

LONG

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 "Utilizing Solar Energy, Building a Green World" and brand philosophy of "Steadfast and Reliable, Technology Leadership", LONGi has dedicated itself to technology innovation and established five business sectors, covering mono silicon wafers, mono cell and modules, commercial & industrial distributed solar solutions, green energy solutions and hydrogen equipment. The company has honed its capabilities to provide green energy and has, more recently, also embraced green hydrogen products and solutions to support global zero carbon development.



Y2021 Operating Income Y2021 Net Profit

\$12.694B

\$1.425B

R&D Investment

\$689M

2000

oundation



60000+
Global Employees



30+ Global Network



15+
Manufacturing Bases

Milestones of LONGi

LONGI

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

2000

2005

2014

2019

2021

STAGE 1

The era of semiconductor technology accumulation

2000

LONGi was established

2005

Formation of annual production capacity of 30 tons silicon ingot

STAGE 2

The era of technological revolution in the monocrystalline silicon wafers

2012

A-share market listing

2014

World's No.1 in production of monocrystalline silicon wafer

- RCz Ingot pulling
- · Diamond Wire Slicing Technology
- M1/M2 Silicon standard

STAGE 3

The era of promoting monocrystalline back to the mainstream

2015

Entered solar cell and module market World's No.1 in shipment of monocrystalline module

2018

The world's most valuable PV manufacturer

- PERC Trend
- LIR Technology
- Bifacial Technology

STAGE 4

The era of utilizing solar technology to change the earth

2019

Certified the low carbon footprint by CERTISOLIS

Set another standard for ultra high efficiency module

M6 Silicon Wafer Standard

2020

Set a brand new industry standard

M10 Silicon Wafer Standard

Selected as Sole Photovoltaic Sponsor for China Pavilion at Dubai Expo 2020 Officially joined the Climate Group's RE100, EV100, EP100 initiative to achieve carbon neutrality

2021

LONGi established the Hydrogen BU

LONGi broke three more world records for solar cell efficiency

- N-type TOPCon Solar Cell Efficiency
- P-type TOPCon Solar Cell Efficiency
- HJT Solar Cell Efficiency

LONG

The World Leading Mono Silicon Wafer Manufacturer

LONGi took the industry lead in standardizing wafer size and achieving **100%** diamond wire cutting of mono silicon wafer.

70GW+

Wafer Shipment (2021)

105_{GW}

Wafer Capacity (2021)

LONGi Headquarter

Xi'an Factory R&D Center

Yinchuan Crystal Pulling/Cutting Factory

Zhongning Crystal Pulling Factory

Lijiang Mono Crystal Factory

Baoshan Mono Crystal Factory

Wuxi Crystal Cutting Factory

Chuxiong Crystal Cutting Factory

Kuching Factory, Malaysia

Leading Capacity and Shipment



Domestic Factory In 2021, LONGi became the 1st solar Xi'an, Shaanxi Wuxi/Taizhou, Jiangsu technology company to ship more than Quzhou/Jiaxing, Zhejiang Hefei/Chuzhou, Anhui 30GW of modules in one year. Datong, Shanxi Yinchuan/Zhongning, Ningxia Germany Office 6 Baoshan/Lijiang/ Chuxiong/Tengchong, Yunnan Frankfurt, Germany Rotterdam, Netherland Carson City, US Spain Office Japan Office **Headquarters** New Jersey, USA US Office Xi'an, China Madrid, Spain San Ramon, US UAE Office @ Marketing & Sales Center Shanghai, China Dubai, UAE India Office Vietnam Manufacturing Base New Delhi, India Bắc Giang, Vietnam 38.52gw **60**gw Malaysia Manufacturing Base Module Shipment Kuching, Malaysia **Module Capacity** (2021)(2021)**Brazil Office** São Paulo, Brazil Australia Office Sydney, Australia Warehouses Manufacturing Base

We Embrace Innovations with Our Global Customers













Clēnera



CLEANTECH SOLAR



Constellation.

























































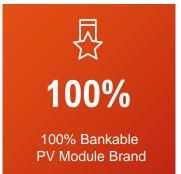


Leading Financial Health

Over a number of years, LONGi has consistently maintained an industry leading ability to mitigate risk and adapt to market changes and, as part of operations, the company prioritizes corporate financial health and stability, with its asset-liability ratio at a low level compared to other global PV manufacturers.







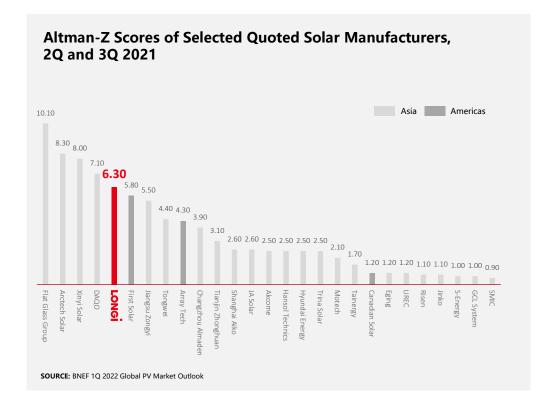


BloombergNEF

Excellent Altman-Z Scores Among Selected Pure-play Manufacturers

In BNEF's Global PV Market Outlook report, LONGi has an Altman-Z score of 6.3.

With the continuous strengthening of the company's technology research and development levels, LONGi has demonstrated highly effective risk control and long-term sustainable development ability.

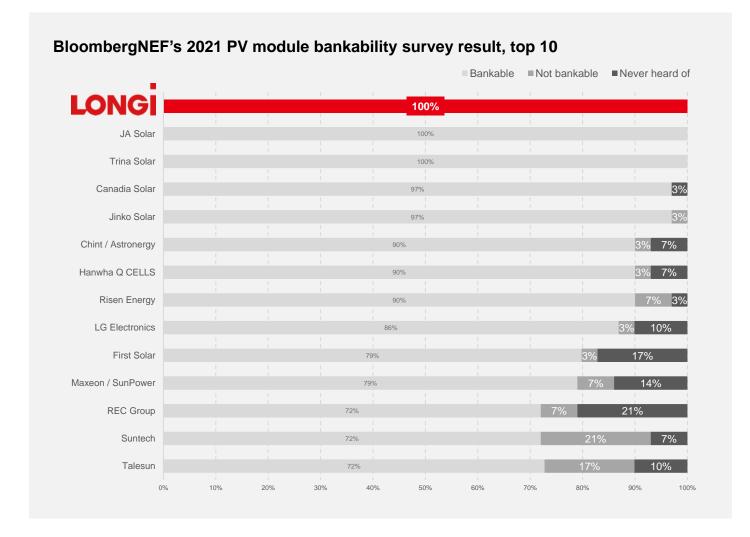




BNEF 100% Bankable PV Module Brand

BloombergNEF

LONGi has been rated '100% bankable' in BloombergNEF's survey of PV Module & Inverter Bankability, underlining the company's capability to assist project developers in securing access to financing from banks in order to bring consistent, steady return on investment to global clients.



PV Module Bankability Rating AAA





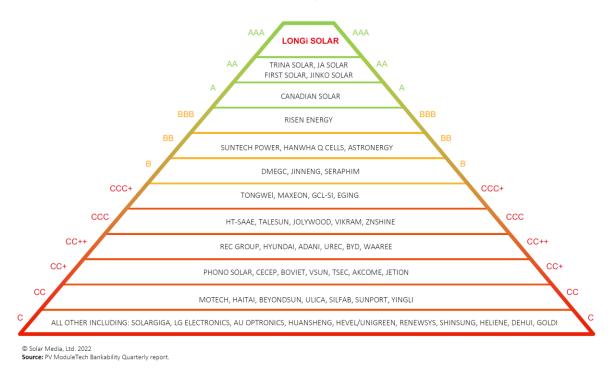
In the PV ModuleTech Bankability Ratings, LONGi is ranked as the only AAA-rated manufacturer, based on numerous demanding criteria. It maintains the world's leading manufacturing capacity and product technology level, showing a stable level of comprehensive strength and the ability to respond to market changes.

PV-Tech is the most influential and professional PV media authority. The PV ModuleTech rating report is based on the evaluation system of PV market research team, which takes into account the manufacturing capability and financial health of the enterprises to determine the investment risk of all PV module manufacturers. It is one of the authoritative analysis tools in the industry.



PV ModuleTech Bankability Ratings Pyramid

February 2022



LONGi Innovation The Benchmark For The Entire Industry



9



Diamond Wire Cutting Technology

Saves the PV industry over 3 billion yuan each year



Mono Technology

The industry trend has undergone significant change, with monocrystalline now dominating with a market share of 90%



Mono PERC Technology

Lower the first year degradation



Bifacial Technology

Promoted mono PERC technology, broadened more application fields



M6 Wafer Standard

Led the industry into the 450W+ high power era



M10 Wafer Standard

Led the industry into the era of the 182mm module and standards



N-type TOPCon Technology

Unlock a new era of N-type mono-crystalline

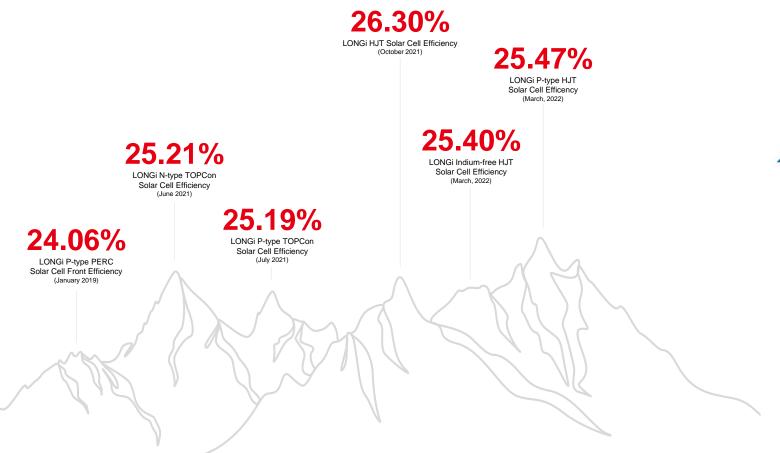


Lifecycle Quality Management

Multiple assurances in innovation, management and customer values

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Efficiency Records and Awards



Ranked first in TÜV Rheinland Power generation simulation: 2017, 2018 Outdoor empirical: 2019, 2020, 2021





TOP PERFORMER in PV Module Reliability Scorecard 2017-2022



HIGH ACHIEVER in PV Module Index 2019, 2020, 2021





Highest Power Generation PV Magazine Test Since June 2018



The Third-party Evaluation of Product Quality & Performance

TÜV Rheinland All Quality Matters

2017, 2018 | Energy Yield Simulation Winner (Mono Group)

- TÜV Rheinland randomly selected solar modules to Panfile
- Simulation power generation in 5 regions





Low light power generation performance



Power temperature coefficient



Incident Angle effect

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

- TÜV Rheinland randomly selected solar modules to test power generation in one year
- In 2019, mono-facial modules won awards based on results from Cologne, Germany
- In 2020, both mono-facial and bifacial groups won awards based on results from Arizona
- In 2021, LONGi achieved PV Module Energy Yield Simulation (Bifacial monocrystalline Group), PV Module Outdoor Energy Yield (Monofacial Group)





The Third-party Evaluation of Product Quality & Performance

The ONLY RETC High Achiever







The U.S. Renewable Energy Testing Center (RETC), a leading engineering service and certification testing provider for PV and renewable energy, named LONGi a "2021 High Achiever" in its PV Module Index Report for the third consecutive year.

In RETC's "Photovoltaic Module Index Report" (PVMI) for 2020, LONGi's results in the three key indicators of reliability, performance and quality identified it as only company to achieve an award. LONGi also became the only manufacturer to perform well in all 8 individual tests, underlining the high reliability and excellent performance of its modules.

2019-2021

RETC 'High Achiever'

The only top performer in all 9 tests for 3 years

Reliability Indicators	Performance Indicators	Quality Indicators
DH2000 Test DML Test PID-Free	Module Efficiency PTC-to-STC Ratio PAN File LID LeTID	Thresher Test (HF30, TC600, DH2000, DML, UVSoak)



14

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



600cycles

Thermal Cycling

2000hours

Damp Heat

192hours

PID Test

1000cycles +

Dynamic Mechanical Load

50cycles

Thermal Cycling

30 cycles

Humidity Freeze

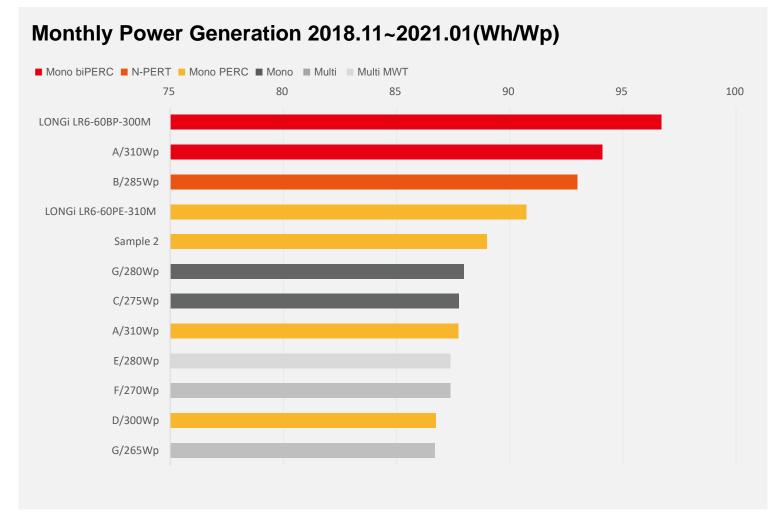
The Third-party Evaluation of Product Quality & Performance

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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.
- LONGi modules were ranked top in the outdoor category.

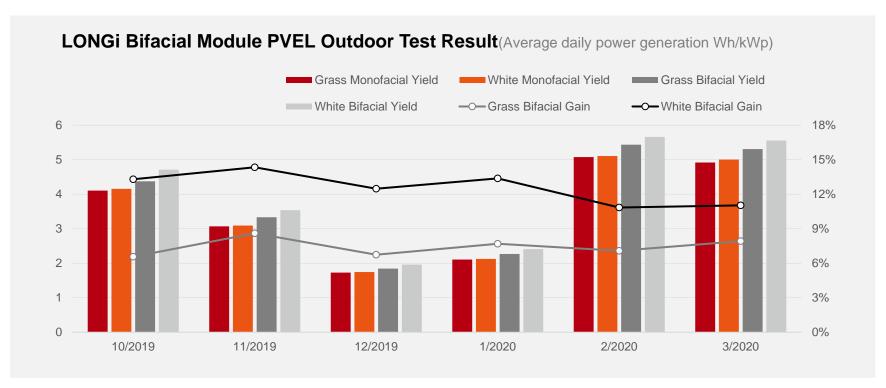


The Third-party Evaluation of Product Quality & Performance

LONG

PVEL Bifacial Module Outdoor Test

- PVEL laboratory, which is in Davis, California, studied the reliability and power generation of bifacial modules of different manufacturers, and found that the products of different manufacturers are significantly different.
- In fact, it shows that the power generation gain of LONGi bifacial modules is obviously better than others.



Manufacturer	Α	В	С	D LONG
Grass-Reflectivity 21%	5.57%	6.57%	7.23%	7.46%
White-Reflectivity 45%	8.28%	8.78%	10.73%	11.44%

Source: Bifacial bake-off: comparing ttchnologies and manufactures, July 2020

Guarantee of Product Quality and Performance



1. Design

- Established models of optics, electricity, mechanics and heat
- Combines theories with experimental results and historical experience
 - Comprehensive analysis of product value based on application scenarios

2. Material

- Specific tests based on material properties
 - Suppliers with high financial health
 - · Thresher reliability test

3. Plan

- Product and Material Standard
- Ensure the continuity of production and the versatility of materials



4. Reliability Test

- Advanced lab recognized by the third party
- · Passed the internal thresher reliability test
- Excellent performance in the test of third party organizations

5. Manufacture

- · Highly automated production lines
- Quality assurance(Manufacturing bases, headquarters, marketing)

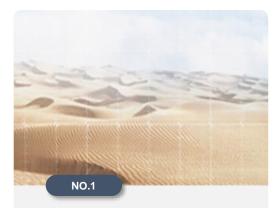
6. Outdoor Power Generation

- The power generation performance and reliability are verified by theory and demonstration
- Joint demonstration with authoritative third party institutions and customers

Professional Reliability Assessment Methods

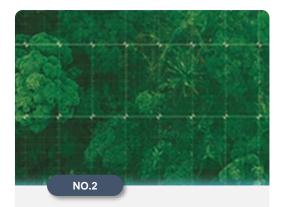


Based on the research results of well-known research units and third-party institutions in the industry, LONGi has established a variety of differentiated reliability testing methods to evaluate product and material reliability more quickly and effectively.



Highly Accelerated Thermal Cycling(HATC)

Increase the maximum temperature of TC from 85 °C to 125 °C. Accelerate the module test and helps to find the failure risk under extreme conditions.



DH+ UV Aging

The comprehensive UV+DH ageing test was introduced to better simulate the extreme conditions of module materials in outdoor environment.



Cell Metal Corrosion Test

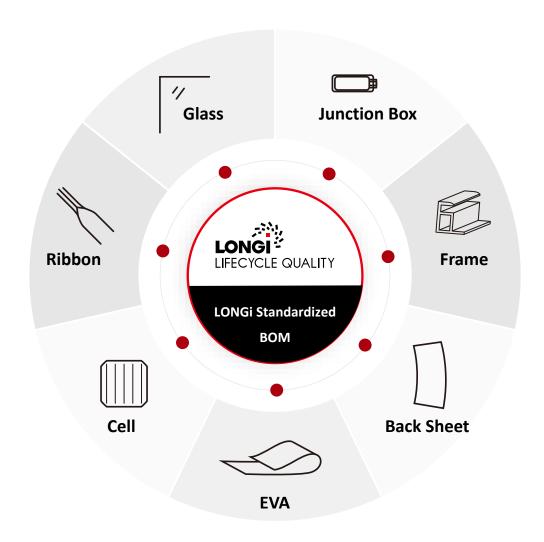
Conduct electrochemical corrosion tests on the cell side in acetic acid solution to verify the corrosion of the cell surface metal. Minimize the outdoor metal corrosion risk of modules and improve the long term reliability.

LONG

LONGi Standardized BOM

LONGStandardized BOM

On the basis of product standardization, LONGi is committed to the standardization of materials. Materials meeting the high standard LONGi requirements are unified as LONGi brand, which further improve the consistency of manufacturing process and product quality.



Rigorous Material Selection

Reliability is the prerequisite for LONGi's product development. LONGi will not compromise on quality standards in order to increase power or reduce costs.



Junction Box

- 182 Bifacial modules must use 25A high current junction box.
- LONGi's assessment believes that there is a risk of uneven shunting through the dual-diode solution, and the reliability risk of long-term use is significantly improved.
- LONGi joint junction box and chip manufacturers have developed a 25A junction box using a single diode.



White EVA Case

- When first introduced into market, white EVA has the risk of electrode corrosion caused by small acidic molecules, so it was not adopted.
- After the electrode corrosion problem of the white EVA was solved by adding cation capture and verified by internal thresher test, white EVA was introduced into our module design.



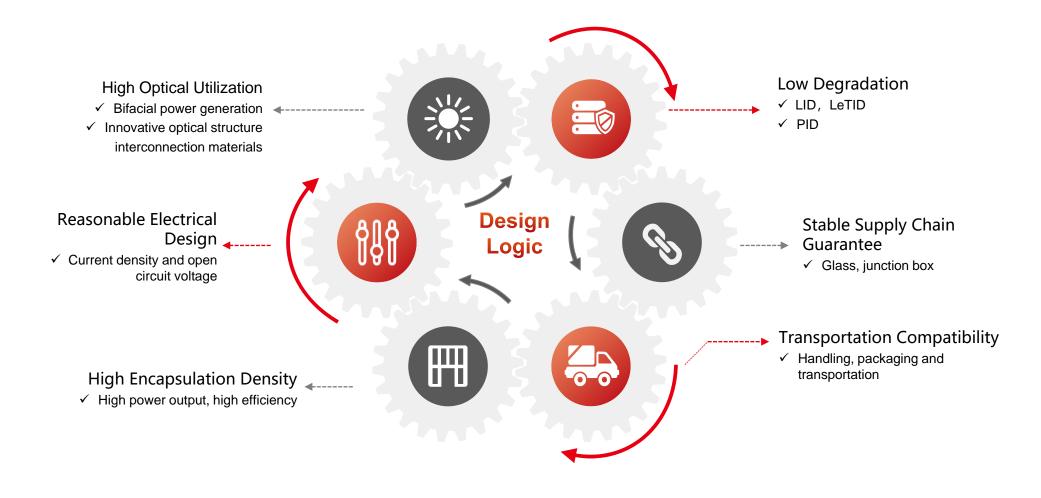
Transparent Backsheet Case

- LONGi has conducted multiple rounds of reliability evaluation for the transparent backsheet case of different manufacturers, and they show failure states such as yellowing, cracking, micro crack, delamination, etc.
- The transparent backsheet module has higher degradation in the DH+UV test, and the double glass module has obvious advantages in reliability.

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LONGi Module Design and Planning

Production and Technology with Highest Customer Value

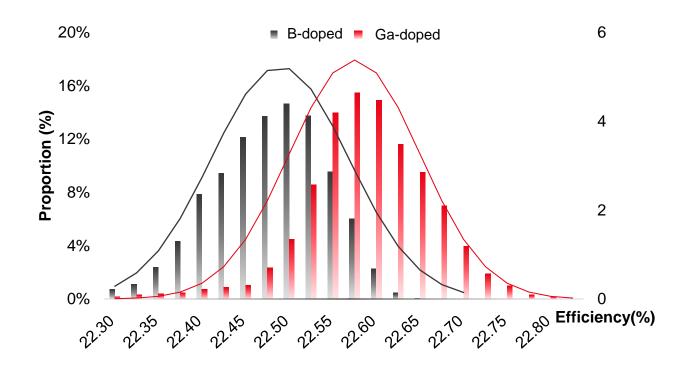


LONGİ

Large-scale Application of Gallium-doped Silicon Wafers

- LONGi overcomes technical challenges such as large segregation coefficient, able to reduce cost and deliver the same price as boron doped wafer.
- Mass production and supply of gallium doped silicon wafers help improving cell efficiency and reducing LID and LeTID.

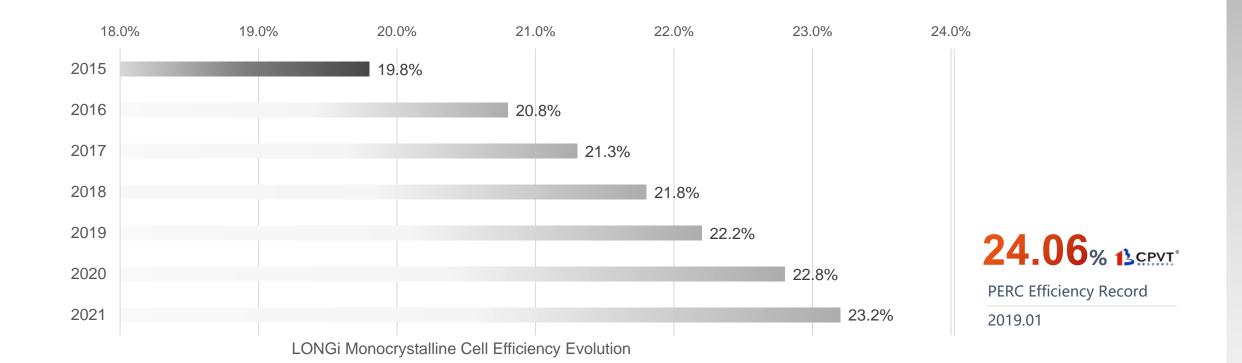






Leading the Efficiency Improvement of Mono PERC Cells

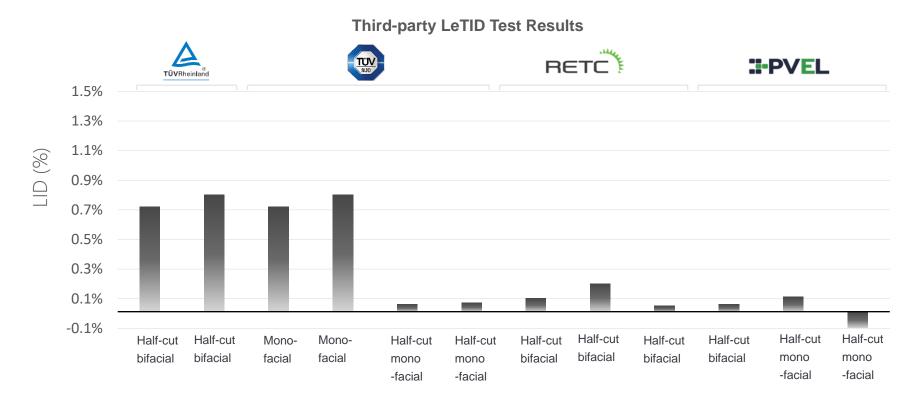
- LONGi started mass production of PERC cells and modules in 2016, which led to industry wide adoption of mono PERC.
- LONGi's research, development and production efficiency of PERC cells has always maintained a leading position, and currently maintains a
 24.06% commercial PERC cell efficiency record.



LONGi

Solve PERC LID Problem and Remove Application Barriers

- Modules made of untreated PERC cells have obvious LID problems. This was effectively solved by LIR technology or gallium-doped monocrystalline silicon wafer
- LONGi PERC products effectively suppress LeTID caused by "hydrogen-metal" through superimposed cell process control, and have performed well in the third-party tests

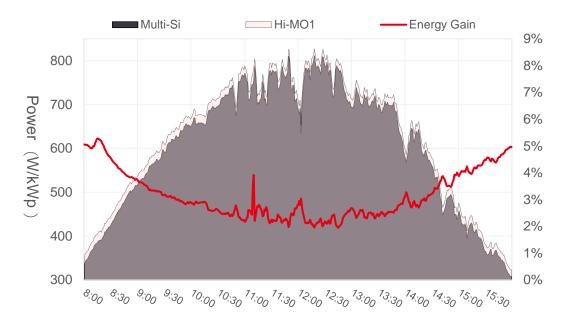




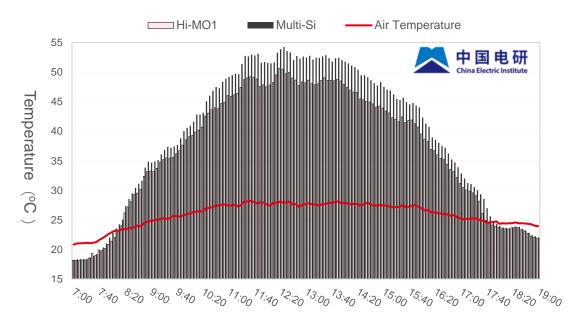
Verification of the Advantages of Mono PERC Modules

- LONGi cooperates with CEI to study the energy yield performance and reliability of monocrystalline PERC modules in Hainan and Xinjiang. It verified the advantages of PERC module's energy yield performance under weak light condition, working temperature, etc., and the energy yield of PERC is 3% higher than Multi Si modules.
- In 2016, LONGi's PERC module were applied in the Golmud power station of Huanghe Hydropower Development and achieved excellent energy performance. The energy gain of PERC module was widely recognized by customers.





Real Time Statistics of Module Temperature in Hainan(20170207)



LONGi

Bifacial PERC and Module Design

- The bifacial PERC cell is to adjust the rear aluminum electrode of PERC cell to localized aluminum bus bar.
- LONGi launched the bifacial and dual glass module based on the bifacial PERC cell in May 2017, well ahead of competition. Since then, LONGi has continued to promote the bifacial module to increase its global market share. LONGi's total shipment of bifacial module has reached 20GW (2017.5~2021.06)
- LONGi's bifacial module used 2+2 mm dual glass to reduce module weight and POE encapsulation to increase reliability. The adoption of a frame avoided damage to the module during installation and long term use, with the design of a short frame without the C side reduced shading on the cell's rear side, enhancing energy yield.

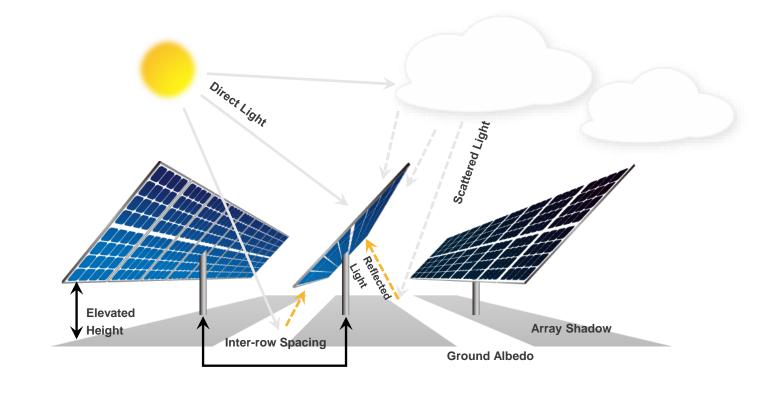


Bifacial Technology for Hi-MO Series



Establish Guidance on Bifacial System Design Optimization

- The ground albedo is the most important factor affecting bifacial gain. The order by albedo of common ground is: concrete & sand> land > grassland > water surface
- If it is unavoidable to use mounts shading the rear side of the module, the distance between the steel purlins and module should not be less than 50mm, in order to reduce the adverse effect on bifacial energy gain.
- The bifacial module's minimum ground clearance should not be less than 1m.
- It is recommended to use bifacial modules in locations with snow, because the rear side yield gain will not be affected, and the operating heat can melt the snow on the front side.





Global Verification of Bifacial Energy Gain and Reliability

Establishing Bifacial Module Bankability





Baseline: Monofacial PERC Module

LONGI

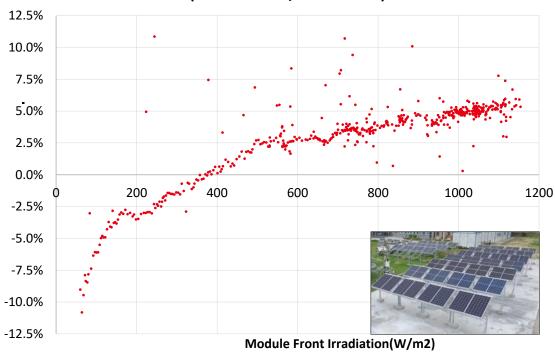
Large Scale Application of Half-cut Technology

Reducing Hot Spot Temperature and Improving Energy Yield

- Half cell technology halves the working current to significantly reduce internal loss and lower the module hot spot temperature. Leaving space for cell size increasing.
- Half cell technology brings higher energy yield under shading or uneven light conditions, and better generation performance under high radiation condition.



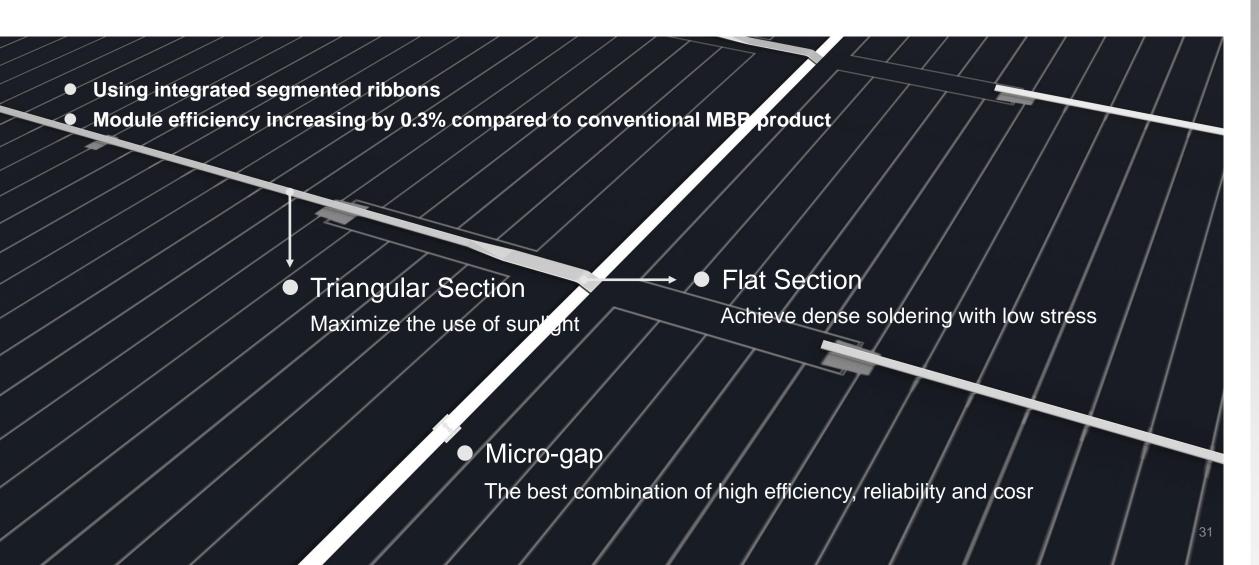
Relationship between half-cell energy gain and irradiation (Hainan China, 2019.10.12)



Smart Soldering Technology

LONG

A Balanced Choice of Overall Efficiency, Cost, and Reliability

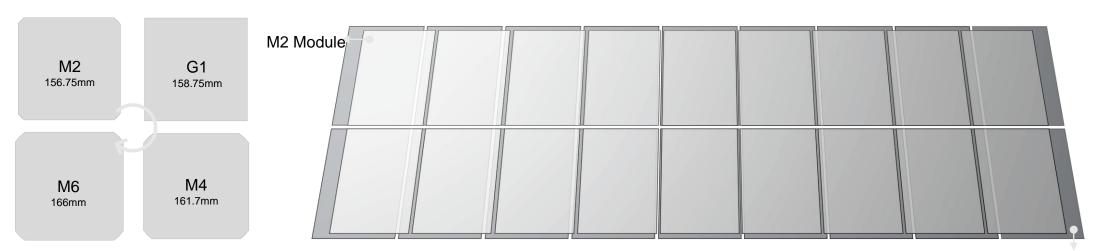


Launch of 166 Standardized Module



Support All Applications, the Best Size Selection of Existing Capacity

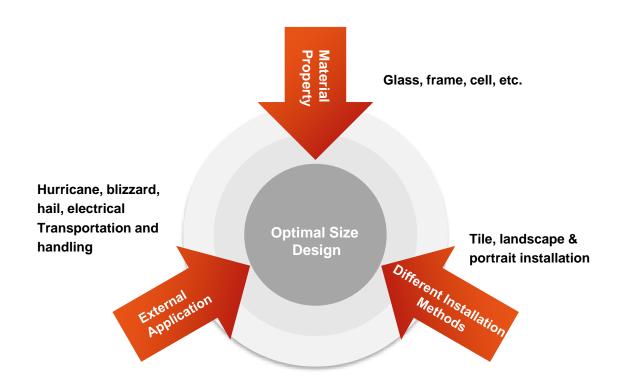
- In response to the mixture application of multiple wafer sizes after 2018, LONGi advocates the standardization of wafer size in the industry, and proposed M6 standard wafers. The length and width of 166 module are slightly increased by 4 ~ 5%, which can realize the full scene replacement of the original products. The appropriate size increase of module reduces the labor cost, and reduces the cost of mounting system and pile foundation.
- Utilizes the equipment margin for cell production and compatible with existing capacity; utilizes the margin of the glass width of the module to reduce manufacturing costs.
- The cumulative shipment of 166 module has reached 10GW per year, driving the standardization of product specifications. It is expected that the market share of M6 module will be close to 50% in 2021.



M6 Module

Optimal Size Design

Module size design should comprehensively consider key factors such as internal material characteristics, external application scenarios and different installation methods.



The size of PV modules is not the bigger the better

It is necessary to comprehensively consider the boundary conditions

182mm, Optimal Size with Systematic Consideration



Optimal Large Size Module for Large Flat Terrain Power Station

- Based on the new build capacity and the entire industry chain, M10 wafer size was introduced to realize the standardization of the manufacturing system and application system. It also realizes the reduction of module manufacturing costs and system BOS costs.
- Based on thorough analysis on module manufacturing and deployment processes, optimal module dimension is determined, and corresponding wafer/cell size of 182mm is deduced
- Further size increasing of module will not bring value in manufacturing cost or system cost reduction, but increase reliability risks
- LONGi believed that the increase of size should stop as 182 (182 72c, 2.56M (m252), 32.3kg, ~ 540W). Future innovation should focus back on the improvement of efficiency and power generation

Manual Installation Production Feasibility& Cost System Compatibility **Module Transportation** Module Reliability Industry chain cost Mechanical load · Mountain scene · Container loading Installation Manufacturing yield Hot spot matching and unloading efficiency Material supply Junction box Design of 120m Transport reliability Installation capacity long array Security damage rate Module efficiency Tracking system Cable matching

LONGI

1.8-2.2m² modules are basically suitable for all-weather application scenarios, and those below 2.7 m² are suitable for most ground power station scenarios.

Modules over 3m² can only be used in very few areas in ground power stations due to various limiting factors.

Climate	Tile Installation	Horizontal Tilt Installation(10°-35°)	Vertical Tilt Installation (10°-35°)				
Residential							
2m Snow Scenario	1.8m ² Module	Residential projects adopt tile installation					
Hurricane speed> 36 m/s	1.8m ² Module						
Hail diameter is greater than 35mm	1.8m ² Module						
Irradiation is greater than 1200W/m²	1.8m ² Module						
C&I							
2m Snow Scenario	1.8-2.2m² Module	1.8-2.2m ² Module	1.8-2.2m ² Module				
Hurricane speed> 36 m/s	1.8-2.2m ² Module	1.8-2.2m ² Module	1.8-2.2m ² Module				
Hail diameter is greater than 35mm	1.8-2.2m ² Module	1.8-2.2m ² Module	1.8-2.2m ² Module				
Irradiation is greater than 1200W/m²	1.8-2.2m ² Module	1.8-2.2m ² Module	1.8-2.2m ² Module				
Utilities							
2m Snow Scenario		2.2-2.7m ² Module	<3.2m² Module				
Hurricane speed> 36 m/s	Utilities does not adopt tile	2.2-2.7m ² Module	2.2-2.7m ² Module				
Hail diameter is greater than 35mm	installation	2.2-2.7m ² Module	2.2-2.7m ² Module				
Irradiation is greater than 1200W/m²		<3.2m ² Module	2.2-2.7m ² Module				

Remarks: The tilt angle is designed according to the actual project site, 10°-35° covers most projects.

Leading the Industry with Innovation



LONGi's technological innovation will quickly be transformed into large-scale advanced capacity and be promoted and applied on the client side, promoting the continuous reduction of the cost of photovoltaic power.

 2015
 2016
 2017
 2018
 2019
 2020
 2021















Monocrystalline

RCz DW Cutting Wafer Improving

PERC

High Efficiency
Low Degradation
(Hi-MO 1)

Bifacial PERC

Significant Energy Yield Increase to Lower LCOE (Hi-MO 2)

Half-cut

Increasing of
Efficiency and Power
Through mass
production
(Hi-MO3)

M6 Standard Wafer

Next Generation of M2 Module (Hi-MO 4)

M10 Ultimate Size

Design for utility application,
Increasing Module Efficiency by
Smart Soldering

N-type + LONGi Lifecycle Quality

N-type Cell + Module efficiency 22% +
Product Lifecycle Quality Management

LONGI

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 \$1568 million, ranking first in the PV industry. And LONGi had obtained 1,387 authorized patents. In 2021, LONGi invested \$689 million on research and development, accounting for 5.43% of operating income, a YoY increase of 69.55%.

> **\$689M** 2020 R&D Investment

5.43% Proportion of Operating Income

Industrial Partner









Research Institute











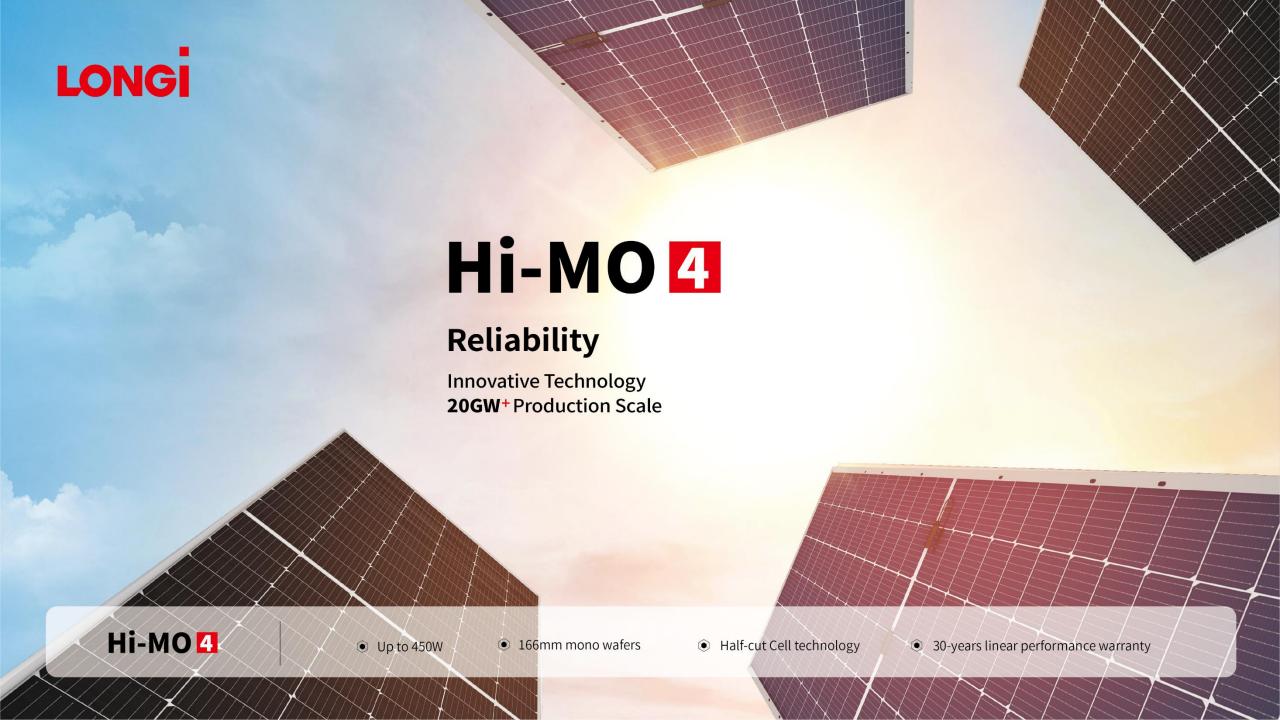












LONGi Hi-MO Series

Unlock More Application Scenarios





Reliability, Innovative Technology, **20GW+** Production Scale Higher Power, Lower LCOE

Recommended Scenarios





C&I

Utilit

LONGi Hi-MO 4 series products are monocrystalline bifacial modules using the new M6 (166mm) silicon wafer that delivers the highest power in the modules. LONGi's advanced R&D technology led the upgrade of silicon wafer size from M2 to M6, and ushers in the era of the 166mm standard.







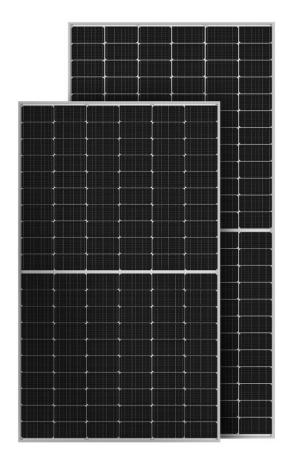
Half-cut cell increases power



9BB design further improves current collection capability



exceeded 45GW (As of April 2022)

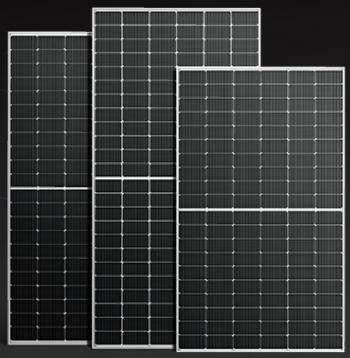




Hi-MO 4m

Maximize Power Density and Flexibility

Available in 3 sizes to maximize use of rooftop space



66-cell format 72-cell format 60-cell format

LONGI HI-MO Series

Unlock More Application Scenarios



41



Maximize Power Density and Flexibility

Available in 3 sizes to maximize use of rooftop space

Recommended Scenarios







Residential

l C&I

With high performance and an aesthetically pleasing appearance, the Hi-MO 4m module combines the advantages of high efficiency, high energy yield and high reliability. Its size and weight are designed to match the requirements of DG system installations and application scenarios.







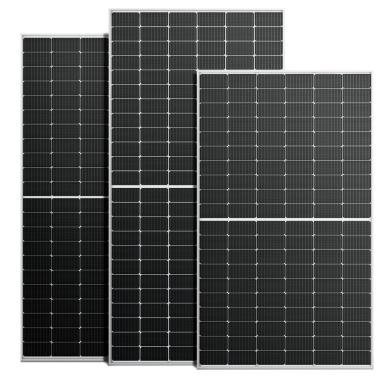
Flexible installation

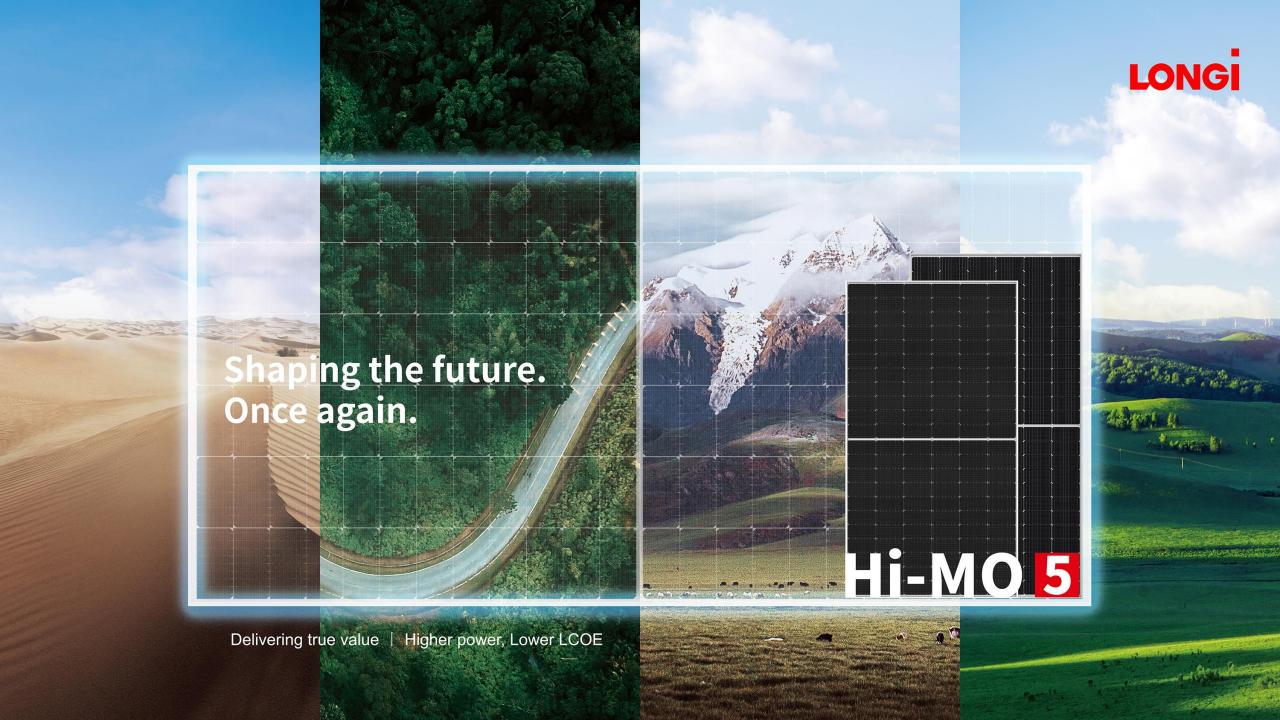


M6 (166mm) monocrystalline silicon wafer



Gallium-doped technology





LONGi Hi-MO Series

Unlock More Application Scenarios





Shaping the future. Again.

The Optimal Size, Delivering True Value

Recommended Scenarios



LONGi base Hi-MO 5 on the M10 wafer which it aims to make the industry standard. It acheives the power output of 540W and an efficency of over 21%. Hi-MO 5 continues the hallmark of "Innovation" that is typical of all of LONGi's Hi-MO series products. LONGi designed Hi-MO 5 from the ground up specifically to deliver greater value for global customers of large-scale PV projects.



M10(182mm) Monocrystalline Silicon wafer



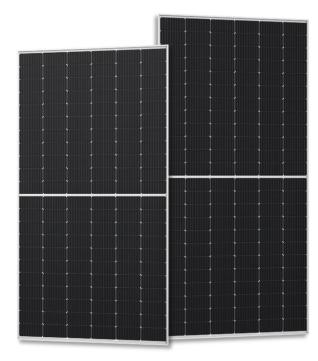
Crackless Smart Soldering



Won prestigious Intersolar Award In 2021



Global shipment exceeded 20GW (As of April 2022)





LONGi Hi-MO Series

Unlock More Application Scenarios





Best Choice for Rooftop Solar Systems

Residential, Commercial and Industrial Applications

Recommended Scenarios





Residential

Hi-MO 5m 54-module uses M10 (182mm) industry standard solar cells., produces a maximum power output of 415W, and achieves an efficiency of 21.25%. This product will further improve LONGi DG product matrix, bringing more value and choices to global customers.







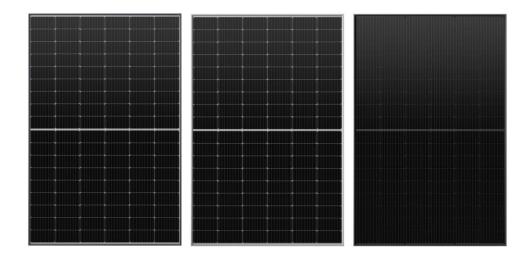
Low-LID technology using gallium-doped wafer



Industry leading temperature coefficients



Excellent energy generation under low light and/or low angles (IAM)



rongi

Professional and Digital Solutions for Our Customers

30+ Optimal Design of Functional Modules **10+** Performance Analysis and Loss Decomposition Algorithm **20+** Patent Protection



Solar Plant Design Optimization - EPC Cost Reduction

Exploring the world's most advanced optimization design methodology, realizing automatic optimization and efficiently empowering the team

PV Plant Performance Analysis - Increase PV plant yield and IRR

Focusing on intelligent algorithms for loss analysis that can be improved through O&M, and providing plant performance loss breakdown and O&M corrective maintenance

Design Stage

- 3 mins for conceptual design
- 30 mins for auto design optimization, with CAD drawing and BOM
- 7 aspects of design optimization: tilt, azimuth, DC/AC ratio, ground clearance, device location



Cost Reduction & Power Increase

O&M stage

- 14 days for first round analysis report
- 60 days for O&M guidance and tracking the improvement
- 100 days for full improvement report after rectification

LONGi Solar @ 2022 46

Customer-oriented Value Creation



Reliable and Economical throughout the Whole Life Cycle



Reliable and Economical
Green Power



Stable and Attractive
Long-term Investment

Reliability Measure

- Low degradation
- Low frequency of operation and maintenance
- 25/30 years operation
- Long-term stability of parts

LCOE Measure

- · System design & installation
- ROI
- BOS cost
- Power generation revenue







Better Products
+Better Cost
Profit



LONGi Product Portfolio

For a Wide Range of Applications

Residential



Suitable for Various Rooftops Maximize Installation Capacity



C&I



For Whole Scenarios



Ultra-large Power Plant

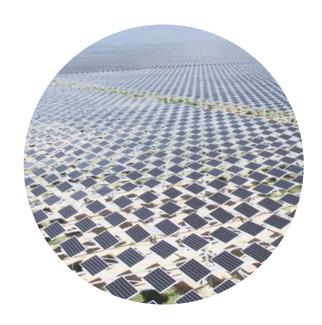


Best LCOE



LONGI

Utility

























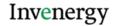




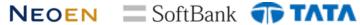








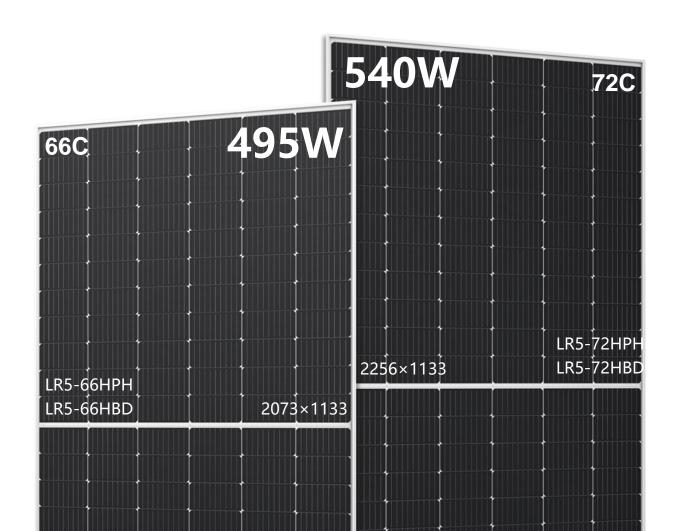








Hi-MO 5 Series



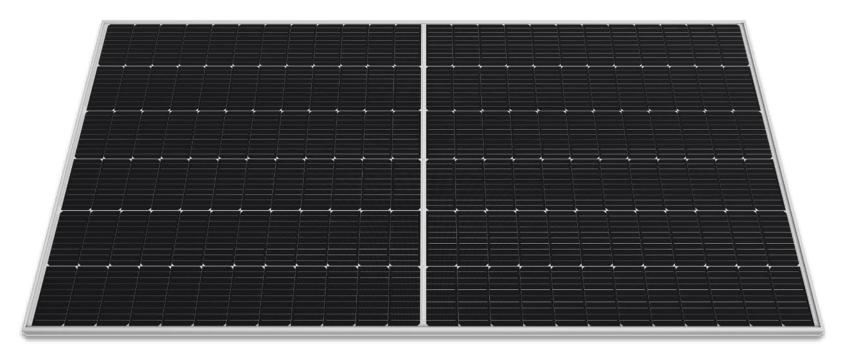


Technology Integration



- M10 Wafer with Gallium-doped Technology
- P-PERC Cell Technology
- 9BB Half-cut Cell
- 72-cell Format







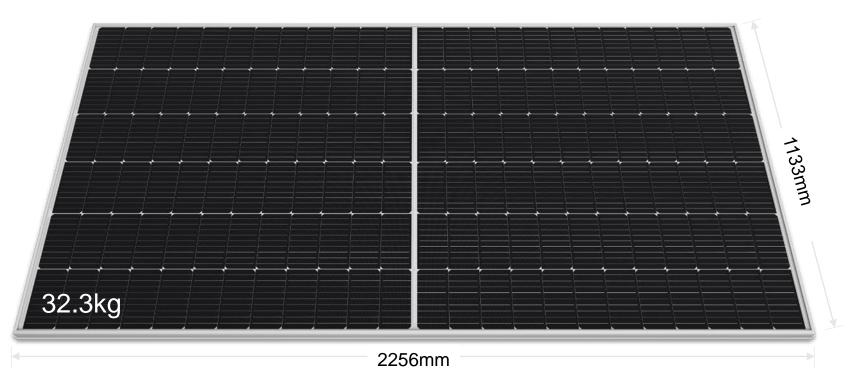
Product Parameters

(540W LR5-72HBD)

Voc 49.5V

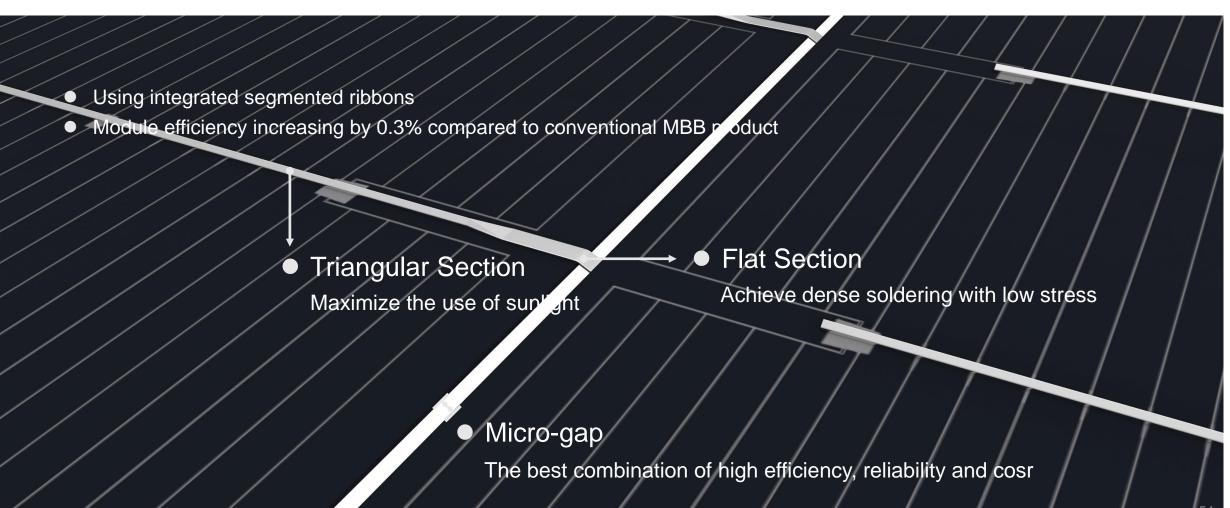
Imp 13.0A

Power Temperature Coefficient -0.35%/°C



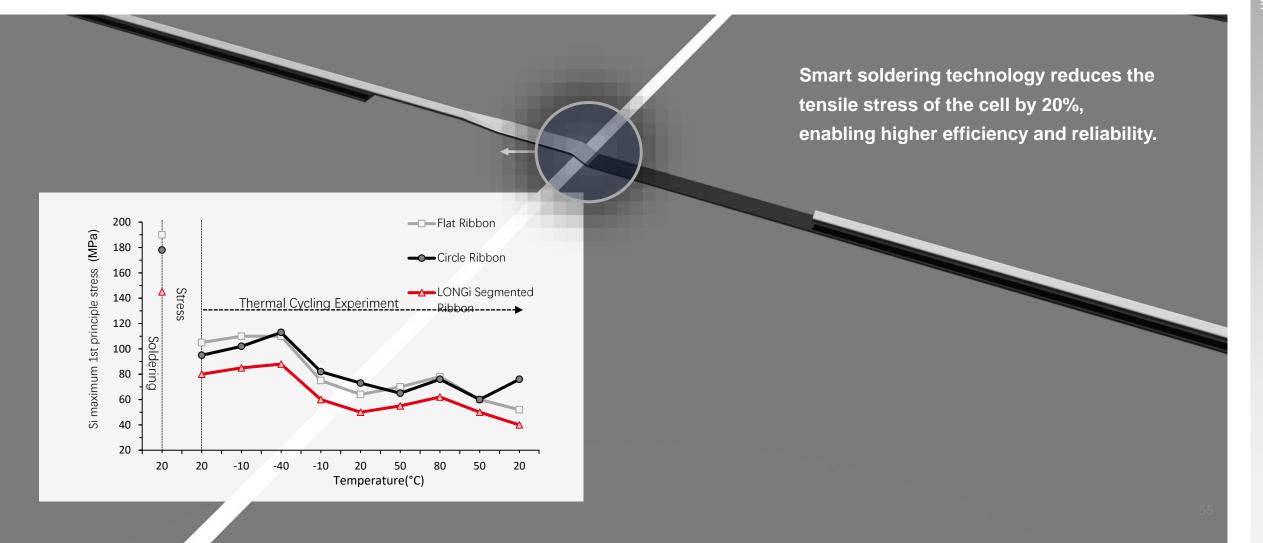


Technology Innovation: Smart Soldering Technology





Smart Soldering | Low Tensile Stress

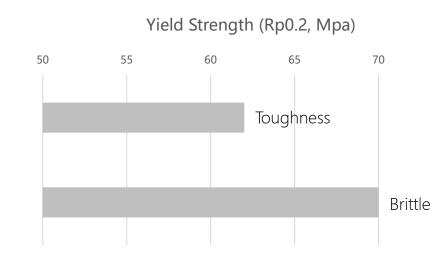




Module Reliability-Smart soldering vs circular shaping ribbon

- Smart soldering is integrated segmented ribbon with small gap connection, the ribbon is soft by annealing process, thus the manufacturing yield is high.
- The circular ribbon is locally flattened with high internal stress, it is easy to form microcrack after laminating.

Small gap connection	Process	Bending test	
Smart soldering	Anneal, eliminating stress	90°Bending Fracture 20times	
Circular shaping ribbon	Locally flatted, Higher stress	90°Bending Fracture 7times	



Lamination verification

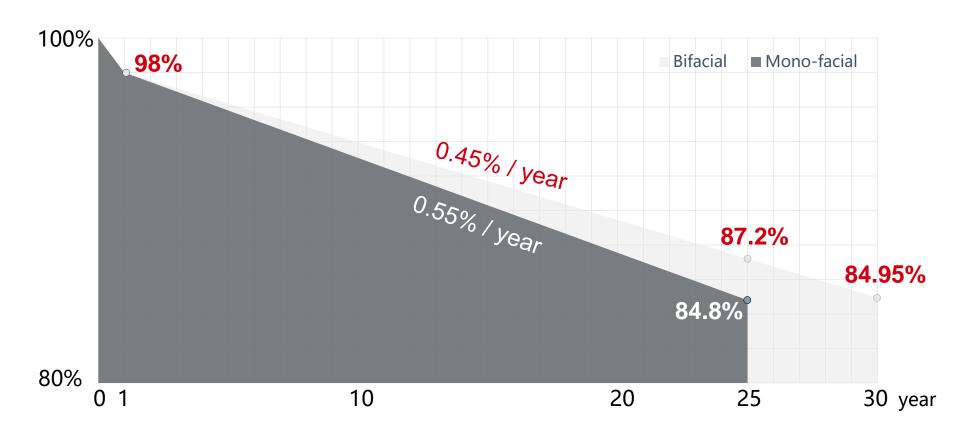




Leading Power Warranty

First-year Degradation ≤ 2%

Bifacial Module Linear Degradation ≤ 0.45%



BOS Saving V.S G1

Hi-MO 5

Hi-MO 5 can save BOS cost of above 1.2 ¢/W

Jiuquan, Gansu, China, 4L fixed rack

158.75,72C



BOS Analysis

HH	Rack and Foundation	-8.1%
	Combiner Box	-26.9%
	Cable	-8.2%
ķ□ ķ	Labor	-20.6%
42	Land	-4.6%





BOS Cost Comparison

- Ultra-scale power plants can save rack and foundation costs by using large racks.
- Considering the thermal expansion and contraction, the length of rack is limited to 120m (GB 50017-2017 《Code for Design of Steel Structure》)
- Both 182 and 210 module can save the costs using large racks, the calculation results are as follows:

Product	72c-166	72c-182	55c-210	60c-210	
Power	450Wp	540Wp	540Wp	590Wp	
DC capacity	3.9852MW	3.96576MW	3.969MW	3.9648MW	
String length	27	27	35	32	
Number of strings on a single rack	8	8	6	6	
Pile spacing	3.5m				
Rack & foundation costs	0.070	0.065	0.066	0.067	
Total cable cost	0.017	0.016	0.016	0.016	
Electrical equipment	0.046	0.045	0.045	0.045	
Floor area	58074 m²	54941 m²	56381 m ²	55348 m²	
Land cost	0.037	0.035	0.036	0.035	
BOS cost	0.170	0.161	0.163	0.163	

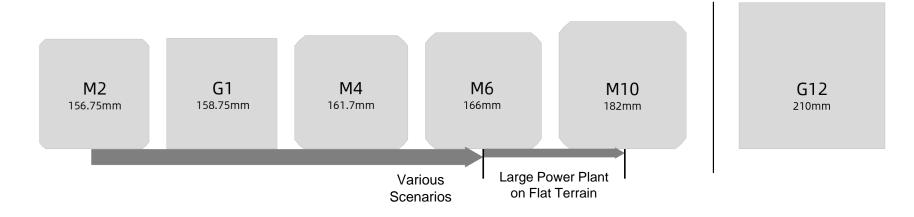
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182 VS 210 Half-cut Modules

Boundary Analysis of BOS Cost

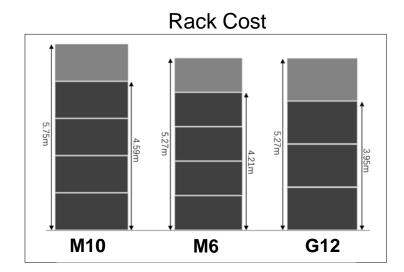
- The high string power saves BOS cost including large racks, cables and string inverters, and the labor costs brought about by large modules.
- Considering that large racks and manual handling are restricted by terrain, large-size modules should be applied to flat terrain.





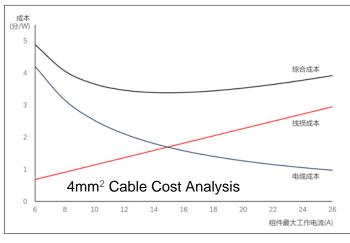
182 VS 210 Half-cut Modules

Analysis of Boundary Conditions of BOS Cost on Flat Ground



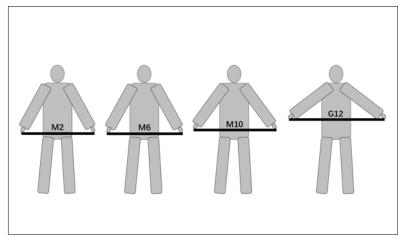
- Rack length is not limited on flat terrain. But the width is still limited considering the installation.
- The length of the main axis of the tracker will limit the number of G12 module strings, and the increase of the module length will reduce the wind load resistance.

Cable Cost



 In terms of cable cost, the advantage of high string power decreases marginally, while the line loss basically increases linearly. G12 half-cut module need to use 6mm2 cables to avoid disadvantages.

Labor Cost



 The significant increase of module area and width will bring difficulties to manual handling and installation.
 The logic of installation cost by piece will no longer hold.



DG Projects





C&I

Residential

























































Traffic

Transportation

Warehousing

Parking

Manufacturing

Retail

Education

Family



DG Module Products and Technologies Development

Monocrystalline replaced polycrystalline, power and efficiency increased dramatically

- · Polycrystalline modules are the mainstream products in the market. LONGi began to promote monocrystalline modules based on the substantial cost reduction of monocrystalline silicon wafers.
- The domestic mono PERC module started mass production, the efficiency of PERC cell was close to 21%, the module power could reach 290W, and the polycrystalline module was 265W in the same period.

23%

2016

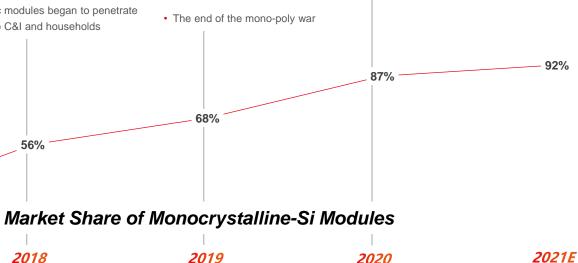
- The efficiency of 60c mono PERC modules reaches 300W, and LONGi proposes the DG 3.0 era.
- Bifacial PERC modules appeared, opening up differentiated application scenarios

2017

- · PERC battery superimposed SE
- Half-cut technology application
- The 531 policy has intensified industry competition, and monocrystalline silicon wafers are brewing size changes
- · 72c modules began to penetrate into C&I and households

2018

- LONGi launches 166 (M6) monocrystalline silicon wafer standard and module products
- Bifacial cells are used to encapsulate mono-facial modules
- 166 products are on hot sale, 156.75 accelerates to exit, 158.75 turns to 166 (newly appeared 182, 210 components are mainly for ground power stations)



LONGi Solar @ 2022

18%

2015



For a Wide Range of Application Scenarios

Standardized Width Choice of Three Different Lengths

- The length covers the range of 1.75~2.1m
- The weight covers the range of 19.5~23.5kg





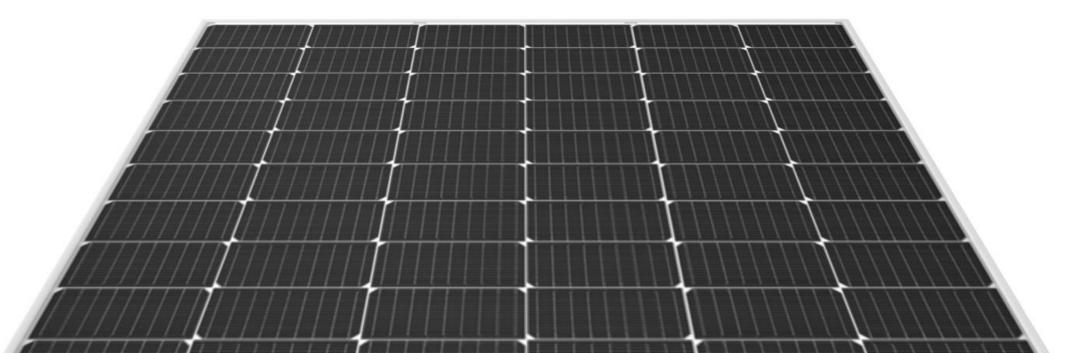




Hi-MO 4m Best DG Products

Integrated Advanced Technology

- M6 Ga-doped monocrystalline silicon wafer
- 9BB high efficiency PERC battery
- Half-cut module technology
- Maximum module efficiency exceeds 21%



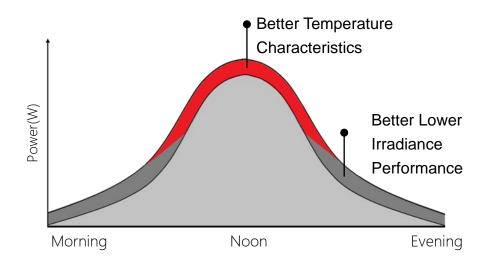


Hi-MO 4m Efficient Monocrystalline Module Product Advantages

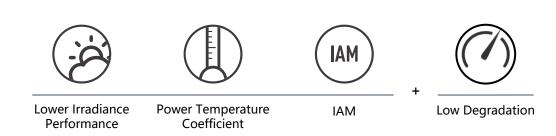
- Excellent power generation capacity
 Resistance to LID, low degradation
- Flexibility to make full use of limited rooftop area Save BOS cost



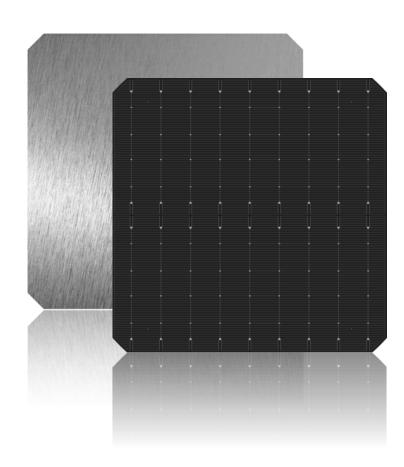
Excellent Power Generation Performance of Hi-MO Series



Based on the wafer-cell-module industry chain technology and quality control, LONGi's Hi-MO series PERC modules have excellent power generation capacity and resistance to LID







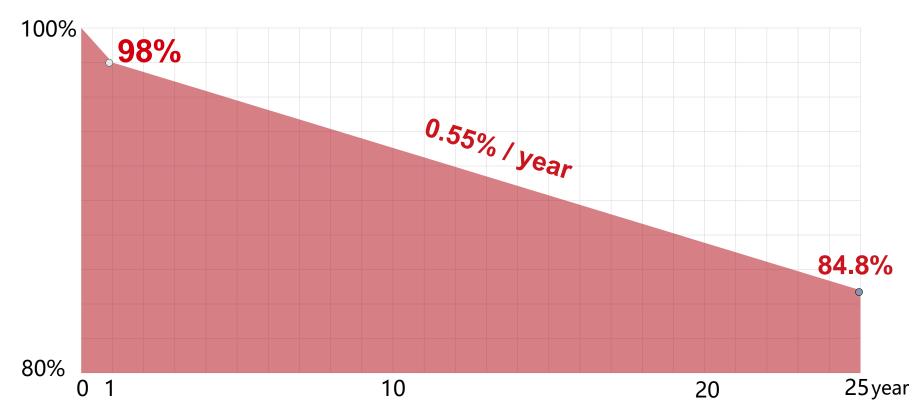
B → Ga

- Using gallium-doped monocrystalline silicon wafers
- Completely solve the B-O LID problem
- With cell-side technology, effectively control LeTID



Leading Product Power Warranty

First-year Degradation \leq 2% Linear Annual Degradation \leq 0.55%





Hi-MO 4m Efficient Monocrystalline Module Product Advantages

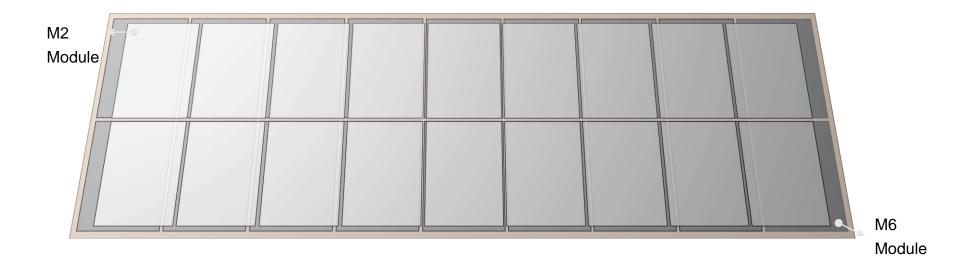
- Excellent power generation capacity
 Resistance to LID, low degradation
- Flexibility to make full use of limited rooftop area Save BOS cost

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BOS Cost Saving

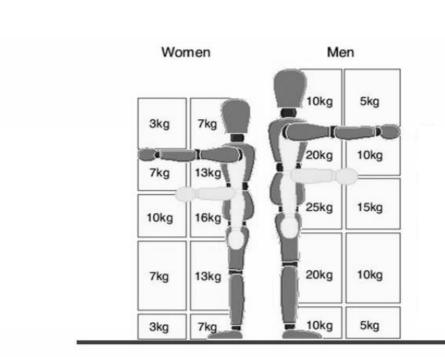
By adopting high-efficiency modules and appropriately increasing the size of modules and the installation capacity of photovoltaic systems in a limited roof area, the cost of racks, cables, inverters and labor are reduced.

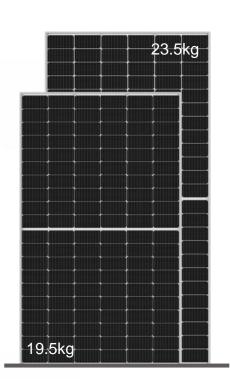


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Reasonable Size & Weight





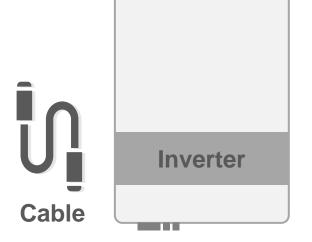
- The maximum weight for one person carrying should between 20kg~25kg. According to the 'Guidelines for Retail Grocery Stores' published by OSHA, the carrying weight for one person shouldn't beyond 50 pounds, that's 22.7kg.
- The length should not exceed the height too much, and the width should not exceed the arm span too much.
- Considering different application habits, Hi-MO
 4m provides 3 options, continuous increase of
 the size and weight will cause inconvenience to
 installation.

Source: 《HSE Guidelines for Retail Grocery Stores》



Flexible Electrics

- Operating current lower than 11A
- Application in all DG projects
- Matches various inverters and optimizers
- Avoids high wiring loss



	60c	66c	72c	
Pmax (W)	375W	415W	450W	-
Isc (A)	11.6	11.65	11.60	< 1
Imp (A)	10.84	10.87	10.85	< 1

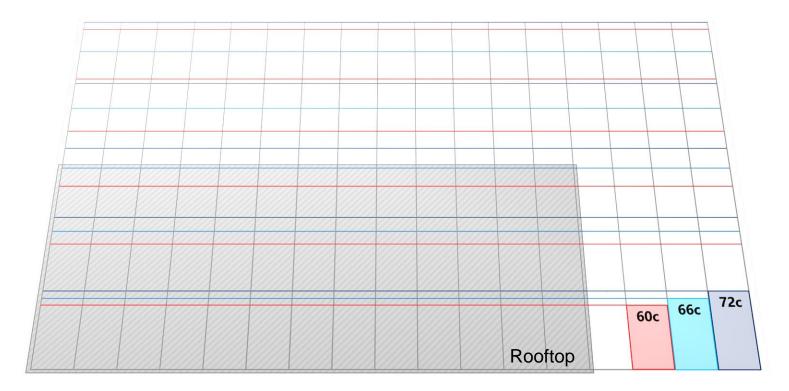
< 12A

< 11A



Available in 3 Size to Maximize Use of Rooftop Space

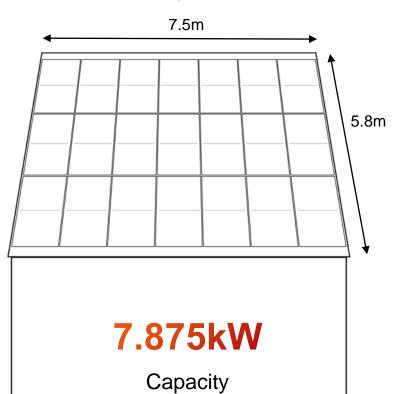
- The following figure shows the area under different arrangements of the three versions of Hi-MO4m when installed vertically
- The examples of different areas on the following 3 pages are from satellite maps, and the installation capacity can be maximized by selecting the right modules.





Residential Application Scenario 1

Amsterdam, Netherlands



60c

Type

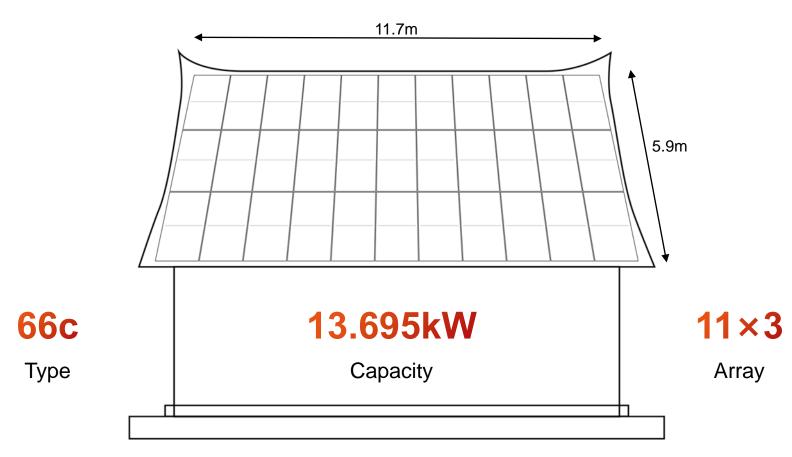
7×3

Array



Residential Application Scenario 2

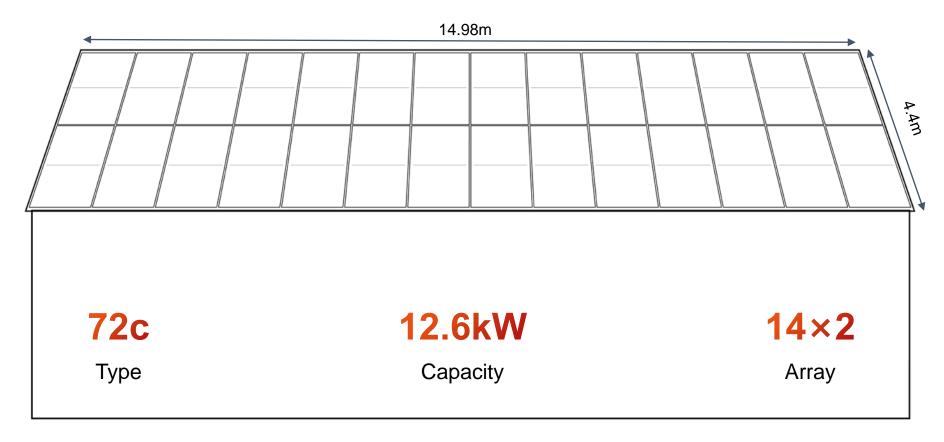
Ningbo, Zhejiang





Residential Application Scenario 3

Shouguang, Shandong

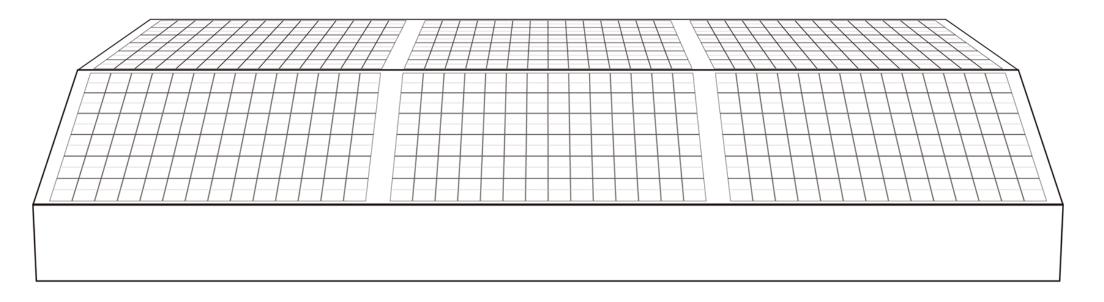




C&I Application

72c Module | Pitched Roof

Reduce the workload of handling and installation and the cost of racking



79

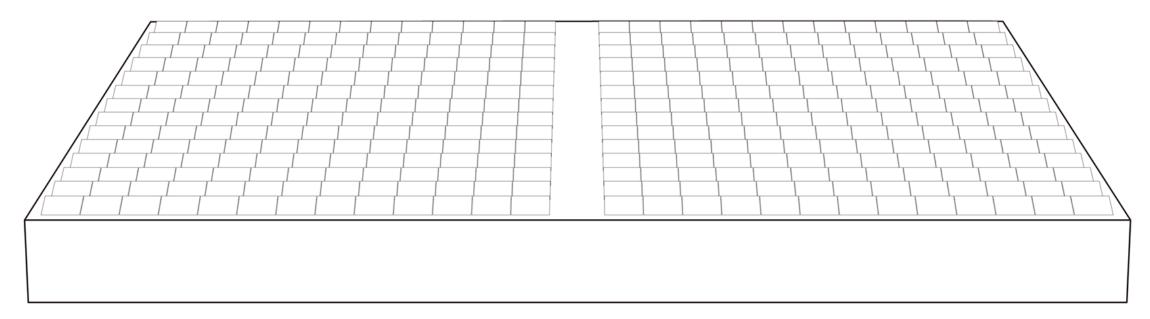


C&I Application



66c Modules | Flat and angular roof*

- Use mounting rack to install on the short side
- For high load requirements



^{*} Commonly found in developed countries, saving expensive labor costs and increasing the cost of racks

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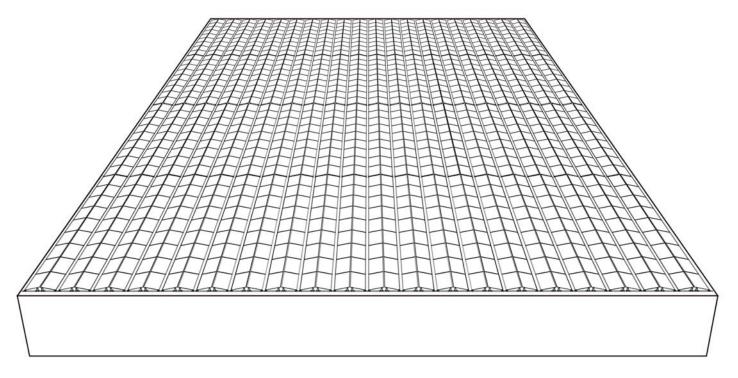


C&I Application



66c Modules | Flat roof with herringbone detail*

- Use mounting rack to install on the short side
- For high load requirements



^{*}Commonly found in Europe

Maximize the use of rooftop area

LONG

THE **FUTURE OF LONGI**









With "Solar for Solar", LONGi officially joined the Global Initiative RE100, EV100, EP100, and will keep building towards achieving 100% in clean energy consumption.

LONGi always had sustainable management as a core criteria for business decision-making, including continuous investments in innovation and research, advocating an open corporate culture and promoting scientific institutional research.

At the same time, LONGi has been leading continuous changes in electric power and energy, promoting the sustainable development of the planet and mankind. It is LONGi's vision and roadmap that Earth will be completely green and self-sustainable in the first half of this century.

LONGi has committed to using 100% renewable power across its entire global operations by 2028. In the coming 10 years, LONGi will install adequate power charging facilities for vehicles to encourage the employees to change family vehicles into electric vehicles. LONGi has committed to completing its energy management system (EnMS) by 2025, as well as a 35% energy efficiency improvement in 2025 from the 2015 level. Solar + desalinated seawater 100% renewable energy. Using clean energy Solar becomes convert deserts into Earth enters a carbon-negative the main electricity source in manufacturing greenland irrigates the mode for electric vehicles desert creating oasis 2020 Solar + pumped-hydro Renewable energy Solar + hydrogen energy, applied to the ocean and energy storage, accelerates the air transportation and

replacement of fossil energy

reducing smelting

starts using solar

in manufacturing

