JHPVTECH
晶弘能源

EMPOWER YOUR SUPPLY CHAIN

Providing Completed PV Supply Chain Solution

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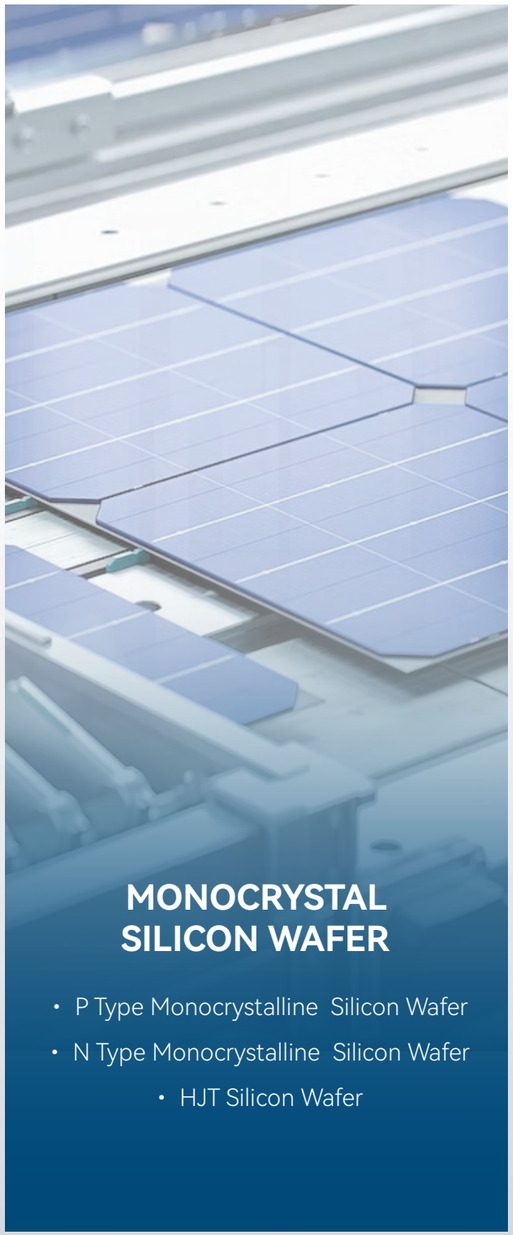
JHPV TECH

PROVIDING COMPLETED PV SUPPLY CHAIN SOLUTION

www.jhpvtech.com

CONTENT

MAIN BUSINESS



MONOCRYSTAL SILICON WAFER

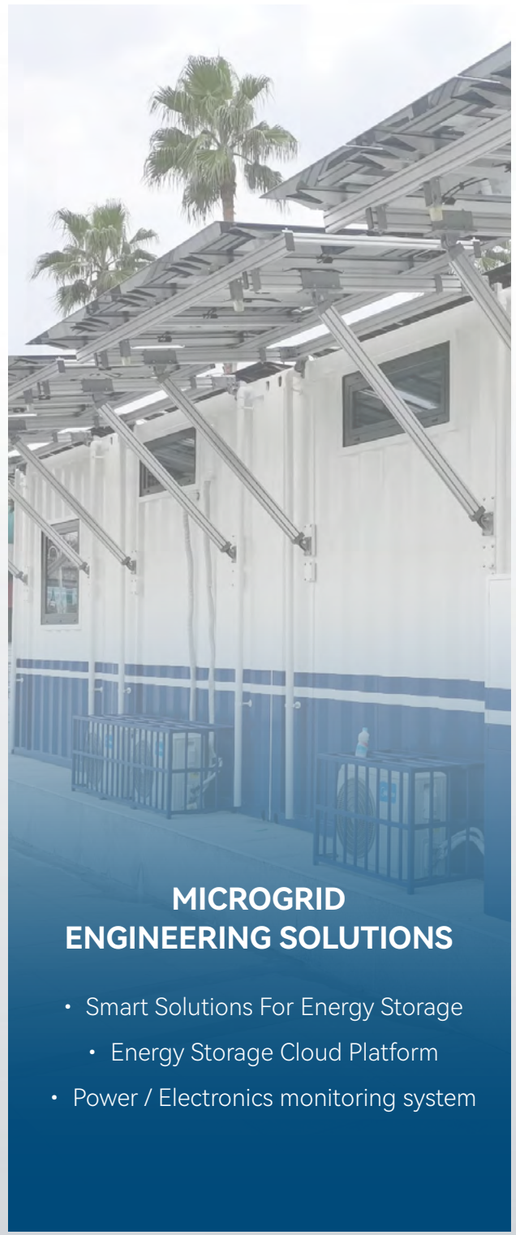
- P Type Monocrystalline Silicon Wafer
- N Type Monocrystalline Silicon Wafer
- HJT Silicon Wafer

SOLAR CELL SOLAR MODULE

- 158.75/166/182/210 P/N Type Solar cell
- High Efficiency Solar Modules
- 210 HJT Solar cells

SMART POWER STATION SOLUTIONS

- PV Power Station Developement And Construction
- Smart Energy System Solution
- Smart Distributed Energy Solutions



MICROGRID ENGINEERING SOLUTIONS

- Smart Solutions For Energy Storage
- Energy Storage Cloud Platform
- Power / Electronics monitoring system

BRAND HISTORY

2015

Ningbo Jinghong Energy Technology Co., Ltd. was established, Cell printing and production

2017

The Cell production capacity was 400MW, and the two-year export sales exceeded from $3 million to $10 million

2019

Established Indian branch SUNLONG cell printing

2022

Established Cutting silicon wafers company and module production base 1.5GW

2023

It established a European branch and a Singapore branch, engaged in Cell and silicon wafer sales

2024

Set sail for the future...

GLOBAL INDUSTRIAL CHAIN LAYOUT

Completed product supply Chain reduces cost and increases efficiency for customers

100 Million +
Wafer Capacity

500 MW
Oversea Solar Cells Capacity

500 MW
China Solar Cells Capacity

1.5 GW
Solar Module Capacity

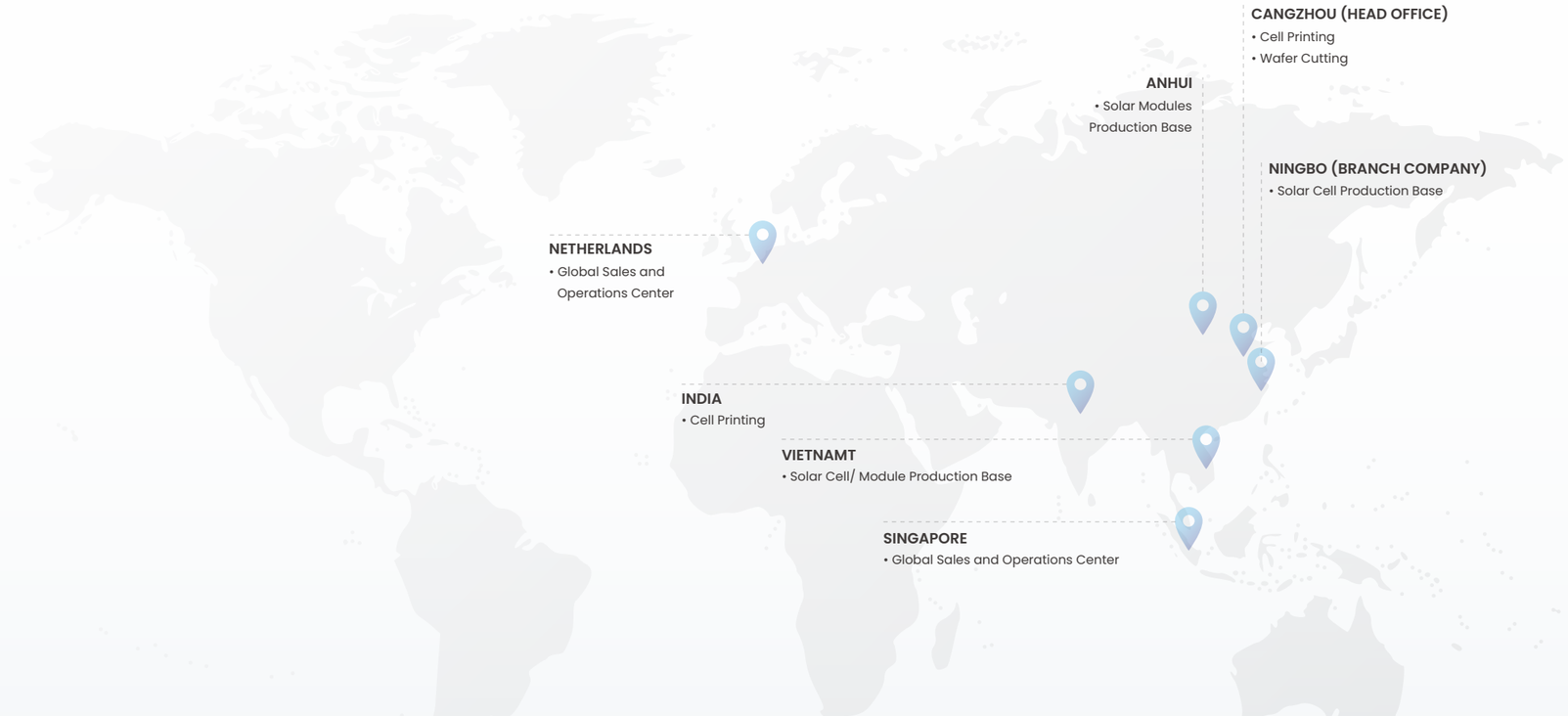
JHPV TECH

120+
R&D Egineers

70+
Global Footprints

3
Production Bases

300+
Company Employees



CERTIFICATION

MORE SECURE INSURANCE SERVICES

TUV Rheinland of North America, Inc. C US

TÜVRheinland® CERTIFIED

JHPV TECH

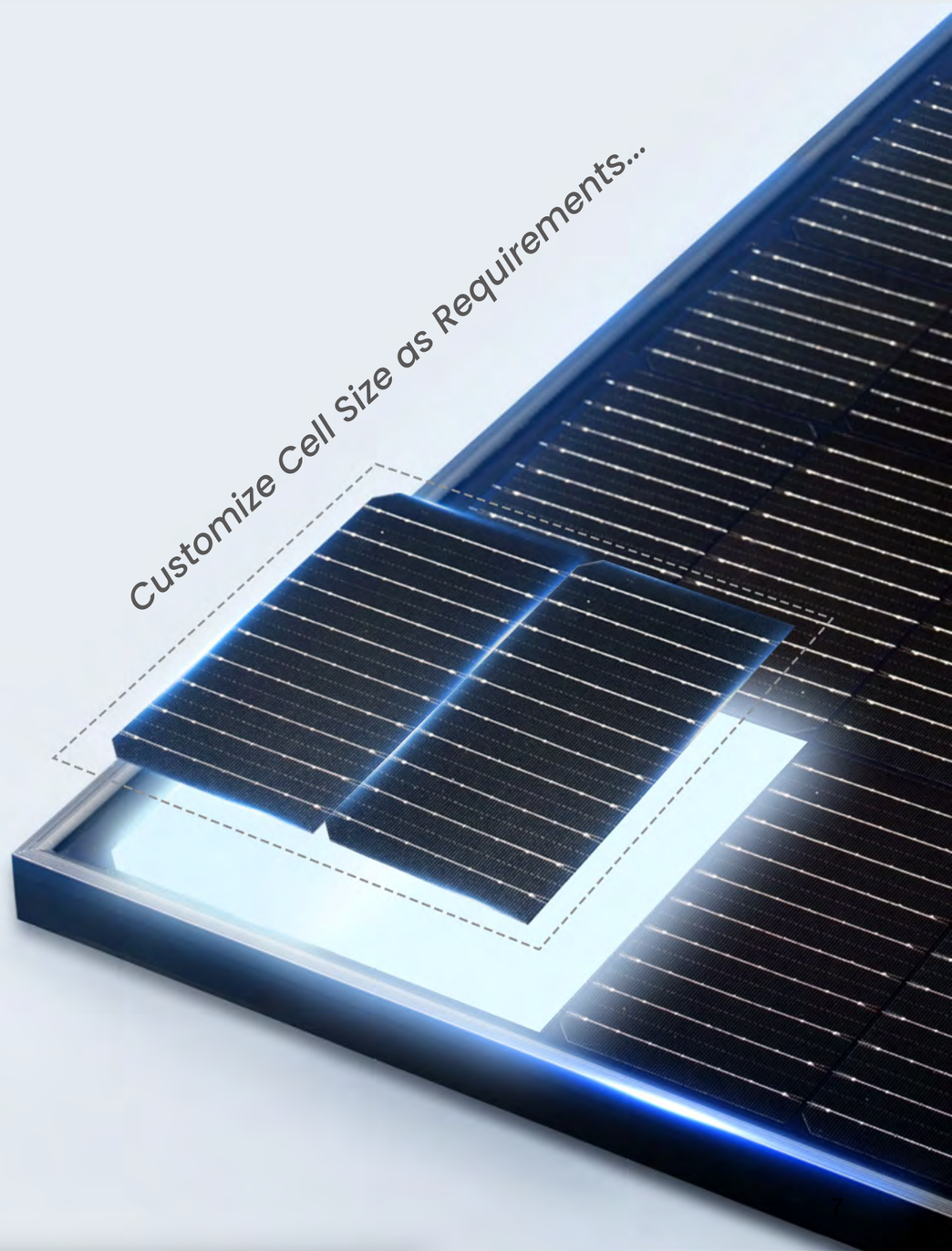
MAJOR PRODUCT DISPLAY

Privide Customized service for cells size, satisfied diffirent watts

The Pioneer of N-Type Solar Cell

- Silicon Wafer
- Solar Cell
- Solar Module

Complete Product Supply Chain Reduces Costs and Increases Efficiency for Customers



CUSTOMIZE

166 166 P Mono-crystalline

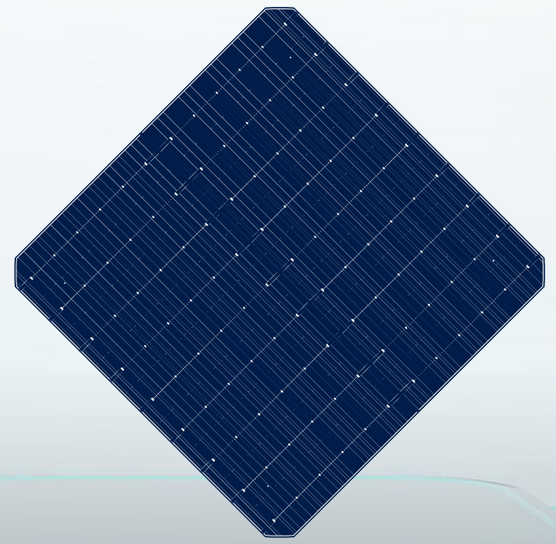
Silicon Solar Cell

efficiency of testing production

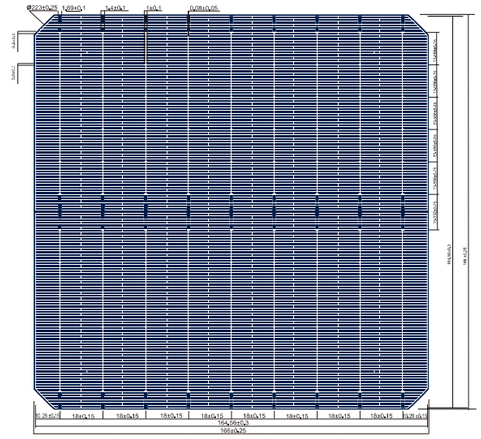
21.5~23.4%

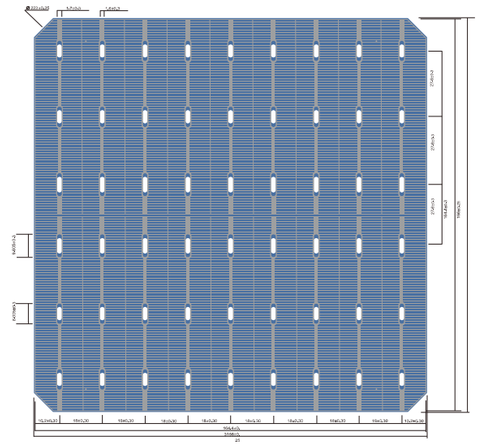
Dimension：166mm×166mm±0.25mm Cell

Thickness：150μm±10μm



Product Appearance

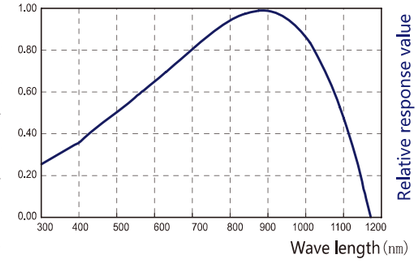


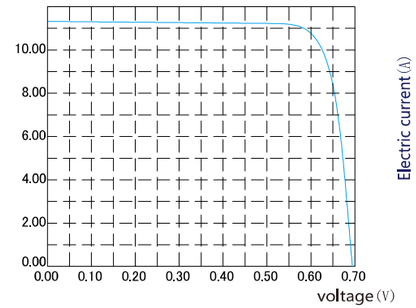


Electrical performance

Conversion efficiency	Peak power	Peak voltage	Peak current	Open-circuit	Short-circuit
NCell(%)	Pmpp(W)	Vmp(V)	Imp(A)	voltage Voc(V)	current Isc(A)
≥23.40	6.42	0.5959	10.766	0.6966	11.311
23.30-23.40	6.39	0.5944	10.747	0.6957	11.292
23.20-23.30	6.36	0.5928	10.730	0.6946	11.275
23.10-23.20	6.33	0.5912	10.712	0.6931	11.250
23.00-23.10	6.31	0.5895	10.697	0.6923	11.239
22.90-23.00	6.28	0.5873	10.689	0.6919	11.223
22.80-22.90	6.25	0.5856	10.674	0.6906	11.201
22.70-22.80	6.22	0.5843	10.650	0.6897	11.187
22.60-22.70	6.20	0.5826	10.635	0.6885	11.172
22.50-22.60	6.17	0.5811	10.615	0.6873	11.158
22.40-22.50	6.14	0.5794	10.598	0.6861	11.142
22.30-22.40	6.11	0.5779	10.579	0.6843	11.128
22.20-22.30	6.09	0.5764	10.559	0.6839	11.121
22.10-22.20	6.06	0.5748	10.540	0.6822	11.103
21.50-21.60	5.89	0.5654	10.425	0.6767	11.011

Spectral response characteristic





Current-voltage characteristic curve

Physical Characteristics

Substrate material	166 P Mono-crystalline Silicon Solar Cell	Front (-)	9*0.1±0.05mm
Cell thickness	150μm±10μm		
Dimension	166mm×166mm±0.25mm	Back (+)	1.4±0.5mm

Version No：EN 202401

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182.2 105 N Mono-crystalline

Silicon Solar Cell

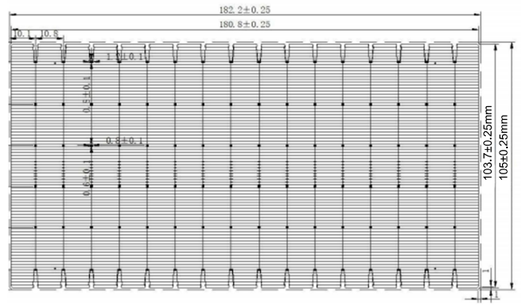
efficiency of testing production

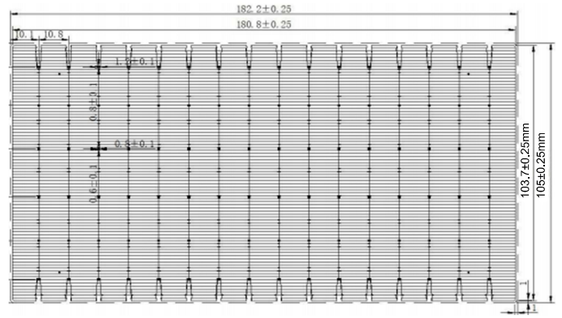
24.0~25.3%

Dimension： 182.2mm×105mm±0.5mm Cell

Thickness： 130μm±8μm

Product Appearance

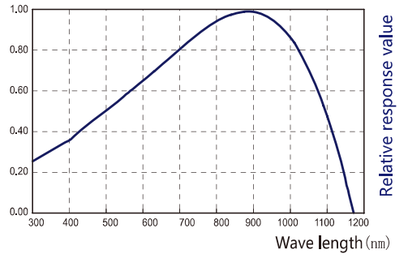


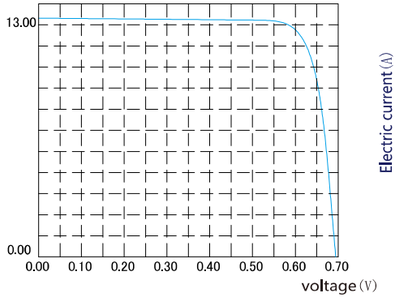


Electrical performance

Conversion efficiency NCell(%)	Peak power Pmpp(W)	Peak voltage Vmp(V)	Peak current Imp(A)	Open-circuit voltage Voc(V)	Short-circuit current Isc(A)
25.30	9.6800	0.6250	15.458	0.7270	15.989
25.20	9.6400	0.6240	15.421	0.7260	15.967
25.10	9.6000	0.6230	15.384	0.7250	15.945
25.00	9.5600	0.6220	15.347	0.7240	15.923
24.90	9.5200	0.6210	15.310	0.7230	15.901
24.80	9.4800	0.6200	15.274	0.7220	15.888
24.70	9.4400	0.6190	15.237	0.7210	15.867
24.60	9.4000	0.6180	15.199	0.7200	15.844
24.50	9.3700	0.6170	15.162	0.7190	15.825
24.40	9.3300	0.6160	15.125	0.7180	15.808
24.30	9.2900	0.6150	15.087	0.7170	15.791
24.20	9.2500	0.6140	15.050	0.7160	15.778
24.10	9.2100	0.6130	15.012	0.7150	15.755
24.00	9.1700	0.6120	14.974	0.7140	15.731

Spectral response characteristic





Current-voltage characteristic curve

Physical Characteristics

Substrate material	182 N Mono-crystalline Silicon Solar Cell	Front (-)	9*0.1±0.05mm
Cell thickness	130μm±8μm		
Dimension	182.2mm×105mm±0.5mm	Back (+)	1.4±0.5mm

Version No：EN 202401

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182 182 N Mono-crystalline

Silicon Solar Cell

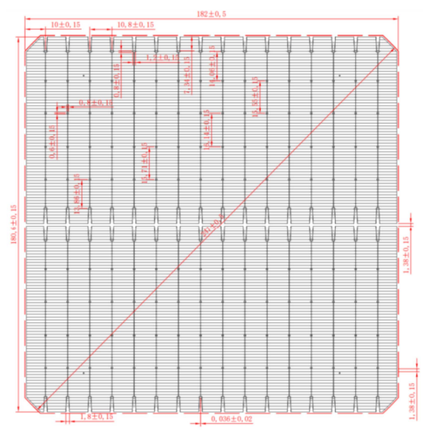
efficiency of testing production

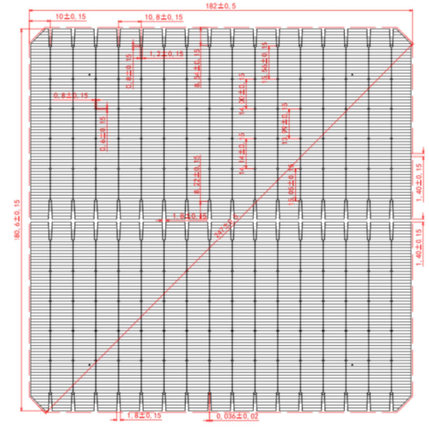
24.0~25.3%

Dimension： 182mm×182mm±0.5mm Cell

Thickness： 130μm±8μm

Product Appearance

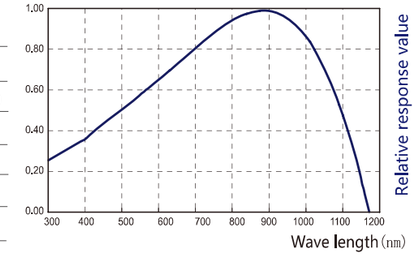


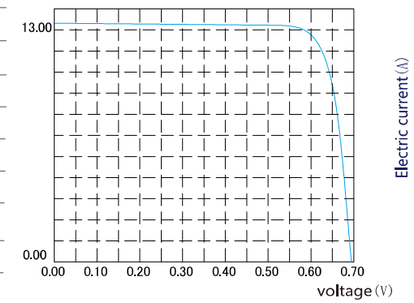


Electrical performance

Conversion efficiency	Peak power	Peak voltage	Peak current	Open-circuit	Short-circuit
NCell(%)	Pmpp(W)	Vmp(V)	Imp(A)	voltage Voc(V)	current Isc(A)
25.3	8.353	0.644	12.971	0.734	13.799
25.2	8.320	0.643	12.946	0.733	13.781
25.1	8.287	0.641	12.921	0.732	13.763
25.0	8.254	0.640	12.896	0.731	13.745
24.9	8.221	0.639	12.871	0.730	13.727
24.8	8.188	0.637	12.846	0.729	13.709
24.7	8.155	0.636	12.821	0.728	13.696
24.6	8.122	0.635	12.796	0.727	13.683
24.5	8.089	0.633	12.771	0.726	13.670
24.4	8.056	0.632	12.746	0.725	13.657
24.3	8.023	0.631	12.721	0.724	13.644
24.2	7.990	0.629	12.696	0.723	13.631
24.1	7.957	0.628	12.671	0.722	13.618
24	7.924	0.627	12.646	0.721	13.605

Spectral response characteristic





Current-voltage characteristic curve

Physical Characteristics

Substrate material	182 N Mono-crystalline Silicon Solar Cell	Front (-)	9*0.1±0.05mm
Cell thickness	130μm±8μm		
Dimension	182mm×182mm±0.5mm	Back (+)	1.4±0.5mm

Version No：EN 202401

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182 182 P Mono-crystalline **Silicon Solar Cell**

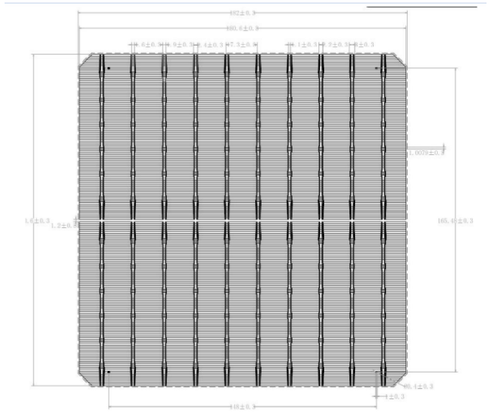
efficiency of testing production

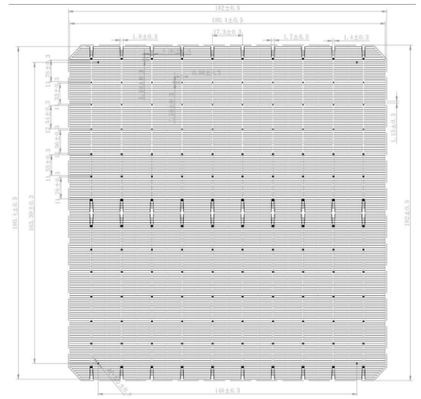
22.8~23.5

Dimension: 182mm×182mm±0.5mm Cell

Thickness: 150μm±10μm

Product Appearance

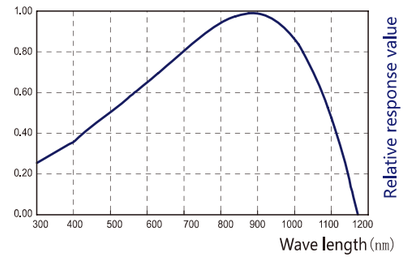


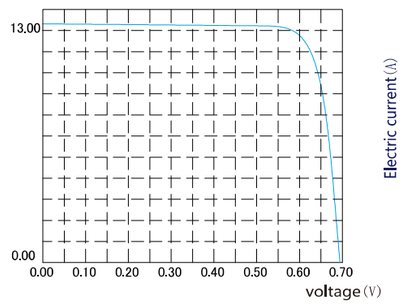


Electrical performance

Conversion efficiency	Peak power	Peak voltage	Peak current	Open-circuit	Short-circuit
NCell(%)	Pmpp(W)	Vmp(V)	Imp(A)	voltage Voc(V)	current Isc(A)
23.50	7.76	0.292	13.148	0.699	13.803
23.40	7.73	0.591	13.122	0.688	13.783
23.30	7.69	0.590	13.105	0.687	13.775
23.20	7.66	0.589	13.088	0.686	13.767
23.10	7.63	0.588	13.067	0.685	13.747
23.00	7.59	0.587	13.042	0.684	13.735
22.90	7.56	0.586	13.017	0.683	13.723
22.80	7.53	0.585	12.992	0.682	13.711

Spectral response characteristic





Current-voltage characteristic curve

Physical Characteristics

Substrate material	182 P Mono-crystalline Silicon Solar Cell	Front (-)	9*0.1±0.05mm
Cell thickness	150μm±10μm		
Dimension	182mm×182mm±0.5mm	Back (+)	1.4±0.5mm

Version No: EN 202401

182 183.75 N Mono-crystalline

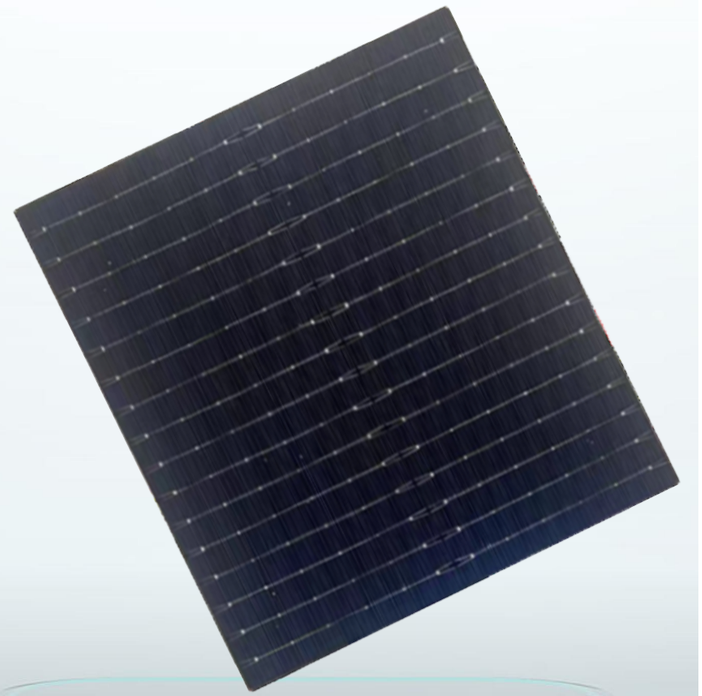
Silicon Solar Cell

efficiency of testing production

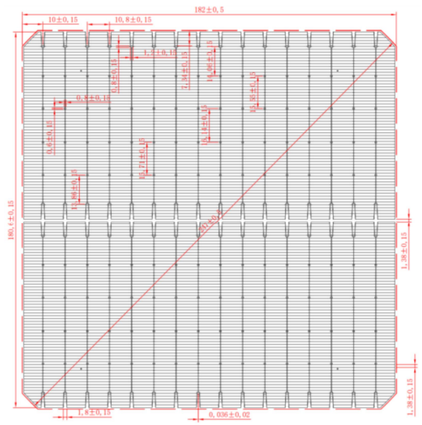
24.0~25.3%

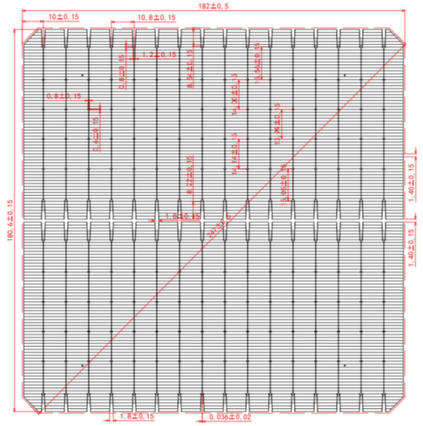
Dimension：182mm×183.75mm±0.5mm Cell

Thickness：130μm±8μm



Product Appearance

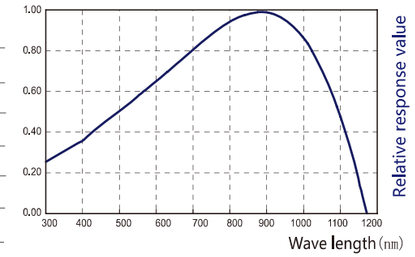


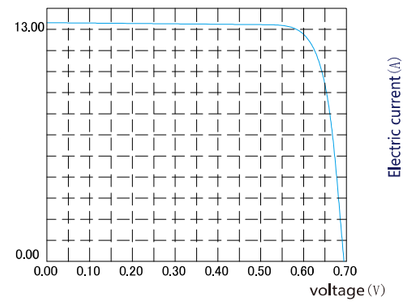


Electrical performance

Conversion efficiency	Peak power	Peak voltage	Peak current	Open-circuit	Short-circuit
NCell(%)	Pmpp(W)	Vmp(V)	Imp(A)	voltage Voc(V)	current Isc(A)
25.3	8.47	0.634	13.3439	0.7373	14.14
25.2	8.43	0.633	13.3175	0.7363	14.13
25.1	8.40	0.632	13.2911	0.7353	14.12
25.0	8.37	0.631	13.2647	0.7342	14.11
24.9	8.33	0.630	13.2222	0.7332	14.10
24.8	8.30	0.629	13.1955	0.7322	14.09
24.7	8.27	0.626	13.2109	0.7312	14.08
24.6	8.23	0.6259	13.1491	0.7301	14.07
24.5	8.20	0.6257	13.1053	0.7291	14.06
24.4	8.17	0.6255	13.0616	0.7281	14.05
24.3	8.13	0.6251	13.0059	0.7270	14.04
24.2	8.10	0.625	12.9600	0.7260	14.03
24.1	8.07	0.6247	12.9182	0.7250	14.02
24.0	8.03	0.6245	12.8583	0.7239	14.01

Spectral response characteristic





Current-voltage characteristic curve

Physical Characteristics

Substrate material	182 N Mono-crystalline Silicon Solar Cell	Front (-)	9*0.1±0.05mm
Cell thickness	130μm±8μm		
Dimension	182mm×183.75mm±0.5mm	Back (+)	1.4±0.5mm

Version No：EN 202401

N-M10
Monocrystalline Wafer

Comprehensive system certification

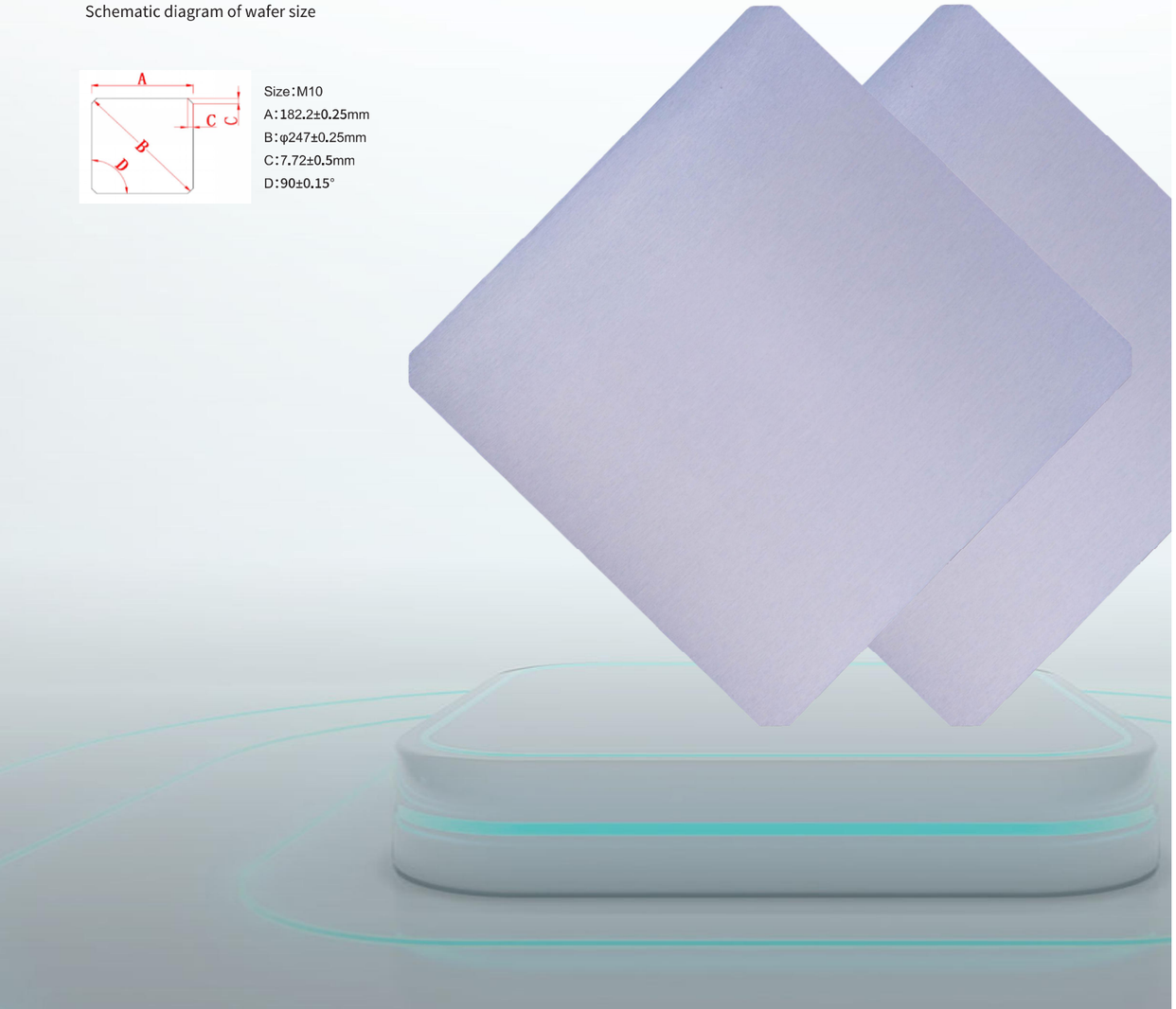
ISO 9001:2015

ISO 14001:2015

OHSAS 18001:2018

Schematic diagram of wafer size

Size:M10
A:182.2±0.25mm
B:φ247±0.25mm
C:7.72±0.5mm
D:90±0.15°



Monocrystalline Wafer Specification

N-type M10

Key parameters

Conductivity type	N-type	P/N type tester(DLY-2 P/N)
Dopant	Phos.	--
Resistivity/Ω.cm	0.4-1.6	Wafer inspection system
MCLT(Minority carrier lifetime)/μs	⩾1000	Transient with injection level:5E14cm^{-3} (Sinton BCT-400)
Oxygen concentration [Oi]/at/cm³	⩽6.0×10^{17}	FTIR(ASTM F121-83)
Carbon Concentration [Cs]/at/cm³	⩽5.0×10^{16}	FTIR(GB/T 1558-2009)

Material properties

Growth method	CZ	--
Crystallinity	Monocrystalline	--
Etch pit density (dislocation density)/pcs/cm²	⩽500	Preferential Etch Techniques(ASTM F47-88)
Surface orientation/°	＜100＞±3	X-ray Diffraction Method (ASTM F26-1987)
Orientation of pseudo square sides/°	＜010＞, ＜001＞±3	X-ray Diffraction Method (ASTM F26-1987)

Geometric dimensions and surface properties

Wafer model	M10	--
Geometry	Pseudo square	--
Bevel edge shape	Round	--
Wafer Side length/mm	182.2±0.25	Wafer inspection system
Wafer Diameter/mm	φ247±0.25	Wafer inspection system
Arc length projection/mm	7.72±0.5	Wafer inspection system
Angle between adjacent sides/°	90±0.15	Wafer inspection system
Thickness/μm	130±8	Wafer inspection system
Batch mean/μm	⩾130	Wafer inspection system
Total thickness variation/μm	⩽20	Wafer inspection system
Saw marks/μm	⩽13	Wafer inspection system
Bow/μm	⩽40	Wafer inspection system
Warp/μm	⩽40	Wafer inspection system
Cutting method		--
Surface quality	as cut and cleaned, no visible contamination， color difference (as determined by standard sample) (oil or grease, finger prints, spot stains, epoxy/glue residue are not allowed)	Wafer inspection system
Chip	depth⩽0.3mm & length⩽0.5mm,Max 1/pcs, no V-chip	Naked eyes or wafer inspection system
Micro cracks / holes	Not allowed	Wafer inspection system

N-M10-C
Monocrystalline Wafer

Comprehensive system certification

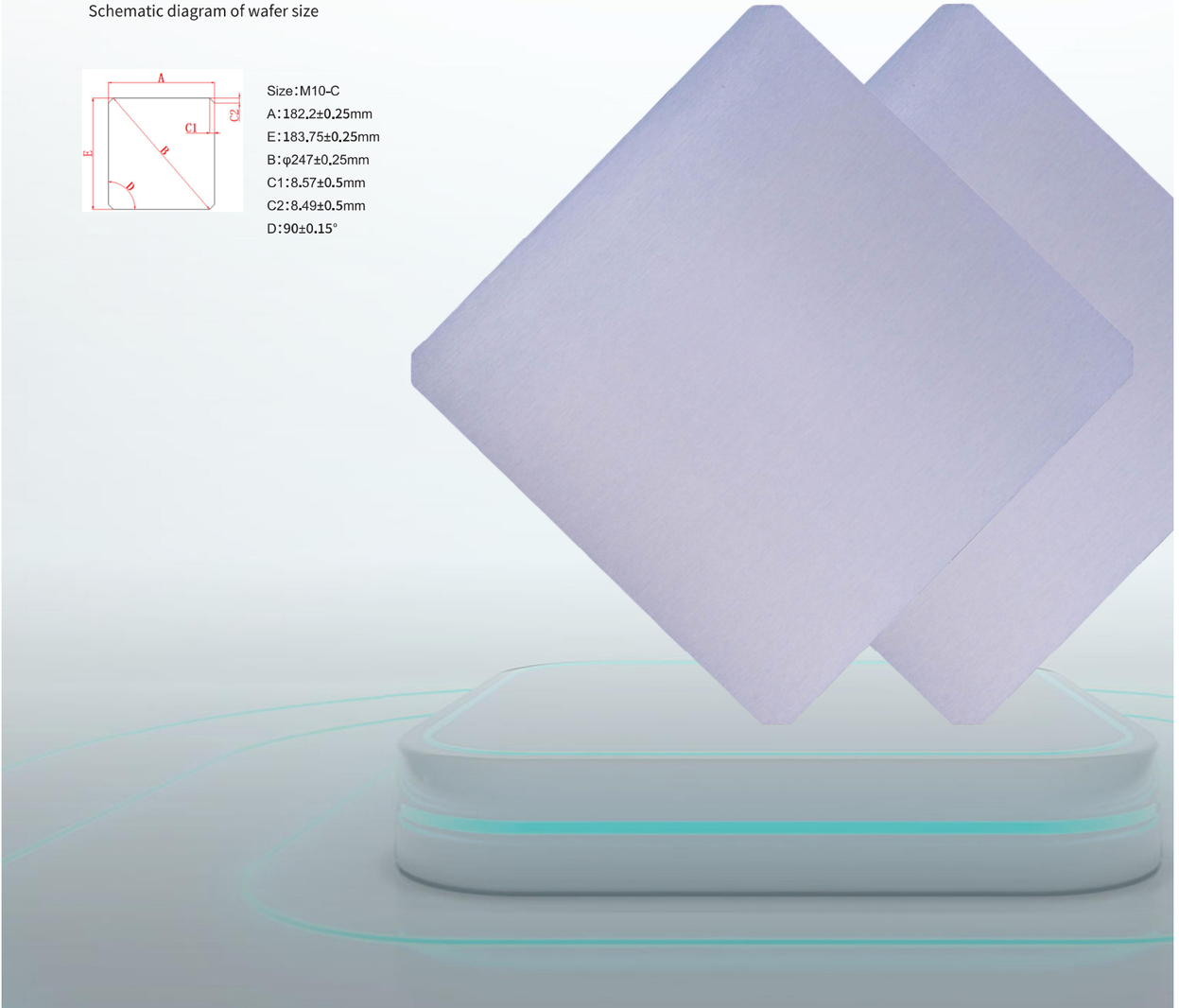
ISO 9001:2015

ISO 14001:2015

OHSAS 18001:2018

Schematic diagram of wafer size

Size：M10-C
A：182.2±0.25mm
E：183.75±0.25mm
B：φ247±0.25mm
C1：8.57±0.5mm
C2：8.49±0.5mm
D：90±0.15°



Monocrystalline Wafer Specification

N-type M10-C

Key parameters

Conductivity type	N-type	P/N type tester(DLY-2 P/N)
Dopant	Phos.	--
Resistivity/Ω.cm	0.4-1.6	Wafer inspection system
MCLT(Minority carrier lifetime)/μs	⩾1000	Transient with injection level:5E14cm^{-3}(Sinton BCT-400)
Oxygen concentration [Oi]/at/cm³	⩽6.0×10^{17}	FTIR(ASTM F121-83)
Carbon Concentration [Cs]/at/cm³	⩽5.0×10^{16}	FTIR(GB/T 1558-2009)

Material properties

Growth method	CZ	--
Crystallinity	Monocrystalline	--
Etch pit density (dislocation density)/pcs/cm²	⩽500	Preferential Etch Techniques(ASTM F47-88)
Surface orientation/°	＜100＞±3	X-ray Diffraction Method (ASTM F26-1987)
Orientation of pseudo square sides/°	＜010＞,＜001＞±3	X-ray Diffraction Method (ASTM F26-1987)

Geometric dimensions and surface properties

Wafer model	M10-C	--
Geometry	Pseudo square	--
Bevel edge shape	Round	--
Wafer Side length/mm	Short side 182.2±0.25; Long side 183.75±0.25	Wafer inspection system
Wafer Diameter/mm	ϕ247±0.25	Wafer inspection system
Arc length projection/mm	C1：8.57±0.5；C2：8.49±0.5	Wafer inspection system
Angle between adjacent sides/°	90±0.15	Wafer inspection system
Thickness/μm	130±8	Wafer inspection system
Batch mean/μm	⩾130	Wafer inspection system
Total thickness variation/μm	⩽20	Wafer inspection system
Saw marks/μm	⩽13	Wafer inspection system
Bow/μm	⩽40	Wafer inspection system
Warp/μm	⩽40	Wafer inspection system
Cutting method		--
Surface quality	as cut and cleaned, no visible contamination，color difference (as determined by standard sample) (oil or grease, finger prints, spot stains, epoxy/glue residue are not allowed)	Wafer inspection system
Chip	depth⩽0.3mm & length⩽0.5mm,Max 1/pcs，no V-chip	Naked eyes or wafer inspection system
Micro cracks / holes	Not allowed	Wafer inspection system

SERVICE SUPPORT

JHPVTECH believes that high-quality customer service is crucial for improving customer satisfaction and loyalty, which is conducive to retaining old customers, attracting new customers, and strengthening cooperative relationships with all the customers. With a professional service team, Renesola provides customers with world-class, high-quality, efficient, and professional pre-sales technical service, after-sales problem solution, training program, consultation, and complaint handling, which brings the best experience to customers.

Global Network, Local Support

As a world leading manufacturer of PV modules, we will proceed to expand our global network of production, logistics, sales and service, to meet the demand of customers all over the world. In various regions, Renesola has built a service team with decades of experiences in PV industry, which is capable of communicating with customers in local languages and providing customers with timely service response and solution just like in the same time zone.

Customer Satisfaction Surveys And Complaint Management

JHPVTECH attaches great importance to customer opinions and suggestions. We conduct regular and irregular customer satisfaction surveys every year, to ensure customer demands are fully figured out and solved. We will invite customers to conduct on-line surveys or one-on-one interviews every year, moreover, the Customer Communication Management (CCM) will timely sort all complaints, to ensure solve the problems timely.

PROFESSIONAL TECHNICAL SUPPORT

Experienced engineer team provide excellent solution and support for you.

FASTER LOGISTICS

As a professional partner, deliver our products to your warehouse or directly to the project location.

SERVICE SUPPORT

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