

Product Handbook

PV Wafers & PV Cells

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Hongyuan Green Energy Co., Ltd. (short for HY Solar, Stock Code: [603185](#)), formerly known as Shangji CNC, was founded in 2002 as a comprehensive photovoltaic solutions provider specializing in new energy innovation and applications across the entire industry chain. The company went public on the Shanghai Stock Exchange in 2018.

As a leading privately-owned enterprise in the renewable energy sector, HY Solar has developed over two decades into one of the industry's few fully integrated ecosystem players. With assets approaching [4 billion USD](#), our products and services reach nearly 100 countries and regions, supported by overseas technical service subsidiaries in over 10 countries. We have established R&D and manufacturing bases in Qingshan (Inner Mongolia), Guyang (Inner Mongolia), Xuzhou (Jiangsu), Wuxi (Jiangsu), Jiangyin (Jiangsu), and Chuzhou (Anhui), with annual production capacities including: [150,000](#) tons of industrial silicon, [100,000](#) tons of polysilicon, [55GW](#) of silicon wafers, [26GW](#) of solar cells, [26GW](#) of modules, [11.5GW](#) of power stations. With over 10,000 employees, HY Solar has been consistently ranked among [China's Top 500](#) Manufacturers, [Global Top 500](#) New Energy Companies, and China's Top 100 Private Energy Enterprises.

Guided by China's carbon peak and neutrality goals, HY Solar will continue advancing its Technology-Driven to provide Smart Services strategy. Embracing our vision of Making Energy Cleaner, Making the World Better and adhering to market-oriented, customer-centric principles, we seek collaborative partnerships to expand in global renewable energy markets and build a technologically advanced, sustainable future.

Silicon Wafer Advantages



Fully Automated Integrated Packaging

Minimal human intervention



Silicon Wafer Advantages

Self-developed high-end production equipment
Specialized crystalline silicon processing systems
Long-standing industry leadership in market share
No. 1 domestic market share for silicon carbide slicing machines



Fully Automated Sorting

Adoption of advanced domestic fully automated sorting systems
Precise wafer classification and grading



Rigorous Quality Assurance

Comprehensive quality management system
Strict inspection standards
Manual secondary visual inspection
100% quality guarantee



AGV Warehouse Integration

One-click inventory management



Ultra-low Oxygen Content

Ultra-low carbon content
High minority carrier lifetime
Excellent resistivity uniformity

Cell Product Advantages



Grading Standards

Strict grading standards
Reduced loss in module encapsulation



Temperature Coefficient

Lower temperature coefficient
Increased power output and lifespan



Visual Standards

Rigorous appearance criteria
Higher module production yield



Anti-PID

Excellent PID resistance
Stable long-term efficiency



Module Power Generation

Bifacial light absorption and half-cell design
Increased power generation

Certifications & Quality Systems

ISO 9001, 14001, 45001, 50001, Carbon Footprint Certification, GB/T 29490-2023, IP Compliance

MES-integrated SPC Control

Compatible with all product models
Intelligent sorting by color and appearance features
100% visual & EL inspection

Automated Monitoring & Alerts

Online PL detection, Online visual/EL inspection

Full Digital Monitoring

Real-time data collection and automated alerts for critical parameters and SPC (Statistical Process Control) via MES (Manufacturing Execution System) integration

Mono N-Type Silicon Wafer(M10)

182.2x182.2



Geometric Parameter

Side length	182.2±0.25mm
Diagonal	247±0.25mm
Thickness	130(+10/-8)μm
Arc length projection	7.72±0.5mm

Electrical Properties

Resistivity	0.6-1.6Ω·cm
Minority carrier	≥1000μs
Oxygen content	≤5.75x10 ¹⁷ at/cm ³
Carbon content	≤5x10 ¹⁶ at/cm ³

Material Properties

Growth method	CZ
Orientation	<100>±2°

Surface Performance

TTV	≤20
Warpage	≤40
Line mark	≤13
Edge collapse	Depth≤0.3mm, length≤0.5mm, no more than one places
Cracks and perforations	Invisible by visual inspection
Silicon wafer surface	Clean, free of oil, soap, glue and other residues

Mono N-Type Silicon Wafer(M10L)

182.2x183.75

Geometric Parameter

Side length	Short Side:182.2±0.25mm,Long Side:183.75±0.25mm
Diagonal	256±0.25mm
Thickness	130(+10/-8)μm
Arc length projection	1.99±0.5mm

Electrical Properties

Resistivity	0.6-1.6Ω·cm
Minority carrier	≥1000μs
Oxygen content	≤5.75x10 ¹⁷ at/cm ³
Carbon content	≤5x10 ¹⁶ at/cm ³

Material Properties

Growth method	CZ
Orientation	<100>±2°

Surface Performance

TTV	≤20
Warpage	≤40
Line mark	≤13
Edge collapse	Depth≤0.3mm, length≤0.5mm, no more than one places
Cracks and perforations	Invisible by visual inspection
Silicon wafer surface	Clean, free of oil, soap, glue and other residues

Mono N-Type Silicon Wafer (10A8N)

182.3x188

Geometric Parameter

Side length	Short Side:182.3±0.25mm,Long Side:188±0.25mm
Diagonal	256±0.25mm
Thickness	130(+8/-8)μm
Arc length projection	182 Length:4.27±0.5mm 188 Length:4.14±0.5mm

Electrical Properties

Resistivity	0.6-1.6Ω·cm
Minority carrier	≥1000μs
Oxygen content	≤5.75x10 ¹⁷ at/cm ³
Carbon content	≤5x10 ¹⁶ at/cm ³

Material Properties

Growth method	CZ
Orientation	<100>±2°

Surface Performance

TTV	≤20
Warpage	≤40
Line mark	≤13
Edge collapse	Depth≤0.3mm, length≤0.5mm, no more than one places
Cracks and perforations	Invisible by visual inspection
Silicon wafer surface	Clean, free of oil, soap, glue and other residues

Mono N-Type Silicon Wafer (G12R)

182.3x210



Geometric Parameter

Side length	Short Side:182.3±0.2mm,Long Side:210±0.2mm
Diagonal	272±0.25mm
Thickness	130(+10/-8)μm
Arc length projection	182 Length:4.72±0.57mm 210 Length:4.07±0.52mm

Electrical Properties

Resistivity	0.6-1.6Ω·cm
Minority carrier	≥1000μs
Oxygen content	≤5.75x10 ¹⁷ at/cm ³
Carbon content	≤5x10 ¹⁶ at/cm ³

Material Properties

Growth method	CZ
Orientation	<100>±2°

Surface Performance

TTV	≤20
Warpage	≤40
Line mark	≤13
Edge collapse	Depth≤0.3mm, length≤0.5mm, no more than one places
Cracks and perforations	Invisible by visual inspection
Silicon wafer surface	Clean, free of oil, soap, glue and other residues

Mono N-Type Silicon Wafer(G12)

210X210



Geometric Parameter

Side length	210±0.25mm
Diagonal	295±0.25mm
Thickness	130(+10/-8)μm
Arc length projection	1.41±0.5mm

Electrical Properties

Resistivity	0.6-1.6Ω·cm
Minority carrier	≥1000μs
Oxygen content	≤5.75x10 ¹⁷ at/cm ³
Carbon content	≤5x10 ¹⁶ at/cm ³

Material Properties

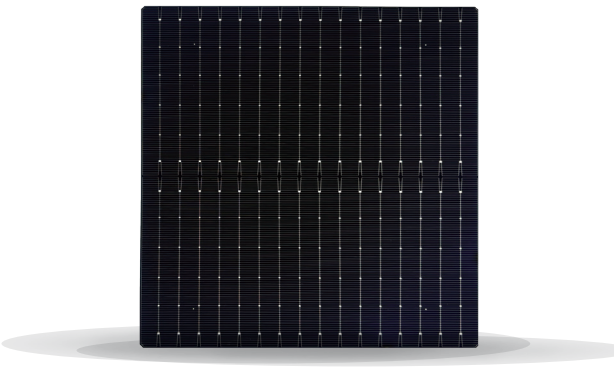
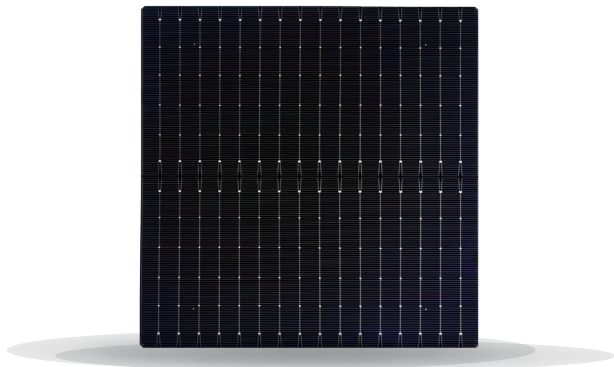
Growth method	CZ
Orientation	<100>±2°

Surface Performance

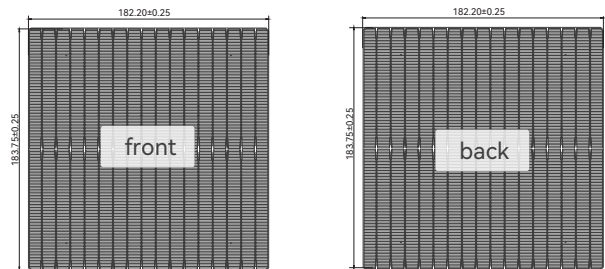
TTV	≤20
Warpage	≤40
Line mark	≤13
Edge collapse	Depth≤0.3mm, length≤0.5mm, no more than one places
Cracks and perforations	Invisible by visual inspection
Silicon wafer surface	Clean, free of oil, soap, glue and other residues

N-Type TOPCon Bifacial Solar Cell (M10L)

182.2*183.75-16BB-194F-196F 24.8%~25.7%



Battery Appearance



Appearance And Structure

Dimension	182.2x183.75mm, Tolerancet±0.25mm
Diagonal	256mm, Tolerancet±0.25mm
Thickness	130μm, Tolerancet±10%μm
Front(+)	16 Main Busbars(Silver) 194 Finger Busbar(Silver)
Back(-)	16 Main Busbars(Silver) 196 Finger Busbar(Silver)

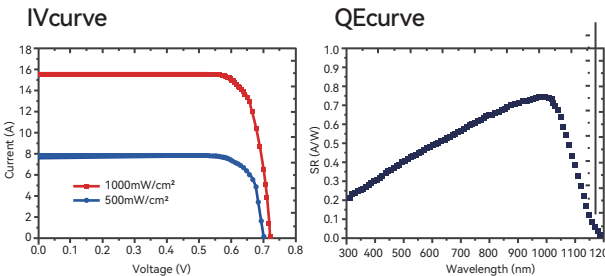
Thermal Ratings

Temperature coefficient of Pmax	-(0.30±0.02)%/°C
Temperature coefficient of Isc	+(0.046±0.015)%/°C
Temperature coefficient of Voc	-(0.261±0.030)%/°C

Positive Electrical Performance Parameters

[Standard test conditions: irradiance 1000w/m², standard solar spectrum Am1.5g, 25 °C]

Conversion efficiency (%)	Maximum output power (W)	Maximum output voltage (V)	Maximum output current (A)	Open circuit voltage (V)	Short-circuit current (A)
25.7	8.60	0.634	13.568	0.726	13.843
25.6	8.57	0.633	13.537	0.725	13.821
25.5	8.54	0.632	13.505	0.724	13.800
25.4	8.50	0.631	13.473	0.723	13.784
25.3	8.47	0.630	13.441	0.722	13.766
25.2	8.43	0.629	13.409	0.721	13.750
25.1	8.40	0.628	13.377	0.720	13.739
25.0	8.37	0.627	13.345	0.719	13.724
24.9	8.33	0.626	13.313	0.718	13.713
24.8	8.30	0.625	13.281	0.717	13.702



Light Induced Degradation Test

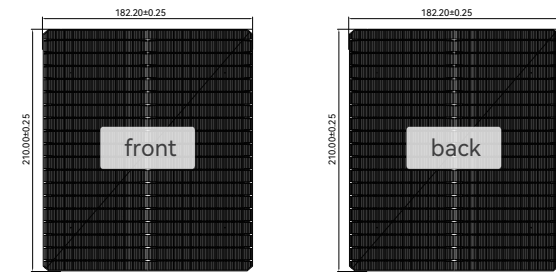
Using xenon lamp (Irradiance of 1000W/m²,with spectrum AM 1.5) to irradiatetest cells, after a total irradiation of 5kWh/m²the degradation of maximumoutput efficiency of cells is ≤0.8%

N-Type ToPCon Bifacial Solar Cell (G12R)

182.2*210-18BB-184F-186F 24.8%~25.7%



Battery Appearance



Appearance And Structure

Dimension	182.2X210mm, Tolerancet±0.25mm
Diagonal	272mm, Tolerancet±0.25mm
Thickness	130μm, Tolerancet±10%μm
Front(+)	18 Main Busbars(Silver) 184 Finger Busbar(Silver)
Back(-)	18 Main Busbars(Silver) 186 Finger Busbar(Silver)

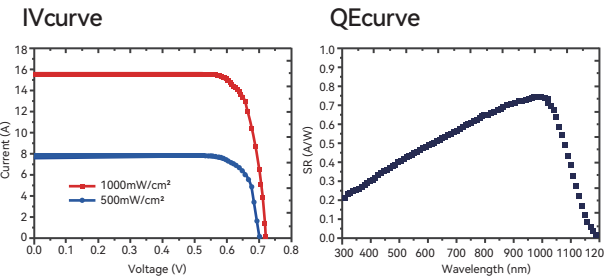
Thermal Ratings

Temperature coefficient of Pmax	-(0.30±0.02)%/°C
Temperature coefficient of Isc	+(0.046±0.015)%/°C
Temperature coefficient of Voc	-(0.261±0.030)%/°C

Positive Electrical Performance Parameters

[Standard test conditions: irradiance 1000w/m², standard solar spectrum Am1.5g, 25 °C]

Conversion efficiency (%)	Maximum output power (W)	Maximum output voltage (V)	Maximum output current (A)	Open circuit voltage (V)	Short-circuit current (A)
25.7	9.81	0.634	15.479	0.724	15.806
25.6	9.78	0.633	15.443	0.723	15.776
25.5	9.74	0.632	15.407	0.722	15.744
25.4	9.70	0.631	15.371	0.721	15.713
25.3	9.66	0.630	15.334	0.720	15.679
25.2	9.62	0.629	15.298	0.719	15.649
25.1	9.58	0.628	15.262	0.718	15.620
25.0	9.55	0.627	15.225	0.717	15.598
24.9	9.51	0.626	15.188	0.716	15.577
24.8	9.47	0.625	15.152	0.715	15.558

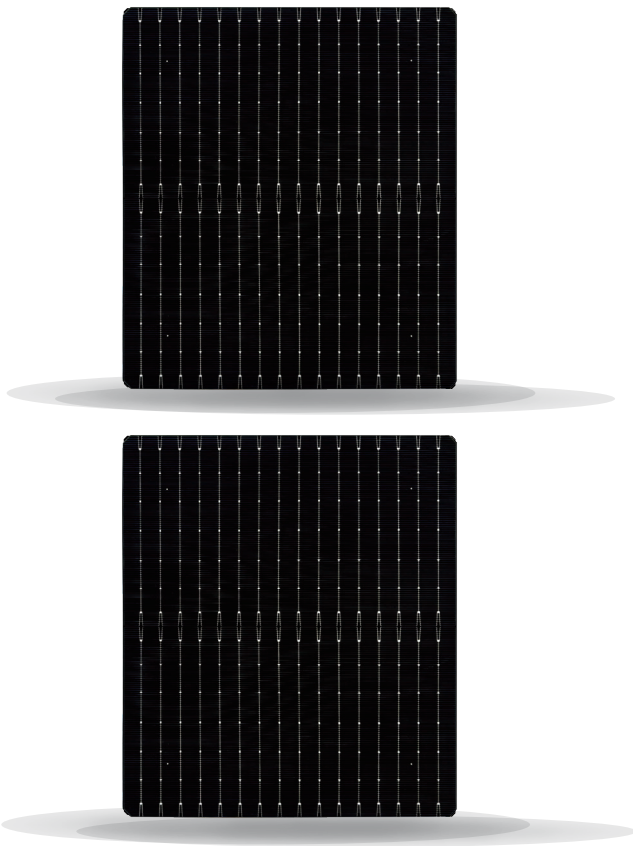


Light Induced Degradation Test

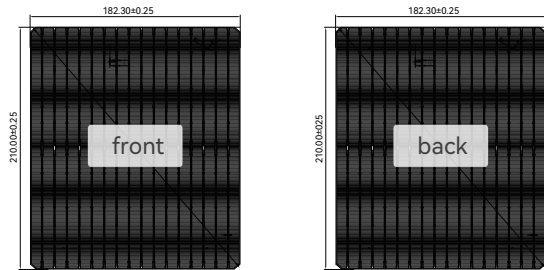
Using xenon lamp (Irradiance of 1000W/m²,with spectrum AM 1.5) to irradiatetest cells, after a total irradiation of 5kWh/m²the degradation of maximumoutput efficiency of cells is ≤0.8%

N-Type ToPCon Bifacial Solar Cell (G12R)

182.3*210-16BB-210F-228F 24.8%~25.7%



Battery Appearance



Appearance And Structure

Dimension	182.3X210mm, Tolerancet±0.25mm
Diagonal	272mm, Tolerancet±0.25mm
Thickness	130μm, Tolerancet±10%μm
Front(+)	16 Main Busbars(Silver) 210 Finger Busbar(Silver)
Back(-)	16 Main Busbars(Silver) 228 Finger Busbar(Silver)

Thermal Ratings

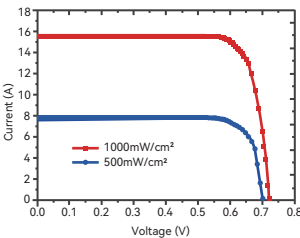
Temperature coefficient of Pmax	-(0.30±0.02)%/°C
Temperature coefficient of Isc	+(0.046±0.015)%/°C
Temperature coefficient of Voc	-(0.261±0.030)%/°C

Positive Electrical Performance Parameters

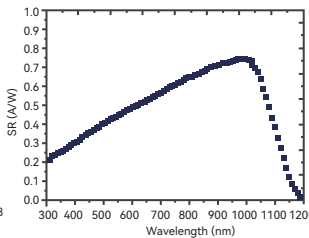
[Standard test conditions: irradiance 1000w/m², standard solar spectrum Am1.5g, 25 °C]

Conversion efficiency (%)	Maximum output power (W)	Maximum output voltage (V)	Maximum output current (A)	Open circuit voltage (V)	Short-circuit current (A)
25.7	9.82	0.634	15.495	0.724	15.823
25.6	9.79	0.633	15.459	0.723	15.793
25.5	9.75	0.632	15.423	0.722	15.761
25.4	9.71	0.631	15.387	0.721	15.730
25.3	9.67	0.630	15.351	0.720	15.695
25.2	9.63	0.629	15.314	0.719	15.666
25.1	9.59	0.628	15.278	0.718	15.636
25.0	9.56	0.627	15.241	0.717	15.614
24.9	9.52	0.626	15.205	0.716	15.593
24.8	9.48	0.625	15.168	0.715	15.574

IVcurve



QEcurve

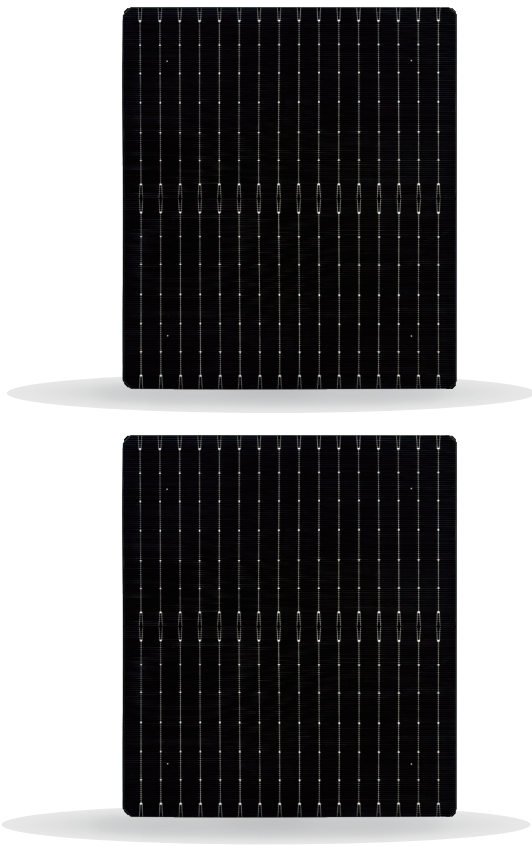


Light Induced Degradation Test

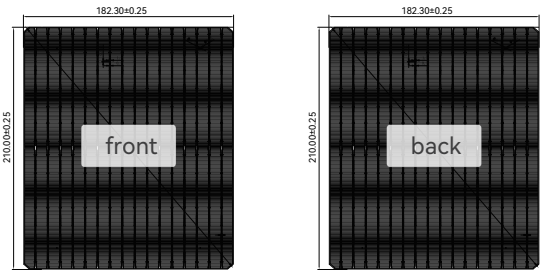
Using xenon lamp (Irradiance of 1000W/m²,with spectrum AM 1.5) to irradiatetest cells, after a total irradiation of 5kWh/m²the degradation of maximumoutput efficiency of cells is ≤0.8%

N-Type ToPCon Bifacial Solar Cell (G12R)

182.3*210-16BB-236F-228F 24.8%~25.7%



Battery Appearance



Appearance And Structure

Dimension	182.3X210mm, Tolerancet±0.25mm
Diagonal	272mm, Tolerancet±0.25mm
Thickness	130μm, Tolerancet±10%μm
Front(+)	16 Main Busbars(Silver) 236 Finger Busbar(Silver)
Back(-)	16 Main Busbars(Silver) 228 Finger Busbar(Silver)

Thermal Ratings

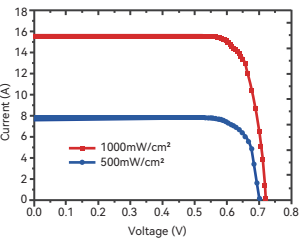
Temperature coefficient of Pmax	-(0.30±0.02)%/°C
Temperature coefficient of Isc	+(0.046±0.015)%/°C
Temperature coefficient of Voc	-(0.261±0.030)%/°C

Positive Electrical Performance Parameters

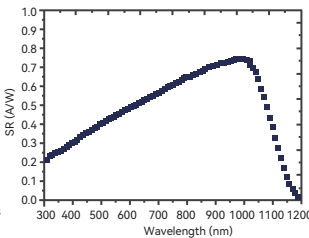
[Standard test conditions: irradiance 1000w/m², standard solar spectrum Am1.5g, 25 °C]

Conversion efficiency (%)	Maximum output power (W)	Maximum output voltage (V)	Maximum output current (A)	Open circuit voltage (V)	Short-circuit current (A)
25.7	9.82	0.634	15.495	0.724	15.823
25.6	9.79	0.633	15.459	0.723	15.793
25.5	9.75	0.632	15.423	0.722	15.761
25.4	9.71	0.631	15.387	0.721	15.730
25.3	9.67	0.630	15.351	0.720	15.695
25.2	9.63	0.629	15.314	0.719	15.666
25.1	9.59	0.628	15.278	0.718	15.636
25.0	9.56	0.627	15.241	0.717	15.614
24.9	9.52	0.626	15.205	0.716	15.593
24.8	9.48	0.625	15.168	0.715	15.574

IVcurve



QEcurve

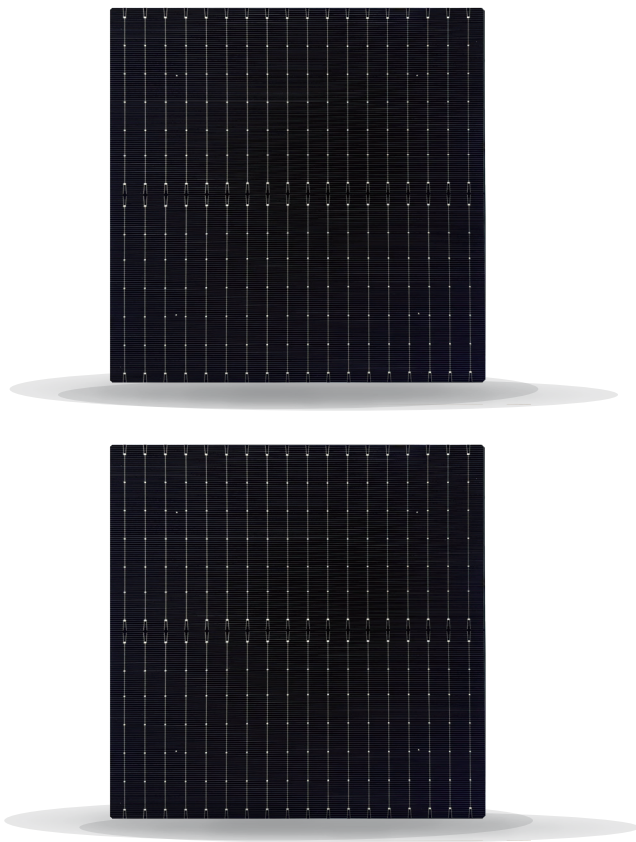


Light Induced Degradation Test

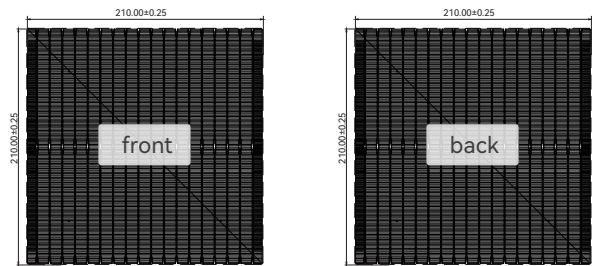
Using xenon lamp (Irradiance of 1000W/m²,with spectrum AM 1.5) to irradiatetest cells, after a total irradiation of 5kWh/m²the degradation of maximumoutput efficiency of cells is ≤0.8%

N-Type TOPCon Bifacial Solar Cell (G12)

210*210-18BB-186F-192F 24.8%~25.7%



Battery Appearance



Appearance And Structure

Dimension	210X210mm, Tolerancet±0.25mm
Diagonal	295mm, Tolerancet±0.25mm
Thickness	130μm, Tolerancet±10%μm
Front(+)	18 Main Busbars(Silver) 186 Finger Busbar(Silver)
Back(-)	18 Main Busbars(Silver) 192 Finger Busbar(Silver)

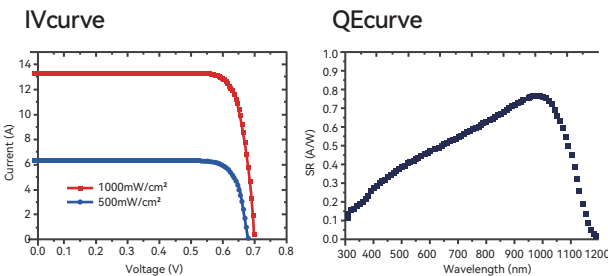
Thermal Ratings

Temperature coefficient of Pmax	-(0.31±0.02)%/°C
Temperature coefficient of Isc	+(0.046±0.015)%/°C
Temperature coefficient of Voc	-(0.261±0.030)%/°C

Positive Electrical Performance Parameters

[Standard test conditions: irradiance 1000w/m², standard solar spectrum Am1.5g, 25 °C]

Conversion efficiency (%)	Maximum output power (W)	Maximum output voltage (V)	Maximum output current (A)	Open circuit voltage (V)	Short-circuit current (A)
25.7	11.33	0.634	17.875	0.724	18.649
25.6	11.29	0.633	17.834	0.723	18.610
25.5	11.24	0.632	17.777	0.722	18.566
25.4	11.20	0.631	17.745	0.721	18.526
25.3	11.16	0.630	17.713	0.720	18.486
25.2	11.11	0.629	17.665	0.719	18.442
25.1	11.07	0.628	17.626	0.718	18.389
25.0	11.02	0.627	17.581	0.717	18.347
24.9	10.98	0.626	17.540	0.716	18.300
24.8	10.94	0.625	17.497	0.715	18.252

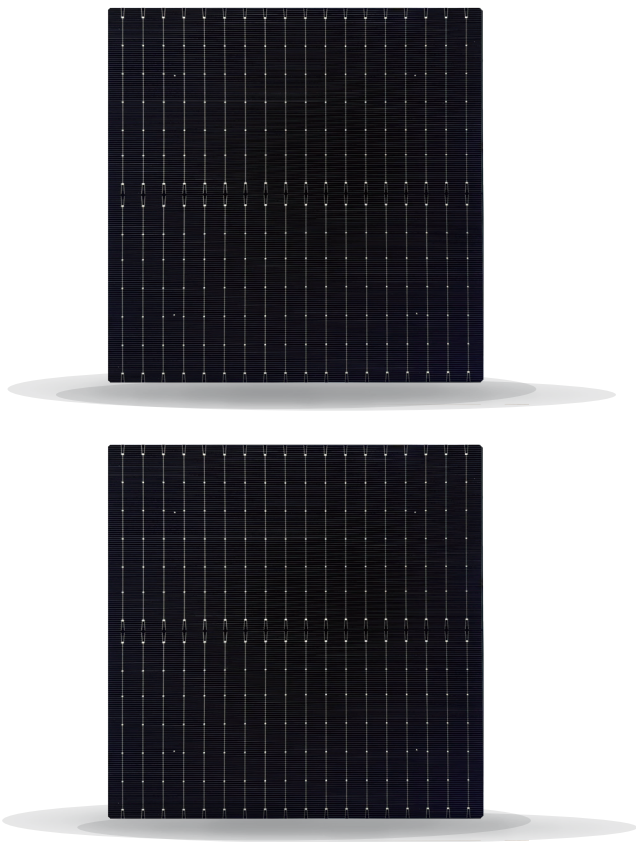


Light Induced Degradation Test

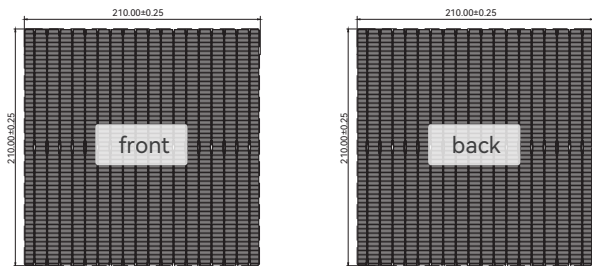
Using xenon lamp (Irradiance of 1000W/m²,with spectrum AM 1.5) to irradiatetest cells, after a total irradiation of 5kWh/m²the degradation of maximumoutput efficiency of cells is ≤0.8%

N-Type TOPCon Bifacial Solar Cell (G12)

210*210-18BB-236F-228F 24.8%~25.7%



Battery Appearance



Appearance And Structure

Dimension	210X210mm, Tolerancet±0.25mm
Diagonal	295mm, Tolerancet±0.25mm
Thickness	130μm, Tolerancet±10%μm
Front(+)	18 Main Busbars(Silver) 236 Finger Busbar(Silver)
Back(-)	18 Main Busbars(Silver) 228 Finger Busbar(Silver)

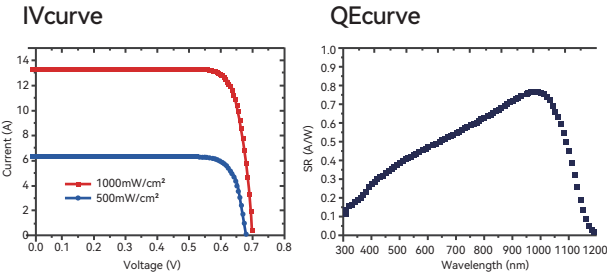
Thermal Ratings

Temperature coefficient of Pmax	-(0.31±0.02)%/°C
Temperature coefficient of Isc	+(0.046±0.015)%/°C
Temperature coefficient of Voc	-(0.261±0.030)%/°C

Positive Electrical Performance Parameters

[Standard test conditions: irradiance 1000w/m², standard solar spectrum Am1.5g, 25 °C]

Conversion efficiency (%)	Maximum output power (W)	Maximum output voltage (V)	Maximum output current (A)	Open circuit voltage (V)	Short-circuit current (A)
25.7	11.33	0.634	17.875	0.724	18.649
25.6	11.29	0.633	17.834	0.723	18.610
25.5	11.24	0.632	17.777	0.722	18.566
25.4	11.20	0.631	17.745	0.721	18.526
25.3	11.16	0.630	17.713	0.720	18.486
25.2	11.11	0.629	17.665	0.719	18.442
25.1	11.07	0.628	17.626	0.718	18.389
25.0	11.02	0.627	17.581	0.717	18.347
24.9	10.98	0.626	17.540	0.716	18.300
24.8	10.94	0.625	17.497	0.715	18.252

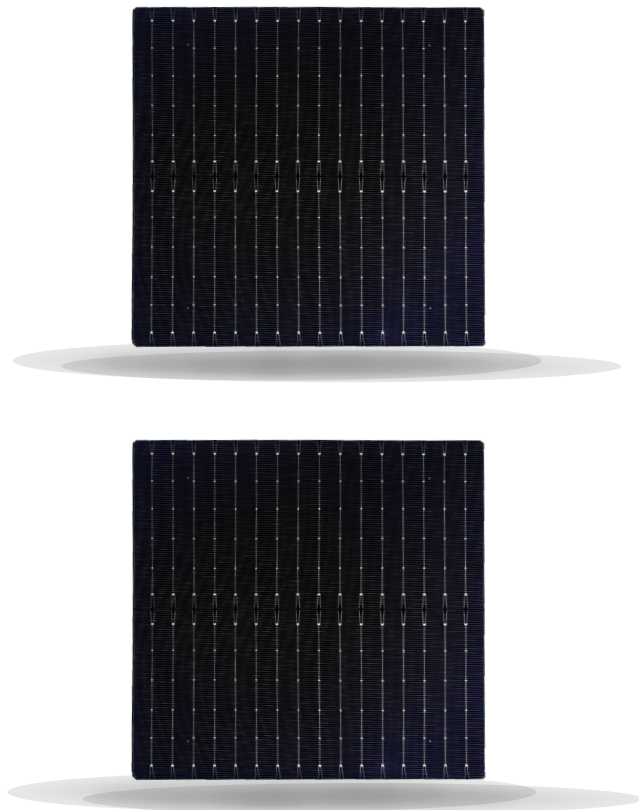


Light Induced Degradation Test

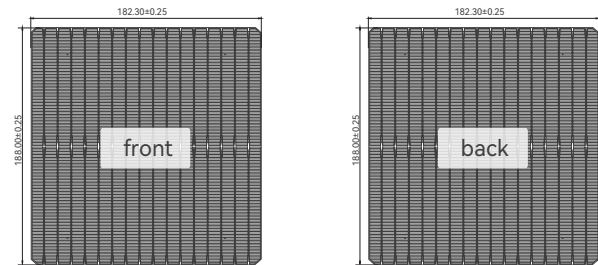
Using xenon lamp (Irradiance of 1000W/m²,with spectrum AM 1.5) to irradiatetest cells, after a total irradiation of 5kWh/m²the degradation of maximumoutput efficiency of cells is ≤0.8%

N-Type TOPCon Bifacial Solar Cell (10A8N)

182.3*188-16BB-196F-198F 24.8%~25.7%



Battery Appearance



Appearance And Structure

Dimension	182.3x188mm, Tolerancet±0.25mm
Diagonal	256mm, Tolerancet±0.25mm
Thickness	130μm, Tolerancet±10%μm
Front(+)	16 Main Busbars(Silver) 196 Finger Busbar(Silver)
Back(-)	16 Main Busbars(Silver) 198 Finger Busbar(Silver)

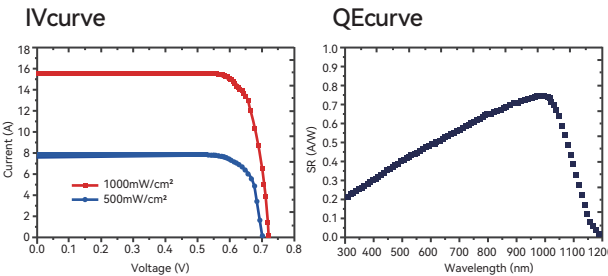
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Temperature coefficient of Isc	+(0.046±0.015)%/°C
Temperature coefficient of Voc	-(0.261±0.030)%/°C

Positive Electrical Performance Parameters

[Standard test conditions: irradiance 1000w/m², standard solar spectrum Am1.5g, 25 °C]

Conversion efficiency (%)	Maximum output power (W)	Maximum output voltage (V)	Maximum output current (A)	Open circuit voltage (V)	Short-circuit current (A)
25.7	8.80	0.634	13.879	0.724	14.175
25.6	8.76	0.633	13.847	0.723	14.146
25.5	8.73	0.632	13.814	0.722	14.117
25.4	8.70	0.631	13.782	0.721	14.089
25.3	8.66	0.630	13.750	0.720	14.058
25.2	8.63	0.629	13.717	0.719	14.032
25.1	8.59	0.628	13.684	0.718	14.005
25.0	8.56	0.627	13.652	0.717	13.985
24.9	8.53	0.626	13.619	0.716	13.967
24.8	8.49	0.625	13.586	0.715	13.950



Light Induced Degradation Test

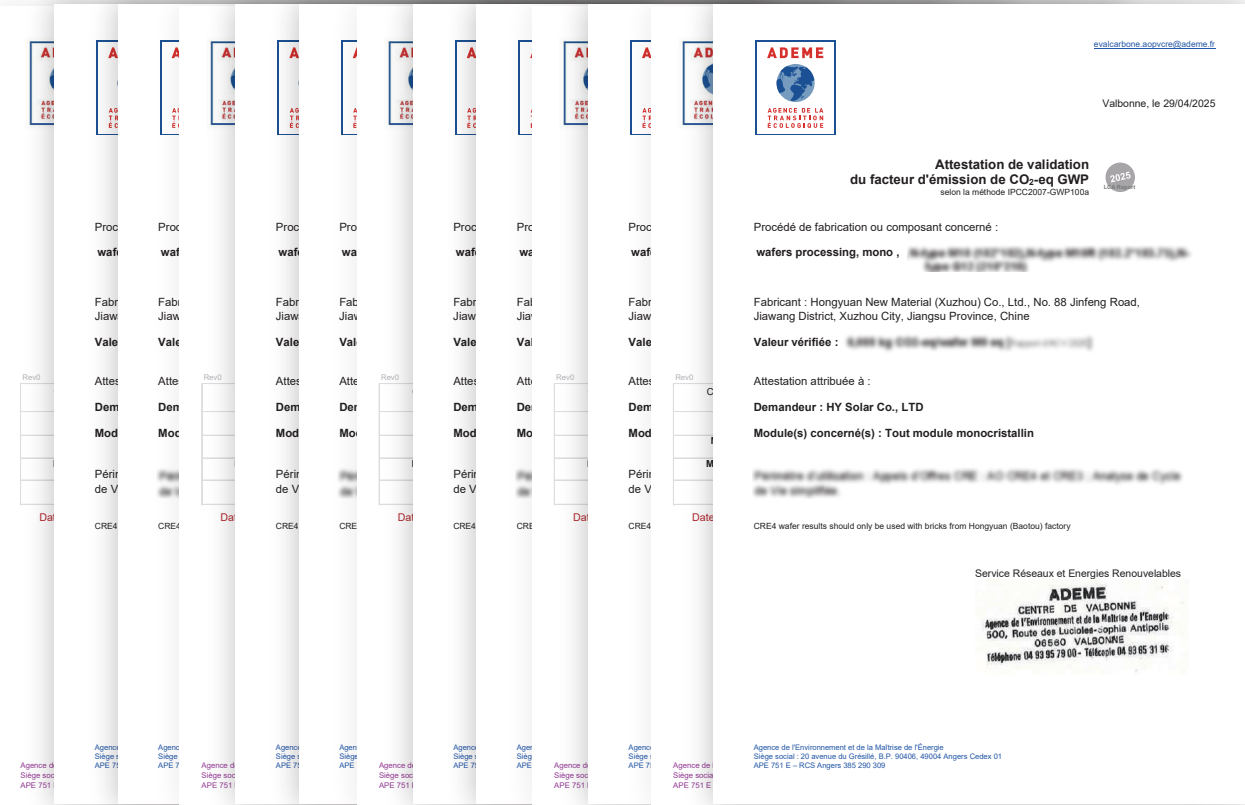
Using xenon lamp (Irradiance of 1000W/m²,with spectrum AM 1.5) to irradiatetest cells, after a total irradiation of 5kWh/m² the degradation of maximumoutput efficiency of cells is ≤0.8%

Full Supply Chain Traceability

Our vertically integrated traceability system begins with proprietary silicon production, providing complete transparency throughout the manufacturing chain from silicon wafers to cells and modules. This end-to-end tracking and precision management system ensures full accountability to meet customer requirements.

13 Carbon Footprint Certifications

(Covering industrial silicon, polysilicon, wafers, cells, and modules)



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