LONGi Propelling the transformation

LONGi Solar Technology Co., Ltd.
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03.2021

LONGi Propelling the transformation

PRODUCT BROCHURE 2021

LONGi GREEN ENERGY

THE WORLD'S LEADING SOLAR TECHNOLOGY COMPANY

LONGi leads the solar PV industry to new heights with product innovations and optimized power-cost ratio with breakthrough monocrystalline technologies. LONGi supplies more than 30GW of high-efficiency solar wafers and modules worldwide yearly, about a quarter of global market demand. LONGi is recognized as the world's most valuable solar technology company with the highest market value. Innovation and sustainable development are two of LONGi's core values.

Y2000	4.76B($)*	8.5B($)*	52.3%*	75GW
Establishment	Total Revenue	Total Assets	Debt Ratio	Wafer Capacity (Y2020 Proposed)

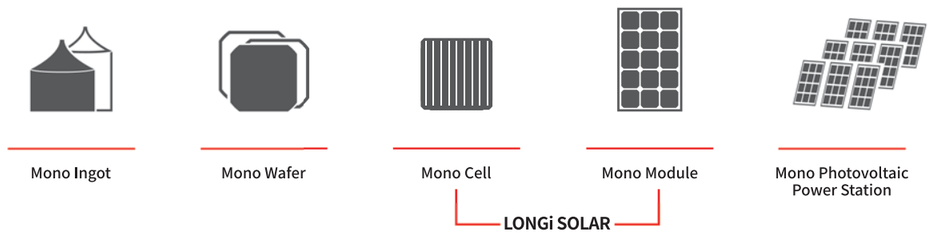
LONGi SOLAR

TAKE THE LEAD IN VOLUME PRODUCTION
FOCUS ON MONOCRYSTALLINE TECHNOLOGY

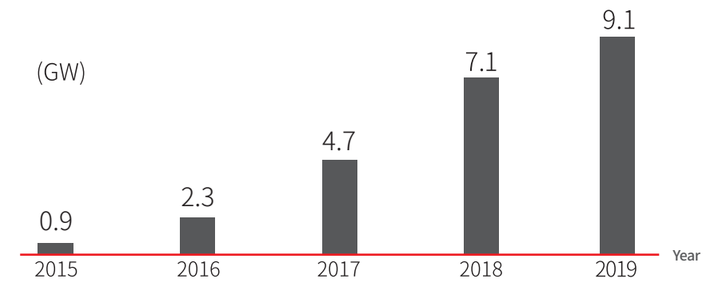
LONGi Solar is a subsidiary of LONGi Green Energy, believing that the core value of innovation lies in real world application, and volume production of the technology delivers true value. LONGi is committed to creating the maximum value for our global partners and customers.

TIER 1	AAA	30GW	24.06%
BNEF PV Module Maker	PV Module Tech Bankability Ratings	Module Capacity (Y2020 Proposed)	The Latest PERC Cell Efficiency Record

LONGi INDUSTRY CHAIN



CELL & MODULE SHIPMENT OVER THE YEARS OF LONGi SOLAR

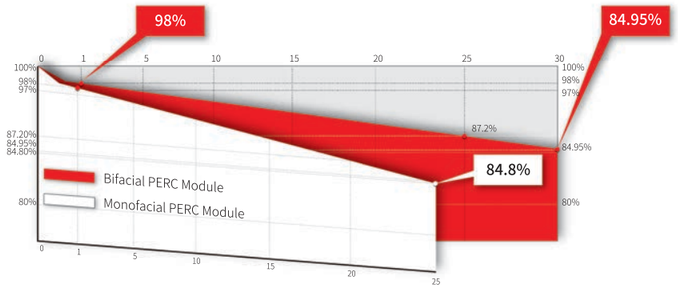


*Based on the 2019 financial report of LONGi
** The Q1 2021 PV ModuleTech Bankability Ratings

WARRANTY

FIRST-YEAR POWER WARRANTY OF ⩾98% FOR PV MODULES

Based on the advanced mono wafer and anti-LID technology, LONGi offers a first-year power warranty of ⩾98% for PV modules.



0.55% Monofacial Module

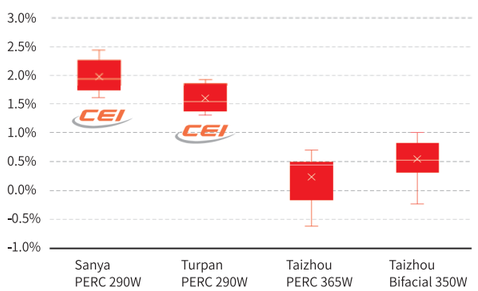
0.45% Bifacial Module

LONGi also provides a 12-years warranty for Material & Craftwork of PV modules, and a 25-years power warranty with a linear degradation inferior to 0.55% per year for monofacial module.

For the Bifacial module, the warranty prolongs to 30 years with a linear power degradation of 0.45% per year.

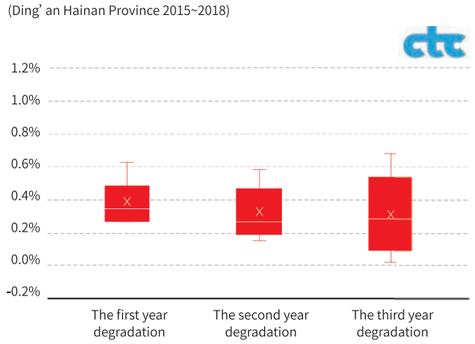
The low degradation property of LONGi's module is demonstrated by long-term outdoor test.

1ST YEAR DEGRADATION IN DIFFERENT CITY IN CHINA



LONGi SOLAR MODULE TESTED BY CTC

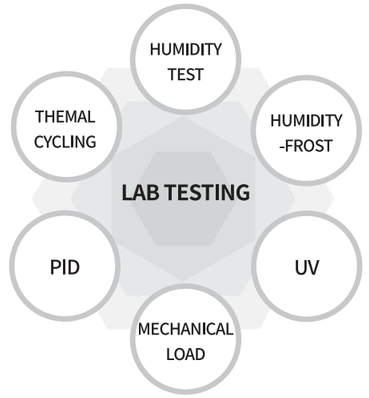
(Ding' an Hainan Province 2015~2018)



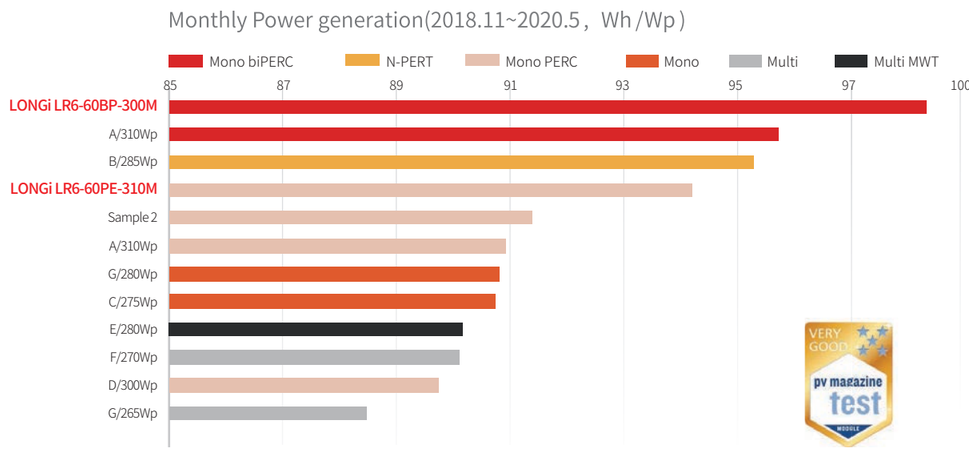
QUALITY

RELIABILITY TEST

LONGi' s modules have passed routine test of IEC and UL, and have an excellent performance in rigorous third-party test.



PERFORMANCE TEST



Rheinland "All Quality Matters" Award

2017 "Energy Yield Simulation" Award
2018 "Energy Yield Simulation" Award
2019 "Outdoor Energy Yield Monofacial Group" Award
2020 "Outdoor Energy Yield Monofacial Group" Award
"Outdoor Energy Yield Bifacial Group" Award

INGOT PULLING

RENDER PERC CELLS WITH HIGH EFFICIENCY AND LOW LID

As a leading company in monocrystalline industry, LONGi focus on reducing production cost by larger silicon loading, higher pulling speed. The RCZ technology was first successfully commercialized by LONGi. Also LONGi has improved the quality of silicon wafers by reducing oxygen content, carbon content and metal impurity, which render PERC cells with high efficiency and low LID.

RCZ Technology

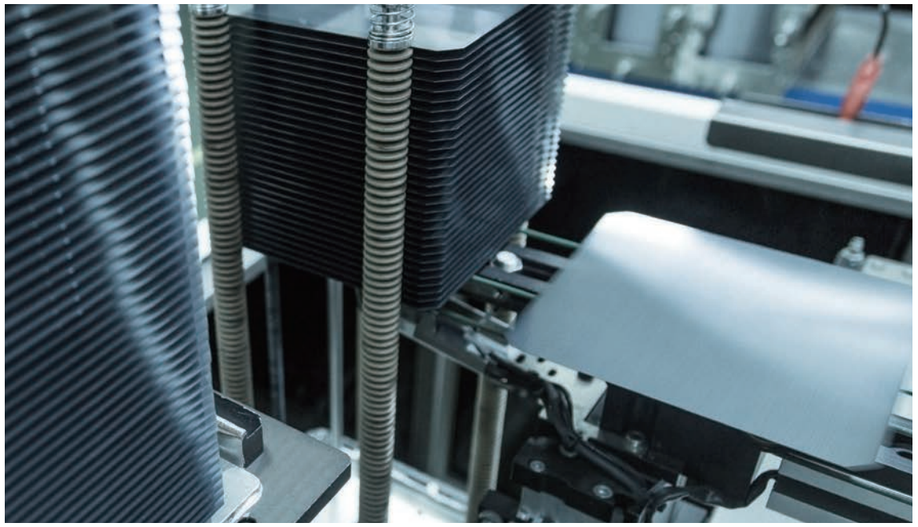
Low LID

High Minority Carrier Lifetime & Low Resistivity

DIAMOND WIRE SLICING

SIGNIFICANTLY INCREASES WAFER OUTPUT PER UNIT MASS

LONGi took the lead in diamond wire slicing technology, which significantly increases wafer output per unit mass. LONGi set the M2 standard of monocrystalline in the industry. And LONGi launched the M6 standard wafer in 2019 and the M10 standard wafer in this year. Each new standard can reduce module manufacturing cost and BOS cost and bring more value.



Diamond Wire Slicing

M2 Standard Wafer

M6 Standard Wafer

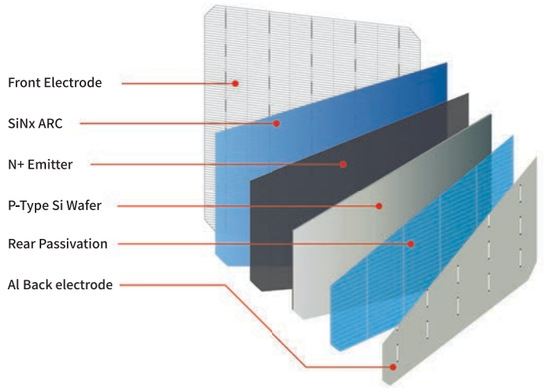
M10 Standard Wafer

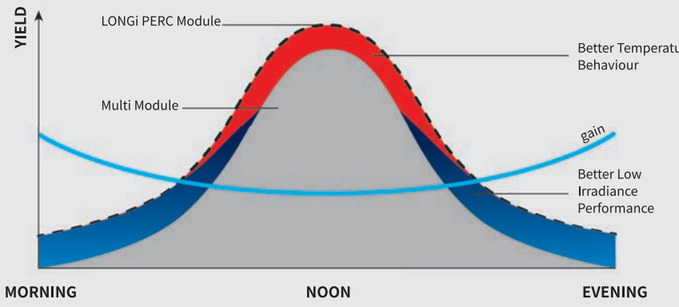
PERC TECHNOLOGY

HIGH EFFICIENCY & MORE ENERGY YIELD

The PERC cell has a passivated rear side and a laser grooving process, which significantly improves the cell efficiency.

In 2016, LONGi released the Hi-MO 1 module with PERC and Anti-LID technologies. At present, the cell efficiency has been increased from 21.0% to over 23.0%.





Outstanding low irradiance performance, low power-temperature coefficient, low operating temperature, all these technologies lead to a high energy yield.

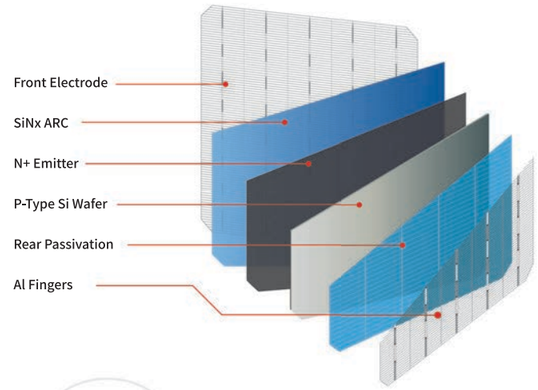
BIFACIAL PERC TECHNOLOGY

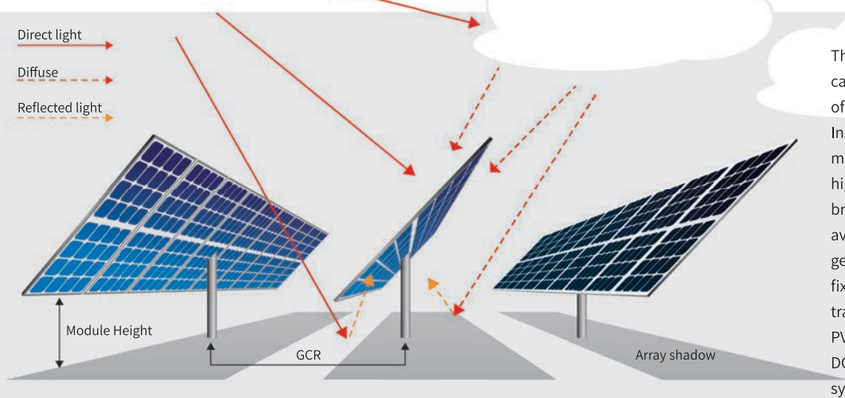
HARVEST MORE LIGHT

For a bifacial PERC cell, the fully covered back electrode is replaced by Al grid, hence render the majority of rear side transparent which enable the cell to absorb light and generate electricity from both sides.

In 2017, LONGi released the Hi-MO 2 module with bifacial PERC and double-glass packaging. Hi-MO 2 module can absorb light on rear side, thus reuduce the LCOE of power plant significantly.

By Nov. 2020, the cumulated shipment of LONGi bifacial module reached 10GW, leading the development of bifacial technology in the industry.





The energy yield of bifacial module can be influenced by albedo, height of module, GCR and DHI etc. Installation height of bifacial module is recommended to be higher than 1m. Shading from bracket and junction box should be avoided. At present, the power generation of bifacial module on fixed brackets and single axis tracker can be simulated with PVsyst. Investors can determine the DC / AC ratio of bifacial module system to minimize the LCOE.

1st Year Degradation, Anti-LID

Outstanding Low Irradiance Performance

Low Power Temperature Coefficient

Albedo

It has considerable gains on grass land, dry sand, especially in snowfield

Module Height

High module height will reduce the shading impact on rear side. A minimum of 1m is recommended

GCR

A low GCR will increase radiance on the rear side

DHI

Diffuse light can be absorbed by the rear side of the module. the higher proportion of Diffuse light, the higher is the bifacial gain.

HALF-CUT TECHNOLOGY

HIGHER POWER & MORE RELIABILITY

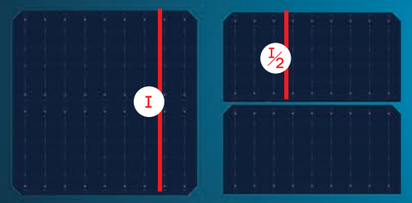
Half-cut cell technology is to cut the cell into two seperate parts by mature infrared laser, hence halve the working current. The thermal loss on the ribbon will be remarkably reduced and the module' s power increases by 2%. The reliability of module is also enhanced.

The combination of half-cut cell technology and bifacial module can amplify the gain over the effect of current-reduction.

In May 2019, LONGi released Hi-MO 4, the bifacial half-cell module using M6 (166mm) standard wafer.

By the end of Nov 2020, the shipment of Hi-MO 4 has reached over 16GW.

In June 2020, LONGi released Hi-MO 5 module using M10 (182mm) standard wafer.



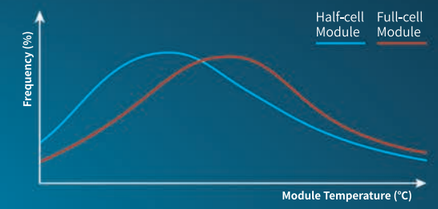
Monofacial or bifacial PERC cell module with half-cut technology has high power, the property of anti-PID, anti-LID (including LeTID), low hot spot temperature, excellent low irradiance performance and low power temperature coefficient.

PROPERTIES

A Lower Hot Spot Temperature

In field applications, small area shadings can cause the temperature of those parts extremely high. This phenomena is called hot spot. The long duration of hot spot could bring irreversible degradation of modules.

Because the string current of half-cell modules is half of full-cell modules, the hot spot temperature can be obviously reduced. LONGi' s experiments show that this reduction could be 10-20°C, which increases the module reliability.



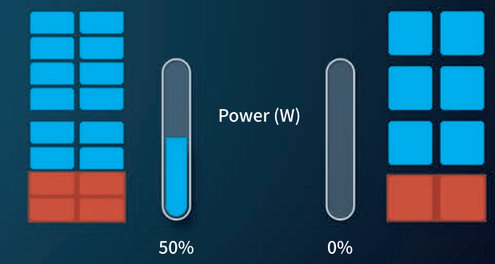
B Lower Operating Temperature

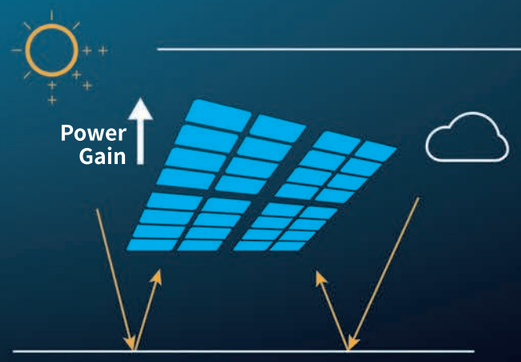
Half-cut cells have half of the working current, thereby the thermal loss is remarkably reduced. Operating temperature correspondingly decreases, and the reliability of module is improved as well as power gain.

C Lower Shading Loss

Because of the unique parallel connection design, half-cell modules still have 50% power output under the circumstance of array shading in sunrise or sunset when portrait installation.

In addition, half-cut technology can improve the output of bifacial module under non-uniform incident illumination on the backside.





D Higher Energy Yield Under High Irradiation Condition

Under high irradiation conditions, half-cell module, especially bifacial half-cell module, will have a higher energy yield compared with conventional module. Bifacial half-cell module will help to achieve the lowest LCOE in regions which is rich in sun radiation resources.

Hi-MO 4m

HIGH EFFICIENCY HALF-CELL MODULE

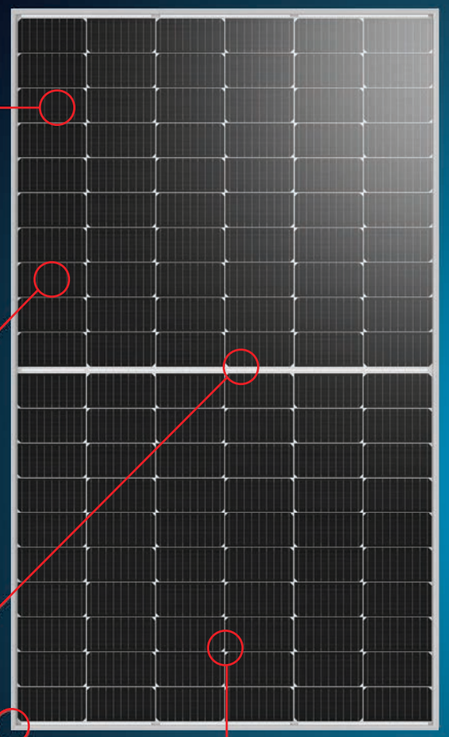
Suitable for residential rooftop and C&I rooftop

The power of half-cell module increases, and the hot spot temperature reduces because of lower working current

Using M6 standard wafer upgraded to 9BB further improve power

Unique parallel connection design, more energy yield in case of shading

35mm frame, front / back side maximum static loading: 5400Pa/2400pa



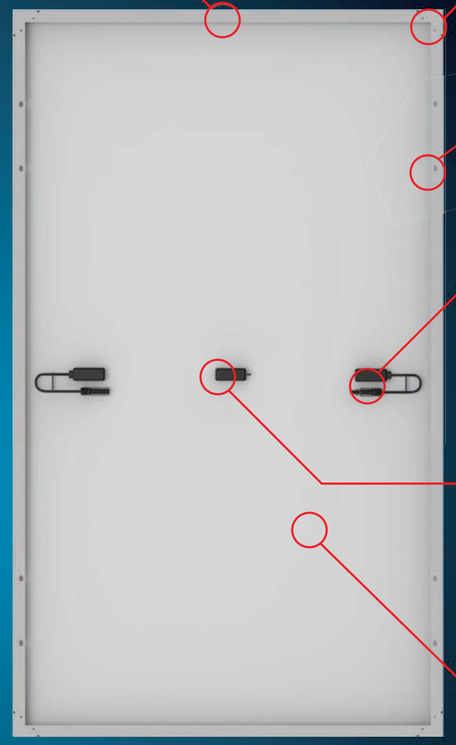
≤2% 1st — 1st year degradation ≤2%

anti LID — anti-LID

anti PID — anti-PID

Option: full Black module with Black frame and black Backsheet (60HPB)

Two grounding holes and one leakage hole at each corner



8 mounting holes, adaptable to various mounting approaches

Split junction box, Cable Length 300mm (can be Customized)

1500V

Backsheet and junction box supporting 1500V system

Anti-UV F

Backsheet with Fluoride on both sides, resistant to ultraviolet radiation

ELECTRICAL CHARACTERISTICS AT STC

Hi-MO 4m	LR4-60HPH			LR4-66HPH			LR4-72HPH		
Pmp(W)	370	375	380	410	415	420	450	455	460
Voc(V)	40.9	41.1	41.3	45.2	45.4	45.6	49.3	49.5	49.7
Imp(A)	10.76	10.84	10.92	10.79	10.87	10.94	10.85	10.92	10.98
Eff(%)	20.3	20.6	20.9	20.5	20.8	21.0	20.7	20.9	21.2
Size/Weight	1755×1038×35mm / 19.5kg			1924×1038×35mm / 22.0kg			2094×1038×35mm / 23.5kg		
Cell Arrangemen	10×6×2			132 (6×12)			12×6×2		

Technical data above mentioned may be of modification, please request for the latest datasheet.

Hi-MO 4

BIFACIAL HALF-CELL MODULE

Suitable for C&I rooftop
and large ground power plant

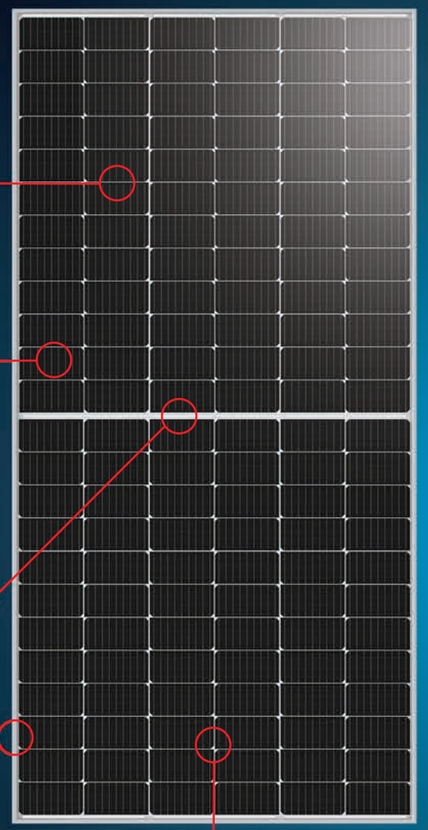
The power output of bifacial half-cell module increases and energy yield is higher under high irradiance condition because of Low working current

Using M6 standard wafer upgraded to 9BB further improve power

Unique parallel connection design, more energy output under non-uniform

Incident illumination on the backside

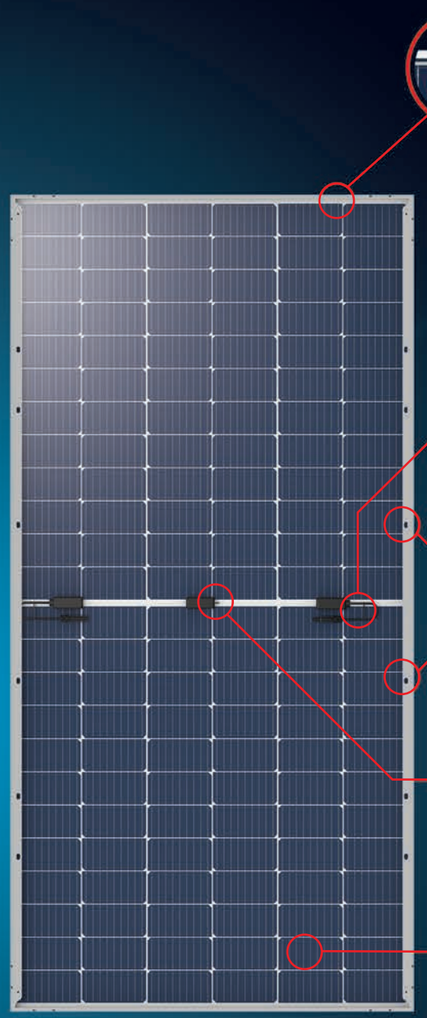
Framed module,
front / back side maximum static loading 5400 / 2400Pa，suitable for tracker



≤2% 1st
1st year degradation ≤2%

anti LID
anti-LID

anti PID
anti-PID



Design of short frame without C side can reduce the shading caused by frame

Split junction box, Cable Length 300mm (can be Customized)

400mm Tracker
Mounting holes with 400mm distance are added to match the horizontal single axis tracker

1500V
Glass and junction box supporting 1500V system

Reliable encapsulation using 2+2mm glass

ELECTRICAL CHARACTERISTICS AT STC

Hi-MO 4			LR4-72HBD
Pmp (W)	445	450	455
Voc (V)	49.4	49.6	49.8
Imp (A)	10.80	10.87	10.93
Eff (%)	20.5	20.7	20.9
Size / Weight	2094×1038×35mm / 27.5kg		
Cell Arrangement	12×6×2		

Technical data above mentioned may be of modification, please request for the latest datasheet.

Hi-MO 5m

HIGH EFFICIENCY MODULE

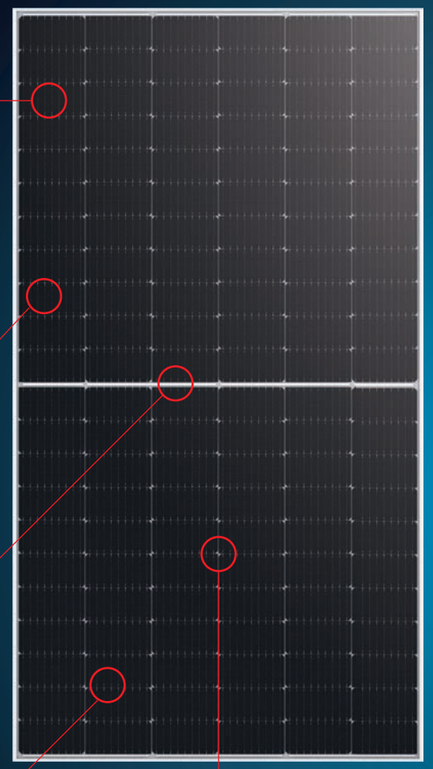
Suitable for
ultra-large power plant

The power of half-cell module increases, and the hot spot temperature reduces because of lower working current

Use the M10 standard and upgrade 9BB technology to further improve efficiency and power

Unique parallel connection design, more energy yield in case of shading

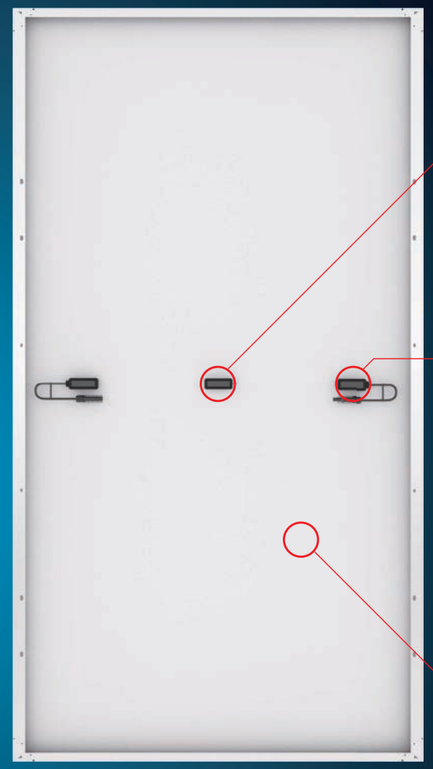
Smart soldering technology enables higher efficiency and better reliability



≤2% 1st
1st year degradation ≤2%

anti LID
anti-LID

anti PID
anti-PID



1500V
Backsheet and junction box supporting 1500V system

Split junction box,
Cable Length 300mm (can be Customized)

Anti-UV F
Backsheet with Fluoride on both sides, resistant to ultraviolet radiation

ELECTRICAL CHARACTERISTICS AT STC

Hi-MO 5m	LR5-66HPH		
Pmp (W)	495	500	505
Voc (V)	45.40	45.55	45.70
Imp (A)	12.95	13.03	13.11
Eff (%)	21.1	21.3	21.5
Size / Weight	2073×1133×35mm/25.1kg		
Cell Arrangement	11×6×2		

Technical data above mentioned may be of modification, please request for the latest datasheet.

Hi-MO 5m	LR5-72HPH		
Pmp (W)	540	545	550
Voc (V)	49.50	49.65	49.80
Imp (A)	12.97	13.04	13.12
Eff (%)	21.1	21.3	21.5
Size / Weight	2256×1133×35mm/27.2kg		
Cell Arrangement	12×6×2		

Technical data above mentioned may be of modification, please request for the latest datasheet.

Hi-MO 5

HIGH EFFICIENCY BIFACIAL MODULE

Suitable for
ultra-large power plant

The power of half-cell module increases, and the hot spot temperature reduces because of lower working current

Use the M10 standard and upgrade 9BB technology to further improve efficiency and power

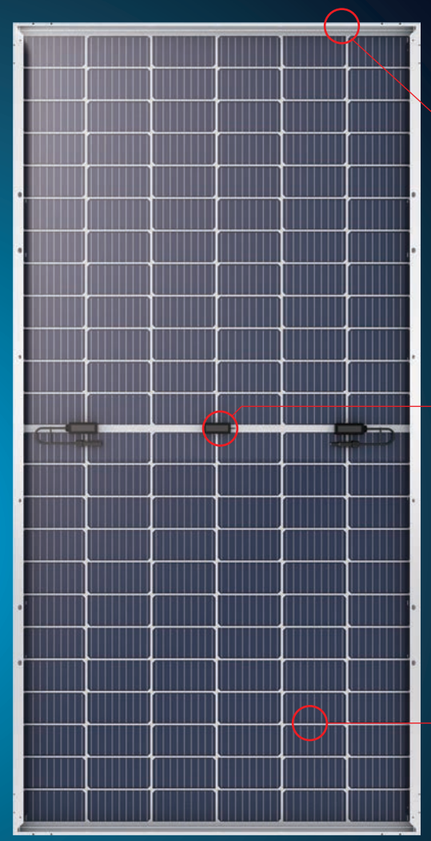
Unique parallel connection design, more energy yield in case of shading

Smart soldering technology enables higher efficiency and better reliability

≤2% 1st
1st year degradation ≤2%

anti LID
anti-LID

anti PID
anti-PID



Design of short frame without C side can reduce the shading caused by frame

1500V
Backsheet and junction box supporting 1500V system

Reliable encapsulation using 2+2mm glass

ELECTRICAL CHARACTERISTICS AT STC

Hi-MO 5	LR5-66HBD		
Pmp (W)	490	495	500
Voc (V)	45.25	45.40	45.55
Imp (A)	12.87	12.95	13.03
Eff (%)	20.9	21.1	21.3
Size / Weight	2073×1133×35mm/30.1kg		
Cell Arrangement	11×6×2		

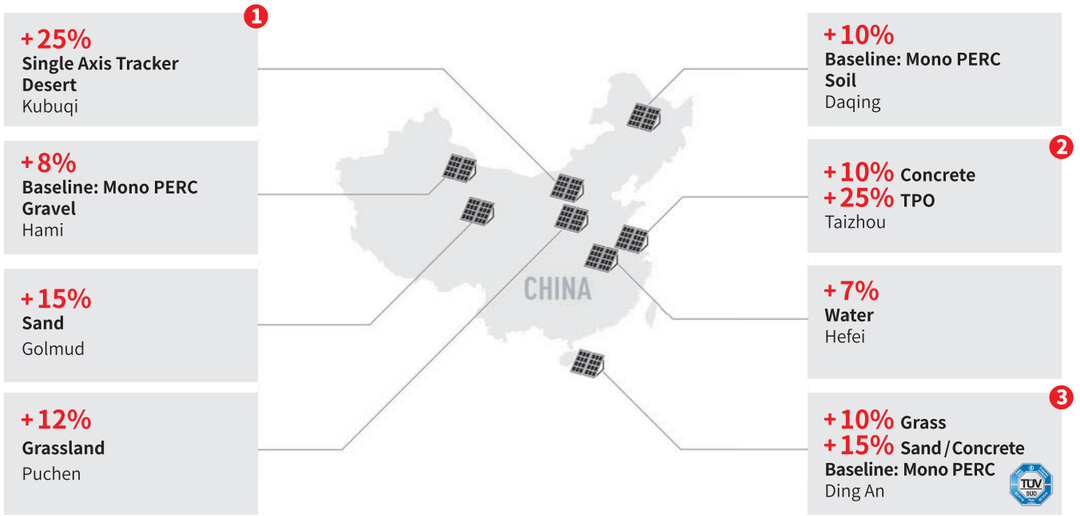
Technical data above mentioned may be of modification, please request for the latest datasheet.

Hi-MO 5	LR5-72HBD		
Pmp (W)	535	540	545
Voc (V)	49.35	49.50	49.65
Imp (A)	12.90	12.97	13.04
Eff (%)	20.9	21.1	21.3
Size / Weight	2256×1133×35mm/32.3kg		
Cell Arrangement	12×6×2		

Technical data above mentioned may be of modification, please request for the latest datasheet.

BIFACIAL CASE STUDY

BIFACIAL GAINS IN VARIOUS PLACES AND ENVIRONMENTS



Project location		Ground	Gain	Capacity	Baseline	Mounting	Statistical Period
Chennai, India 4	TÜVRheinland	White Gravel	19.2%	600Wp	Mono PERC	Fixed	2018.09~2019.02
Thuwal, Saudi Arabia	TÜVRheinland	Sand	10.0%	600Wp	Mono PERC	Fixed	2018.09~2019.02
Fremont, USA	RETC	Light Asphalt	10.6%	1.8kWp	Mono PERC	Fixed	2019.05~2019.06
Livermore, USA	RETC	Gravel	8.3%	2.1kWp	Mono PERC	Single axis tracker	2018.09~2018.10
Pahrump, USA	RETC	Gravel	10.9%	2.8kWp	Mono PERC	Fixed	2018.10~2019.07

1 KUBUQI , ORDOS, INNER MONGOLIA, CHINA

Bifacial Module Type: 350Wp*960

Baseline: Poly module 310Wp, 80MWp

Installation: Bifacial module on tracker with 12 degree, Poly module on fixed bracket

Completion Date: May.2017

Ground Condition: Desert

Module Height: The center height of oblique uniaxle is 2.9m

Energy Yeild: ~25%

2 TAIZHOU, JIANGSU, CHINA

Bifacial Module Type: 350Wp*8

Baseline: Poly module 270Wp*10

Installation: Fixed Bracket

Completion Date: Aug. 2017

Ground Condition: Concrete / TPO

Module Height: 1m / 2m

Energy Yeild: ~10 / 25%

3 DINGAN COUNTY, HAINAN PROVINCE, CHINA

Bifacial Module: 300Wp*10

Baseline: Mono PERC 300Wp*9

Installation: Fixed Bracket

Completion Date: Sep. 2018

Ground Condition: Grass / Concrete / Sand

Module Height: 1.5m

Energy Yeild: ~10% / ~15% / ~15%

4 CHENNAI, INDIA

Bifacial Module: 300Wp*2

Baseline: Mono PERC 310Wp*2

Installation: Fixed Bracket

Completion Date: Aug. 2018

Ground Condition: White gravel

Module Height: 1m

Energy Yeild: ~19.2%

LONGi GLOBAL REFERENCES

Argentina，177kW

Chile，3.6MW

United States，7.5MW

Brazil，33.6MW

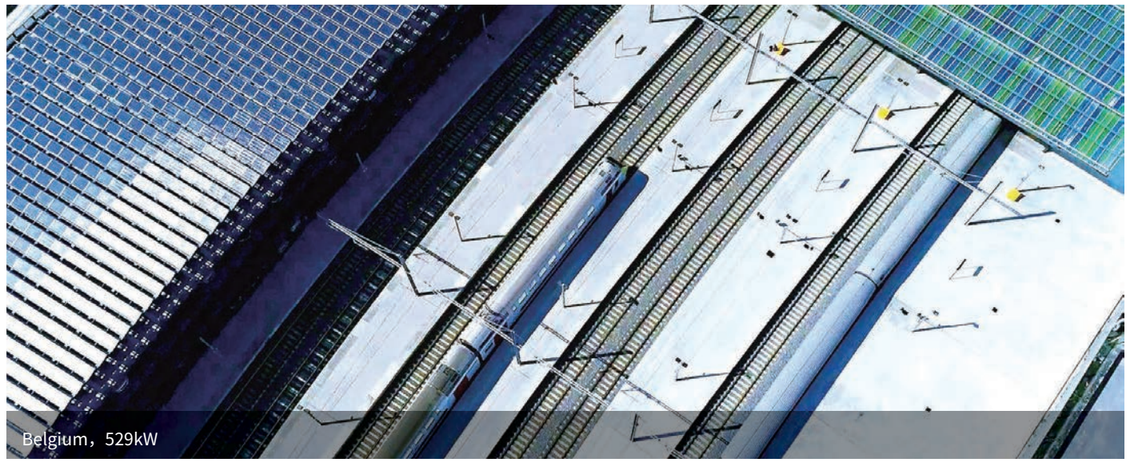
Belgium，20MW

Norway，1.138MW

Australia，180kW

New Zealand，42kW

India，300MW


Belgium，529kW

China，40MW

Netherlands，1.05MW

Netherlands，899kW

Australia，128MW

China，100MW

China，675MW