



# PRODUCT BROCHURE 2021

03.2021

# 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

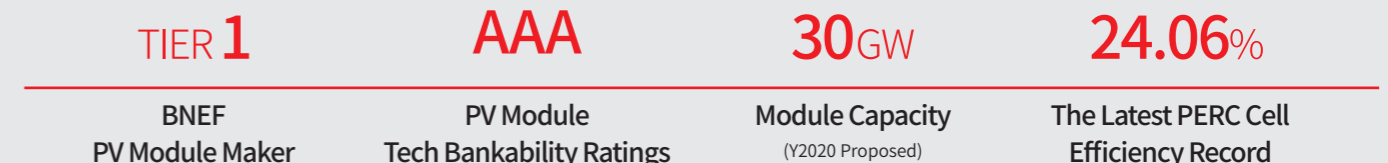
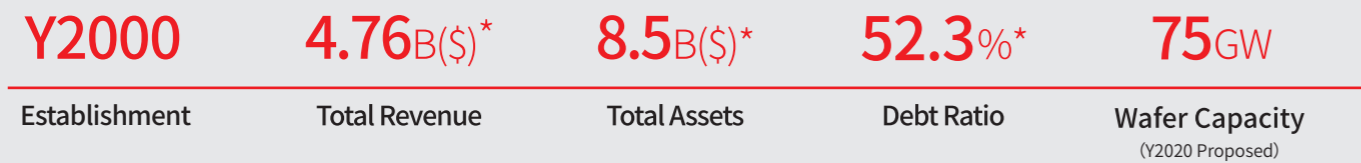
of global market demand. LONGi is recognized as the world's most valuable solar technology company with the highest market value. Innovation and sustainable development are two of LONGi's core values.

# LONGi SOLAR

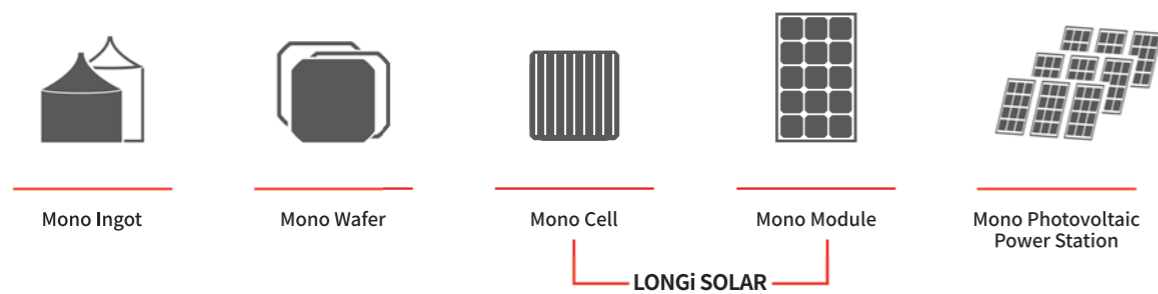
TAKE THE LEAD IN VOLUME PRODUCTION  
FOCUS ON MONOCRYSTALLINE TECHNOLOGY

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

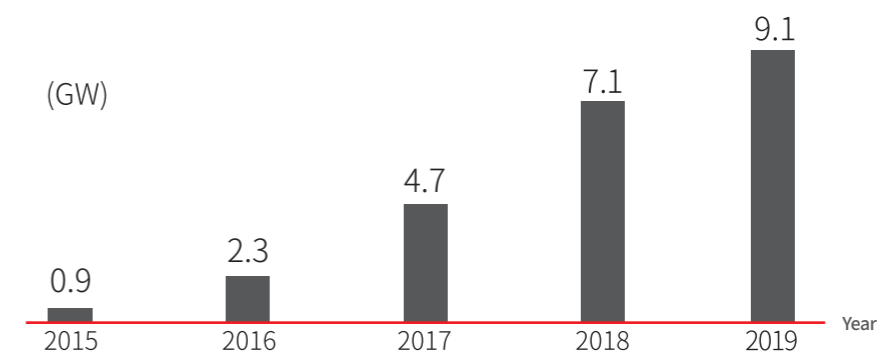
true value. LONGi is committed to creating the maximum value for our global partners and customers.



## LONGi INDUSTRY CHAIN



## CELL & MODULE SHIPMENT OVER THE YEARS OF LONGi SOLAR

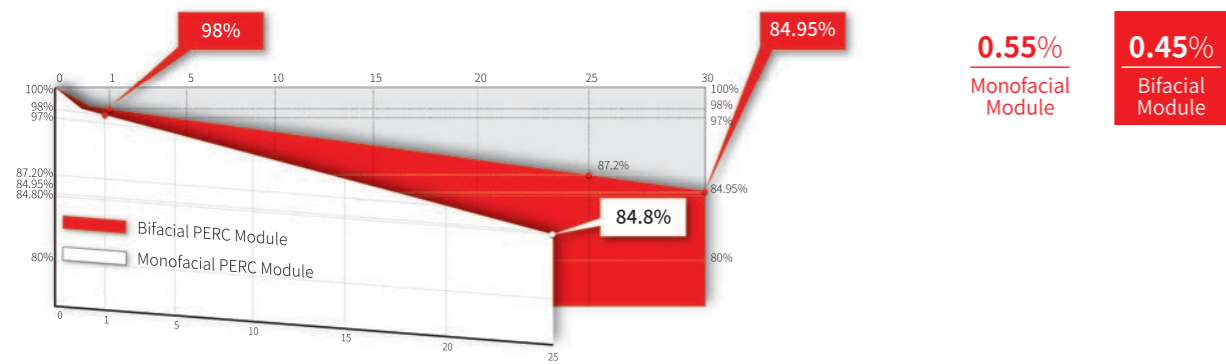


\*Based on the 2019 financial report of LONGi  
\*\* The Q1 2021 PV ModuleTech Bankability Ratings

# WARRANTY

## FIRST-YEAR POWER WARRANTY OF $\geq 98\%$ FOR PV MODULES

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

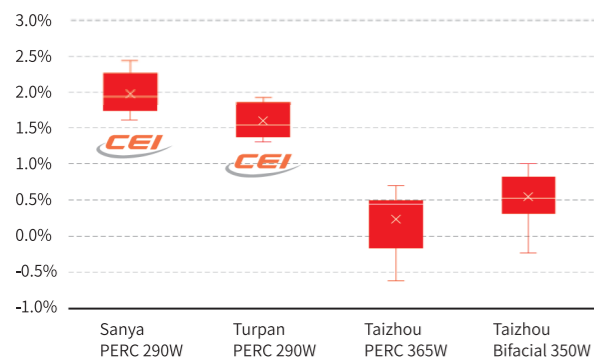


LONGi also provides a 12-years warranty for Material & Craftwork of PV modules, and a 25-years power warranty with a linear degradation inferior to 0.55% per year for monofacial module.

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

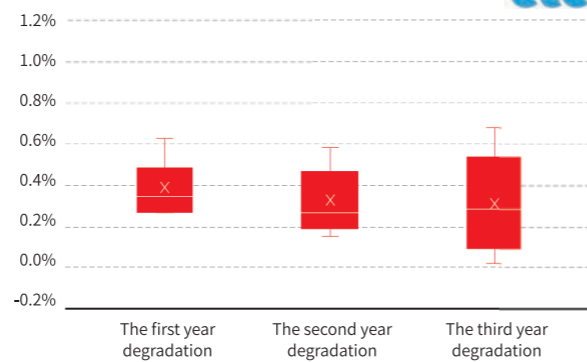
The low degradation property of LONGi's module is demonstrated by long-term outdoor test.

### 1<sup>ST</sup> YEAR DEGRADATION IN DIFFERENT CITY IN CHINA



### LONGi SOLAR MODULE TESTED BY CTC

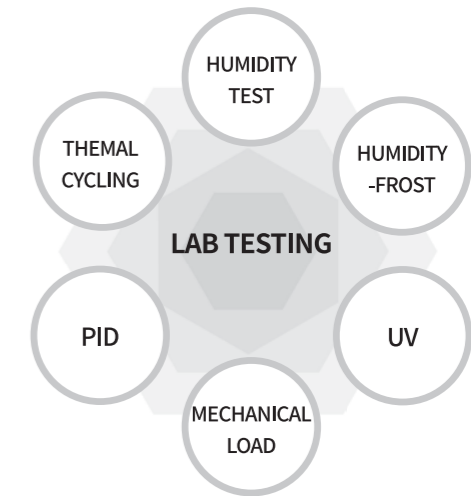
(Ding'an Hainan Province 2015-2018)



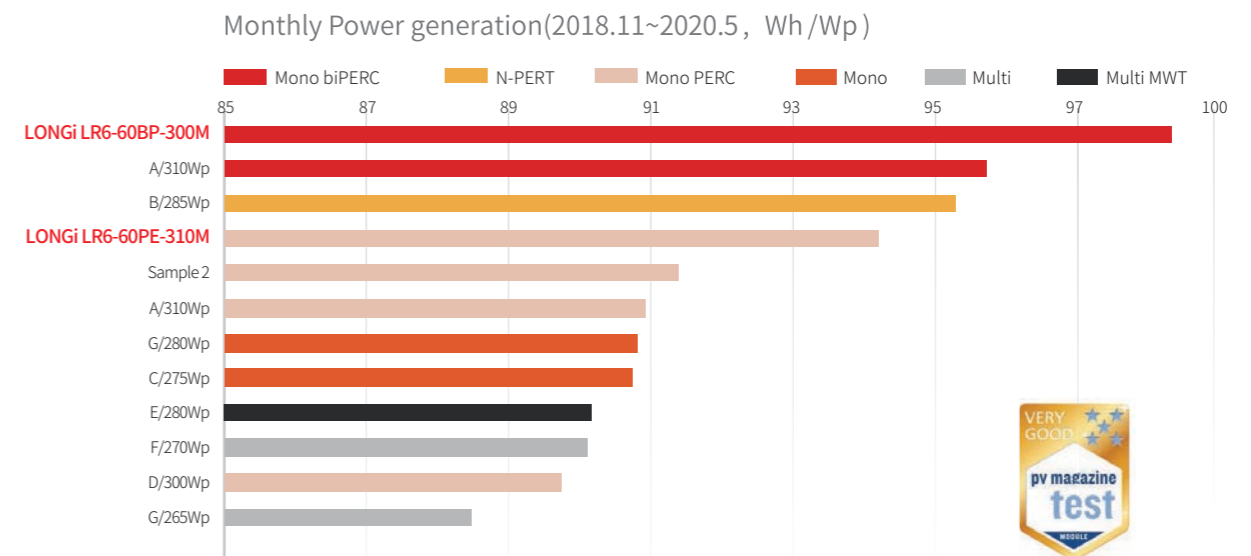
# QUALITY

## 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

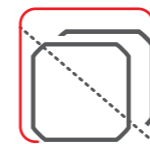
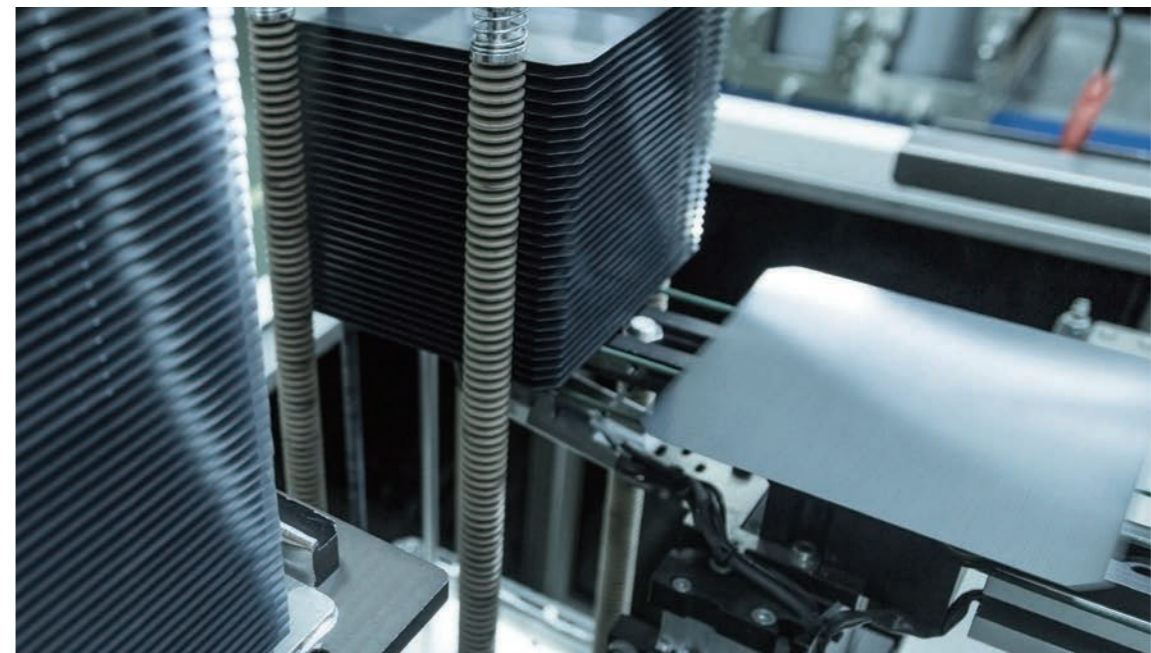


High Minority Carrier Lifetime & Low Resistivity

# 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



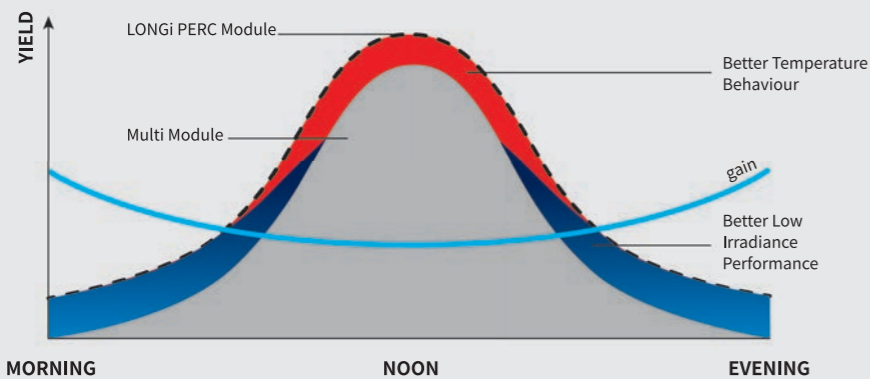
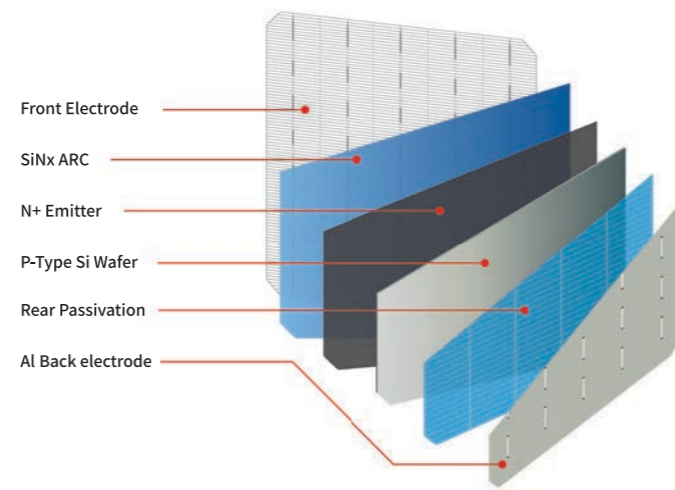
M10 Standard Wafer

# 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.

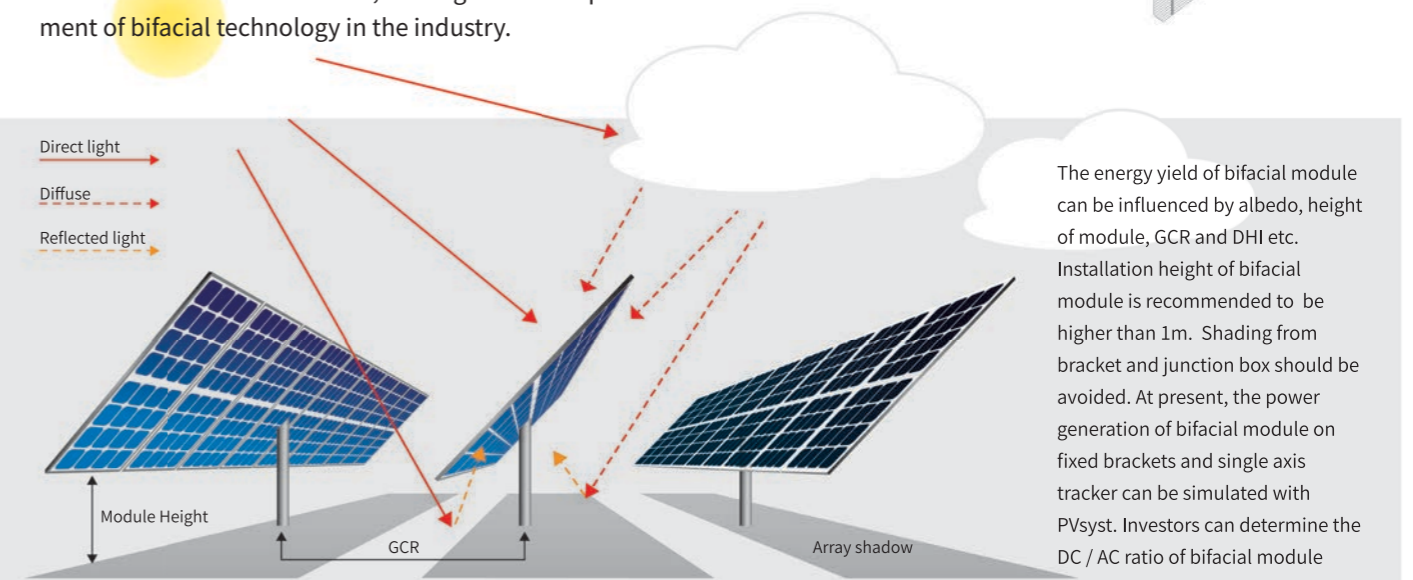
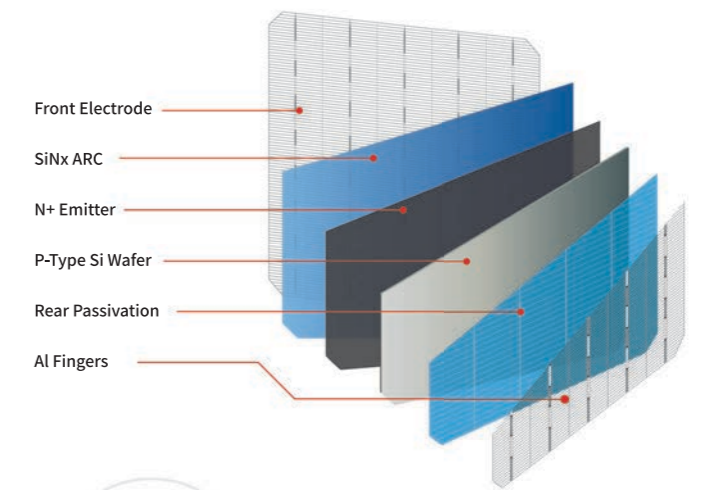
# BIFACIAL PERC TECHNOLOGY

## 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 reduce 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.



**1<sup>st</sup> 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

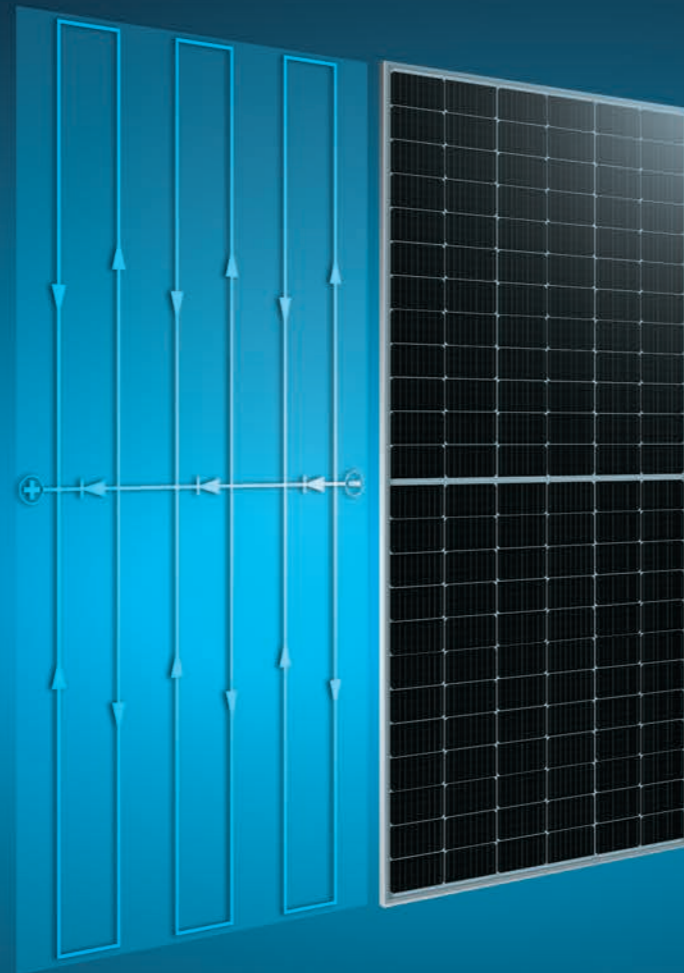
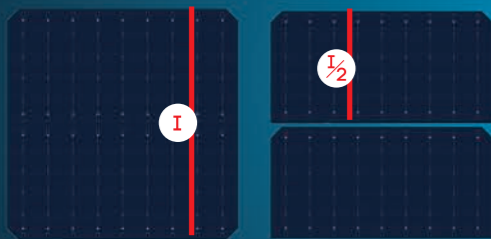
Half-cut cell technology is to cut the cell into two separate parts by mature infrared laser, hence halve the working current. The thermal loss on the ribbon will be remarkably reduced and the module's power increases by 2%. The reliability of module is also enhanced.

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.



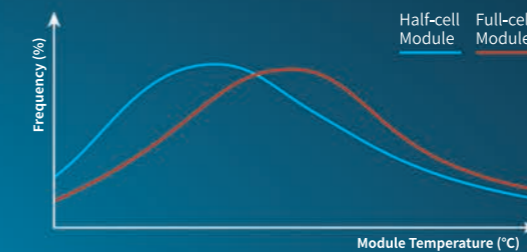
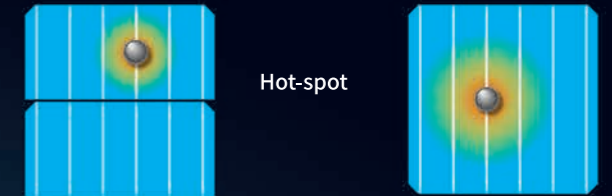
Monofacial or bifacial PERC cell module with half-cut technology has high power, the property of anti-PID, anti-LID (including LeTID), low hot spot temperature, excellent low irradiance performance and low power temperature coefficient.

# 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.



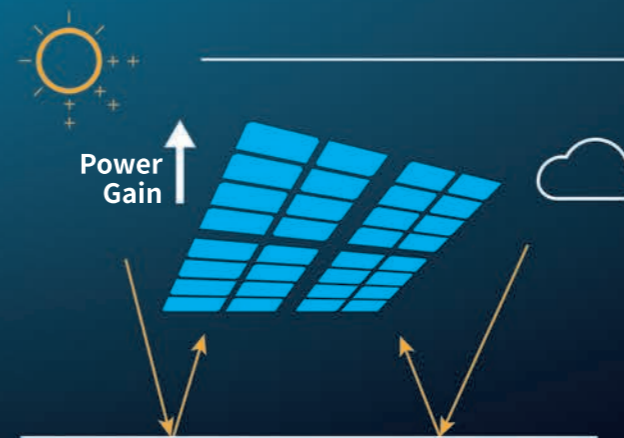
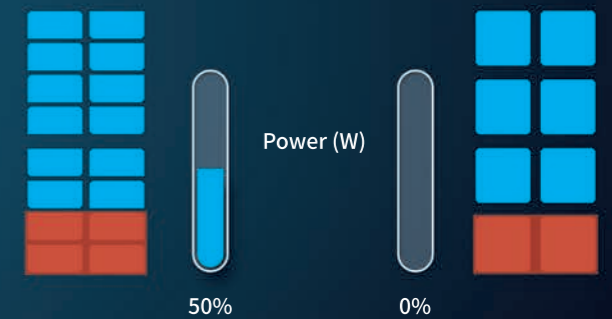
## B Lower Operating Temperature

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

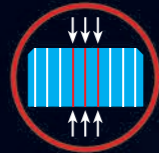
Under high irradiation conditions, half-cell module, especially bifacial half-cell module, will have a higher energy yield compared with conventional module. Bifacial half-cell module will help to achieve the lowest LCOE in regions which is rich in sun radiation resources.

# 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



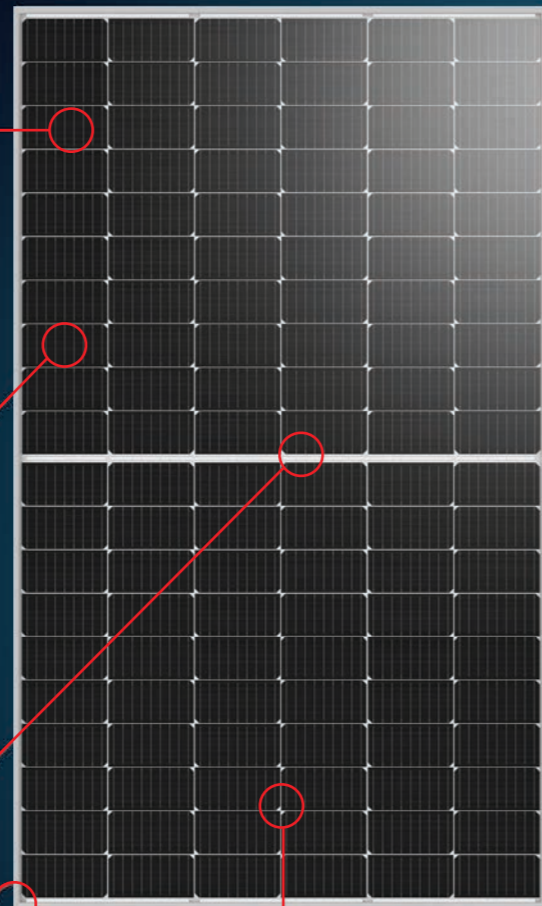
1st year degradation ≤ 2%



anti-LID



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



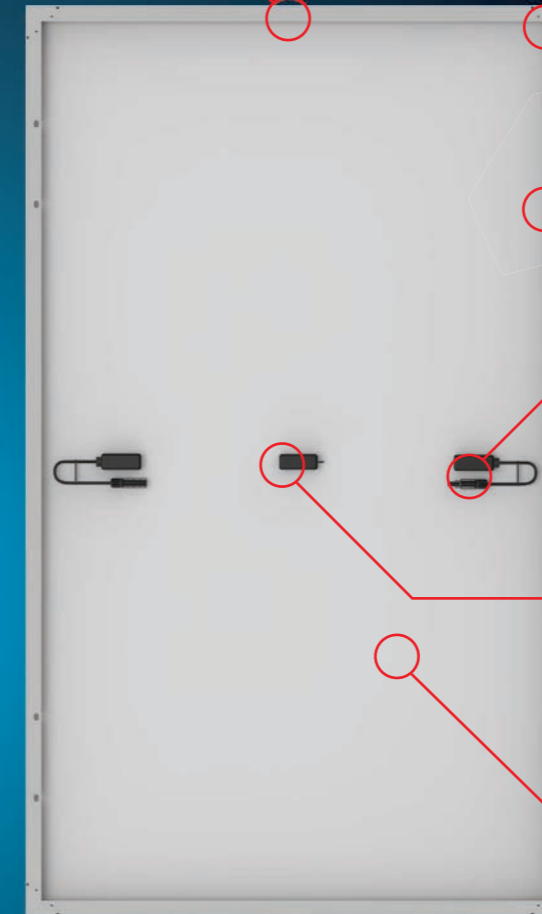
Split junction box, Cable Length 300mm (can be Customized)



Backsheet and junction box supporting 1500V system



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		

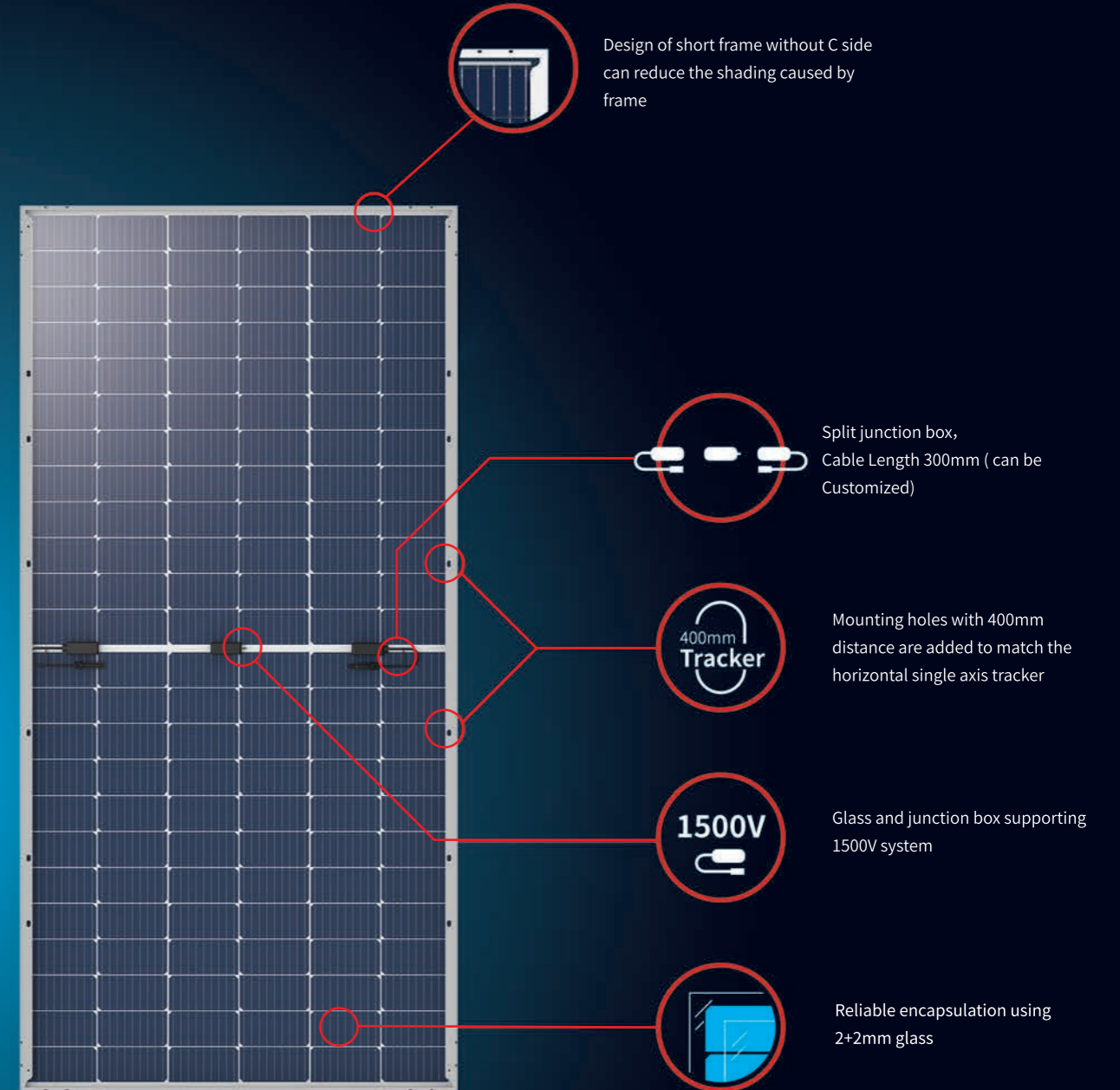
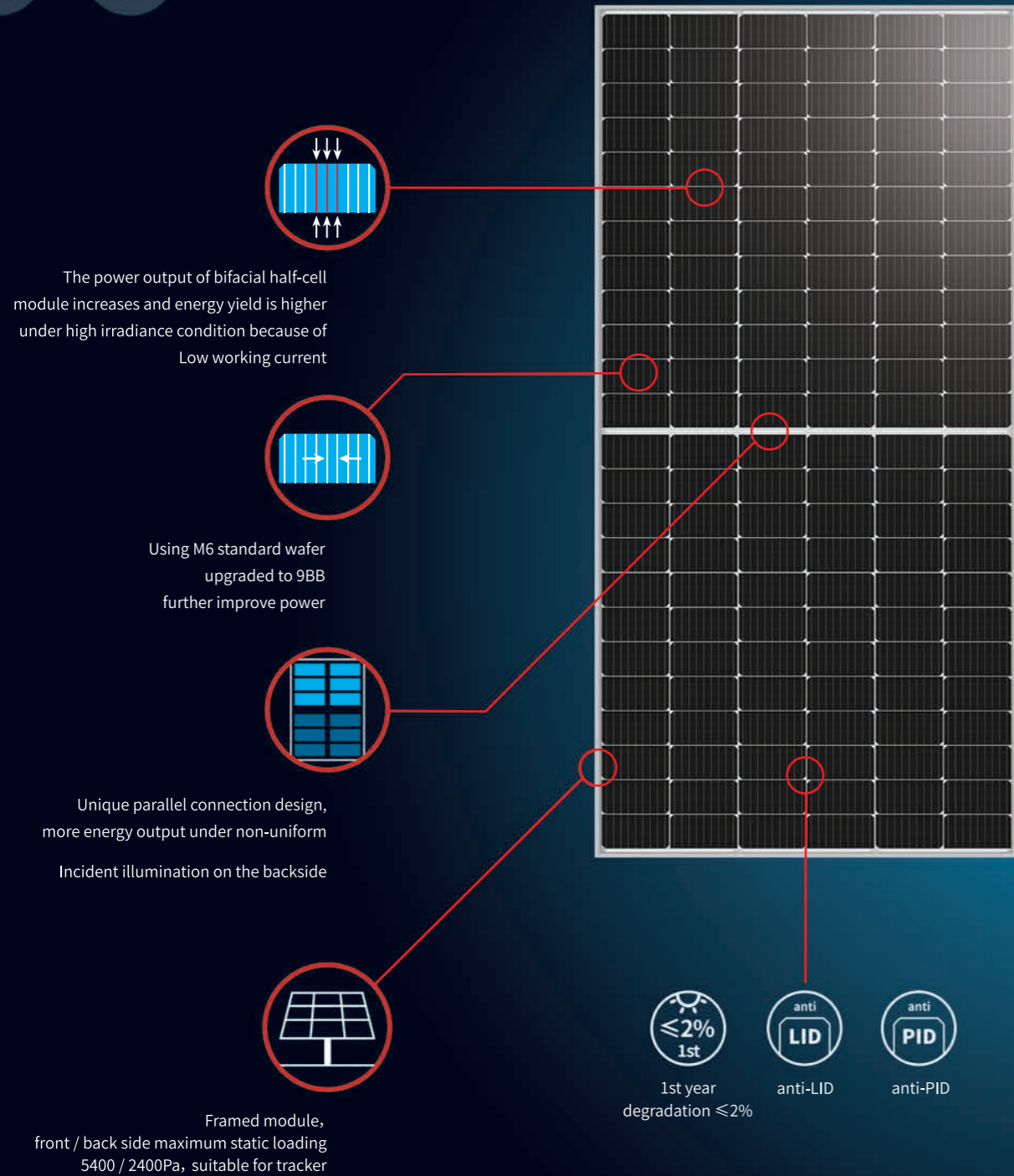
Technical data above mentioned may be of modification, please request for the latest datasheet.

# Hi-MO 4

## BIFACIAL HALF-CELL MODULE



Suitable for C&I rooftop and large ground power plant



### ELECTRICAL CHARACTERISTICS AT STC

	Hi-MO 4	LR4-72HBD
Pmp (W)	445	455
Voc (V)	49.4	49.8
Imp (A)	10.80	10.93
Eff (%)	20.5	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.

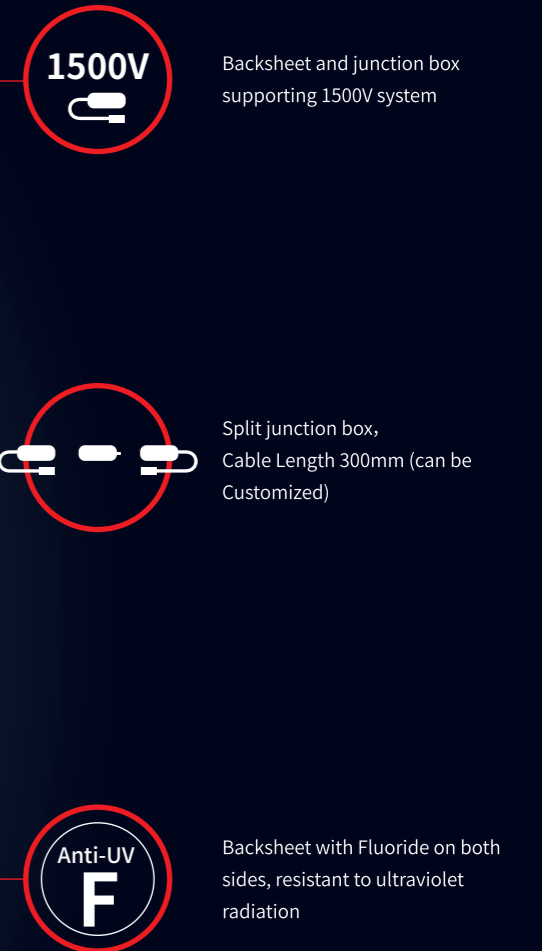
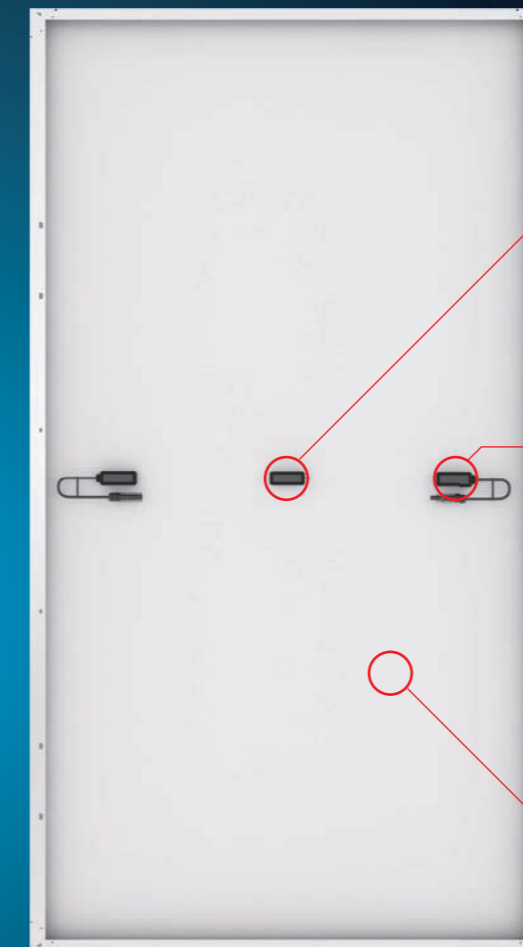
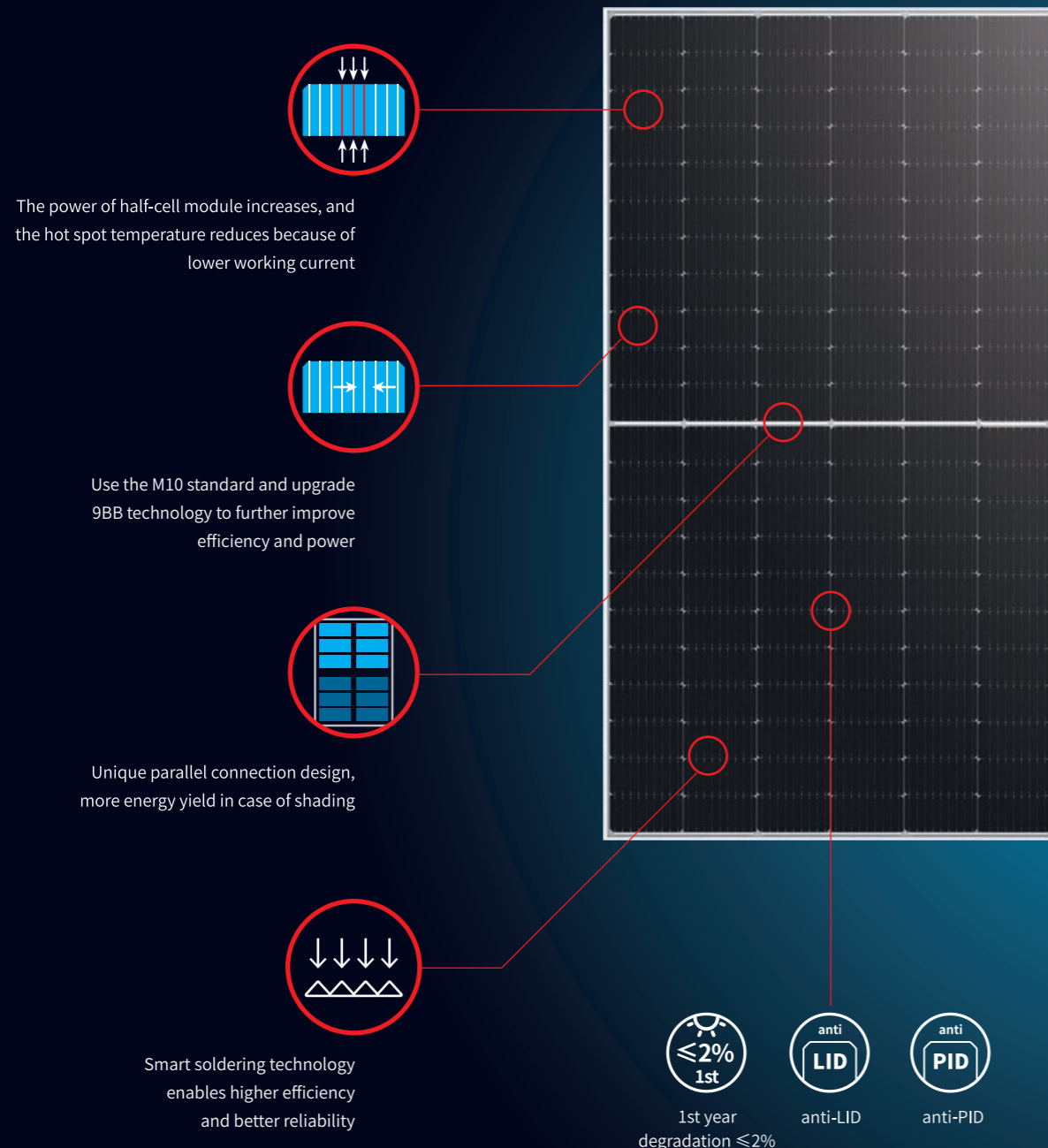


# Hi-MO 5m

## HIGH EFFICIENCY MODULE



Suitable for ultra-large power plant



### ELECTRICAL CHARACTERISTICS AT STC

Hi-MO 5m	LR5-66HPH			Hi-MO 5m	LR5-72HPH		
<b>Pmp (W)</b>	495	500	505	<b>Pmp (W)</b>	540	545	550
<b>Voc (V)</b>	45.40	45.55	45.70	<b>Voc (V)</b>	49.50	49.65	49.80
<b>Imp (A)</b>	12.95	13.03	13.11	<b>Imp (A)</b>	12.97	13.04	13.12
<b>Eff (%)</b>	21.1	21.3	21.5	<b>Eff (%)</b>	21.1	21.3	21.5
<b>Size / Weight</b>	2073×1133×35mm/25.1kg			<b>Size / Weight</b>	2256×1133×35mm/27.2kg		
<b>Cell Arrangement</b>	11×6×2			<b>Cell Arrangement</b>	12×6×2		

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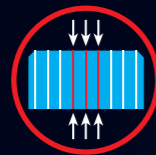
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# Hi-MO 5

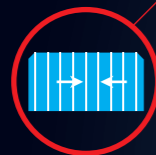
## HIGH EFFICIENCY BIFACIAL MODULE



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



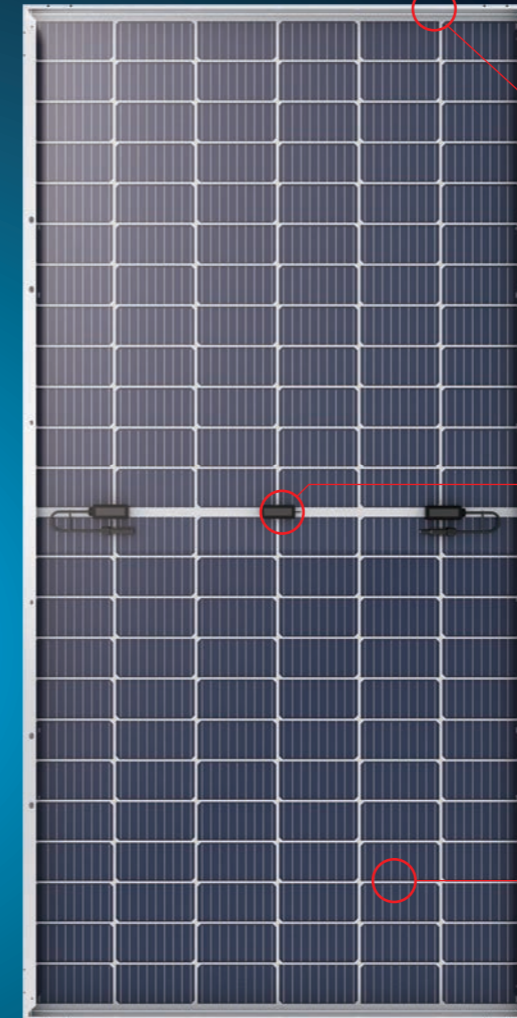
1st year degradation  $\leq 2\%$



anti-LID



anti-PID



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



Backsheet and junction box supporting 1500V system



Reliable encapsulation using 2+2mm glass

### ELECTRICAL CHARACTERISTICS AT STC

Hi-MO 5	LR5-66HBD		
<b>P<sub>mp</sub> (W)</b>	490	495	500
<b>V<sub>oc</sub> (V)</b>	45.25	45.40	45.55
<b>I<sub>mp</sub> (A)</b>	12.87	12.95	13.03
<b>Eff (%)</b>	20.9	21.1	21.3
<b>Size / Weight</b>	2073 × 1133 × 35mm/30.1kg		
<b>Cell Arrangement</b>	11 × 6 × 2		

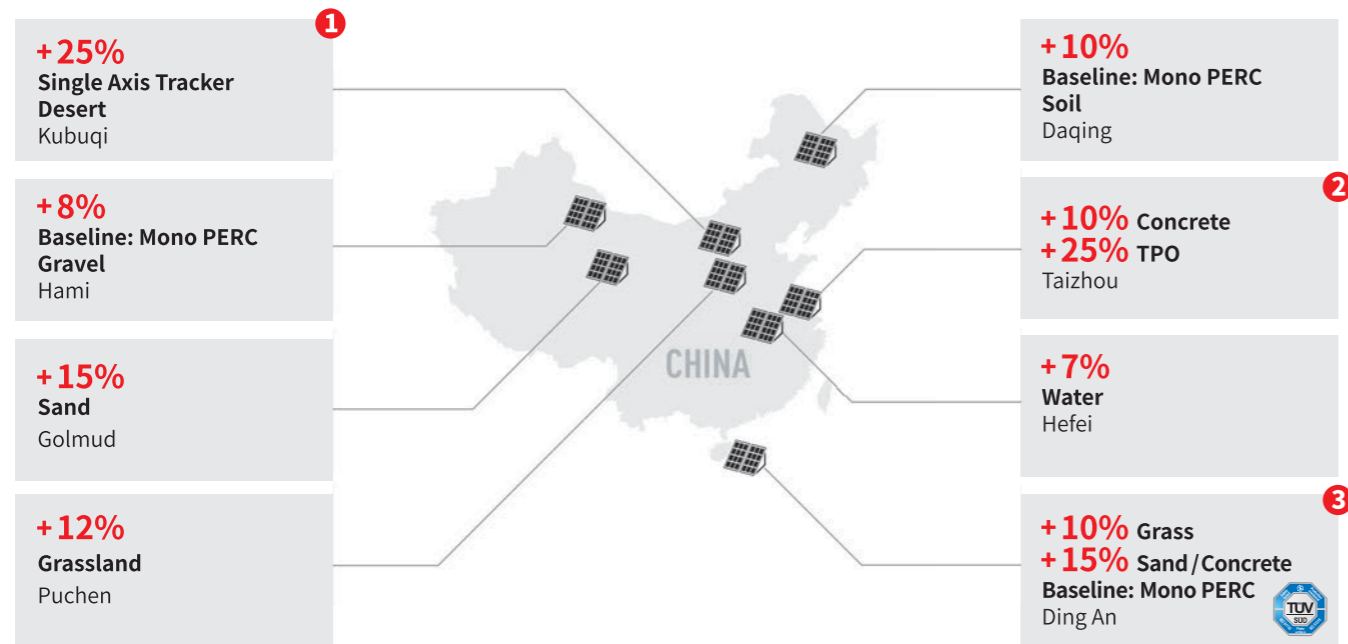
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Hi-MO 5	LR5-72HBD		
<b>P<sub>mp</sub> (W)</b>	535	540	545
<b>V<sub>oc</sub> (V)</b>	49.35	49.50	49.65
<b>I<sub>mp</sub> (A)</b>	12.90	12.97	13.04
<b>Eff (%)</b>	20.9	21.1	21.3
<b>Size / Weight</b>	2256 × 1133 × 35mm/32.3kg		
<b>Cell Arrangement</b>	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 <b>4</b> 	White Gravel	19.2%	600Wp	Mono PERC	Fixed	2018.09~2019.02
Thuwal, Saudi Arabia 	Sand	10.0%	600Wp	Mono PERC	Fixed	2018.09~2019.02
Fremont, USA 	Light Asphalt	10.6%	1.8kWp	Mono PERC	Fixed	2019.05~2019.06
Livermore, USA 	Gravel	8.3%	2.1kWp	Mono PERC	Single axis tracker	2018.09~2018.10
Pahrump, USA 	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%



Argentina, 177kW



Australia, 180kW



New Zealand, 42kW



India, 300MW



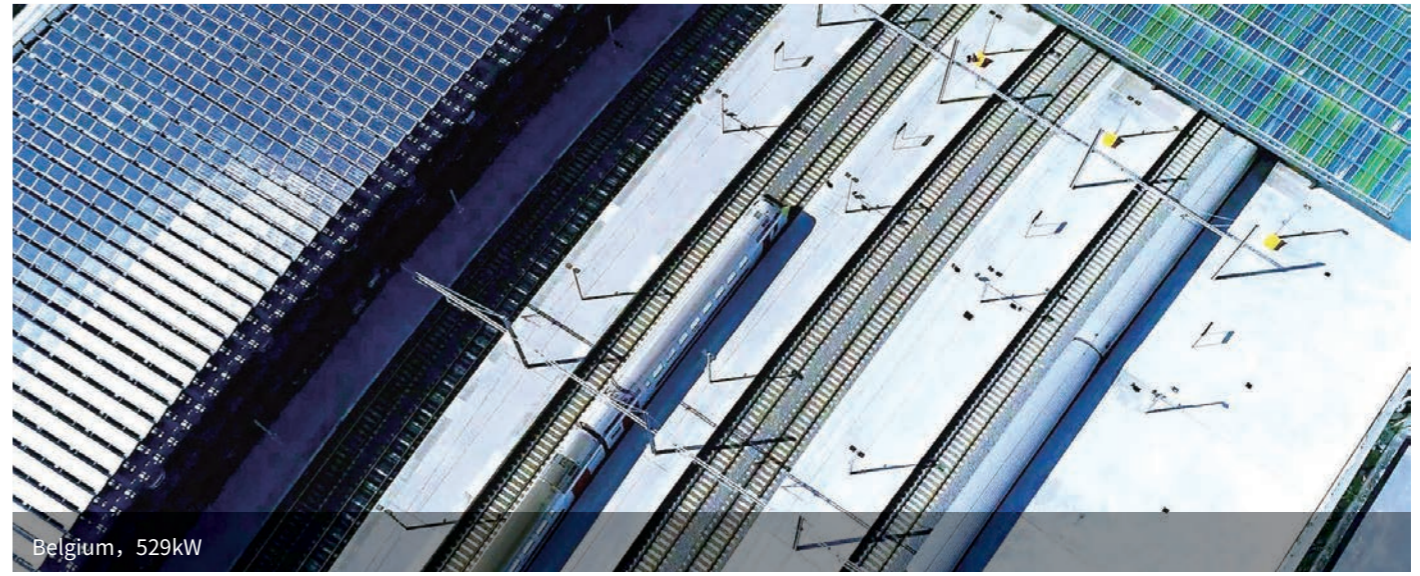
Chile, 3.6MW



United States, 7.5MW



Brazil, 33.6MW



Belgium, 529kW



Belgium, 20MW



Norway, 1.138MW



China, 40MW



Netherlands, 1.05MW



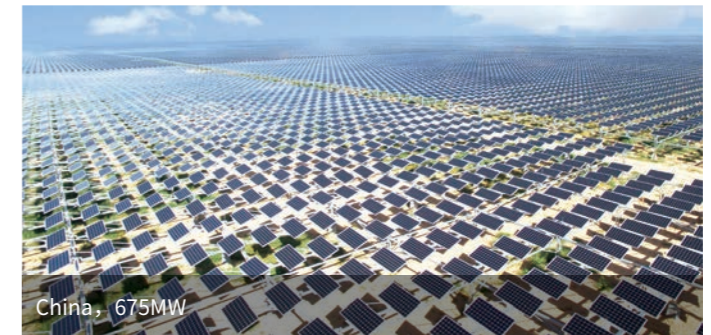
Netherlands, 899kW



Australia, 128MW



China, 100MW



China, 675MW