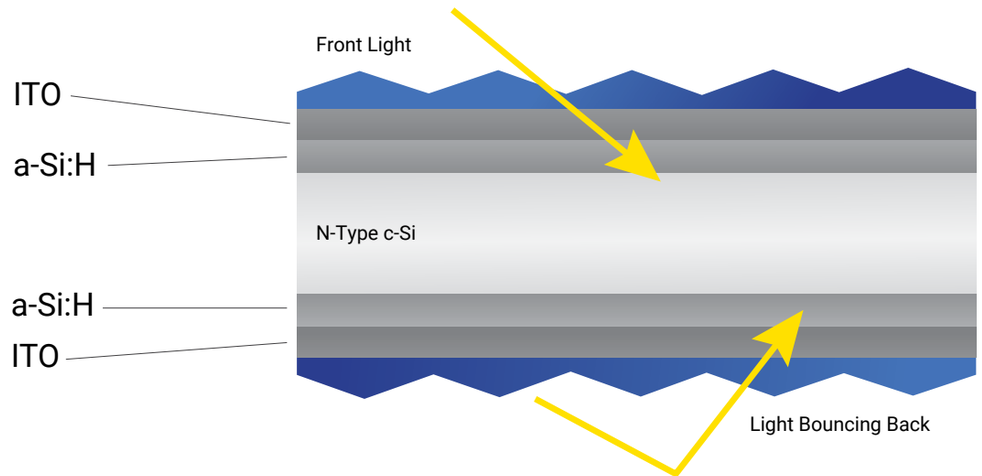


Light is absorbed by the back coating, building up internal heat in the panel.

Light is internally reflected creating an additional opportunity to generate current

PERC's additional layer reflects light back through the silicon which reduces the amount of absorption by the back surface, helping the cell to operate at a cooler temperature and produce a positive effect on energy yield.[7]

Heterojunction (HJT) technology is a superior solar cell that generates energy from both sides. This bi-facial cell combines the advantages of N-type crystalline silicon (c-Si) with the excellent absorption and passivation characteristics of amorphous silicon (a-Si:H).[5]

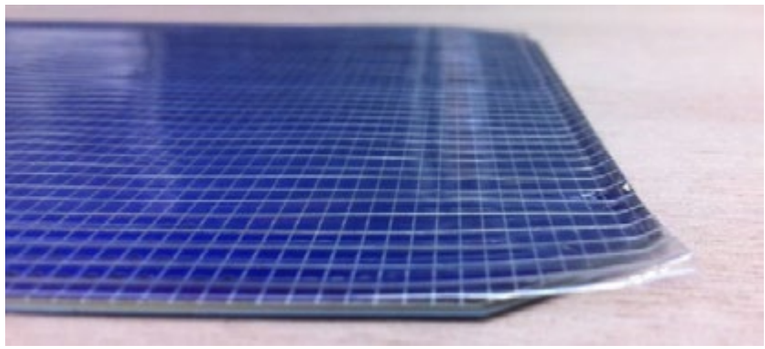


The N-type c-Si makes HJT cells inmune to (LID) while the ITO coating protects the cell from (PID) on both sides of the cell.[6] As a result, HJT cells generate a higher energy yield while exhibiting a lower temperature coefficient than conventional solar cells.[5]

ITO: Transparent Conducting Film,
LID: Light Induced Degradation, PID: Potential Induced Degradation

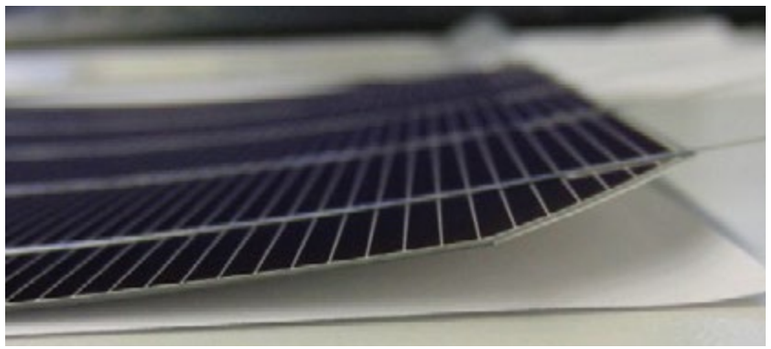
SWCT® exerts less stress on the cells than standard soldering technologies thanks to the reduced temperature process and the flexibility of thin wires as opposed to the stiffer busbars.[1]

SmartWire

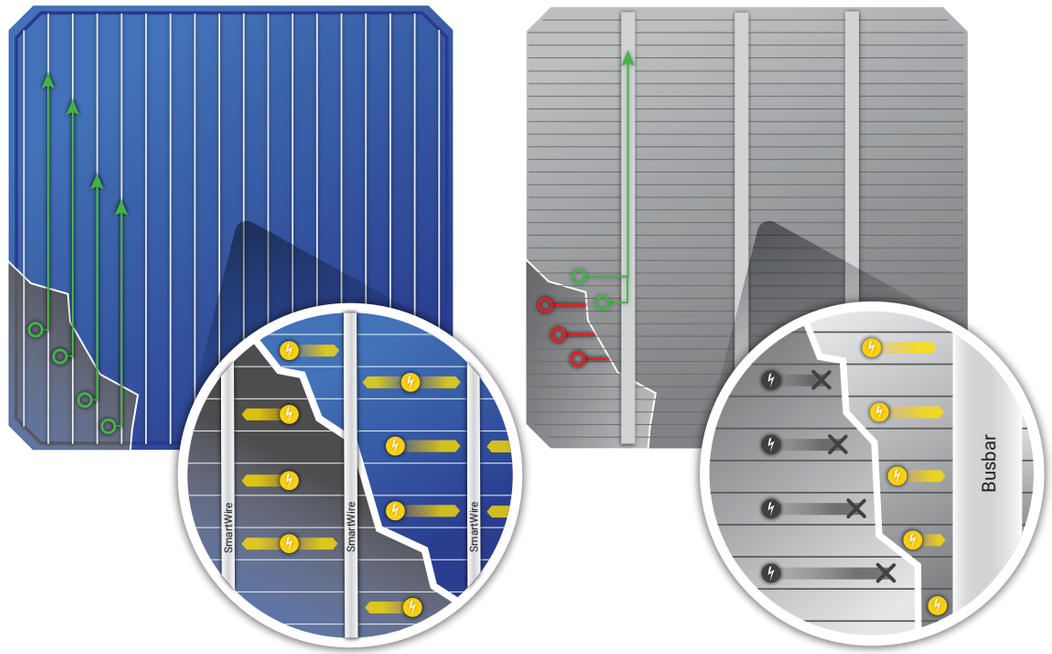


The bow of the cell after interconnection is an excellent signature of the stress applied by the busbar soldering process.[1]

Busbar

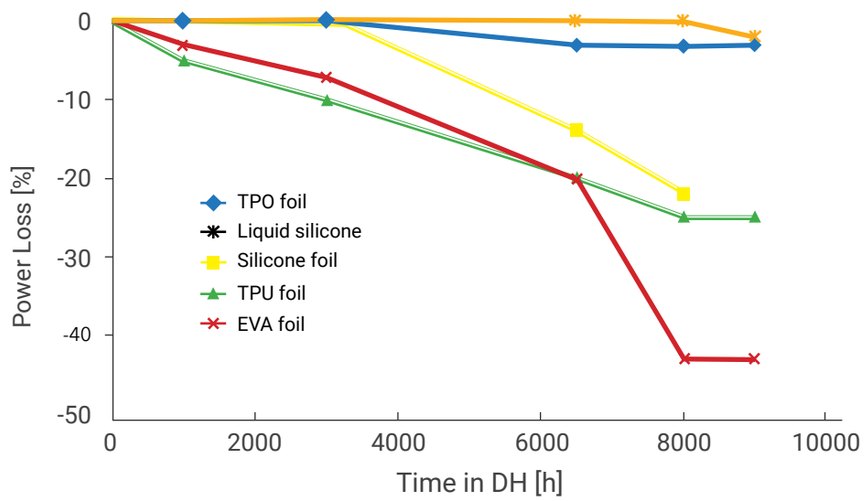


Micro-cracks have a minimum effect on modules with SmartWire Connection Technology, since the FWA acts as a protective layer for the solar cell with the dense grid of up to 2,660 contact points.[4]



Even a micro-cracked cell remains contacted, maintaining the energy collection at high levels.[4]

TPO encapsulant has been chosen as the current solution for SWCT®, as it provides a more reliable performance. Standard module lamination utilizes an EVA encapsulation layer which is the main cause for module degradation when exposed to moisture.[1]



The superior performance of TPO compared with EVA has been proven under testing. TPO offers better protection against potential induced degradation (PID) by absorbing less moisture than EVA.[1]

Module Reliability

SmartWire Technology (SWCT®) is a breakthrough that outrivals busbar technology by collecting the electric current more efficiently and providing protection against micro-crack effects. SWCT® is especially attractive for high-efficiency solar cells because of the lower temperature cell connection and the superior energy extraction obtained with the micro-wires' properties.

References

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We are SolarTech Universal, the next generation of solar technology. We manufacture powerful, efficient, and safe solar panels, utilizing the latest technology from Switzerland in combination with the highest standardsin manufacturing.

15 Year Product Warranty

EPIQ™ NEXT-GENERATION SOLAR PANELS

30 Year Performance Warranty

EPIQ PV modules are backed by our industry leading 15-year craftsmanship and 30-year performance warranties. By combining the most advanced materials and the automated SmartWire Connection Technology manufacturing process; SolarTech Universal delivers premium panels of unrivaled performance.

Certifications

UL UL1703 · CEC Listed · CERTIFIED 2015 ISO 9001 US 3986 · PTL US CERTIFIED · FSEC Certified

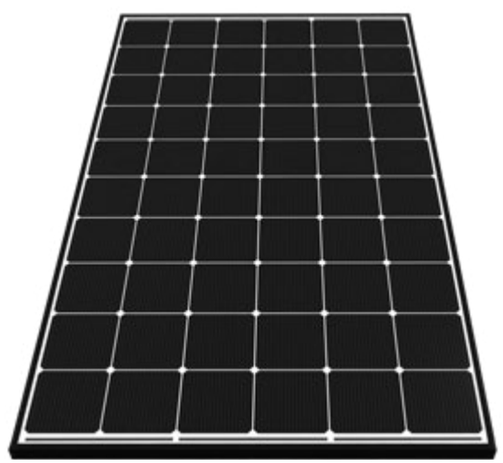
EPIQ™ NEXT-GENERATION SOLAR PANELS

up to **315W**

60 CELL MONO-CRYSTALLINE PERC SOLAR PANEL

19.3	18 Micro-wires	-0+5W
Module Efficiency	Collection Pathways	Power Sorting

5400 PA 112.8 Psf	3800 PA 79.4 Psf
Front Load (Snow)	Rear Load (Wind)



up to **325W**

60 CELL HETEROJUNCTION SOLAR PANEL

19.9	18 Micro-wires	-0+5W
Module Efficiency	Collection Pathways	Power Sorting

5400 PA 112.8 Psf	3800 PA 79.4 Psf
Front Load (Snow)	Rear Load (Wind)

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