

Customer-Driven Value Creation

FOR FULL SCENARIO ENERGY TRANSFORMATION

The World's Leading Solar Technology Company



About LONGi

Founded in 2000, LONGi is committed to being the world's leading solar technology company, focusing on customer-driven value creation for full scenario energy transformation.

Under its mission of "making the best of solar energy to build a green world" and brand positioning of "the most trusted, reliable solar company that blazes the trail for green technology", LONGi has dedicated itself to technology innovation and established five business sectors, covering mono-crystalline silicon wafers, mono-crystalline silicon cells/ mono-crystalline silicon modules, distributed photovoltaic solutions, utility plant system solutions and hydrogen energy equipment solutions. The company has honed its capabilities to provide green energy and has also embraced green hydrogen products and solutions to support global zero carbon development.



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60000+

Global Employees



30+ Global Network

\$18.85B Y2022 Operating Income



\$1,044M Y2022 R&D Investment

NOTE:The current exchange rate conversion method is not unified, this chart is based on the exchange rate at the end of the reporting period.

Milestones of LONGi

Each milestone has become a key force to promote the development of the industry



LONG



Sound Management, Healthy Finances

Adhering to the principles of steady operation and sustainable development, LONGi has maintained a relatively low asset-liability ratio over the years. It has also demonstrated excellence in asset returns, profitability and financing capabilities, earning unanimous recognition from authoritative industry institutions.



Tier 1 PV Module Manufacturers

In the Bloomberg New Energy Finance (BNEF) standard PV module manufacturers listing, LONGi ranked in the first tier and is the absolute leader in the industry.



'AAA' PV Module Tech Bankability Rating

The quarterly report developed by Solar Media's PV Tech analysis team, based on comprehensive evaluation of module manufacturers' financial strength, product technology and production/supply capacity, has identified LONGi as AAA rated manufacturer.



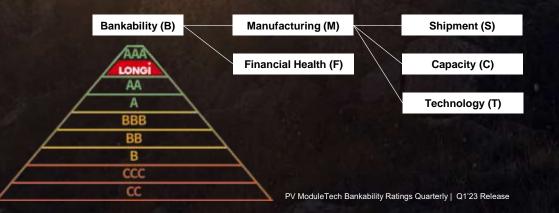
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Excellent Altman-Z Scores of Selected Pure-play Manufacturers

In BloombergNEF's Global PV Market Outlook report, LONGi scored excellently in financial health index due to its continuously increasing corporate strength and technological research and development level. LONGi has demonstrated highly effective risk control and long-term sustainable development ability.

100% Bankable PV Module Brand

LONGi has been rated '100% bankable' in BNEF's survey of PV Module & Inverter Bankability for 3 years, underlining its capability in assisting project developers to secure access to financing from banks in order to bring a consistent, steady return on investment for global clients.



Tier 1



Bloomberg New Energy Finance (BNEF) has developed a tiering system for module manufacturers which employs a set of criteria to qualify for Tier 1 status (i.e. the most bankable module manufacturers in the market):

- Must have provided own-manufactured, own-brand products to six different >1.5MW projects, which have been financed non-recourse by six different non development banks, in the past two years.
- Module maker must be in the public domain and must not have filed for bankruptcy or a form of insolvency protection, or experienced a major default on bond payments
- **BUT**, as BNEF rightly points out their classification is purely a measure of <u>industry acceptance</u>, and not a testament to the quality of product or the likelihood of bankruptcy of the manufacturer

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Bankability

In years to come many PV projects will likely face the question of whom to contact with performance complaints and replacement requests regarding a malfunctioning module after 1, 2, 5 or even 15

Working with solar PV modules from financially stable manufacturers provides for a better insurance against the potential risks of collapsing return of investment (ROI) of any PV project due to these potential failures.

Financial stability of a PV module manufacturer reflects the validity and enforceability of the warranty policies on its modules. (Will they be able to claim if the manufacture is in a poof financial position in the future)

PV modules are the most crucial technical components of a PV project. Banks seek to manage bankability in order to reduce their credit risks.

Key factors considering bankability

- financial management of the supplier
- stable cash flows and long-term debt service
- module performance insurance
- module performance testing
- conducting a thorough due diligence

Bankability

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Global Presence, Leading the World

LONGi has established multiple production bases in countries and regions such as China, Vietnam, and Malaysia. It has also set up branches in countries such as the United States, Japan, Germany, India, Australia, the United Arab Emirates, and Thailand, with business coverage in more than 150 countries and regions worldwide.



LONG

A Global Leading Manufacturer of Monocrystalline PV Products Leading Production Capacity and Module Shipments

With breakthrough monocrystalline technology and vertical integration advantages in the industry chain, LONGi is leading the PV industry to continuously reach new heights in product transformation and levelized cost of electricity optimization.

No.1 LONGi has held the top position in global monocrystalline silicon wafer shipments for 9 consecutive years. No.1

In 2020, 2021, and 2022, LONGi ranked world No.1 in three consecutive years in terms of shipment volume and market share.

85.06_{GW}

Wafer Shipment (2022)



Module Shipment (2022)



Wafer Planned Capacity (2023)



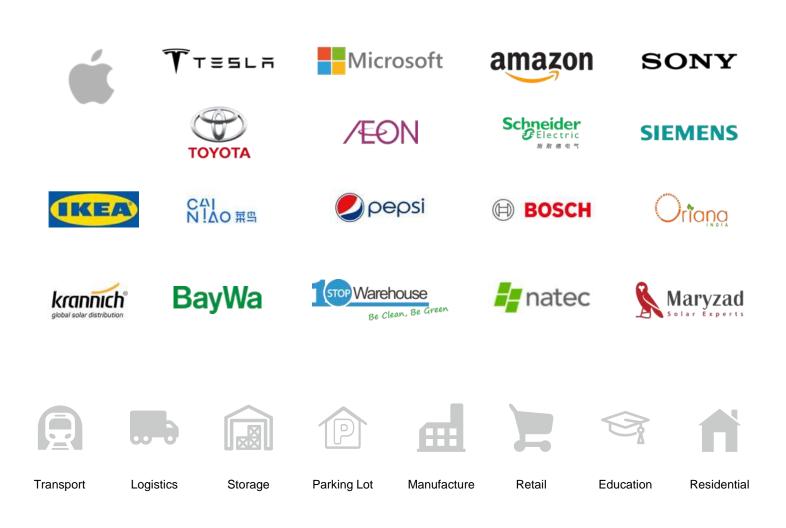
The Rank of LONGi Module Shipment form 2018 to 2022

		2018	-	2019		2020		2021		2022
1	Par .	A		А		LONGI		LONG		LONGI
2	1	в	6	в	-	A	-	D	1	А
3	L	C	1	D		В		В		D
4		D	E	LONG		D	5/1	A		в
5	4	LONG	1	J. LE		E		E	0	E
6	A	E	B	С		C		С		F
7		F		F		F		C E		L
8		G		H	-	J	2	м		М
9		н		J		М		H	-	C/N
10		J/K		К		н		J	a.	M IS

We Embrace Innovations with Our Global Customers

150+ Global Footprint

5000+ Global Customers



LONGi Innovations Continuous Technology Innovations on Open Platforms

LONGI's innovations are not just limited to technology. The company hopes to integrate innovations and create an open, collaborative platform. This is essentially a new way to connect with industrial partners, universities, research institutes, PV start-ups, as well as customers and colleagues. In a ecosystem, all elements come together in active collaboration and interaction that enables us to design innovative solutions to drive the solar-led energy transformation.

In the past ten years, the cumulative R&D investment has exceeded \$2,631 million, ranking first in the PV industry. And LONGi had obtained 2,132 authorized patents. In 2022, LONGi invested \$1,044 million on research and development, accounting for 5.54% of operating income, a YoY increase of 62.51%.

\$1,044 Million 2022 R&D Investment



Proportion of Operating Income

Industrial Partner





NOTE: The current exchange rate conversion method is not unified, this chart is based on the exchange rate at the end of the reporting period.

LONG

Continuous Innovation, Achieving Breakthroughs Industry Records for the Highest Efficiency of Silicon Solar Cells

***** 2019.01

LONGi P-type PERC Solar Cell Front Efficiency

24.06%

★ 2021.06 LONGi N-type TOPCon Solar Cell Efficiency

25.21%

★ 2021.07 LONGi P-type TOPCon Solar Cell Efficiency

25.19%

26.81%

★ 2022.11 LONGi HJT silicon solar cell Efficiency

* 2022.06

Efficiency

LONGi HJT Solar Cell

26.50%

★ 2022.12 LONGi P-type HJT Solar Cell Efficency

26.56%

★ 2022.12 LONGi Indium-free HJT Solar Cell Efficiency

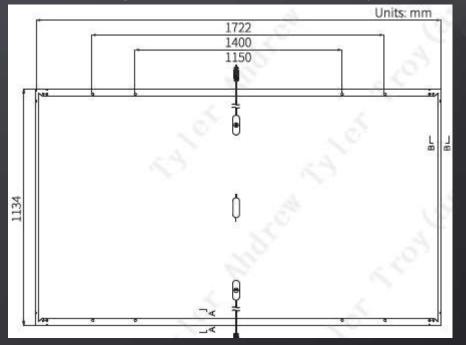
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26.09%

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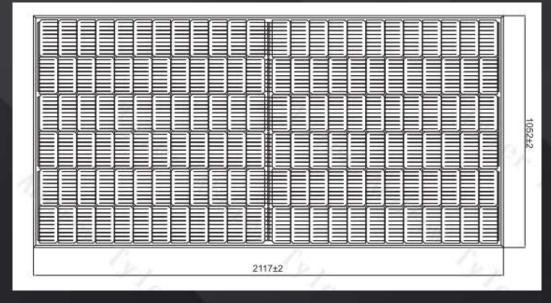
What is module efficiency?

Module Efficiency measures the percentage of sunlight that hits your panel that is converted into usable electricity. The higher the efficiency rating, the less number of panels you'll need to make up a system that meets your energy requirements.



Longi 435W, 22.3% Efficiency

Other 460W, 20.7% Efficiency



LR54HTH 435M vs XXM72D20-460MB

LR54HTH 435M

- \succ New HPBC technology, Launch in 2022 \checkmark
- ➢ High efficiency 22.3% √
- \succ better degradation of first year: 1.5% \checkmark
- better annual degradation: 0.4%
- Better temperature coefficient: -0.29%/°C
- Better low light Performance

XXM72D20-460MB

- PERC technology, Launch in 2019
- ➢ low efficiency 20.7%
- Degradation of first year: 2%
- annual degradation first year: 0.45%
- temperature coefficient: -0.35%/ °C

LONG

Comparison of references



Referenced situation

Location: Cape Town XX Panel Area: 89m^2 XX DC capacity: 18.4kWp 460Wp*40 Inverter: sun2000-17KW

Longi Panel Area: 82m^2 Longi DC capacity: 18.27kWp 435Wp*42

Total power generation in 25 years

	1st	2nd	3rd	4th	5th	6th	25th	total
Longi(MWh)	32.07	31.95	31.81	31.66	31.50	31.32	 27.66	749.36
XX(MWh)	30.78	30.67	30.53	30.39	30.23	30.04	 26.68	722.58

The Longi Himo6 generate more 27MWh power than XX

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Reliable Quality, Perfect Performance **Continuously Acquiring Third-Party Honors** and Evaluations

TÜV Rheinland All Quality Matters



2017, 2018 , 2021, 2022

Energy Yield Simulation Winner (Mono Group)

2019, 2020, 2021 "PV Module Outdoor Power Generation "Winner

Top Performer in PVEL's PV Module Reliability Scorecard 6 Times



600 cycles + 2000 hours + 192 hours Thermal Cycling

Damp Heat

50hours

TC Test

PID Test



1000times DML Test



30a HF Test



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Excellent Performance in Energy Yield Test Conducted by pv magazine

Organized by the German-based pv magazine Group, in cooperation with CEA in the United States and GSolar in China, sampled by CEA.

RETC 'High Achiever' for 4 Years



The Only Module Manufacturer Achieving '2021 Intersolar Award'



Proof of product value and technological innovation

LONGi Hi-MO Series Unlock More DG Application Scenarios

Hi-MO 5. 5

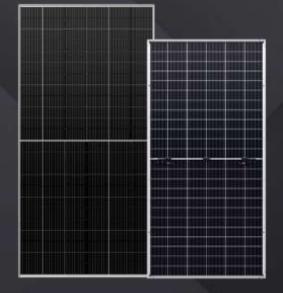


M10 Ultimate Size Design for utility application, Increasing Module Efficiency by Smart Soldering Hi-MO 6



High-efficiency HPBC cel promote new technological revolution

Hi-MO 7

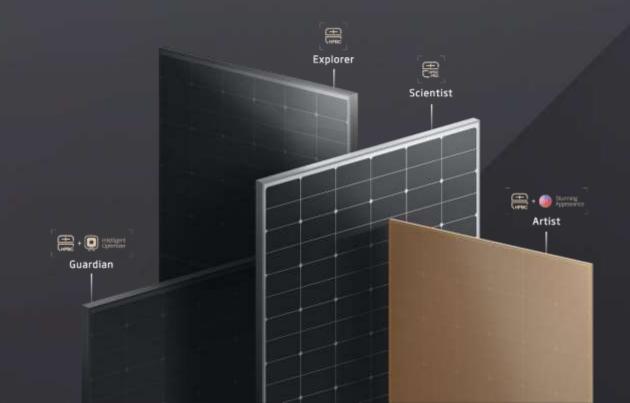


High-efficiency HPDC cell Better power generation performance and product reliability LONG

LONG

Hi-MO 6 The World's First Modules Platform Tailored Specially for DG Users

Hi-MO 6 includes four series—Explorer, Scientist, Guardian, and Artist—all of which are in the standard M10 size (182mm) and are available in 72C, 66C and 54C types. The module complements a wide variety of application scenarios.





No ribbon on the front Enhanced oblique light absorption



26MPa Cell edge stress

Back contract welding structure, reduces the risk of cell cracking

High efficiency HPBC cells promote new technological revolution

Efficiency of conventional HPBC cells exceeds 25%

Efficiency of PRO version HPBC cells break through 25.3%



Light absorption

Multi-layer anti-reflection film and absence of front grid increase light absorption

Light absorption

Image: A state of the state of

Photoelectric conversion

Multi layer passivation reduces impurity recombination and improves photoelectric conversion efficiency Photoelectric onversion

Electric transmission



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Electric transmission

Innovative all-back welding technology stabilizes the current transmission

PRO PRO defe

PRO Hydrogen passivation process repairs micro lattice defects and exceeds the efficiency limit.

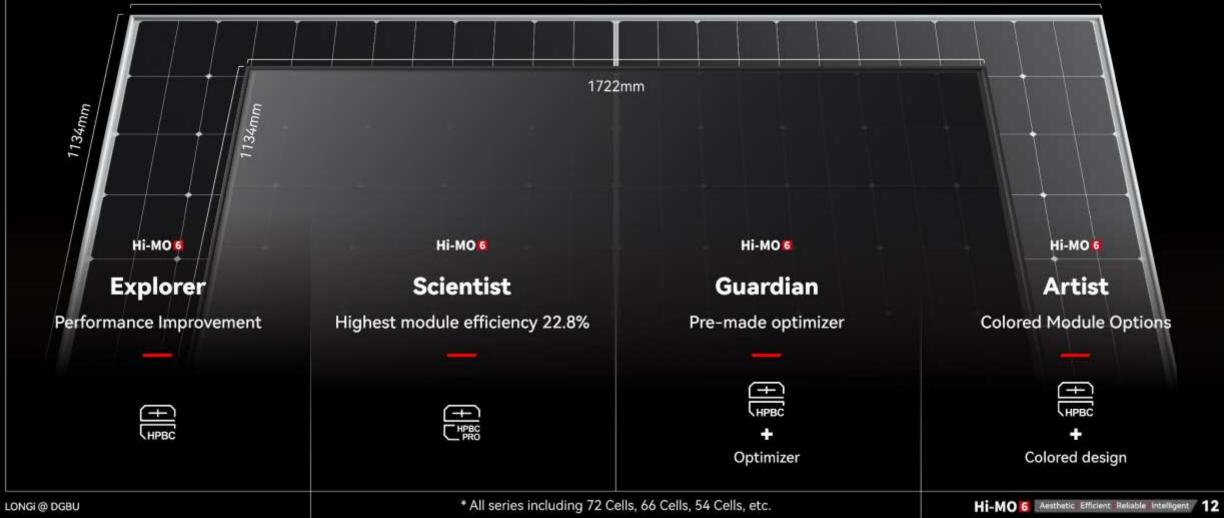
PRO

Hydrogen Passivation

Hi-MO 6 Product Family

Four product series, all adhering to the 182mm standard

2278mm



Follow the trend of minimalism | Define the aesthetic of the PV module

HPBC Cell designed with no frontal busbar

Based on the aesthetic concept of simplifying complexity

To continue the trend of minimalist beauty

To create the appearance of pure texture

Matched diversified scenarios harmoniously

To satisfy various design styles

To present the best angle of buildings

Comprehensive upgrade | Stronger power generation performance

Energy generation simulation of typical regions worldwide

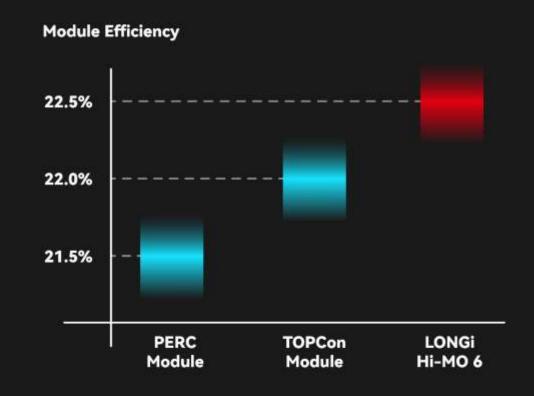
10% higher on average that conventional PERC module



New levels of module efficiency introduce a breakthrough in installation capacity

Demonstrates significant efficiency improvement when

compared to PERC and TOPCon technology





In the same installation conditions:

Comparing with PERC module, the installation capacity is increased about 6% Comparing with TOPCon module, the installation capacity is increased about 3%

Multi angle incidence | Unshielded absorption

No Ribbon on the front

Enhance oblique light absorption



No ribbon shielding on the front, improve light absorption by about 2.27%

*Data based on simulated light incidence simulation from conventional BOM

Innovative welding technology protects HPBC cells

Back contact welding structure

Lower cells stress

Ribbon

Stress

Cell

Cell edge stress 50Mpa

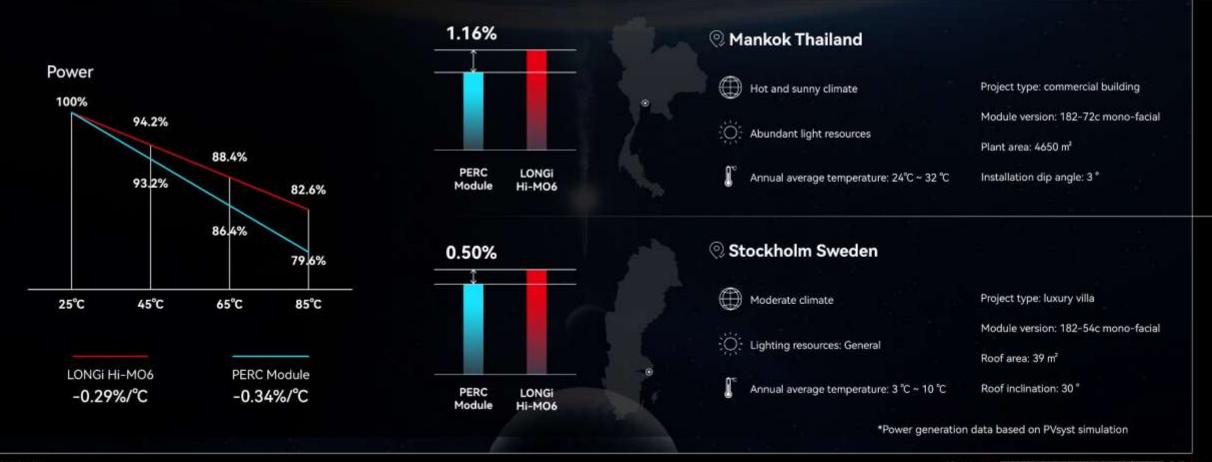
Traditional Z-shaped welding structure

Cell edge stress 26Mpa

Hi-MO 6 uses back contact one-line welding structure

Resilient in high temperatures

Power temperature coefficient as low as -0.29% / °C ensure stable power generation in hot conditions

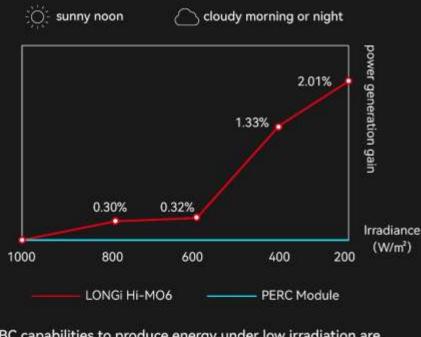


Low irradiation environment with high power generation performance

Better low irradiation performance

Longer energy generation time

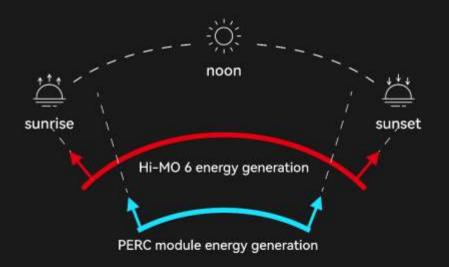
Better low irradiation performance



HPBC capabilities to produce energy under low irradiation are +2.01% better compared to standard product

*Gain=HPBC normalization PR/PERC normalization PR-1 *Data from TUV SUD



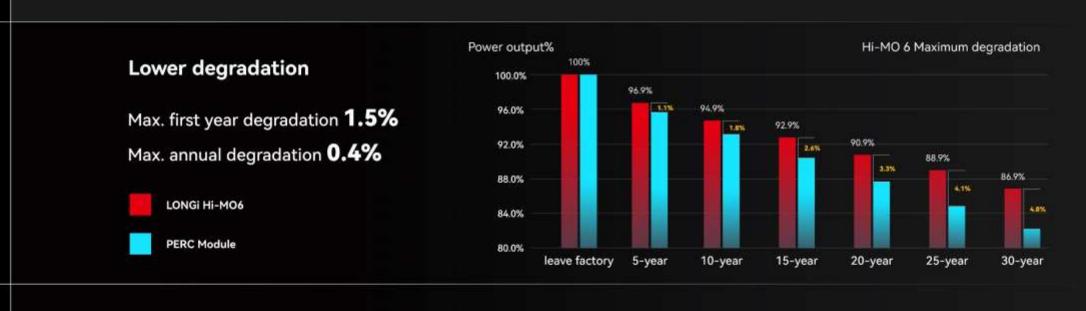


Higher module voltage ensures that the working voltage of the inverter can be reached faster in the morning and at night, effectively extending the power generation time.

Lower degradation | Extra long warranty

Lower power degradation ensures

stable power generation over 30 years



Protecting your investment

by long warranties



Single glass module 25-years warranty 25th-year 88.9% power output warranty



Dual glass module 30-years warranty 30th-year 86.9% power output warranty

* Hi-MO 6 series enjoy extended warranty service

Reliability test

Excellent performance and ultra-low

degradation under severe test conditions

IEC standard: Degradation less than 5% Thermal cycle test Hail impact simulation Hail weather simulation High and low temperature environment simulation Diameter: 25, 35, 45mm Falling at 84-134km / h 85°C to - 40°C 200 runs 0.38% 0.32% DH1000+ML (5400Pa Salt spray test **Dynamic load test** UV+DML+TC50+HF10 Coastal environment simulation Storm simulation 5% saturation 1000 cycles 1000 hours of operation at 35 °C The maximum pressure is ±1000Pa +3600Pa) 0.09% **rc200**

under extreme test conditions 5.00% -

0.18%

LETID

PID192

0.36%

0.5%



0.07%

ED

LONGI @ DGBU

Understanding a PV Module Datasheet

Electrical Characteristics	STC : AM1	.5 1000W/m	² 25°C	NOCT : AM	NOCT : AM1.5 800W/m2 20°C 1			.m/s Test uncertainty for Pmax: ±3%		
Module Type	LR5-54H	TH-415M	LR5-54H	HTH-420M	LR5-54H	HTH-425M	LR5-54H	ITH-430M	LR5-54H	ITH-435M
Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax/W)	415	310	420	314	425	318	430	321	435	325
Open Circuit Voltage (Voc/V)	38.53	36.18	38.73	36.36	38.93	36.55	39.13	36.74	39.33	36.93
Short Circuit Current (Isc/A)	13.92	11.24	14.00	11.31	14.07	11.36	14.15	11.43	14.22	11.49
Voltage at Maximum Power (Vmp/V)	32.24	29.42	32.44	29.60	32.64	29.78	32.84	29.97	33.04	30.15
Current at Maximum Power (Imp/A)	12.88	10.54	12.95	10.60	13.03	10.67	13.10	10.72	13.17	10.78
Module Efficiency(%)	2	1.3	2	1.5	2	1.8	2	2.0	2	2.3

Operating Parameters		
Operational Temperature	-40°C ~ +85°C	
Power Output Tolerance	0~3%	
Voc and Isc Tolerance	±3%	
Maximum System Voltage	DC1500V (IEC/UL)	
Maximum Series Fuse Rating	25A	
Nominal Operating Cell Temperature	45±2°C	
Protection Class	Class II	
Fire Rating	UL type 1 or 2	
The Rating	IEC Class C	

Mechanical Loading						
Front Side Maximum Static Loading	5400Pa					
Rear Side Maximum Static Loading	2400Pa					
Hailstone Test	25mm Hailstone at the speed of 23m/s					

Temperature Ratings (STC)

Temperature Coefficient of Isc	+0.050%/°C
Temperature Coefficient of Voc	-0.230%/°C
Temperature Coefficient of Pmax	-0.290%/°C

Understanding a PV Module Datasheet

Maximum Power Point Voltage (Vmpp):

The Vmpp is the voltage when the power output is the greatest. It is the actual voltage you want to see when it is connected to the MPPT solar equipment (like an MPPT solar charge controller or a grid-tie inverter) under standard test conditions.

Maximum Power Point Current (Impp):

The Impp is the current (amps) when the power output is the greatest. It is the actual amperage you want to see when it is connected to the MPPT solar equipment under standard test conditions.

Open Circuit Voltage (Voc)

Open circuit voltage is how many volts the solar panel outputs with no load on it.

This is a very important number, as it is the maximum voltage that the solar panel can produce under standard test conditions, so this is the number to use when determining how many solar panels you can wire in series going into your inverter or charge controller.

***Voc will potentially be briefly produced in the morning when the sun first comes up and the panels are at their coolest, but the connected electronics haven't woken up out of sleep mode yet.

Understanding a PV Module Datasheet

Short Circuit Current (Isc):

Short Circuit Current is how many amps (i.e. current) the solar panels are producing when not connected to a load but when the plus and minus of the panels wires are directly connected to each other. If you just measure with an ammeter across the plus and minus leads, you will read lsc. This is the highest current the solar panels will produce under standard test conditions.

Maximum System Voltage:

Maximum system voltage refers to the maximum voltage that the components are capable of handling. If a panel is rated at a maximum system voltage of 1000V, then the connectors, fuses and all other components are rated to not exceed this threshold.

Maximum Series Fuse Rating:

The maximum sized string fuse that can be used while still providing protection to a string

Temperature coefficient considerations on modules

- Each solar cell technology comes with unique temperature coefficients. These temperature coefficients are important and the temperature of the solar cell has direct influence on the power output of a solar PV module.
- Once the temperature a solar module operates in increases, the power output of the solar module will decrease. The exact opposite is true to.
- The rated power as generally indicated on the module's label is measured at 25 degrees Celsius or STC (Standard Test Conditions).
- Most installed solar modules in sunny countries easily reach higher temperatures than 25°C. In fact, temperatures of 50°C and above are easily reached.
 - Temperature coefficient of the maximum output power (Pmax) at STC is -0.29%/°C.

Temperature coefficient considerations on modules - VOC

Temperature coefficient of the Open Circuit Voltage (Voc) at STC is -0.23%/°C and the Voc is 39,33V for the LONGi Solar HIMO6 435W module.

- Now, let's have a look at an example where the average low temp in Zimbabwe is 12°C and average high temp in Zimbabwe is 39°C. With the temperature at 39°C, the voltage loss of this module is:
 - 39°C 25°C = 14°C, which is the temperature difference between the module's Voc at STC and the highest average temp in Zimbabwe
 - 14°C x -0.23% = -3,22% or 1,267V which means that the module loses 1,267V when the temperature reaches 39°C
 - The opposite is also true if the temperature is at $12^{\circ}C 12^{\circ}C 25^{\circ}C = -13^{\circ}C$
 - -13°C x -0.23% = +2,99%/1,17V which means that the module gains 1,17V when the temperature reaches 12°C

Example:

- MPPT Voltage range of the Phocos 5KVA is 120V 430V
- Minimum no of panels in a string = 120V/(39,33 1,267V) = 2,95 modules (Round up to 3)
- Maximum no of panels in a string = 430V/(39,33 + 1,17V) = 10,61 modules (Round down to 10)

Temperature coefficient considerations on modules - VOC

Temperature coefficient of the Open Circuit Voltage (Voc) at STC is -0.23%/°C and the Voc is 39,33V for the LONGi Solar HIMO6 435W module.

- Now, let's have a look at an example where the average low temp in an area is 0°C and average high temp is 50°C. With the temperature at 50°C, the voltage loss of this module is:
 - 50°C 25°C = 25°C, which is the temperature difference between the module's Voc at STC and the highest average temp
 - 25° C x -0.23% = -5,75% or 2,261V which means that the module loses 2,261V when the temperature reaches 50°C
 - The opposite is also true if the temperature is at $0^{\circ}C | 0^{\circ}C 25^{\circ}C = -25^{\circ}C$
 - -25° C x -0.23° = $+5,75^{\circ}/2,261^{\circ}$ which means that the module gains 2,261[°] when the temperature reaches 0°C

Example:

- MPPT Voltage range of the Phocos 5KVA is 120V 430V
- Minimum no of panels in a string = 120V/(39,33 2,261V) = 3,23 modules (Round up to 4)
- Maximum no of panels in a string = 430V/(39,33 + 2,261V) = 10,33 modules (Round down to 10)

Temperature coefficient considerations on modules - Pmax

- Temperature coefficient of the maximum output power (Pmax) at STC is -0.29%/°C for the LONGi Solar HIMO6 module
- Now, let's have a look at an example if the solar cells inside a solar module reach 50°C. With the solar module reaching 50°C, the power loss of this module is:
 - 50°C 25°C = 25°C, which is the temperature difference between the module's Pmax at STC and the hypothetical example temperature of 50°C reached by the cells
 - $25^{\circ}C \times -0.29\% = -7.25\%$, which means that the module loses 7.25% in power output when the cells reach 50°C
 - Solar module power loss: -7.25% x 435W = 31.53W. The maximum power this module will operate at 50°C is: 403.5W.
- Besides the temperature coefficient of Pmax and Voc there are also other temperature coefficient ratings for solar PV modules. These are:
 - Temperature coefficient of the short-circuit current (lsc), which measures the changing short-circuit current values of the PV module when the solar cell temperature increases (or decreases)

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Andrew Tyler Head of Channels and C&I andrewtyler@longi.com

www.longi.com



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