TW SOLAR

# *PV* CHANGES THE WORLD.

TONGWEI MODULES PRODUCT BROCHURE

TW SOLAR

Add: 888 Changning Avenue, High-tech Zone, Hefei City, Anhui Province

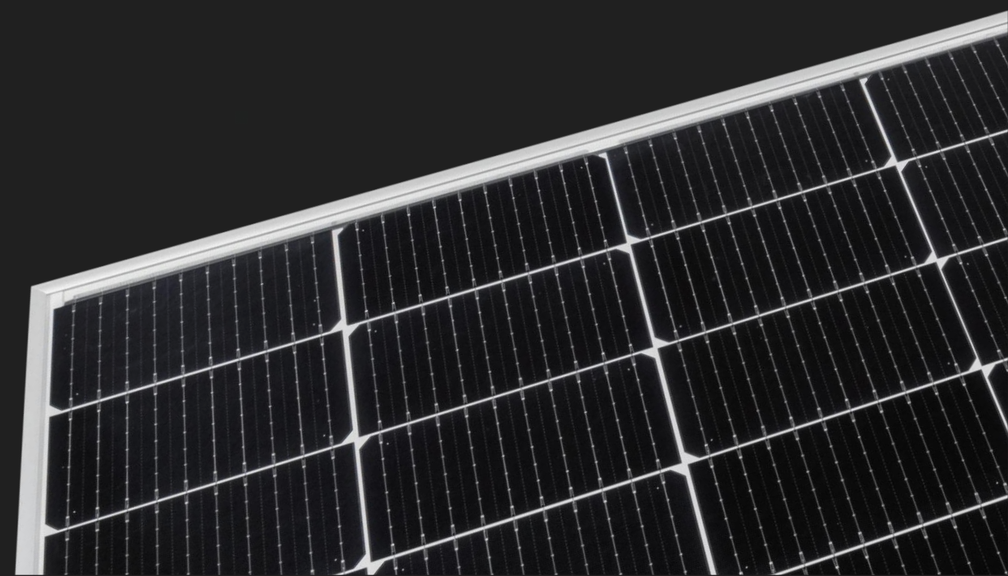
http://en.tongwei.com.cn/



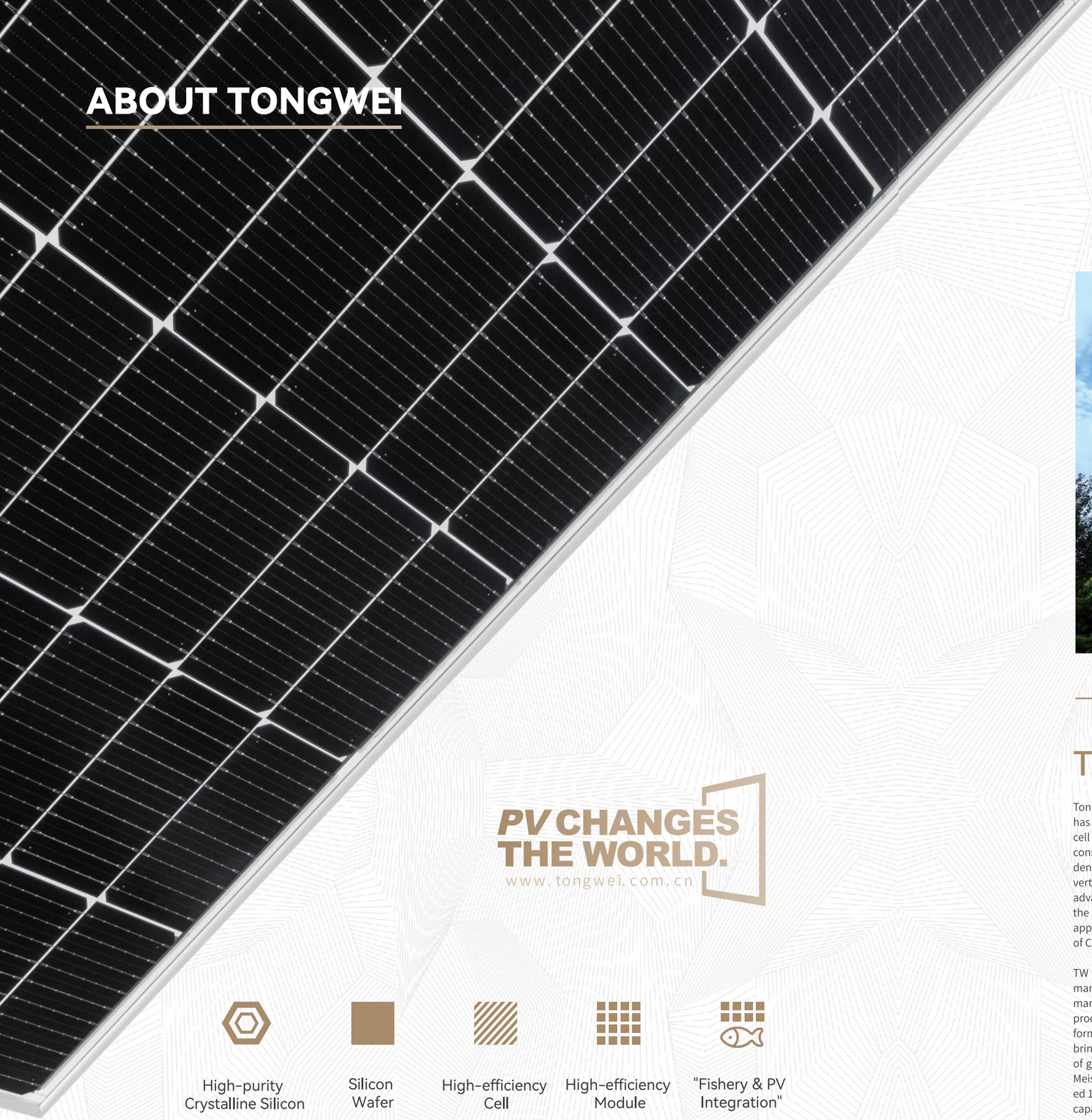
http://en.tongwei.com.cn/

# CONTENTS





# ABOUT TONGWEI



PV CHANGES THE WORLD.

www.tongwei.com.cn

High-purity Crystalline Silicon

Silicon Wafer

High-efficiency Cell

High-efficiency Module

"Fishery & PV Integration"

## Tongwei PV Industry Integration

Tongwei entered the market of photovoltaics (PV) in 2006. After more than 10 years of rapid development, Tongwei has become an integrated PV enterprise with high-purity polysilicon production in upstream, high-efficiency solar cell production and high-efficiency PV module production in midstream , as well as experience in PV power plant construction and operation in downstream. It has formed a complete PV new energy industry chain with independent intellectual property rights and leading scale, technology, cost, and quality advantages, building up the vertically integrated layout of the whole PV industry chain.Tongwei continues to strengthen and enlarge its advantages, focusing on the layout of high-purity crystalline silicon, high-efficiency cells, and module products on the manufacturing side and on building a "Fishery & PV Integration" innovative development model on the application side. Tongwei has become an important participant and significant driving force for the development of China and even the global photovoltaic new energy industry.

TW Solar, as the most critical link in Tongwei's PV new energy industry chain, has deeply engaged in the R&D, manufacturing, and promotion of core solar power generation products and has become the world's largest manufacturer of crystalline silicon solar cell and high-efficiency modules with the most advanced technology, production equipment, and the highest level of automation and intelligence in the PV industry. TW Solar has formed a series of fully-flexible, zero-lead, eco-friendly shingled modules and high-efficiency half-cell modules that bring less LCOE (Levelized Cost Of Electricity) for customers at terminal power stations and cover the diverse needs of global customers. With over 20,000 employees on its payroll, TW Solar now has six bases in Hefei, Shuangliu, Meishan, Jintang, Yancheng, Nantong, and the Tonghe project, with an annual cell capacity of 70GW and an expected 130-150GW in 2024-2026, of which large-size cell capacity will account for more than 90%. It is seeing an annual capacity of high-efficiency modules of 14GW and is estimated to reach 80GW by the end of 2023.

# R&D STRENGTH

TW SOLAR

## PV Technology R&D Layout

**Shuangliu District, Chengdu, Sichuan Province**
HJT Cell Pilot Line
Total Interdigitated Back Contact Cell Pilot Line
Advanced Metallization Test Line
Module R&D Pilot Line
Perovskite Lamination Lab
PV Testing Center

**Jintang County, Chengdu, Sichuan Province**
1GW HJT Production Line
Slicing R&D Line

**Hefei, Anhui Province**
HJT Cell Pilot Line
Module R&D center
Outdoor Module Demonstration Base

**Meishan, Sichuan Province**
TNC Cell R&D Line

**Leshan, Sichuan Province**
Yongxiang Silicon Material R&D Center
Crystal Growth R&D line

## Technology R&D Strength on High-Purity Crystalline Silicon

**Circular Economy Industry Chain**

Tail Gas Recovery / High-Efficiency Reduction / Energy-saving Distillation / Anti-disproportionation / Closed-loop Cycle of Oxygen and Hydrogen Elements / Trichlorosilane Synthesis / Cold Hydrogenation / Thermal Energy Cascade Recycling

- **Electronic Grade Parameters: 100%**
- **Super-efficient Applicable: N-Type**
- **Technical Reserve: Semiconductor**

## Technology R&D Strength on Cell

**The World's First Industrial 4.0 High-efficiency Cell Production Line**

- **"Tongwei Speed": fully automatic production line**
- **"China Speed": 30% energy consumption**
- **"Global Speed": 161% production efficiency**

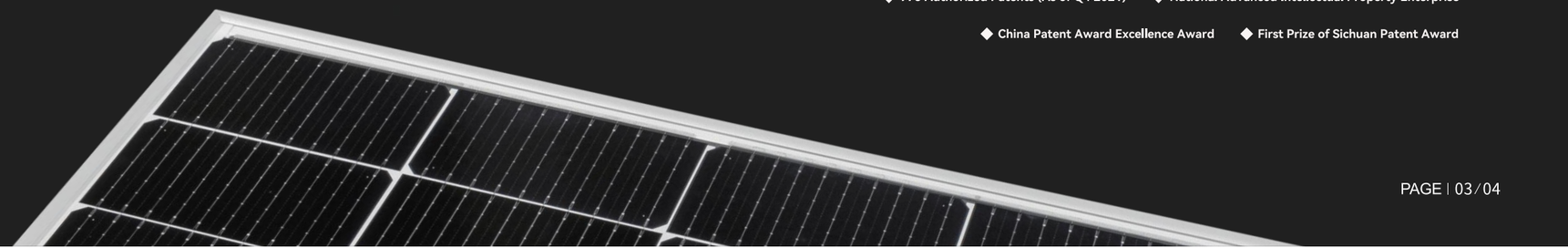
## Qualifications of PV Technology R&D Platforms

- **State-certificated Enterprise Technology Center**
- **Sichuan Engineering Technology Research Center**
- **Sichuan Engineering Research Center**
- **Chengdu PV Testing Center (CNAS Accreditation)**
- **Hefei PV Experimental Center (CNAS Accreditation)**

## PV Technology R&D Intellectual Property Rights

- **976 Authorized Patents (As of Q4 2021)**
- **National Advanced Intellectual Property Enterprise**
- **China Patent Award Excellence Award**
- **First Prize of Sichuan Patent Award**

*PV* CHANGES THE WORLD.
www.tongwei.com.cn



# GLOBAL LAYOUT

TW SOLAR

PV CHANGES THE WORLD.
www.tongwei.com.cn

## Destinations of Module Exporting

### Europe

Albania
Ireland
Austria
Bulgaria
Belgium
Poland
Bosnia and Herzegovina
Germany
Russia
France
Finland
Netherlands
Croatia
Romania
Malta
Portugal
Sweden
Switzerland
Slovenia
Turkey
Ukraine
Spain
Greece
Hungary
Italy
United Kingdom

### America

Brazil
Dominica
Mexico
Chile

### Asia

Pakistan
Georgia
South Korea
Lebanon
Malaysia
Japan
Cyprus
Saudi Arabia
Singapore
Jordan
Vietnam
Yemen

### Oceania

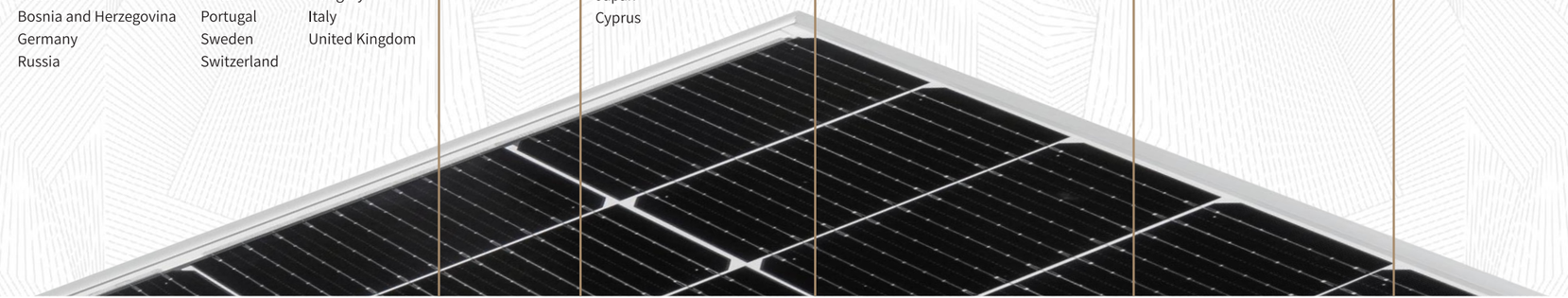
Australia
Fiji
New Zealand

## Silicon Material Bases

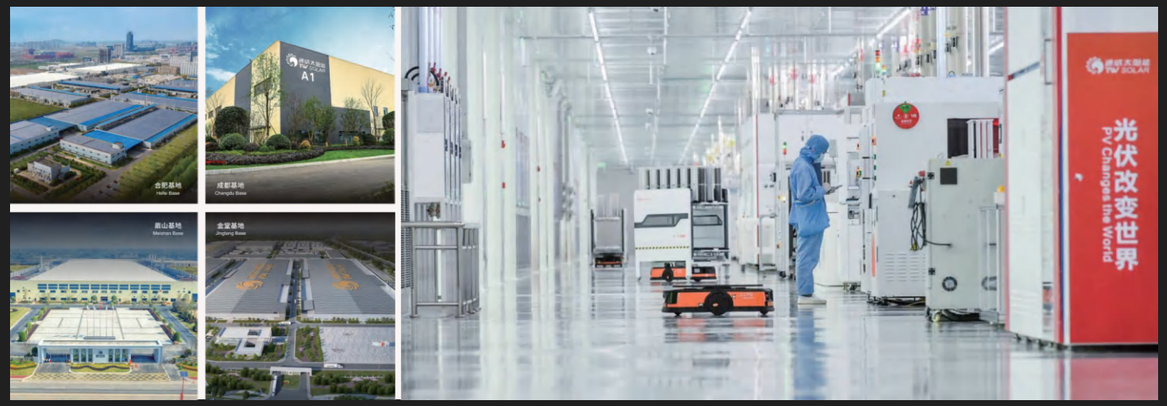
Yongxiang Polysilicon (Sichuan)
Yongxiang New Energy (Sichuan)
Tongwei Inner Mongolia
Tongwei Yunnan

## Cell and Module Bases

Hefei Base (Anhui)
Chengdu Base (Sichuan)
Jintang Base (Sichuan)
Meishan Base (Sichuan)
Yancheng Base (Jiangsu)
Nantong Base (Jiangsu)
Tonghe New Energy (Sichuan)



# TONGWEI PV INDUSTRY CHAIN




## High-purity Crystalline Silicon Products

Circular Economy Industry Chain
The world's highest shipment volume of high-purity crystalline silicon
High-purity crystalline silicon purity: 99.999999999%

After 20 years of development, Yongxiang, a subsidiary of Tongwei, has formed a circular economy industry chain that completely integrates new energy with chemicals, i.e., the processes from "salt brine, caustic soda, polyvinyl chloride to carbide slag cement" and from "hydrogen chloride, Trichlorosilane to polysilicon new energy". Now, Yongxiang has three high-purity crystalline silicon production bases in Leshan (Sichuan), Baotou (Inner Mongolia), and Baoshan (Yunnan). The core technology of high-purity crystalline silicon has been iteratively upgraded to the "Yongxiang Method Gen 7", which ensures over 90% N-type monocrystalline, reaching the level of electronic-grade crystalline silicon. Ranging from electronic grade kinds to solar grade types, Yongxiang's products enjoy a purity of key impurity elements of 99.999999999%, realizing "intelligent manufacturing" of high-purity crystalline silicon in China.

## Cell Module Products

**Products made by the "Industry 4.0" intelligent manufacturing system**

**TPC Cells:**
The level of unit consumption of the main slurry has been further optimized, and the non-silicon cost decreased by 20% year-on-year
Bringing a steady improvement in cell conversion efficiency and product reliability

**TNC Cells:**
The self-developed, industry-leading PECVD polysilicon deposition technology route is adopted
Average conversion efficiency exceeds 24.7%, and the module power reaches 690W

**THC Cells:**
The highest R&D efficiency has reached 25.67% (ISFH Accreditation)
The R&D of cutting-edge technologies such as total interdigitated back contact cells (TIC), perovskite/silicon stacked cells have been carried out.

TW Solar has been deeply engaged in the R&D, manufacturing, and promotion of core solar power generation products and has become the world's largest manufacturer of crystalline silicon solar cells with the most advanced technology, production equipment, and the highest level of automation and intelligence in the PV industry. The company now has six bases in Hefei, Shuangliu, Meishan, Jintang, Yancheng, Nantong, and the Tonghe project, with a production capacity of 70GW.

In 2022, Tongwei started to work on half-cut conventional modules with series and parallel design, a unique layout and circuit design, excellent load and EL performance, and industry-leading technology. After several generations of technical iteration, it forms module products with Tongwei's characteristics and comprehensive coverage of market demand, which are widely used in scenarios such as household rooftops, industrial and commercial distributed power stations, and giant ground power plants to meet the growing needs of global customers for clean energy.

## "Fishery & PV Integration"

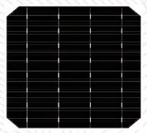
The world's first "Fishery & PV Integration" innovative development mode that can achieve triple harvest of "fishery, electricity, and environmental protection"

Tongwei follows the deployment of the national green development strategy and organically integrates PV power generation with modern fishery, creating the first "Fishery & PV Integration" development mode of "Power generation on the top and fish farming in the bottom". Through screening high-quality water resources and ensuring power consumption as the premise, Tongwei explores the new fishery mode by constantly promoting the scaled, specialized, and intelligent development of the "Fishery & PV Integration" base and cutting the installation cost of PV systems. Now, Tongwei has developed and built 60 "Fishery & PV Integration" bases in many provinces and cities across China. It has also made certain efforts in developing the supporting tertiary industries, such as tourism and leisure as well as sightseeing with popular science, realizing the organic integration of primary, secondary, and tertiary sectors. In this way, the company has successfully created a "Tongwei solution" that fits the construction of new fisheries, new energy, and new villages, which promotes industrial transformation and upgrading and provides an effective way for the development of new rural areas, thus forming Tongwei's unique competitive model.

# HALF-CELL P-TYPE PRODUCT SERIES

## Half-cut

Current density is reduced by 1/2
Internal power loss reduced to 1/4 of conventional modules
Rated output power increased by 5~10W

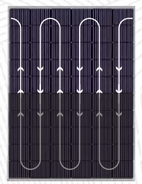


Full-cell:P=I^2R

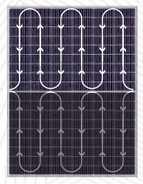
Half-cell:P=(1/2)I^2R

## Shading, not compromising energy

Up-down symmetrical parallel module design
Effectively reduce current mismatch due to shading
As shown in the shading instance below, the power output is raised from 0 to 50%.



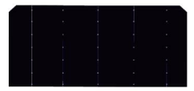
Full-cell: 0 power output



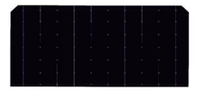
Half-cell: 50% power output

## Multiple Busbars (MBB)

Densely distributed grid lines, uniform load, multi-busbars design
Output power increased by more than 5W



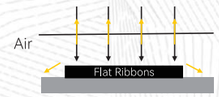
Conventional cell



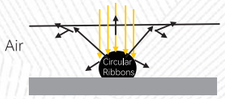
Multi-busbar cell

## New Welding Wire

Round welding wire, reduced shading areas.
The incident light is reflected multiple times, increasing power by 1~2W



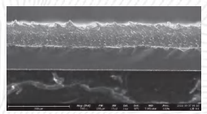

Conventional cell




Multi-busbar cell

## Lossless laser Cutting

Lossless laser cutting technology, no mechanical damage
Smooth cutting surface without burrs
Low cell cracking risks, micro-cracking is reduced by more than 50%



Regular cutting – cross-section

Lossless laser cutting – cross-section

## High-Density Packaging Technology

Adopt advanced high-density packaging technology
Ensure the perfect balance of efficiency and reliability
Module efficiency increased by more than 0.15%

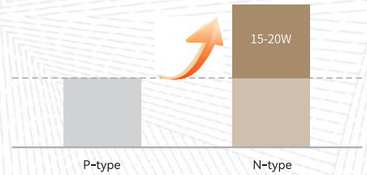

Regular spacing


Small pitch: high density

# HALF-CELL N-TYPE PRODUCT SERIES

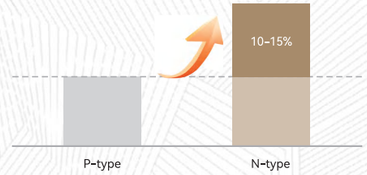
## Higher power

For the same module type, the power of N-type modules is 15~20W higher than that of P-type modules.




## Higher Bifaciality

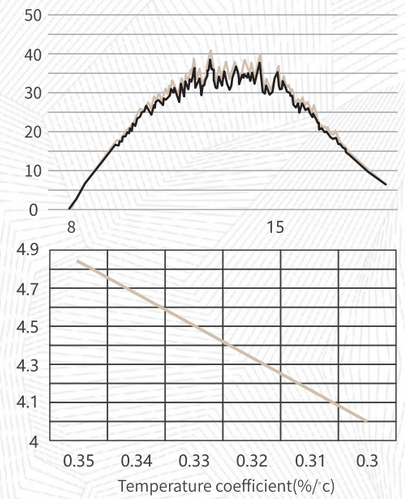
For the same module type, the bifaciality of the N-type module is increased by 10~15% compared with the P-type module.




## Lower Temperature Coefficient

The temperature coefficient of the P-type module is -0.34%/℃
The temperature coefficient of the N-type module is optimized to -0.30%/℃
Power generation is particularly prominent in high-temperature environments

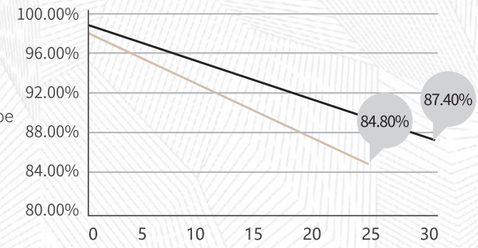
P-type N-type




## Better Output Warranty

1st year <1% (P-type 2%)
30-year warranty for both monofacial and bifacial power output (30 years for P-type bifacial and 25 years for P-type monofacial)
Output power is no less than 87.4% of the initial after 30 years.

P-type N-type



# TWMPD-54HS400-420W

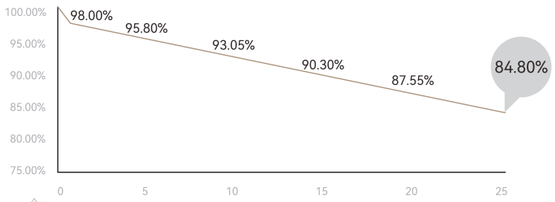
P-type Half-cell Monofacial Module (54)

## PRODUCT FEATURES

- High Power Output, Low LCOE
- Maximum Power 420W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**2%**, **0.55%** power degradation per year from 2 to 25 years




12 12–year Warranty for Materials

25 25–year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

ISO9001: 2015/Quality Management System

ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Rear

## Electrical Characteristics (STC)

| Module Type: TWMPD-54HSXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 400 | 405 | 410 | 415 | 420 |
| Open Circuit Voltage: Voc [V] | 37.08 | 37.23 | 37.38 | 37.53 | 37.68 |
| Short Circuit Current: Isc [A] | 13.77 | 13.87 | 13.92 | 13.95 | 13.98 |
| Voltage at Maximum Power: Vmp [V] | 30.58 | 30.73 | 30.88 | 31.03 | 31.18 |
| Current at Maximum Power: Imp [A] | 13.08 | 13.18 | 13.28 | 13.38 | 13.47 |
| Module Efficiency: η [%] | 20.5 | 20.7 | 21.0 | 21.3 | 21.5 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 302.8 | 306.6 | 310.3 | 314.1 | 317.9 |
| Open Circuit Voltage: Voc [V] | 34.72 | 34.86 | 35.00 | 35.15 | 35.29 |
| Short Circuit Current: Isc [A] | 10.82 | 10.90 | 10.97 | 11.05 | 11.12 |
| Voltage at Maximum Power: Vmp [V] | 28.76 | 28.90 | 29.04 | 29.18 | 29.32 |
| Current at Maximum Power: Imp [A] | 10.52 | 10.60 | 10.68 | 10.76 | 10.84 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TPC |
| Cell Orientation | 108[6X18] |
| Dimension | 1722±2 X1134±2X30mm |
| Weight | 20.5kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | White |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, −200mm or ±1200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 36pcs per pallet, 936pcs per 40'HC |

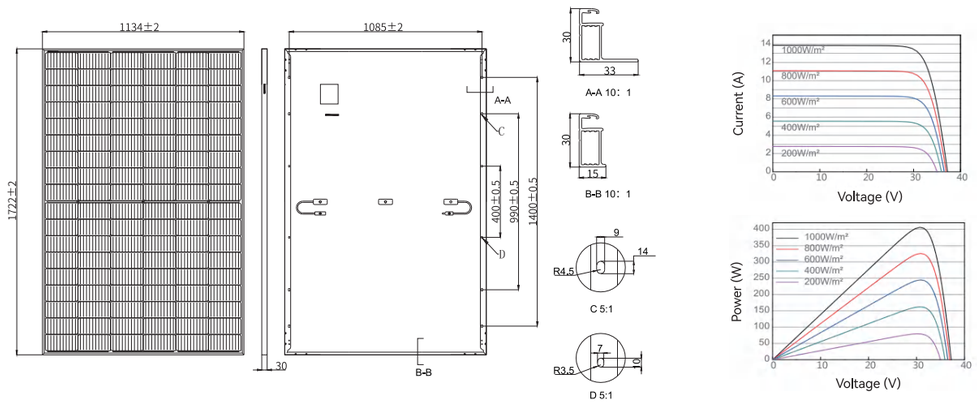
## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 25A |
| Power Output Tolerance | 0~+5W |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.34%/℃ |
| Temperature Coefficient (Voc) | -0.27%/℃ |
| Temperature Coefficient (Isc) | +0.045%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMPD-54HS400-420W

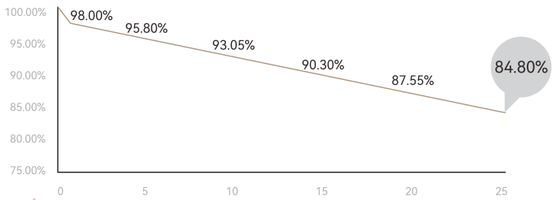
P-type Half-cell Monofacial Black Frame Module (54)

## PRODUCT FEATURES

- High Power Output, Low LCOE
- Maximum Power 420W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**2%**, **0.55%** power degradation per year from 2 to 25 years




12 12-year Warranty for Materials

25 25-year Warranty for Linear Power Output

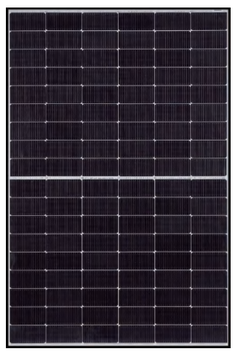
## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

ISO9001: 2015/Quality Management System

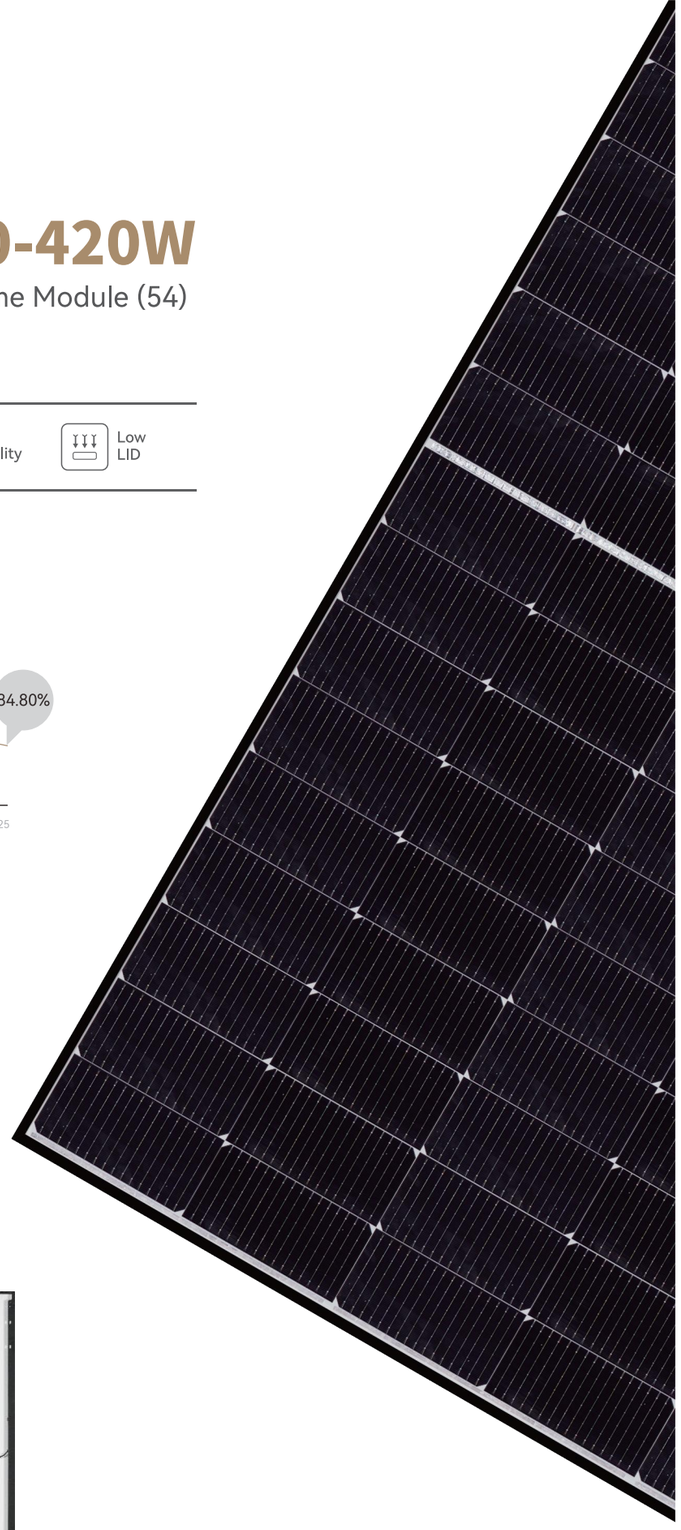
ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front



Rear



## Electrical Characteristics (STC)

| Module Type: TWMPD-54HSXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 400 | 405 | 410 | 415 | 420 |
| Open Circuit Voltage: Voc [V] | 37.08 | 37.23 | 37.38 | 37.53 | 37.68 |
| Short Circuit Current: Isc [A] | 13.77 | 13.87 | 13.92 | 13.95 | 13.98 |
| Voltage at Maximum Power: Vmp [V] | 30.58 | 30.73 | 30.88 | 31.03 | 31.18 |
| Current at Maximum Power: Imp [A] | 13.08 | 13.18 | 13.28 | 13.38 | 13.47 |
| Module Efficiency: η [%] | 20.5 | 20.7 | 21.0 | 21.3 | 21.5 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| Maximum Power: Pmax [W] | 302.8 | 306.6 | 310.3 | 314.1 | 317.9 |
|---|---|---|---|---|---|
| Open Circuit Voltage: Voc [V] | 34.72 | 34.86 | 35.00 | 35.15 | 35.29 |
| Short Circuit Current: Isc [A] | 10.82 | 10.90 | 10.97 | 11.05 | 11.12 |
| Voltage at Maximum Power: Vmp [V] | 28.76 | 28.90 | 29.04 | 29.18 | 29.32 |
| Current at Maximum Power: Imp [A] | 10.52 | 10.60 | 10.68 | 10.76 | 10.84 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TPC |
| Cell Orientation | 108[6X18] |
| Dimension | 1722±2 X1134±2X30mm |
| Weight | 20.5kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | White |
| Frame | Anodized aluminum alloy black frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, -200mm or ±1200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 36pcs per pallet, 936pcs per 40'HC |

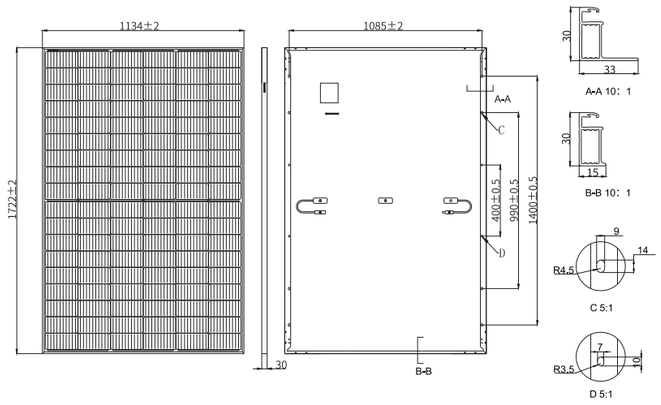
## Operating Parameters

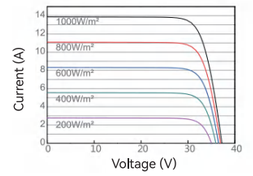
| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 25A |
| Power Output Tolerance | 0~+5W |

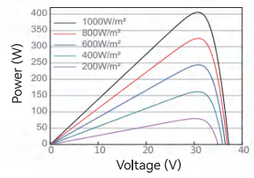
## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.34%/℃ |
| Temperature Coefficient (Voc) | -0.27%/℃ |
| Temperature Coefficient (Isc) | +0.045%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMPD-54HB395-415W

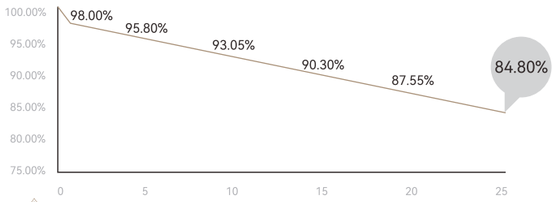
P-type Half-cell Monofacial Full-black Module (54)

## PRODUCT FEATURES

- High Power Output Low LCOE
- Maximum Power 415W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**2%**, **0.55%** power degradation per year from 2 to 25 years




12 12–year Warranty for Materials

25 25–year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

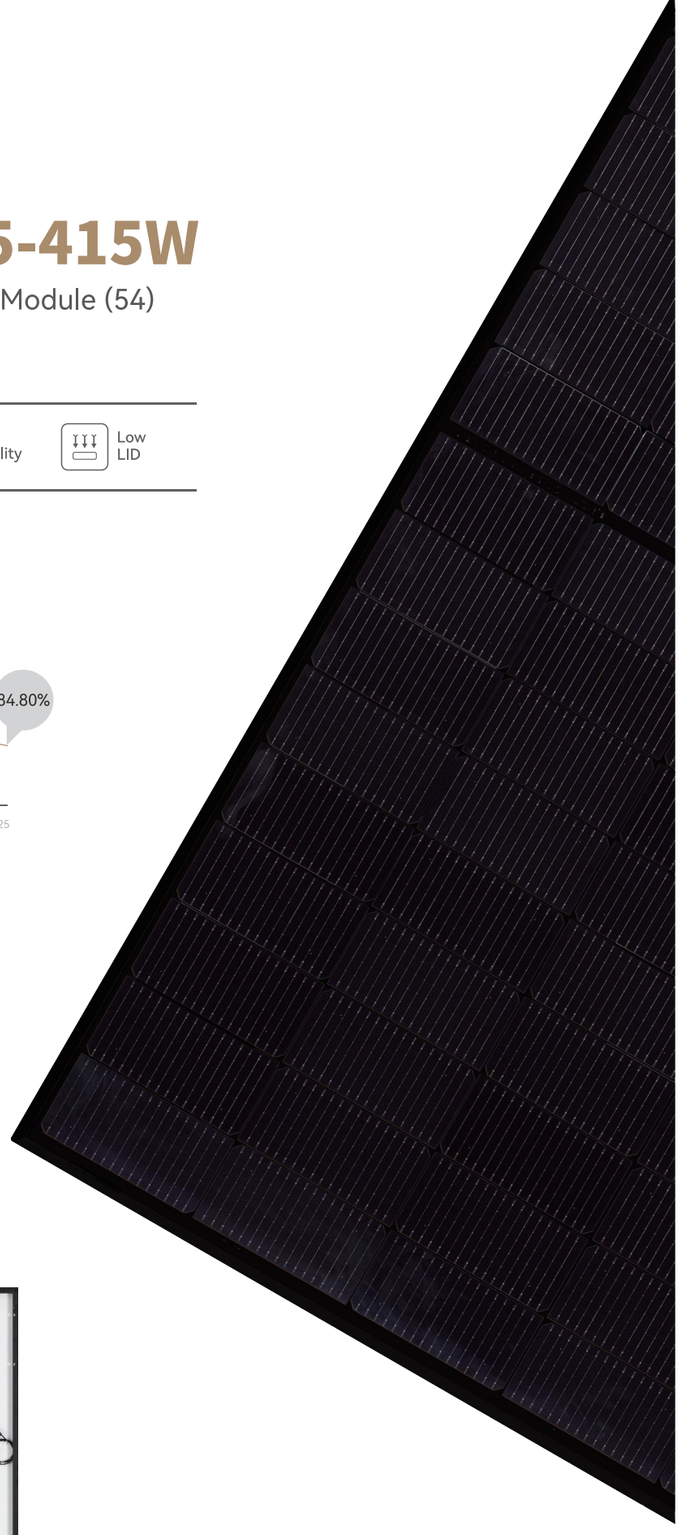
ISO9001: 2015/Quality Management System

ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Rear



## Electrical Characteristics (STC)

| Module Type: TWMPD-54HBXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 395 | 400 | 405 | 410 | 415 |
| Open Circuit Voltage: Voc [V] | 36.98 | 37.07 | 37.23 | 37.38 | 37.53 |
| Short Circuit Current: Isc [A] | 13.70 | 13.79 | 13.87 | 13.93 | 13.99 |
| Voltage at Maximum Power: Vmp [V] | 30.84 | 31.01 | 31.21 | 31.40 | 31.60 |
| Current at Maximum Power: Imp [A] | 12.81 | 12.90 | 12.98 | 13.06 | 13.14 |
| Module Efficiency: η [%] | 20.2 | 20.5 | 20.7 | 21.0 | 21.3 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| Maximum Power: Pmax [W] | 298.2 | 302.0 | 306.0 | 310.0 | 314.0 |
|---|---|---|---|---|---|
| Open Circuit Voltage: Voc [V] | 34.80 | 34.88 | 35.12 | 35.31 | 35.50 |
| Short Circuit Current: Isc [A] | 10.96 | 11.03 | 11.10 | 11.16 | 11.22 |
| Voltage at Maximum Power: Vmp [V] | 29.10 | 29.26 | 29.47 | 29.68 | 29.89 |
| Current at Maximum Power: Imp [A] | 10.25 | 10.32 | 10.38 | 10.44 | 10.51 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TPC |
| Cell Orientation | 108[6X18] |
| Dimension | 1722±2 X1134±2X30mm |
| Weight | 20.5kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | Black inside and white outside |
| Frame | Anodized aluminum alloy black frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, −200mm or ±1200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 36pcs per pallet, 936pcs per 40'HC |

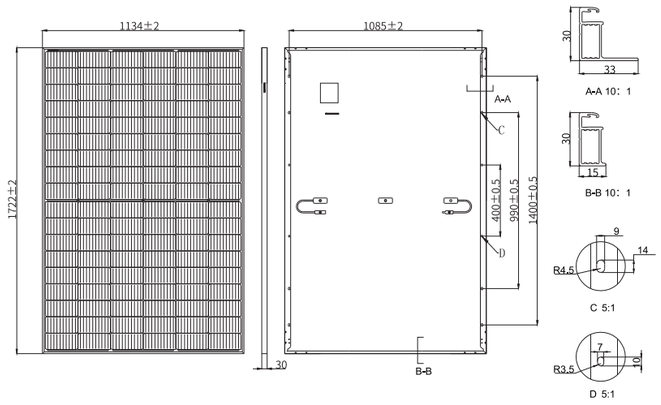
## Operating Parameters

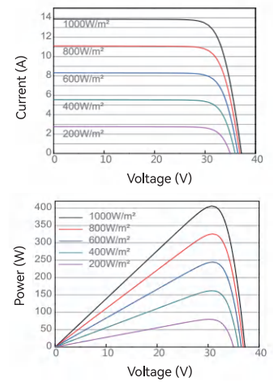
| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 25A |
| Power Output Tolerance | 0~+5W |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.34%/℃ |
| Temperature Coefficient (Voc) | -0.27%/℃ |
| Temperature Coefficient (Isc) | +0.045%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMPD-60HS445-465W

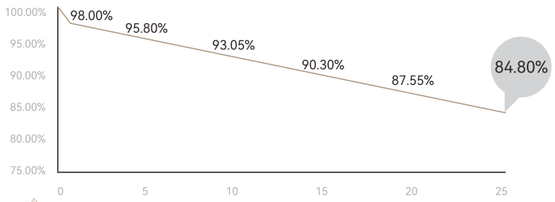
P-type Half-cell Monofacial Module (60)

## PRODUCT FEATURES

- High Power Output, Low LCOE
- Maximum Power 465W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**2%**, **0.55%** power degradation per year from 2 to 25 years




12 12–year Warranty for Materials

25 25–year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

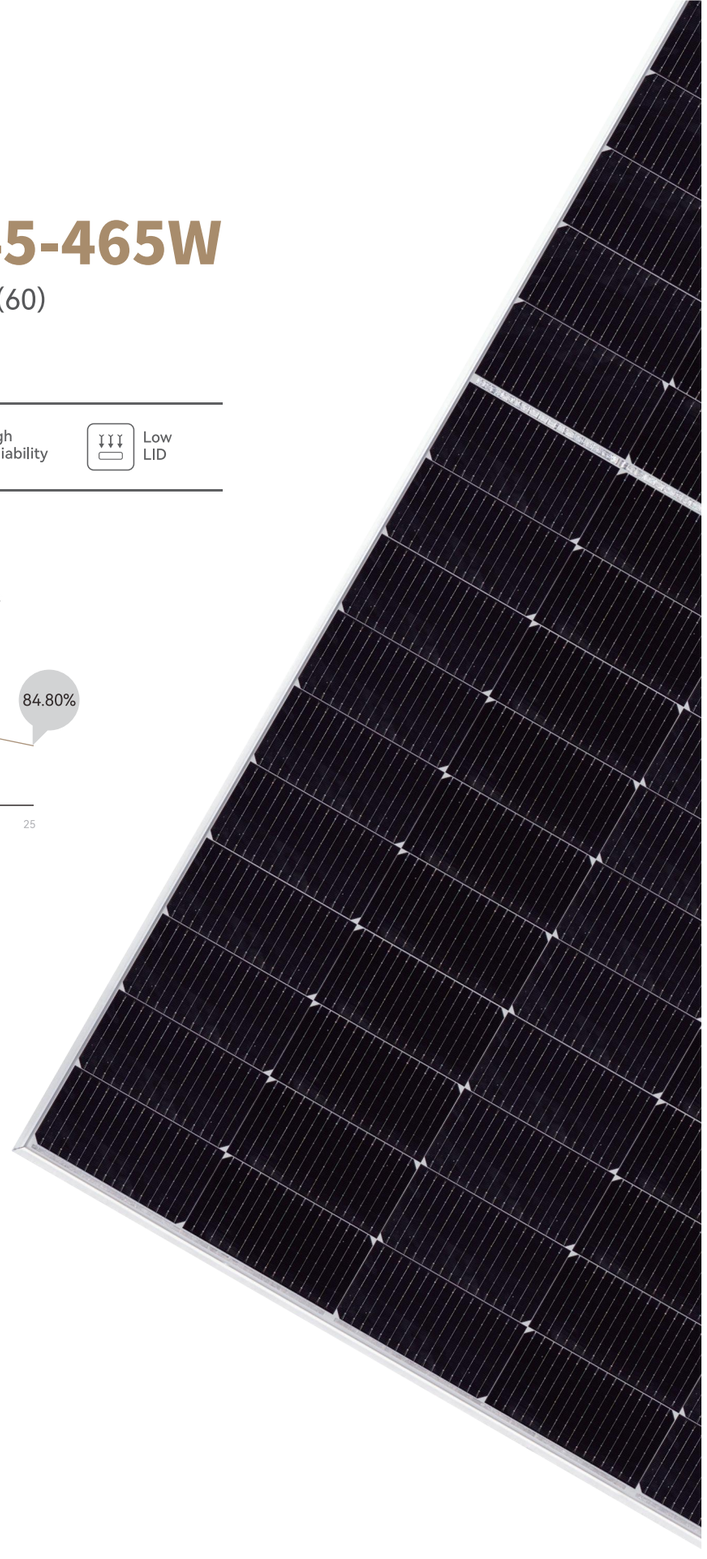
ISO9001: 2015/Quality Management System

ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Rear



## Electrical Characteristics (STC)

| Module Type: TWMPD-60HSXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 445 | 450 | 455 | 460 | 465 |
| Open Circuit Voltage: Voc [V] | 41.04 | 41.21 | 41.38 | 41.55 | 41.72 |
| Short Circuit Current: Isc [A] | 13.79 | 13.84 | 13.89 | 13.94 | 13.99 |
| Voltage at Maximum Power: Vmp [V] | 33.67 | 33.83 | 33.99 | 34.15 | 34.31 |
| Current at Maximum Power: Imp [A] | 13.22 | 13.30 | 13.39 | 13.47 | 13.55 |
| Module Efficiency: η [%] | 20.6 | 20.8 | 21.0 | 21.3 | 21.5 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| Maximum Power: Pmax [W] | 336.7 | 340.5 | 344.3 | 348.1 | 351.9 |
|---|---|---|---|---|---|
| Open Circuit Voltage: Voc [V] | 38.93 | 39.11 | 39.30 | 39.49 | 39.68 |
| Short Circuit Current: Isc [A] | 10.88 | 10.91 | 10.95 | 10.97 | 11.01 |
| Voltage at Maximum Power: Vmp [V] | 32.15 | 32.37 | 32.59 | 32.81 | 33.02 |
| Current at Maximum Power: Imp [A] | 10.47 | 10.52 | 10.56 | 10.61 | 10.65 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TPC |
| Cell Orientation | 120[6X20] |
| Dimension | 1908±2 X1134±2X35mm |
| Weight | 24.2kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | White |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +1200mm, -1200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 31pcs per pallet, 744pcs per 40'HC |

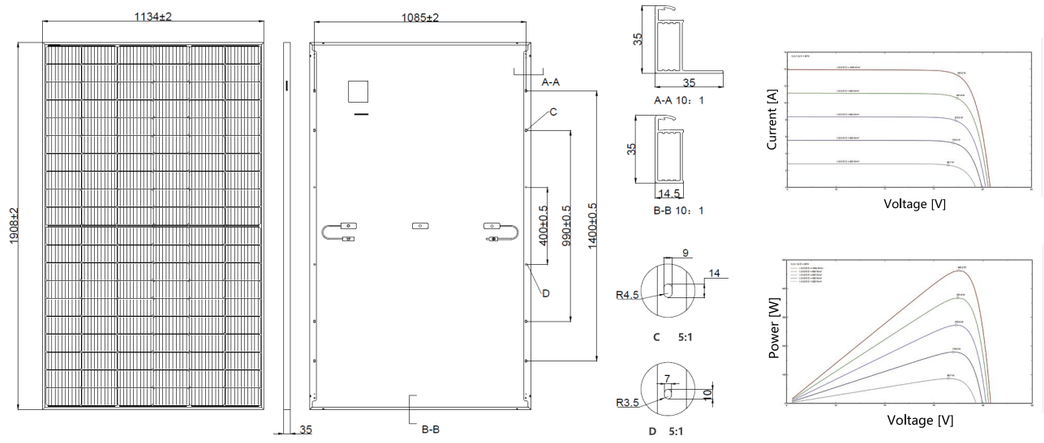
## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 25A |
| Power Output Tolerance | 0~+5W |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.34%/℃ |
| Temperature Coefficient (Voc) | -0.27%/℃ |
| Temperature Coefficient (Isc) | +0.045%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMPD-72HS545-565W

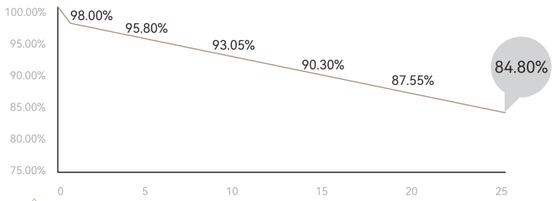
P-type Half-cell Monofacial Module (72)

## PRODUCT FEATURES

- High Power Output Low LCOE
- Maximum Power 565W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**2%**, **0.55%** power degradation per year from 2 to 25 years




12 12-year Warranty for Materials

25 25-year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

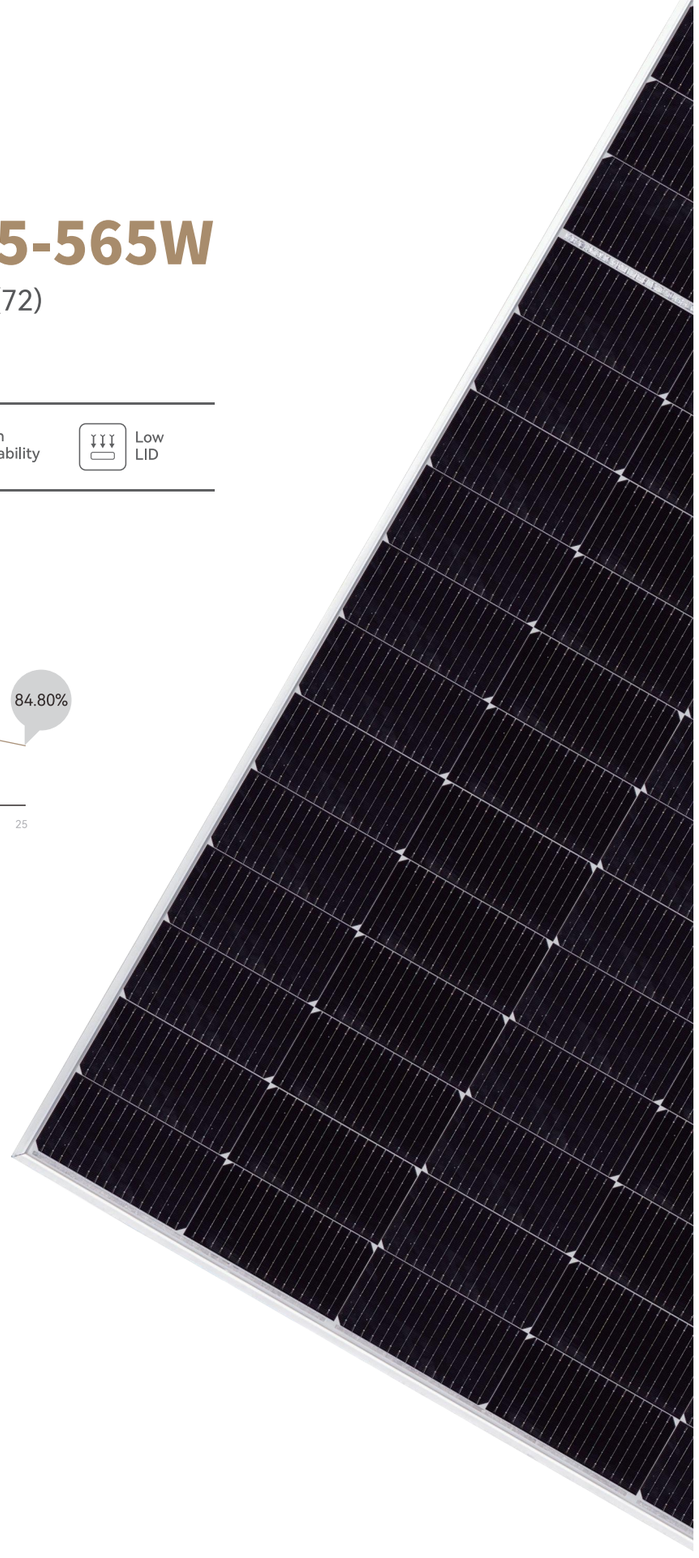
ISO9001: 2015/Quality Management System

ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Rear



## Electrical Characteristics (STC)

| Module Type: TWMPD-72HSXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 545 | 550 | 555 | 560 | 565 |
| Open Circuit Voltage: Voc [V] | 49.71 | 49.91 | 50.11 | 50.31 | 50.51 |
| Short Circuit Current: Isc [A] | 13.88 | 13.92 | 13.96 | 14.00 | 14.04 |
| Voltage at Maximum Power: Vmp [V] | 41.05 | 41.25 | 41.45 | 41.65 | 41.85 |
| Current at Maximum Power: Imp [A] | 13.28 | 13.33 | 13.39 | 13.45 | 13.51 |
| Module Efficiency: η [%] | 21.1 | 21.3 | 21.5 | 21.7 | 21.9 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 412.4 | 416.2 | 420.0 | 423.8 | 426.9 |
| Open Circuit Voltage: Voc [V] | 47.18 | 47.40 | 47.62 | 47.85 | 48.07 |
| Short Circuit Current: Isc [A] | 10.94 | 10.97 | 10.99 | 11.02 | 11.05 |
| Voltage at Maximum Power: Vmp [V] | 39.28 | 39.55 | 39.82 | 40.09 | 40.31 |
| Current at Maximum Power: Imp [A] | 10.50 | 10.52 | 10.55 | 10.57 | 10.59 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TPC |
| Cell Orientation | 144[6X24] |
| Dimension | 2278±2 X1134±2X35mm |
| Weight | 27.8kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | White |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, -200mm or ±1400mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 31pcs per pallet, 620pcs per 40'HC |

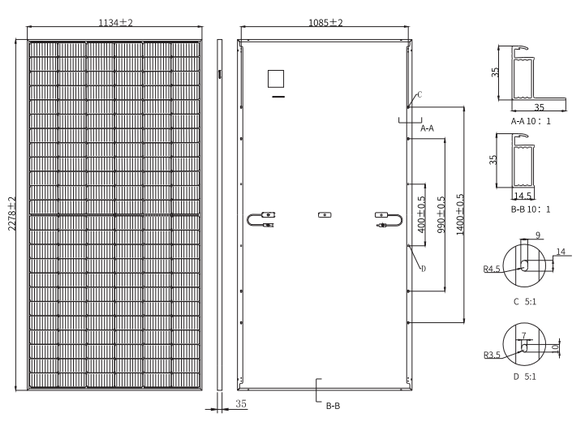
## Operating Parameters

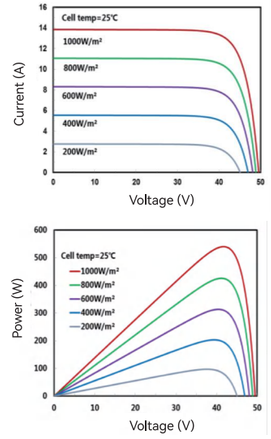
| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 25A |
| Power Output Tolerance | 0~+5W |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.34%/℃ |
| Temperature Coefficient (Voc) | -0.27%/℃ |
| Temperature Coefficient (Isc) | +0.045%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMPD-72HD540-560W

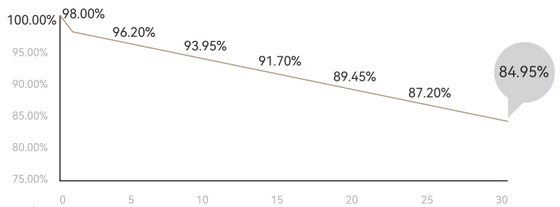
P-type Half-cell Bifacial Module (72)

## PRODUCT FEATURES

- High Power Output Low LCOE
- Maximum Power 560W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**2%**, **0.45%** power degradation per year from 2 to 30 years




12 12-year Warranty for Materials

30 30-year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

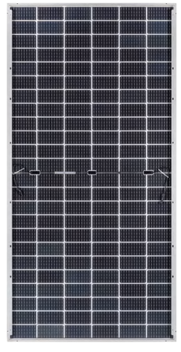
ISO9001: 2015/Quality Management System

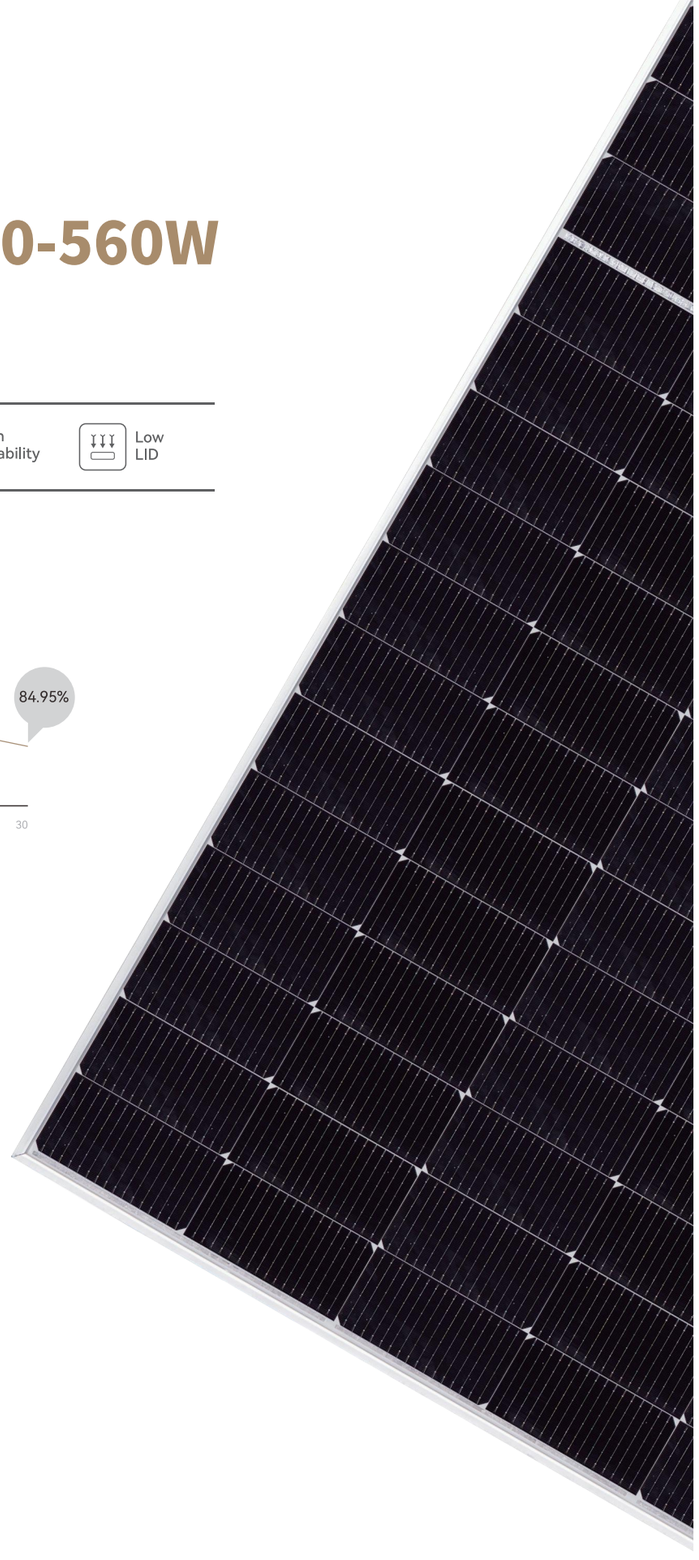
ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Rear





## Electrical Characteristics (STC)

| Module Type: TWMPD-72HDXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 540 | 545 | 550 | 555 | 560 |
| Open Circuit Voltage: Voc [V] | 49.70 | 49.90 | 50.10 | 50.30 | 50.50 |
| Short Circuit Current: Isc [A] | 13.78 | 13.83 | 13.88 | 13.93 | 13.98 |
| Voltage at Maximum Power: Vmp [V] | 41.56 | 41.76 | 41.96 | 42.16 | 42.36 |
| Current at Maximum Power: Imp [A] | 13.00 | 13.05 | 13.11 | 13.17 | 13.23 |
| Module Efficiency: η [%] | 20.9 | 21.1 | 21.3 | 21.5 | 21.7 |

STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3%

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.34%/℃ |
| Temperature Coefficient (Voc) | -0.28%/℃ |
| Temperature Coefficient (Isc) | 0.05%/℃ |
| NMOT | 45±2℃ |

## Electrical Characteristics (NMOT)

| | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 408.6 | 412.4 | 416.2 | 420.0 | 423.8 |
| Open Circuit Voltage: Voc [V] | 46.48 | 46.74 | 47.01 | 47.28 | 47.47 |
| Short Circuit Current: Isc [A] | 11.04 | 11.08 | 11.12 | 11.16 | 11.20 |
| Voltage at Maximum Power: Vmp [V] | 38.45 | 38.67 | 38.90 | 39.12 | 39.31 |
| Current at Maximum Power: Imp [A] | 10.62 | 10.66 | 10.70 | 10.74 | 10.79 |

NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s

## Mechanical Parameters

| | |
|---|---|
| Cells | TPC |
| Cell Orientation | 144[6X24] |
| Dimension | 2278±2 X1134±2X30mm |
| Weight | 32.7kg |
| Front Glass | 2.0mm high transmittance, AR coated tempered glass |
| Rear Glass | 2.0mm high transmittance, coated tempered glass |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, -200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 36pcs per pallet, 720pcs per 40'HC |

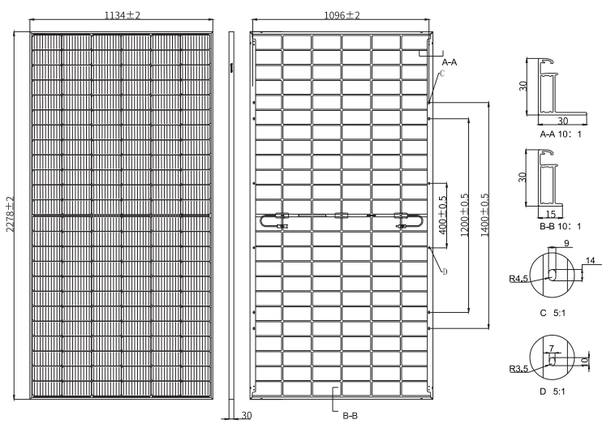
## Electrical characteristics with different rear side power gain

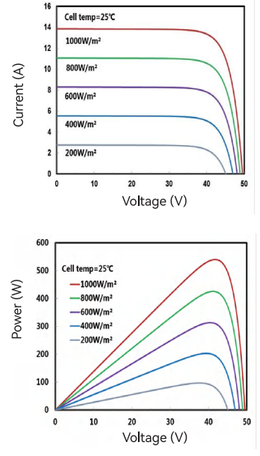
| | | | | | | |
|---|---|---|---|---|---|---|
| 5% | Maximum Power: Pmax[W] | 567.0 | 572.3 | 577.5 | 582.8 | 588.0 |
| | Module Efficiency: η [%] | 21.9 | 22.2 | 22.4 | 22.6 | 22.8 |
| 15% | Maximum Power: Pmax[W] | 621.0 | 626.8 | 632.5 | 638.3 | 644.0 |
| | Module Efficiency: η [%] | 24.0 | 24.3 | 24.5 | 24.7 | 24.9 |
| 25% | Maximum Power: Pmax[W] | 675.0 | 681.3 | 687.5 | 693.8 | 700.0 |
| | Module Efficiency: η [%] | 26.1 | 26.4 | 26.6 | 26.9 | 27.1 |

## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 30A |
| Power Output Tolerance | 0~+5W |
| Maximum Bifaciality | 70±5% |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMPF-60HS590-610W

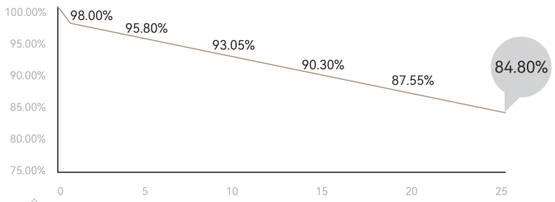
P-type Half-cell Monofacial Module (60)

## PRODUCT FEATURES

- High Power Output Low LCOE
- Maximum Power 610W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**2%**, **0.55%** power degradation per year from 2 to 25 years




12 12-year Warranty for Materials

25 25-year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

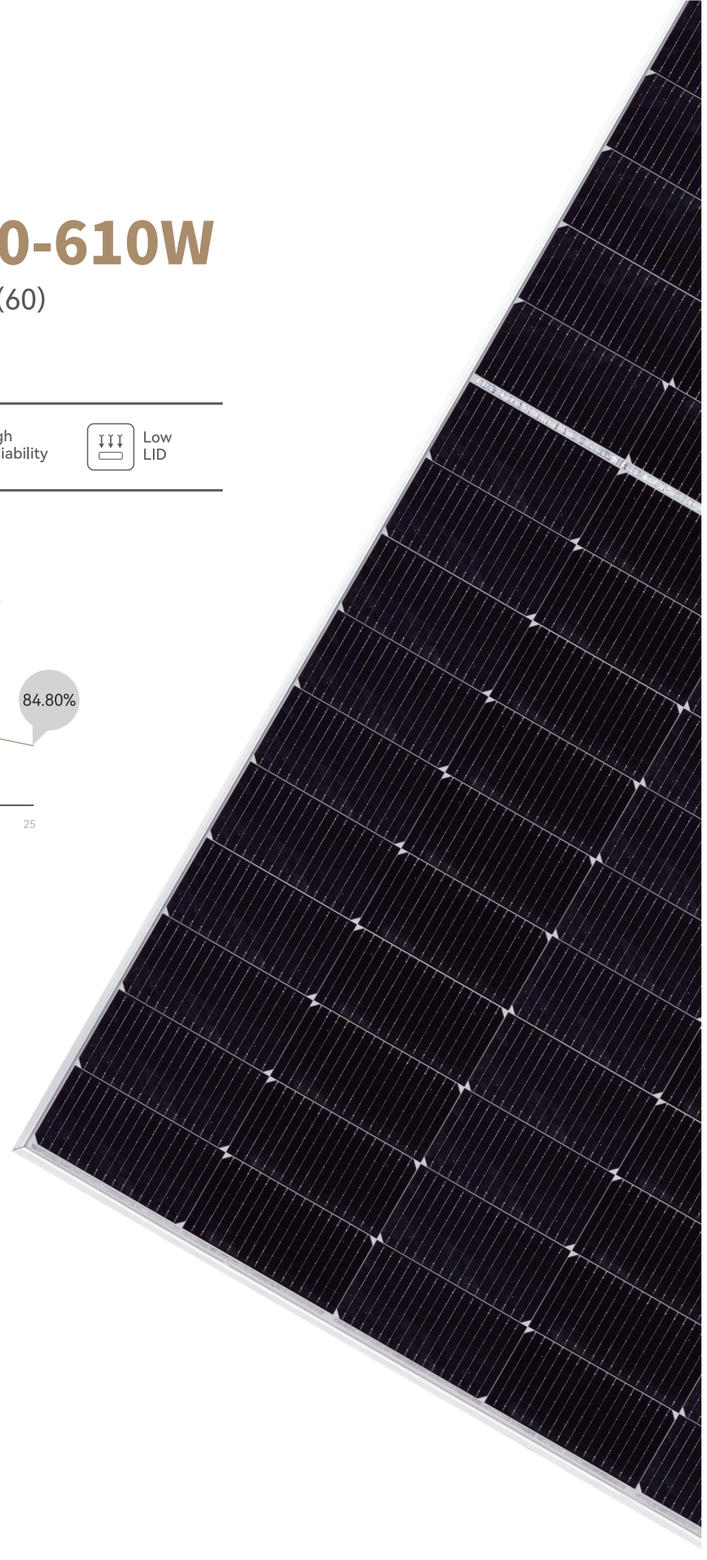
ISO9001: 2015/Quality Management System

ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Rear



## Electrical Characteristics (STC)

| Module Type: TWMPF-60HSXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 590 | 595 | 600 | 605 | 610 |
| Open Circuit Voltage: Voc [V] | 41.05 | 41.25 | 41.45 | 41.65 | 41.85 |
| Short Circuit Current: Isc [A] | 18.45 | 18.50 | 18.55 | 18.61 | 18.66 |
| Voltage at Maximum Power: Vmp [V] | 33.96 | 34.16 | 34.36 | 34.56 | 34.76 |
| Current at Maximum Power: Imp [A] | 17.37 | 17.41 | 17.46 | 17.50 | 17.55 |
| Module Efficiency: η [%] | 20.8 | 21.0 | 21.2 | 21.4 | 21.6 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 446.4 | 450.2 | 454.0 | 457.7 | 461.5 |
| Open Circuit Voltage: Voc [V] | 38.67 | 38.86 | 39.05 | 39.24 | 39.43 |
| Short Circuit Current: Isc [A] | 14.87 | 14.92 | 14.96 | 15.00 | 15.04 |
| Voltage at Maximum Power: Vmp [V] | 31.69 | 31.88 | 32.06 | 32.25 | 32.43 |
| Current at Maximum Power: Imp [A] | 14.09 | 14.12 | 14.16 | 14.19 | 14.23 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TPC |
| Cell Orientation | 120[6X20] |
| Dimension | 2172±2 X1303±2X35mm |
| Weight | 31kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | White |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, -200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 31pcs per pallet, 558pcs per 40'HC |

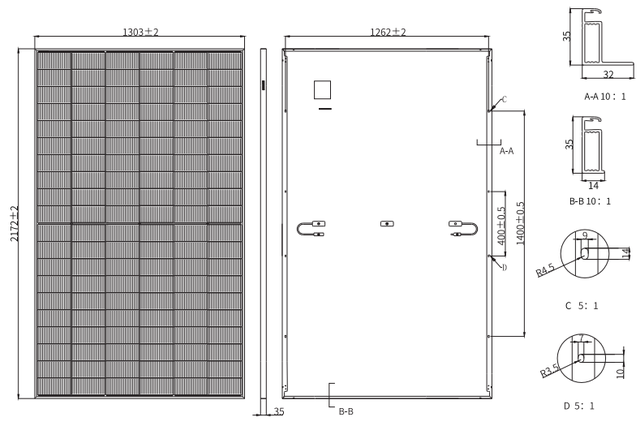
## Operating Parameters

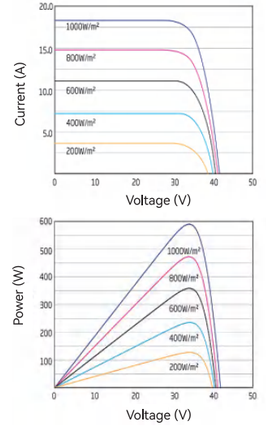
| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 30A |
| Power Output Tolerance | 0~+5W |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.34%/℃ |
| Temperature Coefficient (Voc) | -0.27%/℃ |
| Temperature Coefficient (Isc) | +0.045%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMPF-60HD585-605W

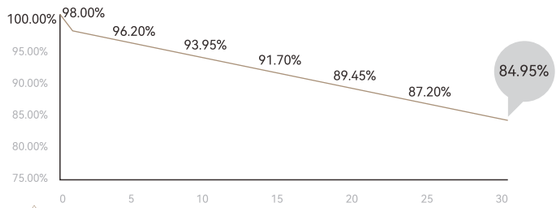
P-type Half-cell Bifacial Module (60)

## PRODUCT FEATURES

- High Power Output, Low LCOE
- Maximum Power 605W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**2%**, **0.45%** power degradation per year from 2 to 30 years




12 12-year Warranty for Materials

30 30-year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

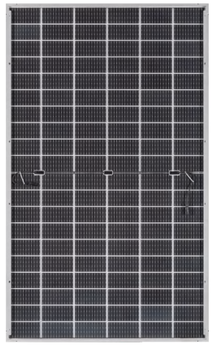
ISO9001: 2015/Quality Management System

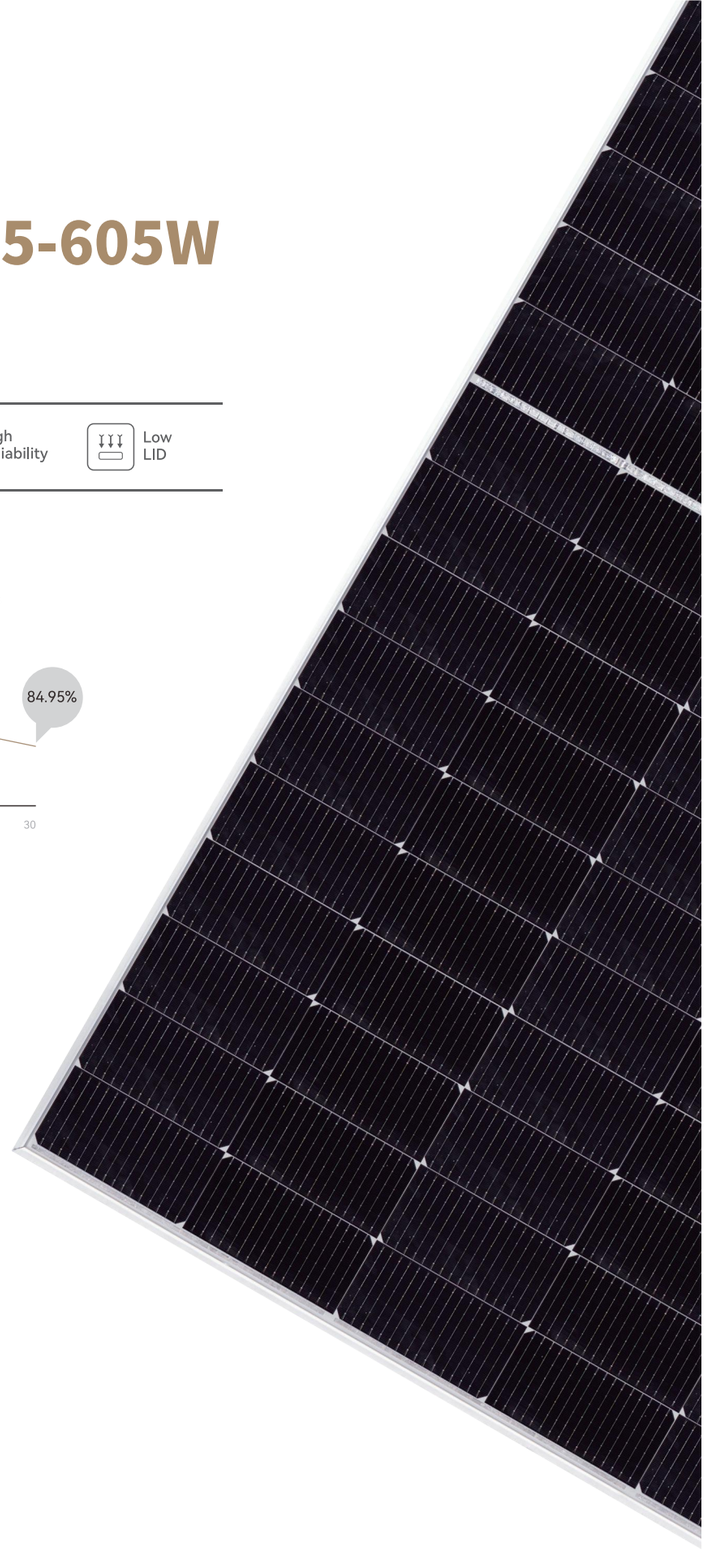
ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Rear





## Electrical Characteristics (STC)

| Module Type: TWMPF-60HDXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 585 | 590 | 595 | 600 | 605 |
| Open Circuit Voltage: Voc [V] | 41.04 | 41.24 | 41.44 | 41.64 | 41.84 |
| Short Circuit Current: Isc [A] | 18.30 | 18.36 | 18.41 | 18.46 | 18.52 |
| Voltage at Maximum Power: Vmp [V] | 33.95 | 34.15 | 34.35 | 34.55 | 34.75 |
| Current at Maximum Power: Imp [A] | 17.23 | 17.28 | 17.32 | 17.37 | 17.41 |
| Module Efficiency: η [%] | 20.7 | 20.8 | 21.0 | 21.2 | 21.4 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.34%/℃ |
| Temperature Coefficient (Voc) | -0.28%/℃ |
| Temperature Coefficient (Isc) | 0.05%/℃ |
| NMOT | 45±2℃ |

## Electrical Characteristics (NMOT)

| Maximum Power: Pmax [W] | 442.6 | 446.4 | 450.2 | 454.0 | 457.7 |
|---|---|---|---|---|---|
| Open Circuit Voltage: Voc [V] | 38.66 | 38.84 | 39.03 | 39.22 | 39.41 |
| Short Circuit Current: Isc [A] | 14.76 | 14.80 | 14.84 | 14.88 | 14.93 |
| Voltage at Maximum Power: Vmp [V] | 31.67 | 31.86 | 32.05 | 32.23 | 32.42 |
| Current at Maximum Power: Imp [A] | 13.97 | 14.01 | 14.05 | 14.09 | 14.12 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TPC |
| Cell Orientation | 120[6X20] |
| Dimension | 2172±2 X1303±2X35mm |
| Weight | 34.8kg |
| Front Glass | 2.0mm high transmittance, AR coated tempered glass |
| Rear Glass | 2.0mm high transmittance, coated tempered glass |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, -200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 31pcs per pallet, 558pcs per 40'HC |

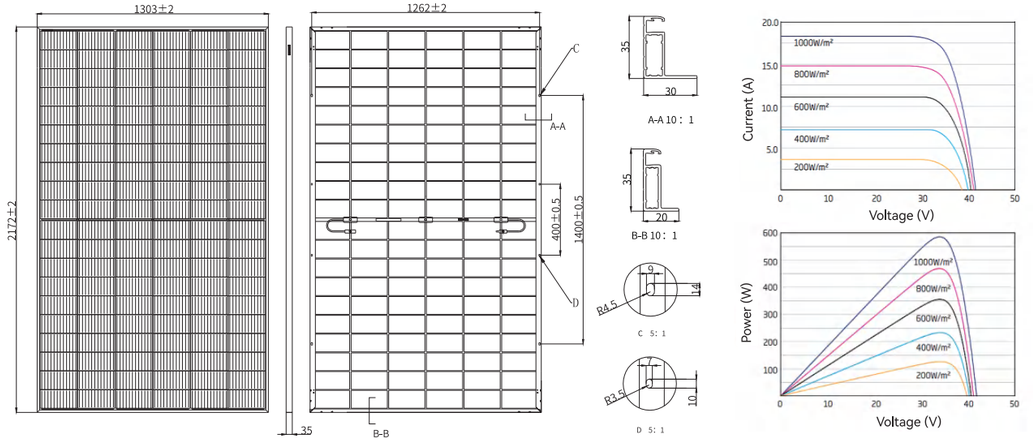
## Electrical characteristics with different rear side power gain

| | | | | | | |
|---|---|---|---|---|---|---|
| 5% | Maximum Power: Pmax[W] | 614.3 | 619.5 | 624.8 | 630 | 635.3 |
| | Module Efficiency: η [%] | 21.7 | 21.9 | 22.1 | 22.3 | 22.4 |
| 15% | Maximum Power: Pmax[W] | 672.8 | 678.5 | 684.3 | 690.0 | 695.8 |
| | Module Efficiency: η [%] | 23.8 | 24.0 | 24.2 | 24.4 | 24.6 |
| 25% | Maximum Power: Pmax[W] | 731.3 | 737.5 | 743.8 | 750.0 | 756.3 |
| | Module Efficiency: η [%] | 25.8 | 26.1 | 26.3 | 26.5 | 26.7 |

## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 35A |
| Power Output Tolerance | 0~+5W |
| Maximum Bifaciality | 70±5% |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMPF-66HD650-670W

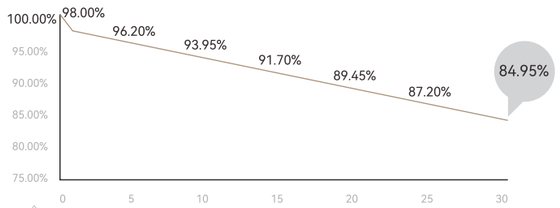
P-type Half-cell Bifacial Module (66)

## PRODUCT FEATURES

- High Power Output Low LCOE
- Maximum Power 670W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**2%**, **0.45%** power degradation per year from 2 to 30 years




12 12-year Warranty for Materials

30 30-year Warranty for Linear Power Output

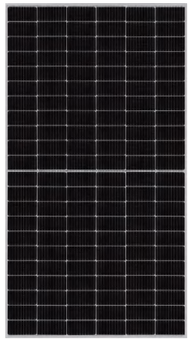
## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

ISO9001: 2015/Quality Management System

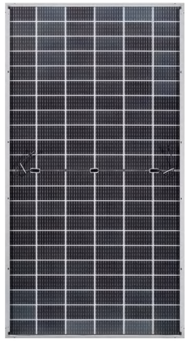
ISO14001: 2015/Environment Management System

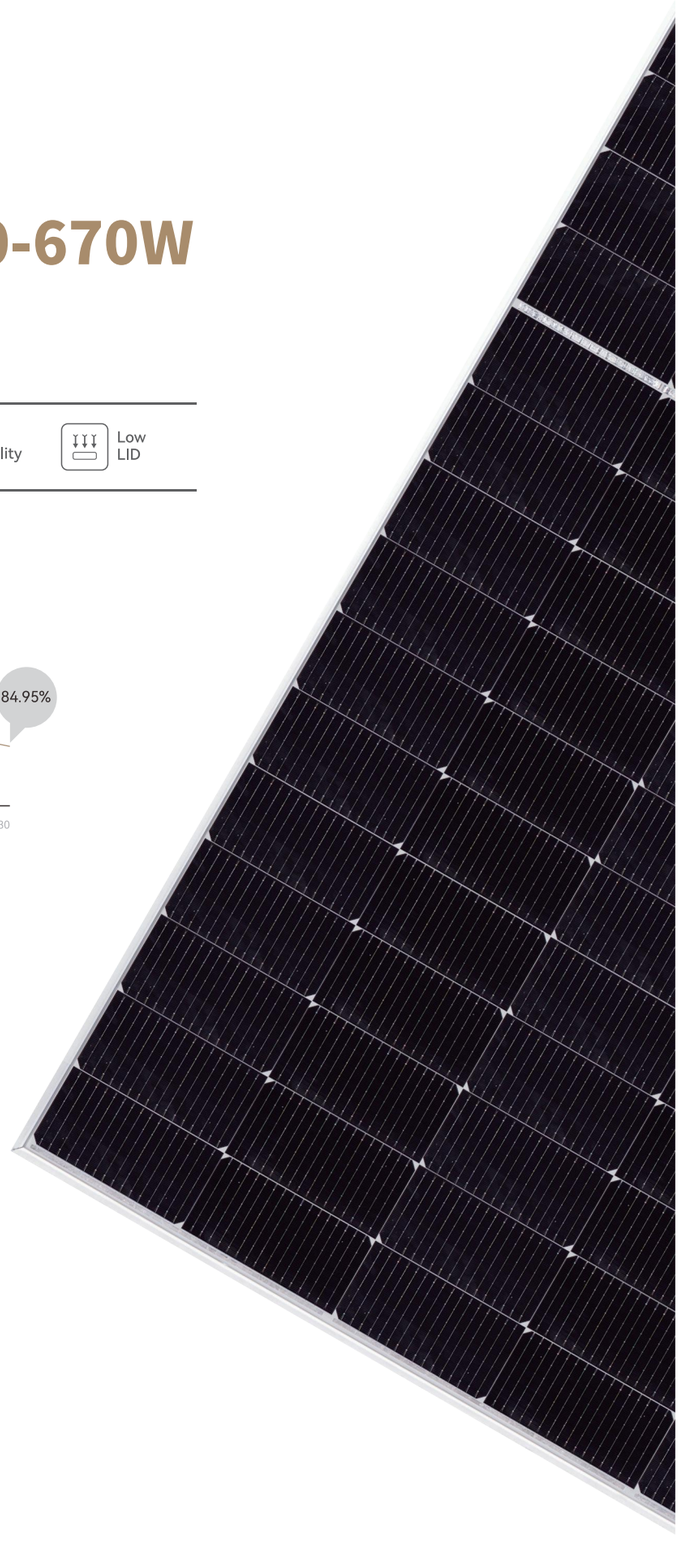
ISO45001: 2018/Occupational Health and Safety Management System

Front



Rear





## Electrical Characteristics (STC)

| Module Type: TWMPF-66HDXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 650 | 655 | 660 | 665 | 670 |
| Open Circuit Voltage: Voc [V] | 45.40 | 45.60 | 45.80 | 46.00 | 46.20 |
| Short Circuit Current: Isc [A] | 18.21 | 18.26 | 18.31 | 18.36 | 18.41 |
| Voltage at Maximum Power: Vmp [V] | 37.60 | 37.80 | 38.00 | 38.20 | 38.40 |
| Current at Maximum Power: Imp [A] | 17.29 | 17.33 | 17.37 | 17.41 | 17.45 |
| Module Efficiency: η [%] | 20.9 | 21.1 | 21.2 | 21.4 | 21.6 |

STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3%

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.34%/℃ |
| Temperature Coefficient (Voc) | -0.28%/℃ |
| Temperature Coefficient (Isc) | 0.05%/℃ |
| NMOT | 45±2℃ |

## Electrical Characteristics (NMOT)

| Maximum Power: Pmax [W] | 491.8 | 495.6 | 499.4 | 503.1 | 506.9 |
|---|---|---|---|---|---|
| Open Circuit Voltage: Voc [V] | 42.77 | 42.96 | 43.14 | 43.33 | 43.52 |
| Short Circuit Current: Isc [A] | 14.68 | 14.72 | 14.76 | 14.80 | 14.84 |
| Voltage at Maximum Power: Vmp [V] | 35.08 | 35.26 | 35.45 | 35.64 | 35.82 |
| Current at Maximum Power: Imp [A] | 14.02 | 14.05 | 14.09 | 14.12 | 14.15 |

NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s

## Mechanical Parameters

| | |
|---|---|
| Cells | TPC |
| Cell Orientation | 132[6X22] |
| Dimension | 2384±2 X1303±2X35mm |
| Weight | 38.7kg |
| Front Glass | 2.0mm high transmittance, AR coated tempered glass |
| Rear Glass | 2.0mm high transmittance, coated tempered glass |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, -200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 31pcs per pallet, 558pcs per 40'HC |

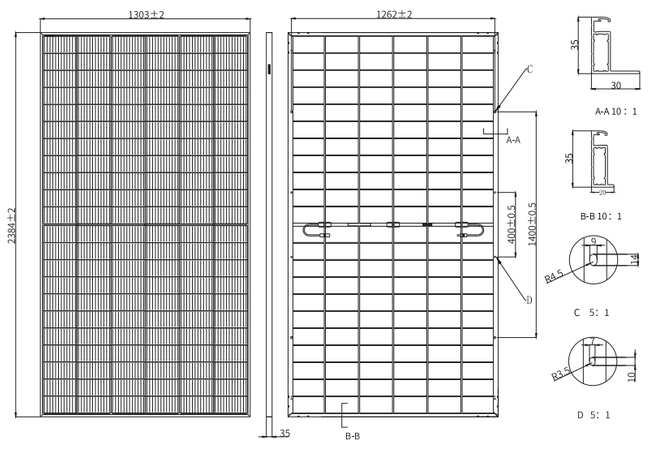
## Electrical characteristics with different rear side power gain

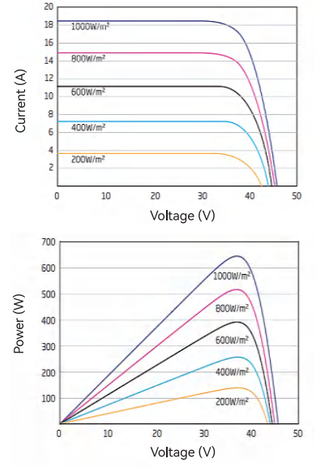
| | | | | | | |
|---|---|---|---|---|---|---|
| 5% | Maximum Power: Pmax[W] | 682.5 | 687.8 | 693.0 | 698.3 | 703.5 |
| | Module Efficiency: η [%] | 22.0 | 22.1 | 22.3 | 22.5 | 22.6 |
| 15% | Maximum Power: Pmax[W] | 747.5 | 753.3 | 759.0 | 764.8 | 770.5 |
| | Module Efficiency: η [%] | 24.1 | 24.2 | 24.4 | 24.6 | 24.8 |
| 25% | Maximum Power: Pmax[W] | 812.5 | 818.8 | 825.0 | 831.3 | 837.5 |
| | Module Efficiency: η [%] | 26.2 | 26.4 | 26.6 | 26.8 | 27.0 |

## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 35A |
| Power Output Tolerance | 0~+5W |
| Maximum Bifaciality | 70±5% |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMND-54HS415-435W

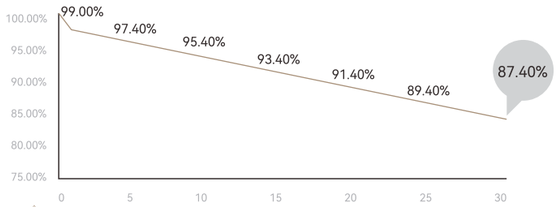
N-type Half-cell Monofacial Module (54)

## PRODUCT FEATURES

- High Power Output Low LCOE
- Maximum Power 435W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**1%**, **0.4%** power degradation per year from 2 to 30 years




12 12–year Warranty for Materials

30 30–year Warranty for Linear Power Output

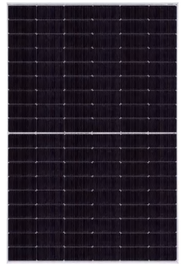
## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

ISO9001: 2015/Quality Management System

ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front



Rear

## Electrical Characteristics (STC)

| Module Type: TWMND-54HSXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 415 | 420 | 425 | 430 | 435 |
| Open Circuit Voltage: Voc [V] | 37.85 | 38.00 | 38.15 | 38.30 | 38.45 |
| Short Circuit Current: Isc [A] | 14.22 | 14.27 | 14.32 | 14.37 | 14.42 |
| Voltage at Maximum Power: Vmp [V] | 31.25 | 31.41 | 31.57 | 31.73 | 31.89 |
| Current at Maximum Power: Imp [A] | 13.28 | 13.37 | 13.46 | 13.55 | 13.64 |
| Module Efficiency: η [%] | 21.3 | 21.5 | 21.8 | 22.0 | 22.3 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 312.0 | 316.0 | 320.0 | 324.0 | 328.0 |
| Open Circuit Voltage: Voc [V] | 35.98 | 36.14 | 36.30 | 36.46 | 36.62 |
| Short Circuit Current: Isc [A] | 11.51 | 11.57 | 11.63 | 11.69 | 11.75 |
| Voltage at Maximum Power: Vmp [V] | 29.18 | 29.34 | 29.50 | 29.66 | 29.82 |
| Current at Maximum Power: Imp [A] | 10.69 | 10.77 | 10.85 | 10.92 | 11.00 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TNC |
| Cell Orientation | 108[6X18] |
| Dimension | 1722±2 X1134±2X30mm |
| Weight | 20.5kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | White |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, –200mm or ±1200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 36pcs per pallet, 936pcs per 40'HC |

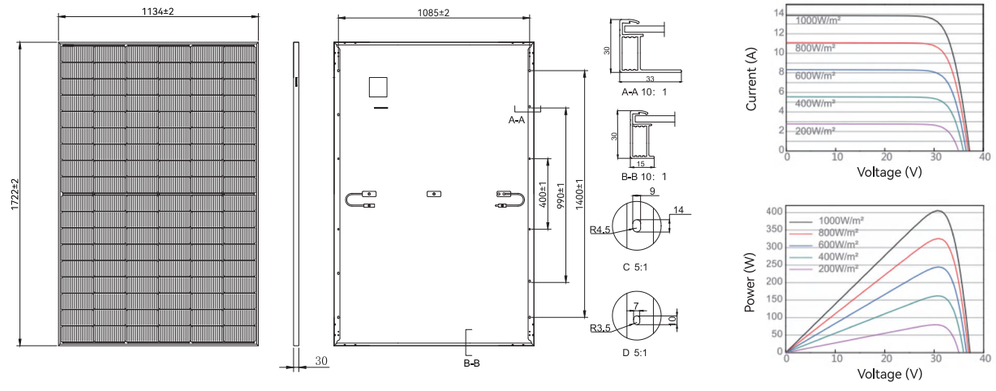
## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 25A |
| Power Output Tolerance | 0~+5W |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.30%/℃ |
| Temperature Coefficient (Voc) | -0.25%/℃ |
| Temperature Coefficient (Isc) | +0.046%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMND-54HS415-435W

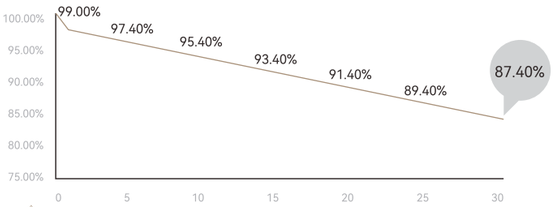
N-type Half-cell Monofacial Black Frame Module (54)

## PRODUCT FEATURES

- High Power Output Low LCOE
- Maximum Power 435W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**1%**, **0.4%** power degradation per year from 2 to 30 years




12 12–year Warranty for Materials

30 30–year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

ISO9001: 2015/Quality Management System

ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Rear

## Electrical Characteristics (STC)

| Module Type: TWMND-54HSXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 415 | 420 | 425 | 430 | 435 |
| Open Circuit Voltage: Voc [V] | 37.85 | 38.00 | 38.15 | 38.30 | 38.45 |
| Short Circuit Current: Isc [A] | 14.22 | 14.27 | 14.32 | 14.37 | 14.42 |
| Voltage at Maximum Power: Vmp [V] | 31.25 | 31.41 | 31.57 | 31.73 | 31.89 |
| Current at Maximum Power: Imp [A] | 13.28 | 13.37 | 13.46 | 13.55 | 13.64 |
| Module Efficiency: η [%] | 21.3 | 21.5 | 21.8 | 22.0 | 22.3 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 312.0 | 316.0 | 320.0 | 324.0 | 328.0 |
| Open Circuit Voltage: Voc [V] | 35.98 | 36.14 | 36.30 | 36.46 | 36.62 |
| Short Circuit Current: Isc [A] | 11.51 | 11.57 | 11.63 | 11.69 | 11.75 |
| Voltage at Maximum Power: Vmp [V] | 29.18 | 29.34 | 29.50 | 29.66 | 29.82 |
| Current at Maximum Power: Imp [A] | 10.69 | 10.77 | 10.85 | 10.92 | 11.00 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TNC |
| Cell Orientation | 108[6X18] |
| Dimension | 1722±2 X1134±2X30mm |
| Weight | 20.5kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | White |
| Frame | Anodized aluminum alloy black frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, –200mm or ±1200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 36pcs per pallet, 936pcs per 40'HC |

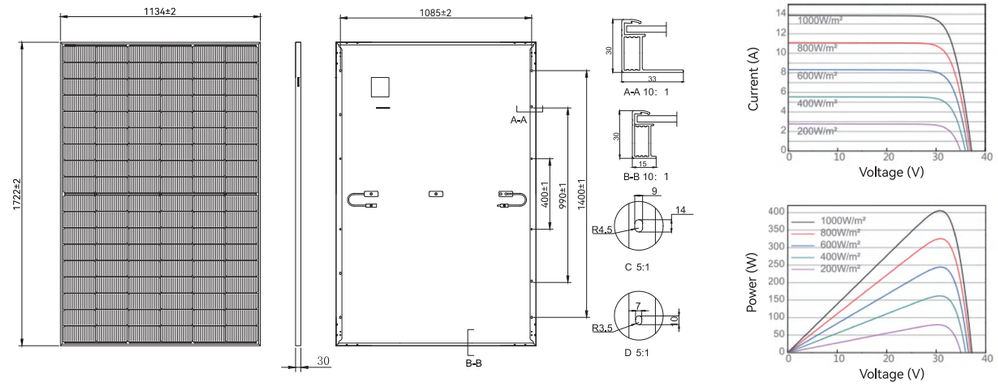
## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 25A |
| Power Output Tolerance | 0~+5W |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.30%/℃ |
| Temperature Coefficient (Voc) | -0.25%/℃ |
| Temperature Coefficient (Isc) | +0.046%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMND-54HB410-430W

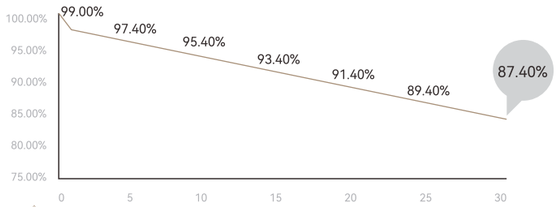
N-type Half-cell Monofacial Full-black Module (54)

## PRODUCT FEATURES

- High Power Output Low LCOE
- Maximum Power 430W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**1%**, **0.4%** power degradation per year from 2 to 30 years




12 12–year Warranty for Materials

30 30–year Warranty for Linear Power Output

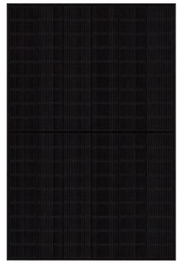
## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

ISO9001: 2015/Quality Management System

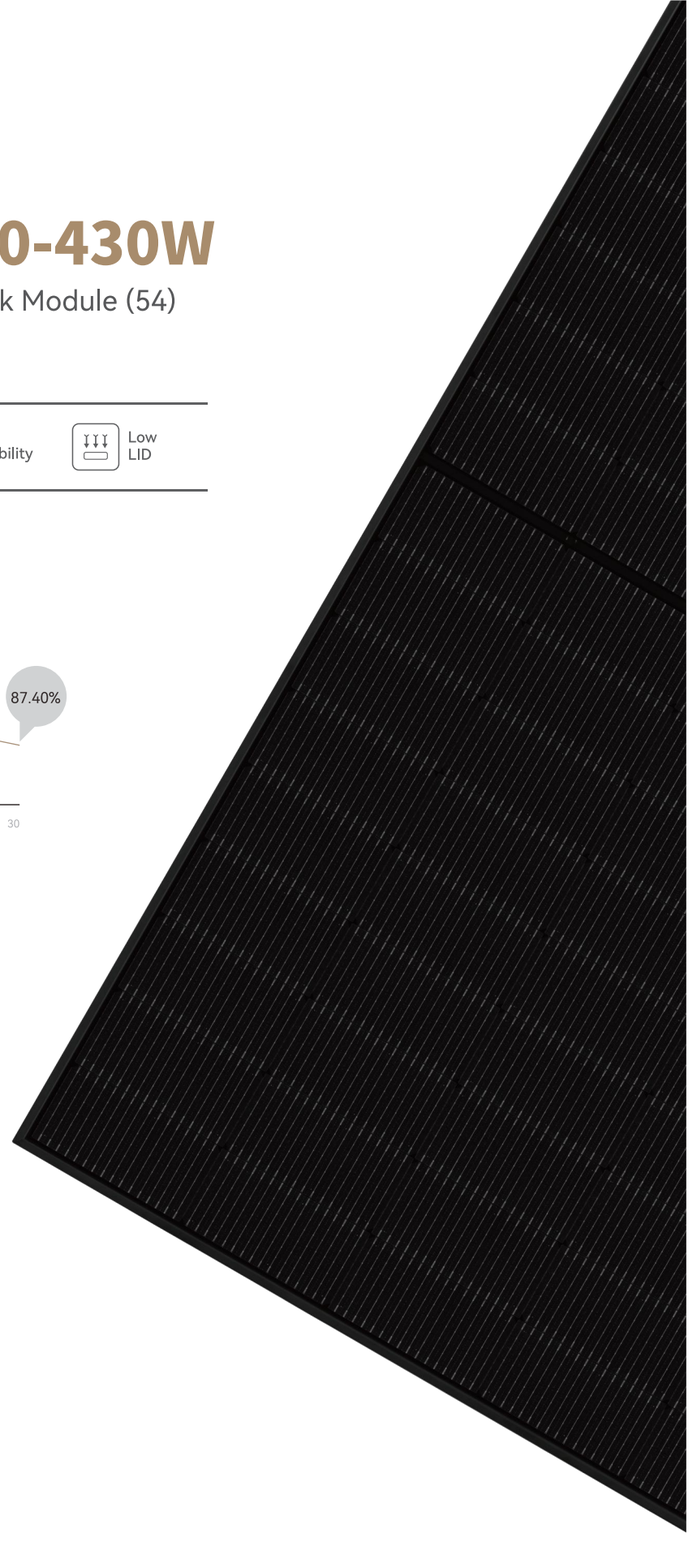
ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front



Rear



## Electrical Characteristics (STC)

| Module Type: TWMND-54HBXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 410 | 415 | 420 | 425 | 430 |
| Open Circuit Voltage: Voc [V] | 37.85 | 38.01 | 38.17 | 38.33 | 38.49 |
| Short Circuit Current: Isc [A] | 14.05 | 14.10 | 14.15 | 14.20 | 14.25 |
| Voltage at Maximum Power: Vmp [V] | 31.20 | 31.36 | 31.52 | 31.68 | 31.84 |
| Current at Maximum Power: Imp [A] | 13.14 | 13.23 | 13.32 | 13.42 | 13.51 |
| Module Efficiency: η [%] | 21.0 | 21.3 | 21.5 | 21.8 | 22.0 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 308.0 | 312.0 | 316.0 | 320.0 | 324.0 |
| Open Circuit Voltage: Voc [V] | 35.92 | 36.08 | 36.24 | 36.40 | 36.56 |
| Short Circuit Current: Isc [A] | 11.25 | 11.31 | 11.37 | 11.43 | 11.49 |
| Voltage at Maximum Power: Vmp [V] | 29.02 | 29.18 | 29.34 | 29.50 | 29.66 |
| Current at Maximum Power: Imp [A] | 10.61 | 10.69 | 10.77 | 10.85 | 10.92 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TNC |
| Cell Orientation | 108[6X18] |
| Dimension | 1722±2 X1134±2X30mm |
| Weight | 20.5kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | Black inside and white outside |
| Frame | Anodized aluminum alloy black frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, −200mm or ±1200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 36pcs per pallet, 936pcs per 40'HC |

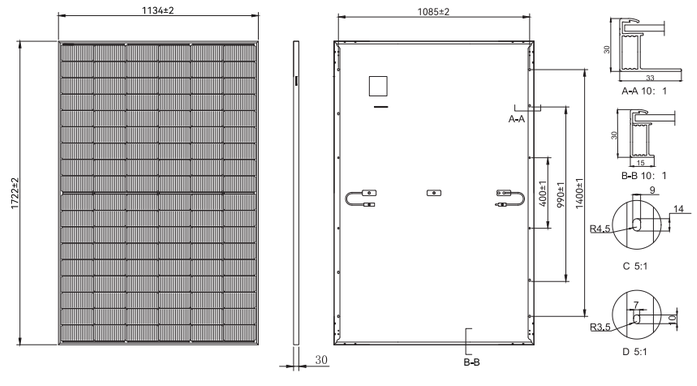
## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 25A |
| Power Output Tolerance | 0~+5W |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | −0.30%/℃ |
| Temperature Coefficient (Voc) | −0.25%/℃ |
| Temperature Coefficient (Isc) | +0.046%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMND-72HS560-580W

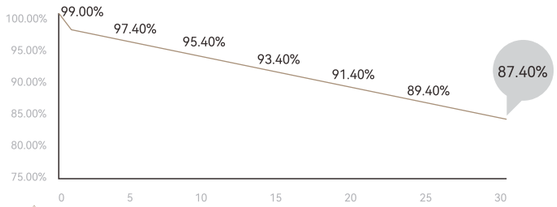
N-type Half-cell Monofacial Module (72)

## PRODUCT FEATURES

- High Power Output, Low LCOE
- Maximum Power 580W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**1%**, **0.4%** power degradation per year from 2 to 30 years




12 12–year Warranty for Materials

30 30–year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

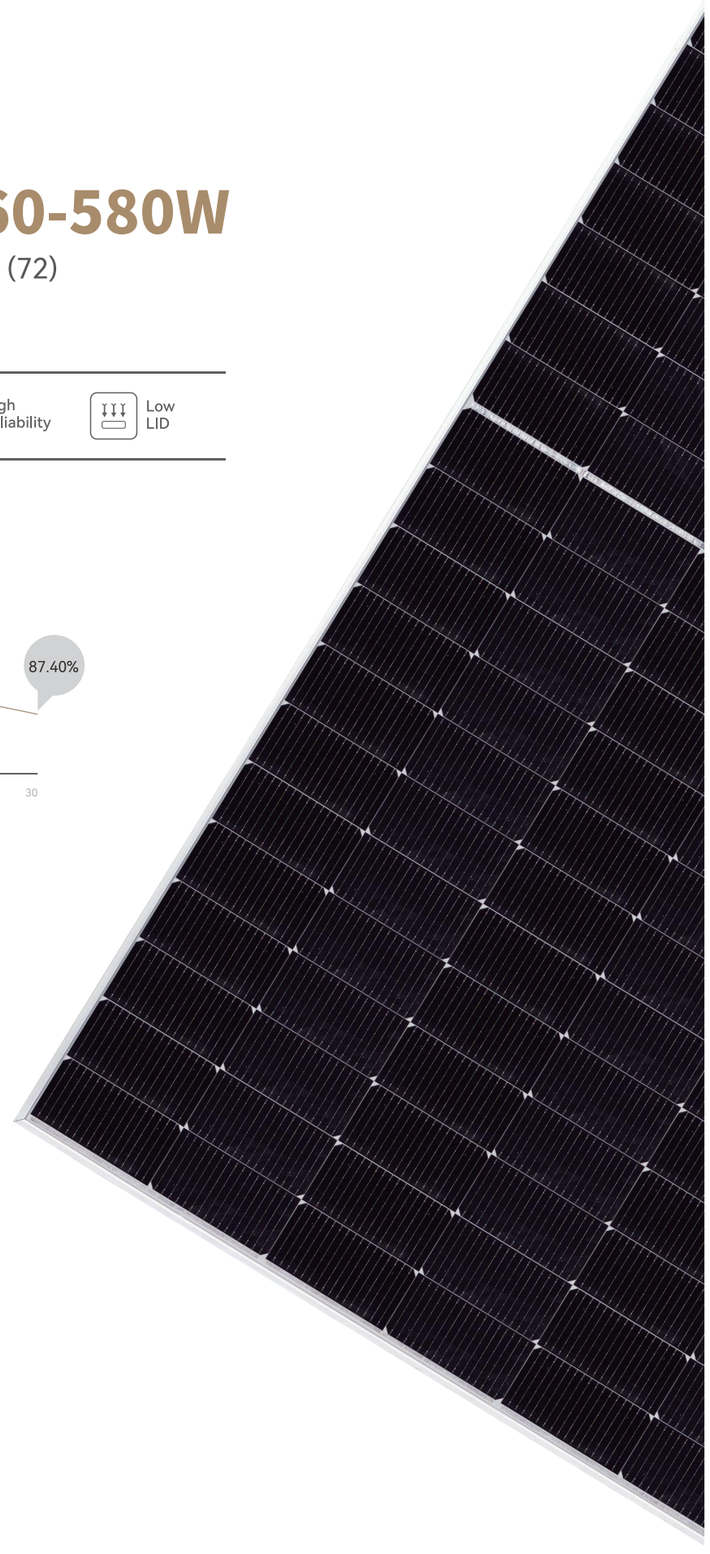
ISO9001: 2015/Quality Management System

ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Side



## Electrical Characteristics (STC)

| Module Type: TWMND-72HSXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 560 | 565 | 570 | 575 | 580 |
| Open Circuit Voltage: Voc [V] | 52.00 | 52.20 | 52.40 | 52.60 | 52.80 |
| Short Circuit Current: Isc [A] | 13.34 | 13.38 | 13.42 | 13.46 | 13.50 |
| Voltage at Maximum Power: Vmp [V] | 44.23 | 44.43 | 44.63 | 44.83 | 45.03 |
| Current at Maximum Power: Imp [A] | 12.66 | 12.72 | 12.77 | 12.83 | 12.88 |
| Module Efficiency: η [%] | 21.7 | 21.9 | 22.1 | 22.3 | 22.5 |
| STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3% | | | | | |

## Electrical Characteristics (NMOT)

| | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 423.8 | 427.6 | 431.4 | 435.2 | 438.9 |
| Open Circuit Voltage: Voc [V] | 49.35 | 49.57 | 49.80 | 50.03 | 50.22 |
| Short Circuit Current: Isc [A] | 10.51 | 10.54 | 10.56 | 10.59 | 10.63 |
| Voltage at Maximum Power: Vmp [V] | 42.32 | 42.60 | 42.87 | 43.15 | 43.34 |
| Current at Maximum Power: Imp [A] | 10.01 | 10.03 | 10.06 | 10.08 | 10.12 |
| NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s | | | | | |

## Mechanical Parameters

| | |
|---|---|
| Cells | TNC |
| Cell Orientation | 144[6X24] |
| Dimension | 2278±2 X1134±2X35mm |
| Weight | 27.8kg |
| Front Glass | 3.2mm high transmittance, AR coated tempered glass |
| Backsheet | White |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, -200mm or ±1400mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 31pcs per pallet, 620pcs per 40'HC |

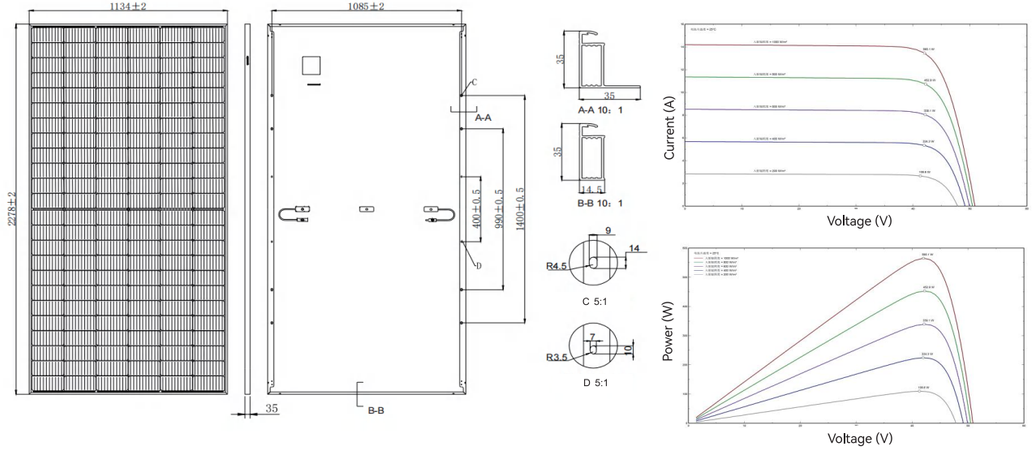
## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 25A |
| Power Output Tolerance | 0~+5W |

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.30%/℃ |
| Temperature Coefficient (Voc) | -0.25%/℃ |
| Temperature Coefficient (Isc) | +0.046%/℃ |
| NMOT | 45±2℃ |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# TWMND-72HD555-575W

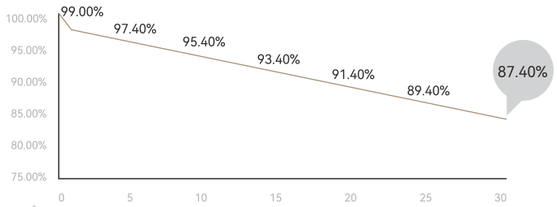
N-type Half-cell Bifacial Module (72)

## PRODUCT FEATURES

- High Power Output Low LCOE
- Maximum Power 575W+
- High Reliability
- Low LID

## POWER WARRANTY

1st year <**1%**, **0.4%** power degradation per year from 2 to 30 years




12 12–year Warranty for Materials

30 30–year Warranty for Linear Power Output

## MANAGEMENT SYSTEM AND PRODUCT CERTIFICATION

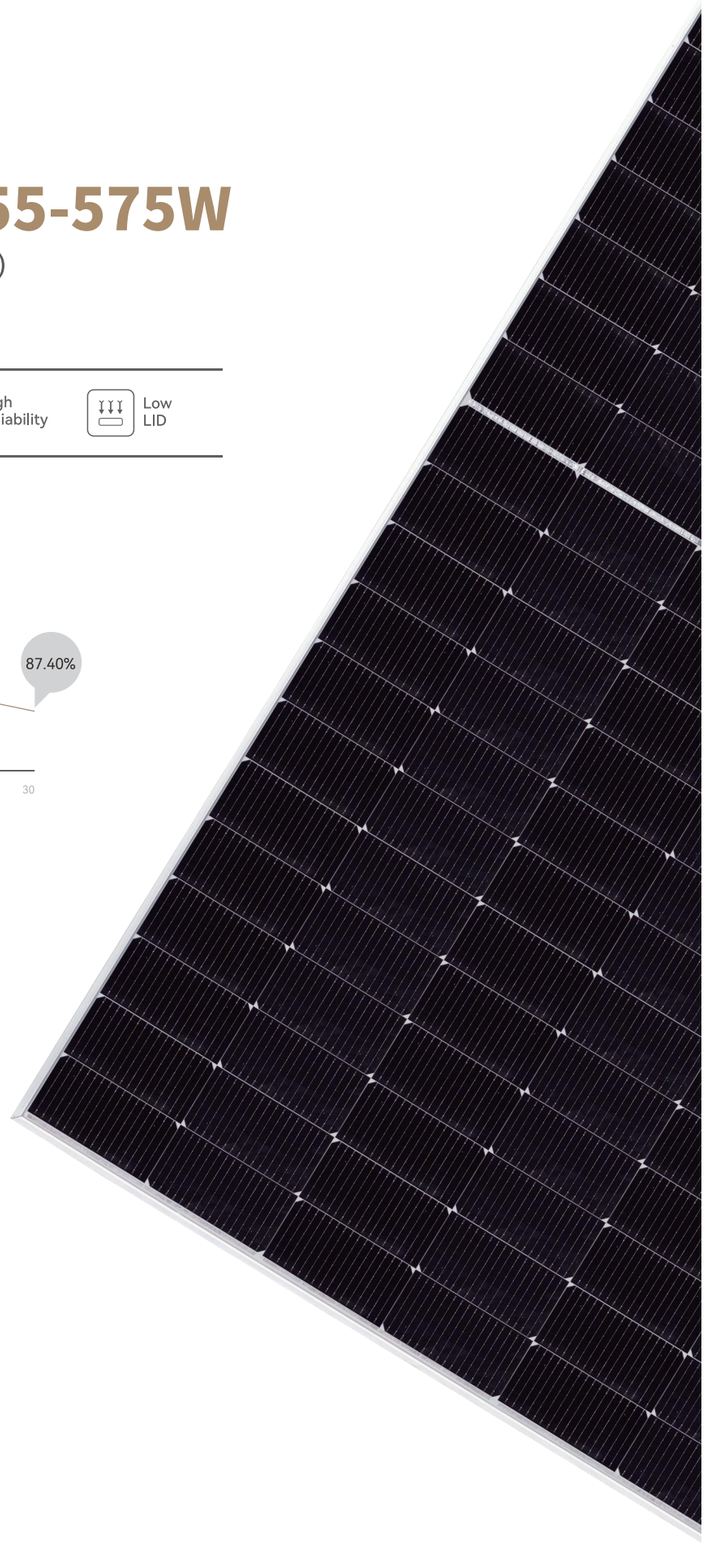
ISO9001: 2015/Quality Management System

ISO14001: 2015/Environment Management System

ISO45001: 2018/Occupational Health and Safety Management System

Front

Side



## Electrical Characteristics (STC)

| Module Type: TWMND-72HDXXX | | | | | |
|---|---|---|---|---|---|
| Maximum Power: Pmax [W] | 555 | 560 | 565 | 570 | 575 |
| Open Circuit Voltage: Voc [V] | 50.64 | 50.84 | 51.04 | 51.24 | 51.44 |
| Short Circuit Current: Isc [A] | 14.09 | 14.13 | 14.17 | 14.21 | 14.25 |
| Voltage at Maximum Power: Vmp [V] | 42.28 | 42.48 | 42.68 | 42.88 | 43.08 |
| Current at Maximum Power: Imp [A] | 13.13 | 13.18 | 13.24 | 13.29 | 13.35 |
| Module Efficiency: η [%] | 21.5 | 21.7 | 21.9 | 22.1 | 22.3 |

STC: Irradiance 1000W/m², Cell Temperature 25℃, Air Mass1.5, Measuring Tolerance: ±3%

## Temperature Ratings

| | |
|---|---|
| Temperature Coefficient (Pmax) | -0.30%/℃ |
| Temperature Coefficient (Voc) | -0.25%/℃ |
| Temperature Coefficient (Isc) | 0.046%/℃ |
| NMOT | 45±2℃ |

## Electrical Characteristics (NMOT)

| Maximum Power: Pmax [W] | 417.4 | 421.1 | 424.8 | 428.6 | 432.4 |
|---|---|---|---|---|---|
| Open Circuit Voltage: Voc [V] | 47.80 | 48.29 | 48.48 | 48.67 | 48.86 |
| Short Circuit Current: Isc [A] | 11.37 | 11.42 | 11.47 | 11.52 | 11.56 |
| Voltage at Maximum Power: Vmp [V] | 39.80 | 39.84 | 39.89 | 39.95 | 40.00 |
| Current at Maximum Power: Imp [A] | 10.49 | 10.56 | 10.63 | 10.70 | 10.78 |

NMOT: Irradiance 800W/m², Ambient Temperature 20℃, Air Mass1.5, Wind Speed 1m/s

## Mechanical Parameters

| | |
|---|---|
| Cells | TNC |
| Cell Orientation | 144[6X24] |
| Dimension | 2278±2 X1134±2X30mm |
| Weight | 32.7kg |
| Front Glass | 2.0mm high transmittance, AR coated tempered glass |
| Rear Glass | 2.0mm high transmittance, coated tempered glass |
| Frame | Anodized aluminum alloy frame |
| Junction Box | IP68, 3 diodes |
| Output Cable | 4.0mm² |
| Cable Length | +400mm, -200mm, length can be customized |
| Wind/Snow Load | 2400Pa/5400Pa |
| Packaging | 36pcs per pallet, 720pcs per 40'HC |

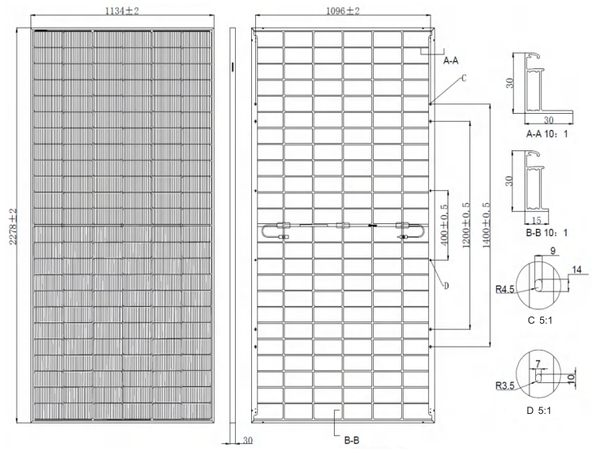
## Electrical characteristics with different rear side power gain

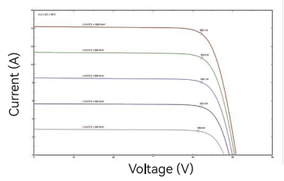
| | | | | | |
|---|---|---|---|---|---|
| 5% | Maximum Power: Pmax[W] | 582.8 | 588.0 | 593.3 | 598.5 | 603.8 |
| | Module Efficiency: η [%] | 22.6 | 22.8 | 23.0 | 23.2 | 23.4 |
| 15% | Maximum Power: Pmax[W] | 638.3 | 644.0 | 649.8 | 655.5 | 661.3 |
| | Module Efficiency: η [%] | 24.7 | 24.9 | 25.2 | 25.4 | 25.6 |
| 25% | Maximum Power: Pmax[W] | 693.8 | 700.0 | 706.3 | 712.5 | 718.8 |
| | Module Efficiency: η [%] | 26.9 | 27.1 | 27.3 | 27.6 | 27.8 |

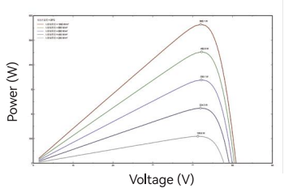
## Operating Parameters

| | |
|---|---|
| Operational Temperature | -40℃~+85℃ |
| Maximum System Voltage | 1500V DC |
| Maximum Series Fuse Rating | 30A |
| Power Output Tolerance | 0~+5W |
| Maximum Bifaciality | 80±5% |

## Drawings (Unit: mm)




With technological progress and product updates, there may be deviations between the technical parameters of Tongwei's module products and the technical parameters contained in this specification, and Tongwei Solar has the right to adjust the technical parameters at any time without notifying the customer, the final interpretation of the technical specification is vested in Tongwei Solar.

# GLOBAL PARTNERS

中国能建 ENERGY CHINA
中国建材
SUNGROW 阳光电源
POWER JINKO 晶科科技
CNE 正泰新能源
ECO DELTA
Libra ENERGY BALANCE IN POWER
JIAYANG
国家电投 SPIC
国家能源集团 CHN ENERGY
Blue Sun Group
CYBRID
kdisolar
boviet
REVOLT SOLAR
中国大唐集团公司 China Datang Corporation
中国三峡 China Three Gorges Corporation
SOLTEC
华能智链 HUANENG SMART SUPPLY CHAIN
RECOM
Mysolar
華潤电力 CR POWER
中国电建 POWERCHINA
华强集团 HUA QIANG GROUP
HYUNDAI ENERGY SOLUTIONS
3M 科技改善生活
中核汇能有限公司 CNNP Rich Energy Corporation Limited
湖南建投
OSW
CHNT 正泰新能源
BOE
KENO GROUP
DUALSUN
中航特玻 AVIC GLASS
人和光伏 RENHESOLAR
FGG 福莱特集团
斯威克 SVLOCK
Darbond
FIRST
ENGIE
enel