GROUPS

ATC

THE BEST INDUSTRIAL EQUIPMENT

SOLAR POWER SYSTEM

World-Class R&D Center

As one of the world's leading manufacturers of photovoltaic products, Lovsun established an in-house R&D center in 2010. The center specializes in R&D and product testing for further development, new materials testing, client customization and periodic sample testing, etc., to provide technical support, thereby guaranteeing the product development and quality control.

The laboratory has been recognized as a CSA and DEKRA witness laboratory, CNAS certified in-house laboratory, CTC authorized testing laboratory, TUV SUD assessed CTF laboratory and CGC approved laboratory. This allows Lovsun to shorten the certification period and accelerate the speed of new product release under our strict reliability control procedures.

A+A+A+ Rated
H.A.L.M. Sun Simulator

ATLAS Fluorescent / UV
Instrument

VOTSCH Walk-in
Climate Simulation Chamber

SMARTER MANUFACTURING MORE GUARANTEED QUALITY

Lovsun has steadfastly worked with its partners to overcome any technical issues encountered. For the plant layout, a complete set of highly automated manufacturing architecture has been developed. In addition, Lovsun also uses statistical engineering, equipment control, and a variety of management systems to achieve lean production. While ensuring the consistency of product quality, we also strive to shorten the yield learning curve and new product mass production cycle, reduce production costs, and improve customer profitability.

HIGHLY AUTOMATED

REDUCE PRODUCTION COSTS

IMPROVE CUSTOMER PROFITABILITY

High-efficiency And High-flexibility Modular Automatic Production Line

To achieve a high utilization rate and efficiency, Lovsun has divided the entire production chain into separate but closely united automated production sectors. Over 40 patents are applied on the production process optimization, which effectively avoids manual errors and makes sure all the production processes from raw material inspection to packing are all monitored online and saved for later use.

At the same time, the production department collects data from various key monitoring points in the production process to achieve further improvement in equipment, manufacturing process and yield.

15%
Lower production cost

15%
Higher equivpment effectiveness

24*7
Real-time online monitoring

100+
Patents on products and production process optimization

99.9%
Good product yield rate

35%
Higher production efficiency

SOLAR POWER SYSTEM

Real-Time Monitored And Recorded

From incoming material testing to online production, OBA test and delivery status, Lovsun 's in-house developed ERP system interconnects all data in one database to achieve complete traceability.

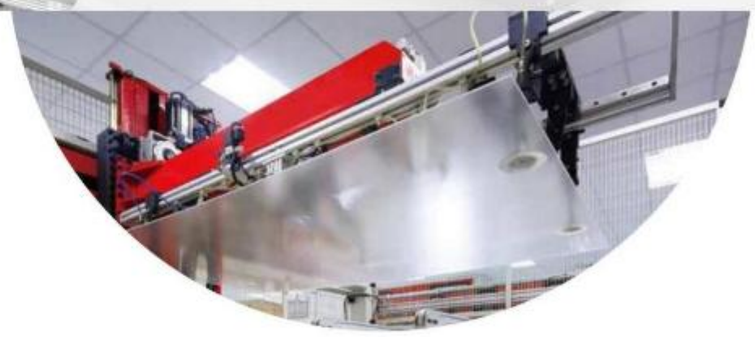
The system implements a unique bar code for each module component. Information such as raw material suppliers, production workers, quality testing results, and production details are all accessible online through our ERP system. This data is kept on our server for client's access, and allows us to track and take responsibility for product full cycle monitoring and production process optimization.

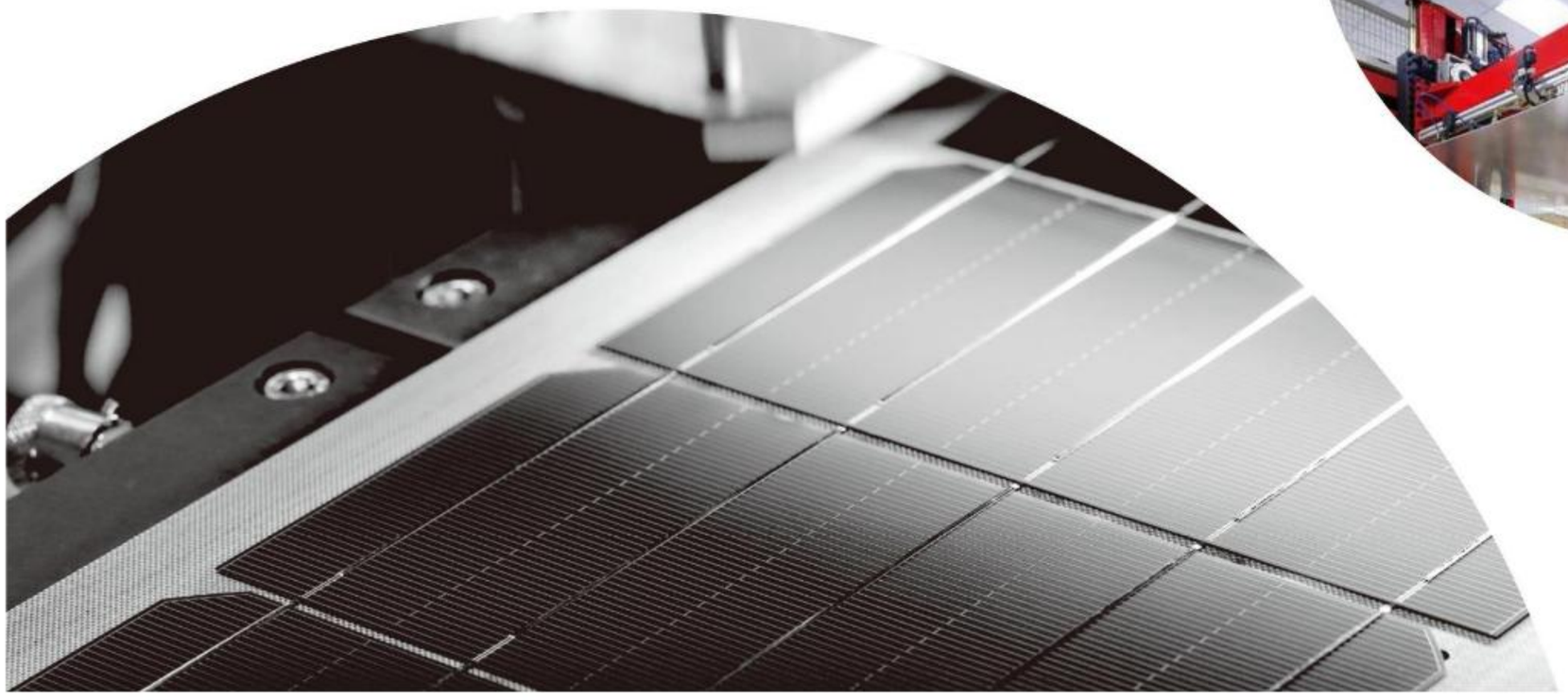
Improved Company Competitiveness

- Continuously improve line efficiency and process management
- Improve capacity utilization and yield rate
- Reduce production costs
- Guarantee customer trust by utilizing transparent and traceable production processes

Added Value For Customer

- Customers can access real-time production data including BOM detail, EL report, power data, etc.
- A unique bar code enables you to track all the information related to your order.
- Visual access to real-time workshop floor monitor recordings via our ERP system.





EXCELLENT PERFORMANCE AND CONSISTENT QUALITY

Quality is Lovsun 's core competitiveness. We start from the very beginning of production, strictly control every step, and are strict with ourselves and products. We are proud of our product quality and reliable performance even in the most extreme conditions.

Quality Management System

Lovsun has received certifications for Quality Management System (ISO 9001: 2015), Environment Management System (ISO 14001: 2015) and Occupational Health and Safety Management System (ISO45001: 2018) from both DNV GL and GZCC.

Beyond ISO9001, Lovsun also applied for the national "GB T19580 2012 Criteria for Performance Excellence". This regulates not only product quality, but also production waste, environmental burden, management foresight, etc., which are the necessary requirements for an "excellent" company.

Supply Chain Control

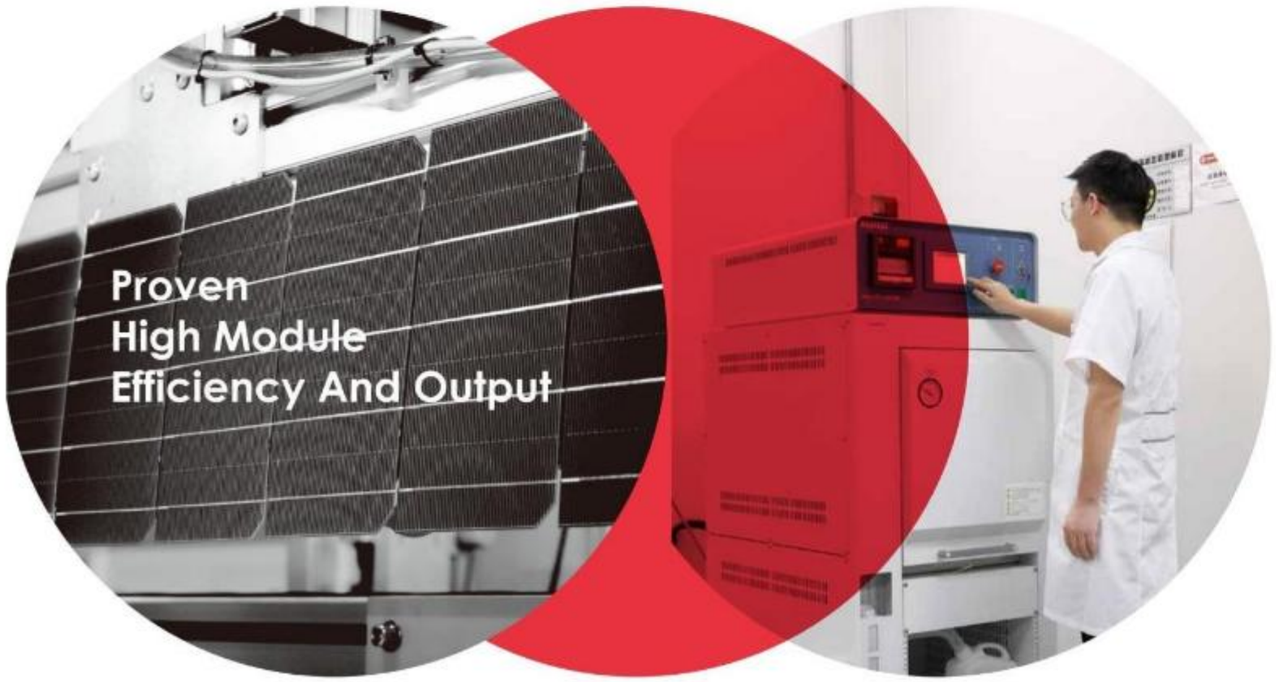
- Stringent Supplier Management
- Spot Check Every Feedstock Batch
- Supplier Quality Engineering
- Automatic Material Filtration and Sorting
- Proper Storage at Fixed Temperature and Humidity
- Incoming-material Quality Assurance

Production Control

- 300+ Quality Check Points
- 5 * EL Tests
- In-process Quality Control

After Production Inspection

- Open Box Audit (OBA) Test



Lovsun Has Been Recognized as Top Performer in PVEL PV Module Reliability Scorecard for Third Time

Lovsun passed the strictest accelerated stress testing and characterization under PV Evolution Labs Product Qualification Program (PQP) and earned 2017, 2019, and 2020 Top Performance. The PQP is a comprehensive evaluation of environmental sensitivities and degradation mechanisms of PV module designs.

In addition, Lovsun 's module products have received the China Quality Certification Center's ("CQC") Top Runner Program level-one energy efficiency certification.

DIVERSIFIED SOLAR MODULES MEET DIFFERENT NEEDS

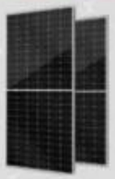
Lovsun redefines a variety of products by integrating large silicon wafers with bifacial-cell, multi-bus-bar, high-density encapsulation and other related technologies. With years of R&D investment, Lovsun innovates and continues to deliver highly competitive products and value to the customers.

SOLAR POWER SYSTEM

182MM SERIES

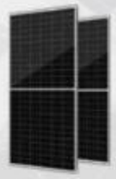
Wafer Size 182 mm
Power Range:
390-405W/525-540W

166MM SERIES



Wafer Size 166 mm
Power Range:
360-375W/435-450W

158MM SERIES



Wafer Size 158 mm
Power Range:
330-345W/380-395W

LOVSUN MX

Maximize power generation
Flexible system design

182MM BIFACIAL SERIES

Using reflected light,
10-30% more energy
generation

166MM BIFACIAL SERIES

Using reflected light,
10-30% more energy
generation

158MM BIFACIAL SERIES

Using reflected light,
10-30% more energy
generation

LOVSUN SMART

Fully compatible and multifunctio
Intelligent monitoring
to optimize power output

SEAMLESS SERVICES LET YOU ENJOY

Lovsun provides all aspects of services prior to an order being placed. Meticulous and professional technology consultation is available, fully transparent ERP, including local offices and an online instant response system. This seamless service structure delivers the benefits provided by clean energy.

24 * 7 REAL-TIME MONITORING
ERP system allows you to observe production process online

48-HOUR RESPONSE
Timely response warranty calls

LOCAL OFFICES
Global network insures rapid on-site support

TECHNOLOGY SUPPORT
Professional technical team helps maximize the benefits of your projects

FINANCING SERVICE
Professional bankability support and assistance

TAILOR-MADE EVALUATIONS AND RECOMMENDATIONS
Experienced sales and technical staff provide professional consultation

MARKETING SUPPORT
Co-marketing to enhance your brand awareness

CUSTOMIZED SERVICE
Customized service to meet your unique needs

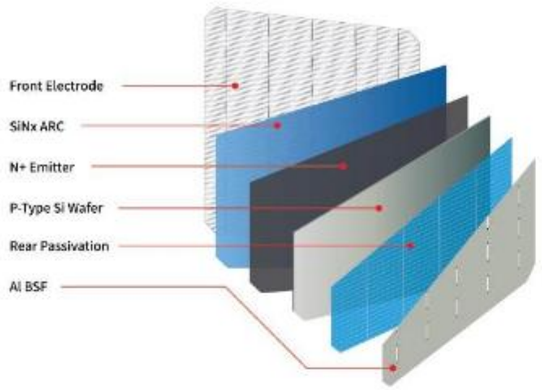
PV POLICY CONSULTATION
Experienced team of analysts provides up-to-date analysis and forecast

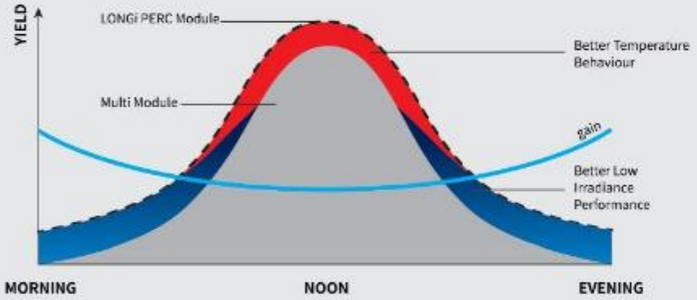
SOLAR POWER SYSTEM

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.



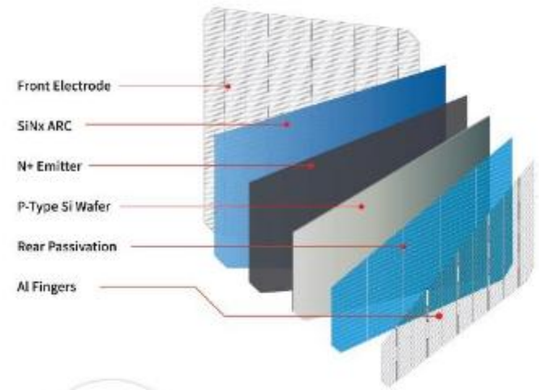


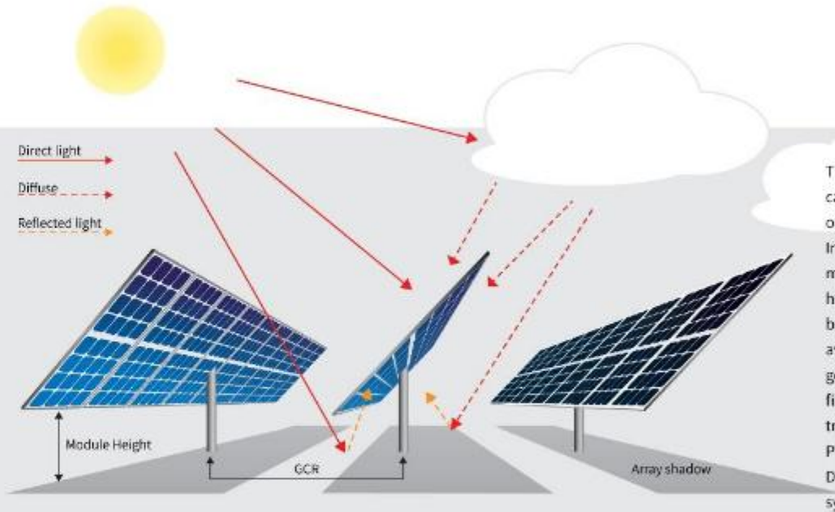
Outstanding low irradiance performance, low power-temperature coefficient, low operating temperature, all these technologies lead to a high energy yield.

BIFACIAL PERC TECHNOLOGY

CELL BIFACIALITY OF 75%-80%: HARVEST MORE LIGHT

For a bifacial PERC cell, the Al back surface field is replaced by Al grid, hence render the majority of rear side transparent and attain a bifaciality of 75%-80%.





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.

PERC Cell Efficiency in Mass Production

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.

SOLAR POWER SYSTEM

HALF-CUT TECHNOLOGY

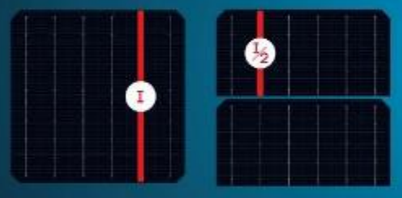
HIGHER POWER & MORE RELIABLE

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.

LOVSUNreleased Hi-MO3, a bifacial half-cell module, at the SNEC exhibition in 2018.

Nearly 275MWp Hi-MO3 were supplied to the Chinese TOP runner project in Sihong County. The total signed order of Hi-MO3 was up to 500MWp throughout 2018.



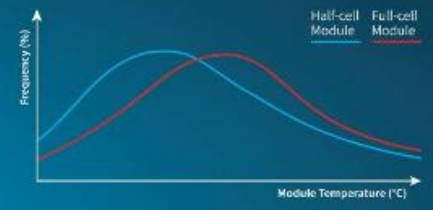
Monofacial or bifacial PERC cell module with half-cut technology has high power, the property of anti-PID、anti-LID (including LeTID)、low hot spot temperature、excellent low irradiance performance and low power temperature coefficient.

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. LOVSUN'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

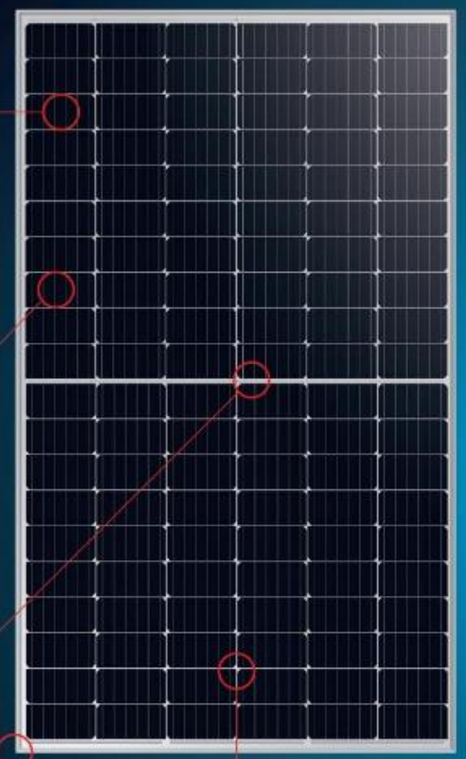
Under high irradiation conditions, half-cell module, especially bifacial half-cell module, will have a higher energy yield compared with conventional module. Bifacial half-cell module will help to achieve the lowest LCOE in regions which is rich in sun radiation resources.

SOLAR POWER SYSTEM

60 / 72 HPH

HALF-CELL MODULE

Suitable for Residential and Commercial Installation



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

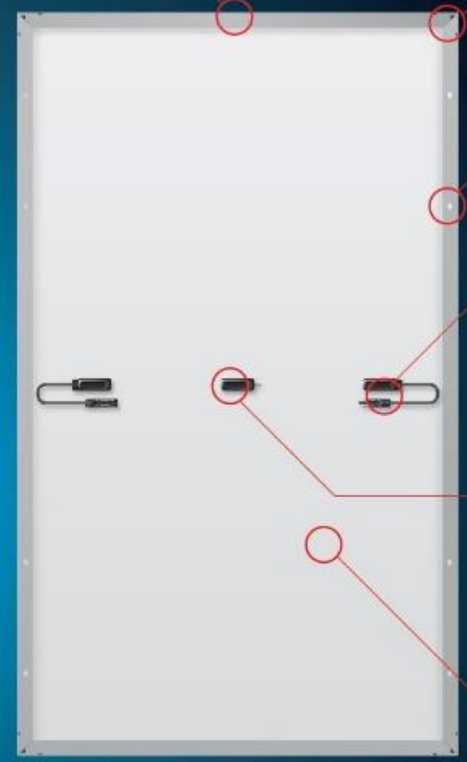
Cells with 6BB have better current collection ability

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

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

>22% ≤2% 1st anti LID anti PID

Cell efficiency >22%, anti-LID、anti-PID, 1st year degradation ≤2%



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-MO3m	LR6-60HPH		
Pmp (W)	315	320	325
Voc (V)	40.6	40.9	41.2
Imp (A)	9.36	9.43	9.52
Eff (%)	19.0	19.3	19.6
Size / Weight	1672×991×35mm / 16.8kg		
Cell Arrangement	10×6×2		

Hi-MO4m	LR4-60HPH		
Pmp (W)	360	365	370
Voc (V)	40.9	41.1	41.3
Imp (A)	10.69	10.77	10.86
Eff (%)	19.3	19.5	19.8
Size / Weight	1776×1052×35mm / 20.0kg		
Cell Arrangement	10×6×2		

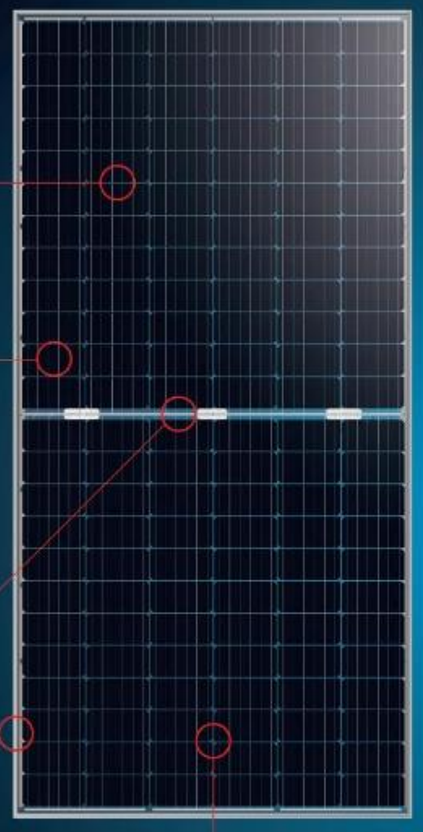
Technical data above mentioned may be of modification, please request for the latest datasheet.

SOLAR POWER SYSTEM

60 / 72 HBD

BIFACIAL HALF-CELL MODULE

Suitable for Utility Station and Distributed Flat Roof Station with High Albedo



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

Cells with 6BB have better current collection ability

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

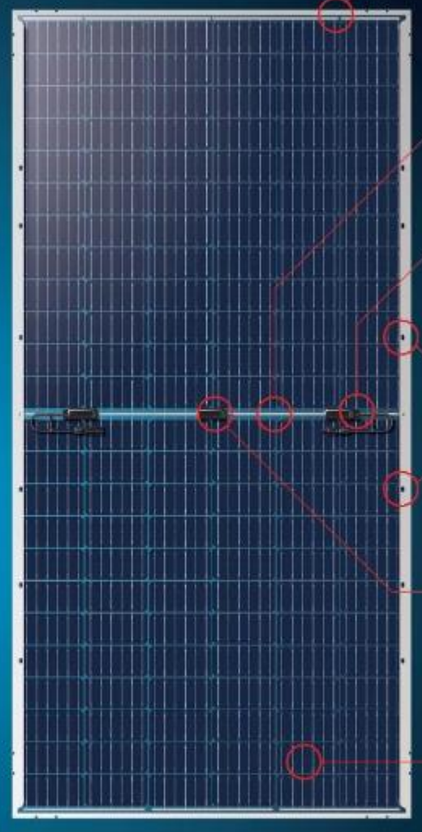
Incident illumination on the backside

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

Cost can be reduced using 60 cells frameless module in low load condition

>22% | ≤2% 1st | anti LID | anti PID

Cell efficiency >22%, anti-LID, anti-PID, 1st year degradation ≤2%



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

33mm

The 33mm gap width coordinate with single axis tracker (such as NEXTracker) can reduce the shading

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

The bifaciality is 80% when transparent glass is used on the back side.While the bifaciality is 75% and power of the front side is increased when white ceramic glass is used on the back side

ELECTRICAL CHARACTERISTICS AT STC

Hi-MO3	LR6-72HBD		
Pmp (W)	375	380	385
Voc (V)	48.3	48.5	48.7
Imp (A)	9.38	9.47	9.53
Eff (%)	18.6	18.9	19.1
Size / Weight	2020×996×30mm / 26.3kg		
Cell Arrangement	12×6×2		

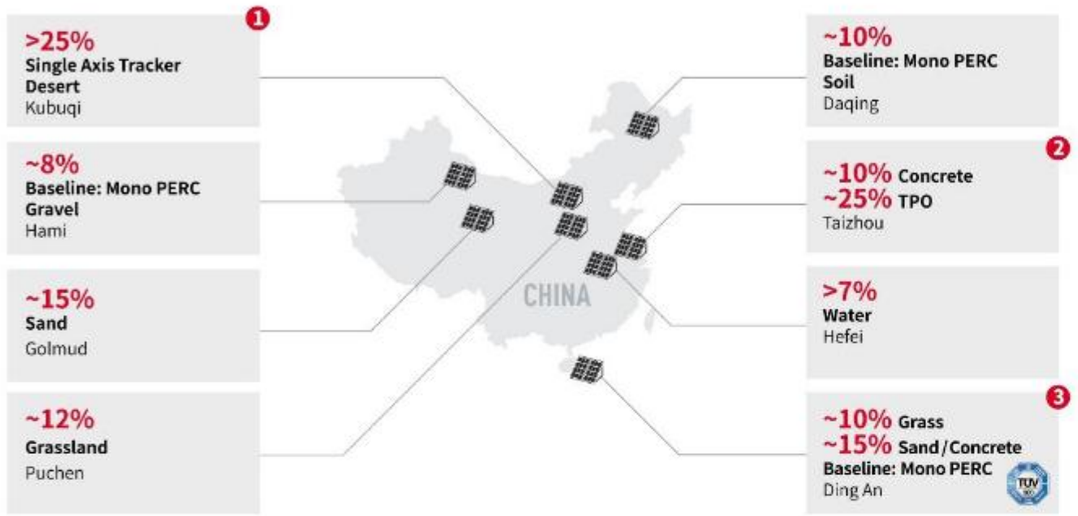
Hi-MO4	LR4-72HBD		
Pmp (W)	430	435	440
Voc (V)	49.6	49.8	49.9
Imp (A)	10.44	10.51	10.61
Eff (%)	19.2	19.4	19.6
Size / Weight	2131×1052×35mm / 29.5kg		
Cell Arrangement	12×6×2		

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

SOLAR POWER SYSTEM

BIFACIAL CASE STUDY

BIFACIAL GAINS IN VARIOUS PLACES AND ENVIRONMENTS



Project location		Ground	Gain	Capacity	Baseline	Mounting	Statistical Period
Chennai, India 4		White Gravel	20%	600Wp	Mono PERC	Fixed	Sept.2018
Thuwal, Saudi Arabia		Sand	9%	600Wp	Mono PERC	Fixed	Sept.2018
Fremont, USA		Light Asphalt	5.8%	1.8kWp	Mono PERC	Fixed	Aug. 2018~Oct. 2018
Livermore, USA		Gravel	7.4%	2.1kWp	Mono PERC	Single axis tracker	Sep. 2018~Oct. 2018
Pahrump, USA		Gravel	8.0%	2.8kWp	Mono PERC	Fixed	Oct. 2018~Jan. 2019

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: ~20%

SOLAR POWER SYSTEM

REFERENCE PROJECTS

CALIFORNIA, USA
7.5MWp
Module Type: LR6-72HV 340Wp
Completion Date: Nov. 2017

MEXICO CITY, MEXICO
1MWp
Module Type: LR6-72 340Wp
Completion Date: Mar. 2018

VICTORIA, AUSTRALIA
30kW
Module Type: LR6-60 290Wp
Completion Date: Apr. 2018

TERNOPIL, UKRAINE
32.5kW
Module Type: LR6-60PE 300Wp
Completion Date: Jan. 2018

GOLMUD, QINGHAI, CHINA
20MWp
Module Type: LR6-72BP 350Wp
Completion Date: Dec. 2017

THE THIRD TOP RUNNER PROJECT IN SIHONG, JIANGSU, CHINA **275MWp**
Module Type: LR6-60HBD 315Wp
Completion Date: Oct. 2018

"SOLAR FOR SOLAR"

LOVSUN has selected Yunnan, China and Kuching, Malaysia as new facilities, to be powered by 100% hydro energy. The company believe in producing clean energy by using clean energy. In the near future, LOVSUN will combine solar power and energy storage to build Solar for Solar fabs, using solar power to produce solar products.

Solar for Solar is a perfect way to fully leverage the whole industry chain. Carbon emissions are zero throughout the entire process. Through the "Solar for Solar" model, we can continue to develop the solar industry and create more green energy.