

Vertex N

N-type i-TOPCon bifacial dual glass
Monocrystalline module

PRODUCT: TSM-NEG19RC.20

POWER RANGE: 590-620W

620W

MAXIMUM POWER OUTPUT

0~+5W

POSITIVE POWER TOLERANCE

23.0%

MAXIMUM EFFICIENCY



High customer value

- Lower LCOE (Levelized Cost Of Energy), reduced BOS (Balance of System) cost, shorter payback time
- More energy harvest with cutting-edge N-type i-TOPCon technology
- Designed for compatibility with existing mainstream system components
- Higher container space utilization effectively reduces the freight cost



High power up to 620 W

- Up to 23.0% module efficiency with high density interconnect technology
- SMBB (Super multi-busbar) technology for better light trapping effect, lower series resistance and improved current collection



High reliability

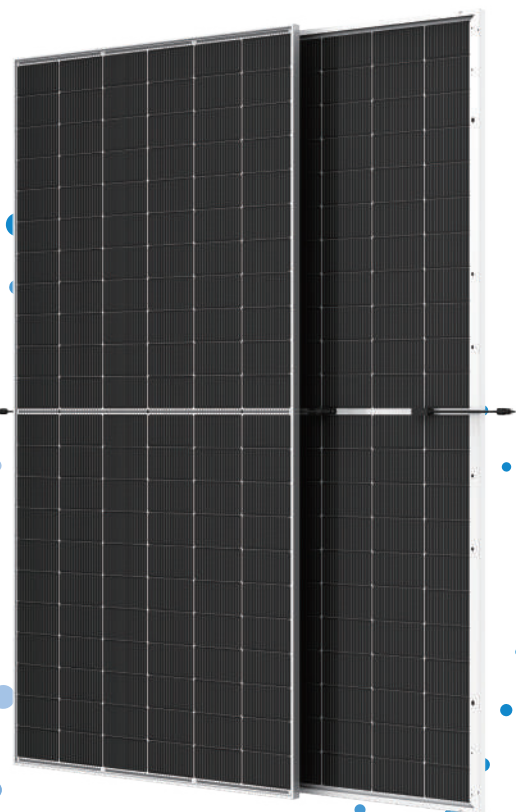
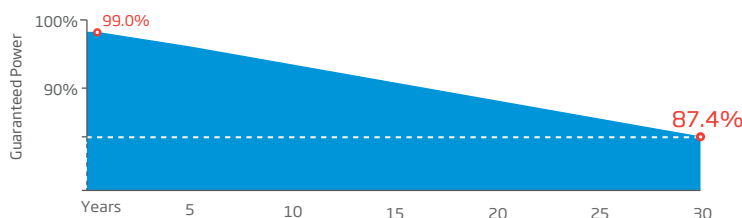
- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load



High energy yield

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- Lower degradation: 1% first year, 0.4% annually thereafter
- Lower temperature coefficient (-0.29%/°C)
- Up to 30% additional power gain from back side depending on albedo

Trina Solar's Vertex Bifacial Dual Glass Performance Warranty



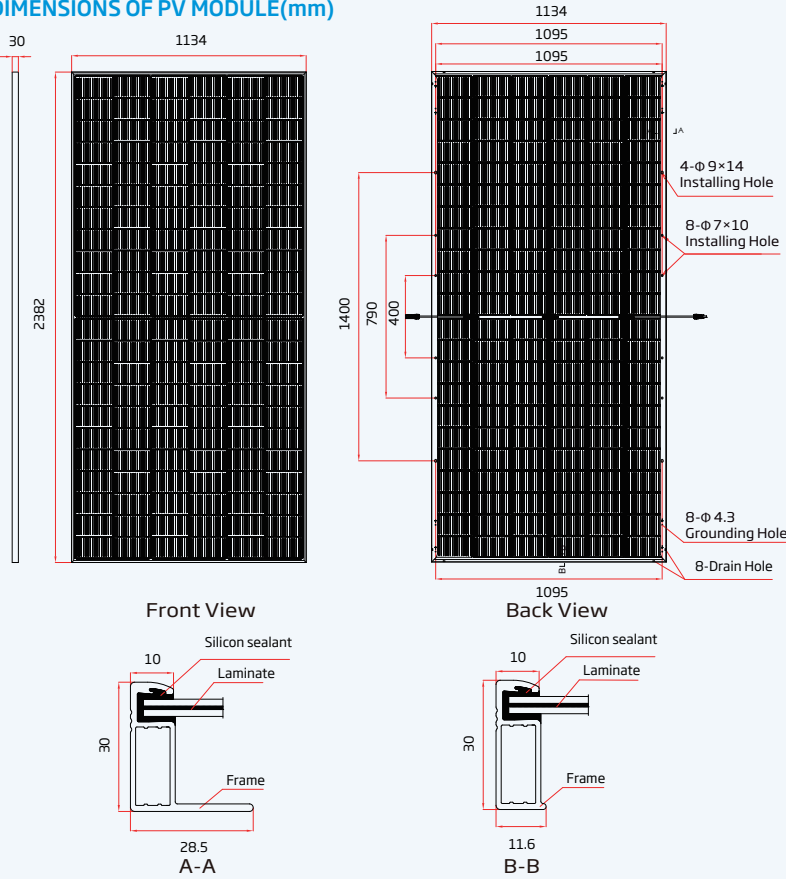
Comprehensive Products and System Certificates



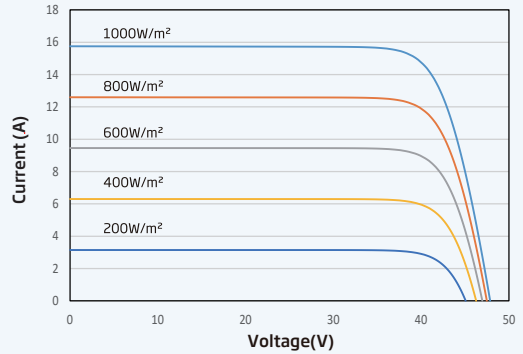
IEC61215/IEC61730/IEC61701/IEC62716/UL61730
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System



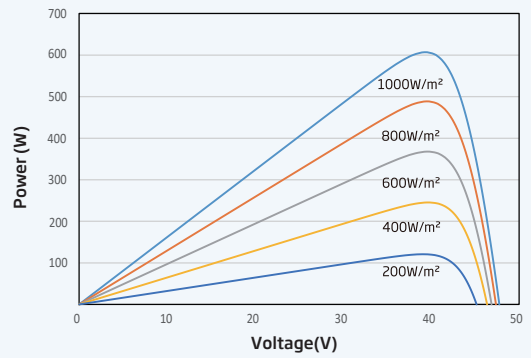
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE (605 W)



P-V CURVES OF PV MODULE (605 W)



MECHANICAL DATA

Solar Cells	N-type Monocrystalline
No. of cells	132 cells
Module Dimensions	2382×1134×30 mm (93.78×44.65×1.18 inches)
Weight	33.7kg (74.3 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)

Frame	30mm(1.18 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm ² (0.006 inches ²) Portrait: 350/280 mm(13.78/11.02 inches) Length can be customized
Connector	MC4 EVO2 / TS4 PLUS / TS4*

*Please refer to regional datasheet for specified connector.

ELECTRICAL DATA (STC & NOCT)

Testing Condition	STC		NOCT		STC		NOCT		STC		NOCT		STC		NOCT	
Peak Power Watts-P _{MAX} (Wp)*	590	450	595	454	600	459	605	462	610	466	615	470	620	474		
Power Tolerance-P _{MAX} (W)	0 ~ +5															
Maximum Power Voltage-V _{MPP} (V)	39.7	37.4	40.0	37.6	40.3	37.9	40.5	38.1	40.8	38.3	41.1	38.6	41.4	38.8		
Maximum Power Current-I _{MPP} (A)	14.86	12.05	14.89	12.07	14.91	12.11	14.94	12.13	14.96	12.16	14.98	12.19	14.99	12.20		
Open Circuit Voltage-V _{OC} (V)	47.8	45.4	48.1	45.7	48.4	46.0	48.7	46.2	49.0	46.5	49.3	46.8	49.6	47.1		
Short Circuit Current-I _{SC} (A)	15.72	12.67	15.76	12.69	15.80	12.73	15.83	12.75	15.86	12.78	15.89	12.80	15.91	12.82		
Module Efficiency η _m (%)	21.8		22.0		22.2		22.4		22.6		22.8		23.0			

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass 1.5. NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 5% & 10% backside power gain)

Backside Power Gain	5%		10%		5%		10%		5%		10%		5%		10%	
Total Equivalent power -P _{MAX} (Wp)	620	649	625	655	630	660	635	666	641	671	646	677	651	682		
Maximum Power Voltage-V _{MPP} (V)	39.7	39.7	40.0	40.0	40.3	40.3	40.5	40.5	40.8	40.8	41.1	41.1	41.4	41.4		
Maximum Power Current-I _{MPP} (A)	15.60	16.35	15.63	16.38	15.66	16.40	15.69	16.43	15.71	16.46	15.73	16.48	15.74	16.49		
Open Circuit Voltage-V _{OC} (V)	47.8	47.8	48.1	48.1	48.4	48.4	48.7	48.7	49.0	49.0	49.3	49.3	49.6	49.6		
Short Circuit Current-I _{SC} (A)	16.51	17.29	16.55	17.34	16.59	17.38	16.62	17.41	16.65	17.45	16.68	17.48	16.71	17.50		

Power Bifaciality: 80±5%.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P _{MAX}	-0.29%/°C
Temperature Coefficient of V _{OC}	-0.24%/°C
Temperature Coefficient of I _{SC}	0.04%/°C

MAXIMUM RATINGS

Operational Temperature	-40~+85° C
Maximum System Voltage	1500V DC (IEC) 1500V DC (UL)
Max Series Fuse Rating	35A

WARRANTY

12 year Product Workmanship Warranty
30 year Power Warranty
1% first year degradation
0.40% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box: 36 pieces
Modules per 40' container: 720 pieces

450 W

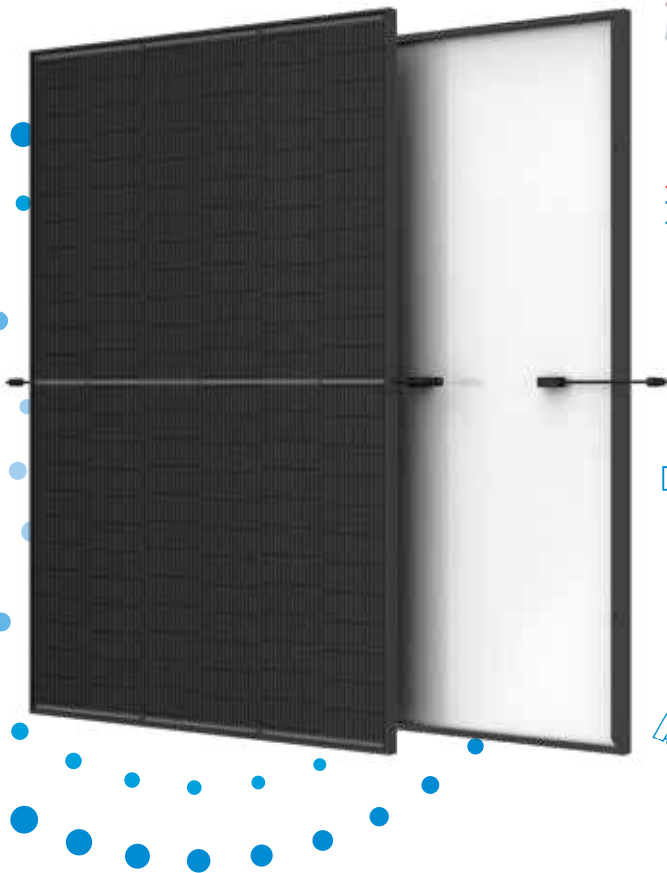
MAXIMUM POWER OUTPUT

0/+5 W

POSITIVE POWER TOLERANCE

22.5 %

MAXIMUM EFFICIENCY



Outstanding Visual Appearance

- Designed with aesthetics in mind
- Inheriting Trina Solar awards-winning full black design



Dual-glass Design, High Reliability

- Up to 25 years product warranty and 30 years power warranty
- Excellent fire rating and resistance to harsh environmental conditions
- 5,400 Pa snow load and 4,000 Pa wind load (test loads)



Small in size, bigger on power

- Up to 450 W, 22.5 % module efficiency with high density interconnect technology
- Reduces installation cost with higher power bin and efficiency
- Boost performance in warm weather with low temperature coefficient and operating temperature



Universal solution for residential and C&I rooftops

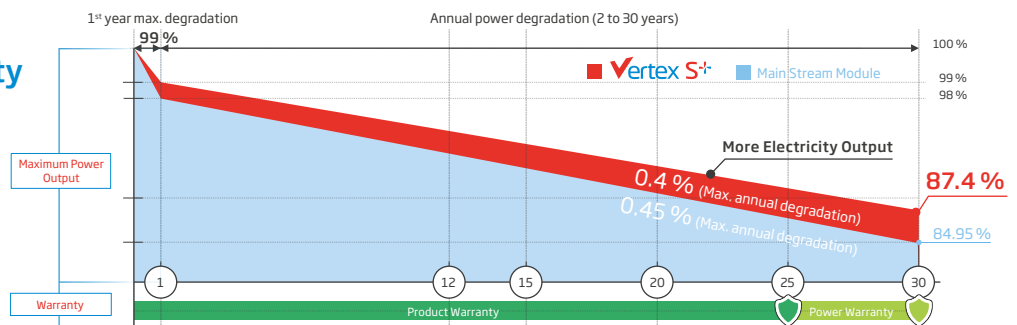
- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Perfect size and low weight for easy handling. Optimized transportation cost
- Flexible installation solutions for system deployment

Extended Vertex S⁺ Warranty

1 %
1st year max. degradation

0.4 %
Max. annual degradation from year 2 to 30

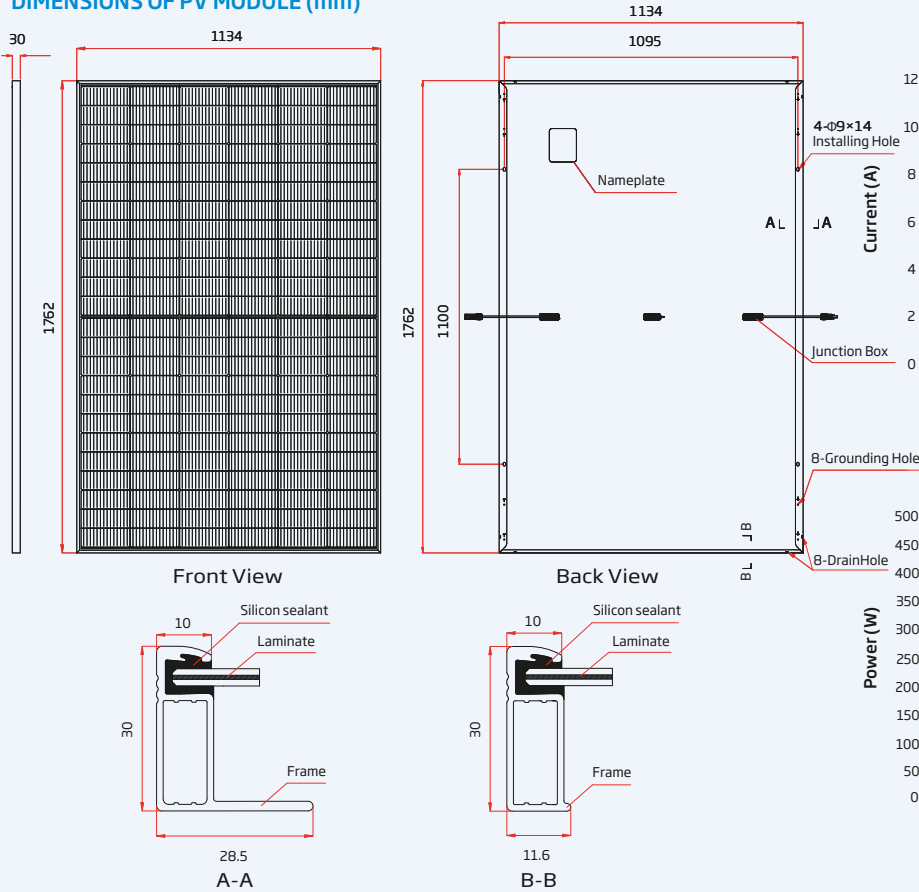
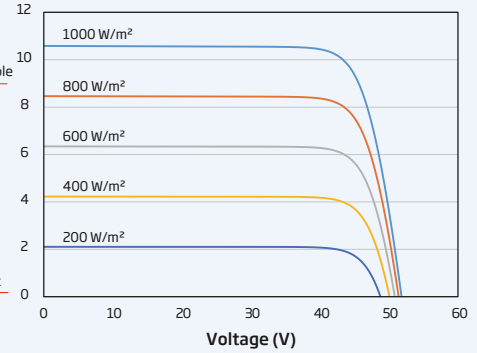
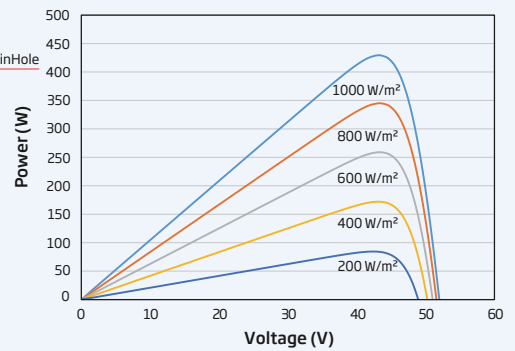
25 Years
Product Workmanship Warranty



Comprehensive Products and System Certificates



IEC61215/IEC61730/IEC61701/IEC62716
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System

DIMENSIONS OF PV MODULE (mm)

I-V CURVES OF PV MODULE (440 W)

P-V CURVES OF PV MODULE (440 W)

ELECTRICAL DATA (STC)

	TSM-425 NEG9R.25	TSM-430 NEG9R.25	TSM-435 NEG9R.25	TSM-440 NEG9R.25	TSM-445 NEG9R.25	TSM-450 NEG9R.25
Peak Power Watts-P _{MAX} (Wp)*	425	430	435	440	445	450
Power Tolerance-P _{MAX} (W)	0/+5					
Maximum Power Voltage-V _{MPP} (V)	42.9	43.2	43.6	44.0	44.3	44.6
Maximum Power Current-I _{MPP} (A)	9.92	9.96	9.99	10.01	10.05	10.09
Open Circuit Voltage-V _{OC} (V)	50.9	51.4	51.8	52.2	52.6	52.9
Short Circuit Current-I _{SC} (A)	10.56	10.59	10.64	10.67	10.71	10.74
Module Efficiency η_m (%)	21.3	21.5	21.8	22.0	22.3	22.5

STC: Irradiance 1000 W/m², Cell Temperature 25 °C, Air Mass AM 1.5. *Measuring tolerance: ±3 %.

ELECTRICAL DATA (NOCT)

	TSM-425 NEG9R.25	TSM-430 NEG9R.25	TSM-435 NEG9R.25	TSM-440 NEG9R.25	TSM-445 NEG9R.25	TSM-450 NEG9R.25
Maximum Power-P _{MAX} (Wp)	325	329	333	337	341	344
Maximum Power Voltage-V _{MPP} (V)	40.4	40.7	41.0	41.4	41.7	42.0
Maximum Power Current-I _{MPP} (A)	8.06	8.08	8.12	8.14	8.17	8.19
Open Circuit Voltage-V _{OC} (V)	48.3	48.7	49.1	49.5	49.9	50.2
Short Circuit Current-I _{SC} (A)	8.51	8.54	8.58	8.60	8.63	8.66

NOCT: Irradiance at 800 W/m², Ambient Temperature 20 °C, Wind Speed 1 m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	144 cells
Module Dimensions	1762×1134×30 mm
Weight	21.0 kg
Front Glass	1.6 mm, High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	1.6 mm, Heat Strengthened Glass
Frame	30 mm Anodized Aluminium Alloy, Black
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0 mm ² Landscape: 1100/1100 mm Portrait: 280/350 mm*
Connector	TS4 / MC4 EVO2*

*Special order only

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43 °C (±2 °C)
Temperature Coefficient of P _{MAX}	-0.29 %/°C
Temperature Coefficient of V _{OC}	-0.24 %/°C
Temperature Coefficient of I _{SC}	0.04 %/°C

MAXIMUM RATINGS

Operational Temperature	-40 to +85 °C
Maximum System Voltage	1500 V DC (IEC)
Max Series Fuse Rating	25 A

WARRANTY

25 year Product Workmanship Warranty
30 year Power Warranty
1% first year degradation
0.4% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box:	36 pieces
Modules per 40' container:	936 pieces

455 W

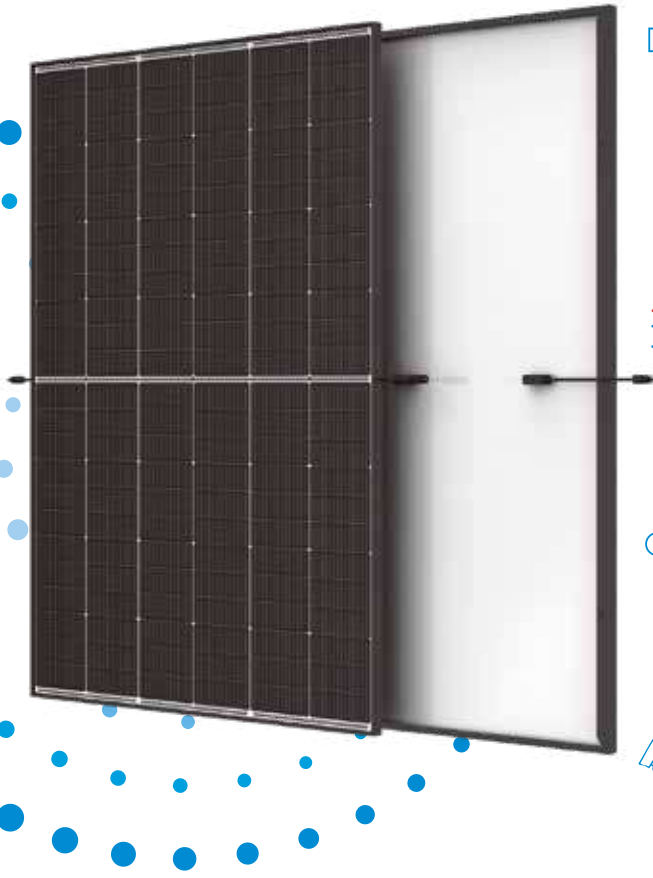
MAXIMUM POWER OUTPUT

0/+5 W

POSITIVE POWER TOLERANCE

22.8 %

MAXIMUM EFFICIENCY



Small in size, bigger on power

- Generates up to 455 W, 22.8 % module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping, lower series resistance, improved current collection and enhanced reliability
- Reduces installation cost with higher power bin and efficiency



Dual-glass Design, High Reliability

- Excellent fire rating and resistance to harsh environmental conditions
- 5,400 Pa snow load and 4,000 Pa wind load (test loads)



Maximize Energy Harvest

- Up to 25 years product warranty and 30 years power warranty
- 1 % first-year degradation and 0.4 % annual degradation enabled by N-type technology



Universal solution for residential and C&I rooftops

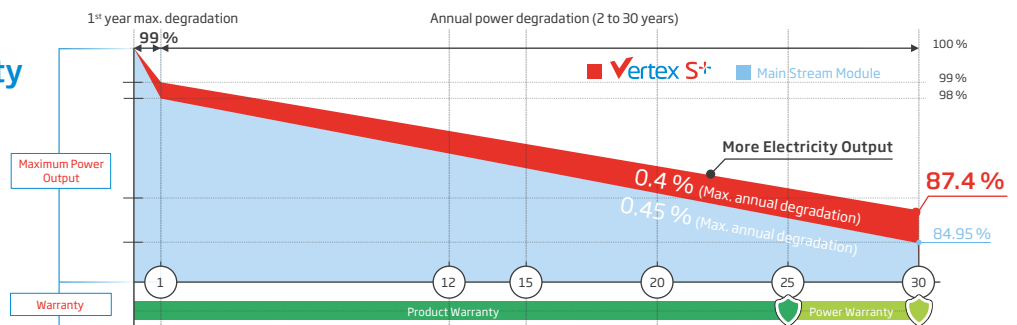
- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Perfect size and low weight for easy handling. Optimized transportation cost
- Flexible installation solutions for system deployment

Extended Vertex S+ Warranty

1 %
1st year max. degradation

0.4 %
Max. annual degradation from year 2 to 30

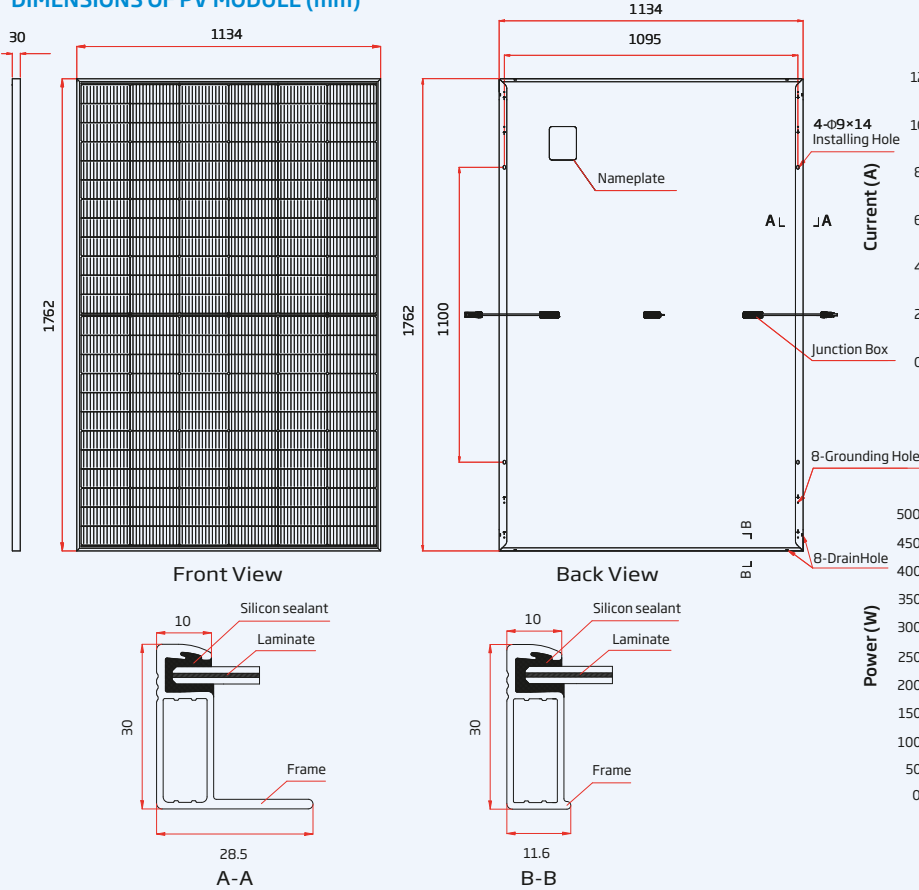
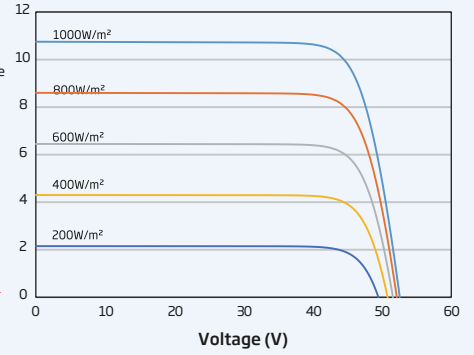
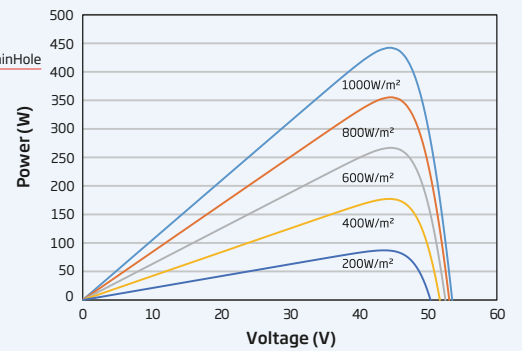
25 Years
Product Workmanship Warranty



Comprehensive Products and System Certificates



IEC61215/IEC61730/IEC61701/IEC62716
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System

DIMENSIONS OF PV MODULE (mm)

I-V CURVES OF PV MODULE (445 W)

P-V CURVES OF PV MODULE (445 W)

ELECTRICAL DATA (STC)

	TSM-430 NEG9R.28	TSM-435 NEG9R.28	TSM-440 NEG9R.28	TSM-445 NEG9R.28	TSM-450 NEG9R.28	TSM-455 NEG9R.28
Peak Power Watts- P_{MAX} (Wp)*	430	435	440	445	450	455
Power Tolerance- P_{MAX} (W)	0/+5					
Maximum Power Voltage- V_{MPP} (V)	43.2	43.6	44.0	44.3	44.6	45.0
Maximum Power Current- I_{MPP} (A)	9.96	9.99	10.01	10.05	10.09	10.11
Open Circuit Voltage- V_{OC} (V)	51.4	51.8	52.2	52.6	52.9	53.4
Short Circuit Current- I_{SC} (A)	10.59	10.64	10.67	10.71	10.74	10.77
Module Efficiency η_m (%)	21.5	21.8	22.0	22.3	22.5	22.8

STC: Irradiance 1000 W/m², Cell Temperature 25 °C, Air Mass AM 1.5. *Measuring tolerance: ±3%.

ELECTRICAL DATA (NOCT)

	TSM-430 NEG9R.28	TSM-435 NEG9R.28	TSM-440 NEG9R.28	TSM-445 NEG9R.28	TSM-450 NEG9R.28	TSM-455 NEG9R.28
Maximum Power- P_{MAX} (Wp)	329	333	337	341	344	348
Maximum Power Voltage- V_{MPP} (V)	40.7	41.0	41.4	41.7	42.0	42.3
Maximum Power Current- I_{MPP} (A)	8.08	8.12	8.14	8.17	8.19	8.22
Open Circuit Voltage- V_{OC} (V)	48.7	49.1	49.5	49.9	50.2	50.6
Short Circuit Current- I_{SC} (A)	8.54	8.58	8.60	8.63	8.66	8.68

NOCT: Irradiance at 800 W/m², Ambient Temperature 20 °C, Wind Speed 1 m/s.

MECHANICAL DATA

Solar Cells	N-type i-TOPCon Monocrystalline
No. of cells	144 cells
Module Dimensions	1762×1134×30 mm
Weight	21.0 kg
Front Glass	1.6 mm, High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	1.6 mm, Heat Strengthened Glass
Frame	30 mm Anodized Aluminium Alloy, Black
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0 mm ² Landscape: 1100/1100 mm Portrait: 280/350 mm*
Connector	TS4 / MC4 EVO2*

*Special order only

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43 °C (±2 °C)
Temperature Coefficient of P_{MAX}	-0.29 %/°C
Temperature Coefficient of V_{OC}	-0.24 %/°C
Temperature Coefficient of I_{SC}	0.04 %/°C

MAXIMUM RATINGS

Operational Temperature	-40 to +85 °C
Maximum System Voltage	1500 V DC (IEC)
Max Series Fuse Rating	25 A

WARRANTY

25 year Product Workmanship Warranty
30 year Power Warranty
1% first year degradation
0.4% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box:	36 pieces
Modules per 40' container:	936 pieces

505 W

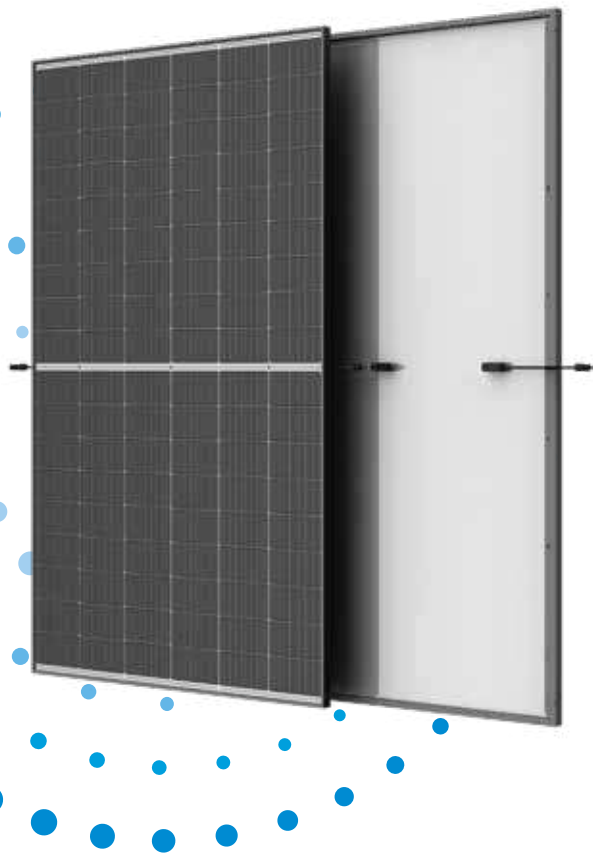
MAXIMUM POWER OUTPUT

0/+5 W

POSITIVE POWER TOLERANCE

22.7 %

MAXIMUM EFFICIENCY



Optimal Size for Commercial & Industrial Rooftops

- Compact module design with medium size for lower total system cost and shorter payback time
- Low voltage design for high string power



Lightweight Dual-glass Design, High Reliability

- Excellent fire resistance; durability in harsh environmental conditions and high temperature or high humidity areas
- Up to 5,400 Pa snow load and 2,400 Pa wind load (test loads)
- 25 years product warranty



Maximized Energy Harvest

- High module power: Up to 505 W, 22.7 % module efficiency with n type i-TOPCon technology
- Maximum 1 % first-year degradation and 0.4 % annual degradation
- 30 years power warranty



Universal Solution for Rooftop Systems

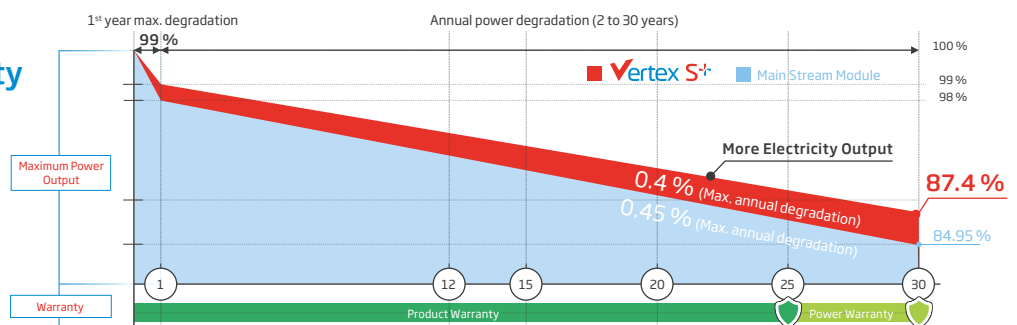
- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Easy to handle (length below 2 meters) and install on roofs with excellent size and light weight
- Flexible installation solutions for system deployment

Extended Vertex S⁺ Warranty

1 %
1st year max. degradation

0.4 %
Max. annual degradation from year 2 to 30

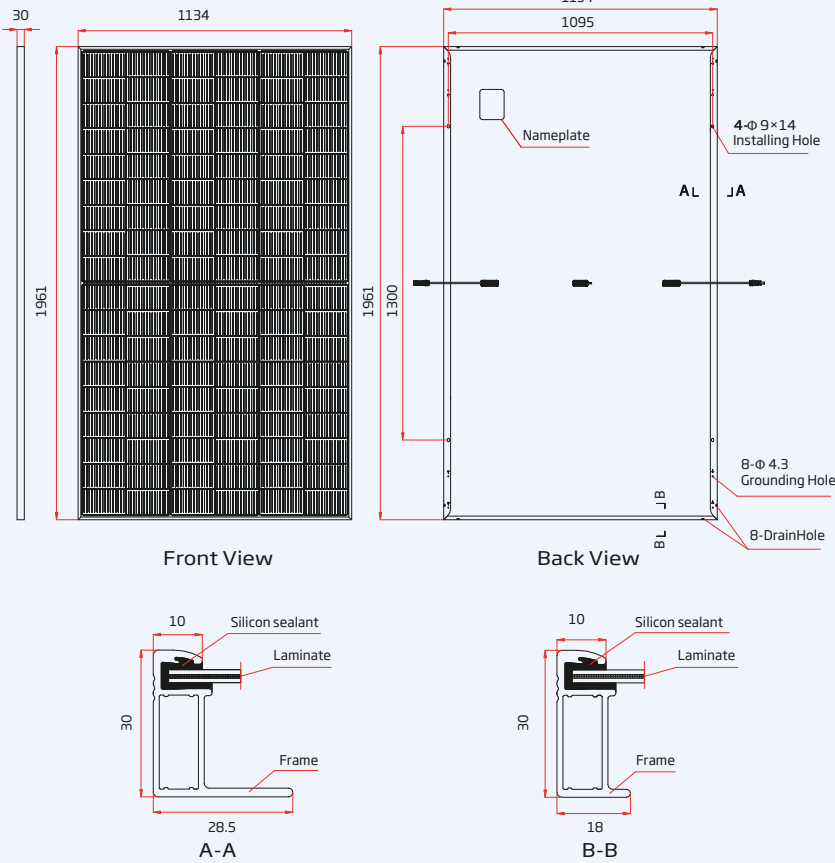
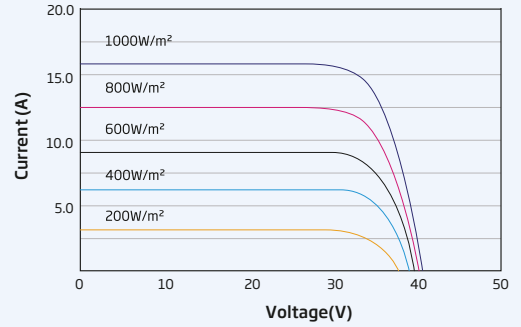
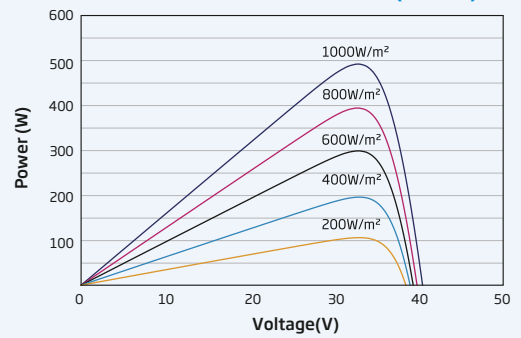
25 Years
Product Workmanship Warranty



Comprehensive Products and System Certificates



IEC61215/IEC61730/IEC61701/IEC62716
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System

DIMENSIONS OF PV MODULE(mm)

I-V CURVES OF PV MODULE (490 W)

P-V CURVES OF PV MODULE (490 W)

ELECTRICAL DATA (STC)
TSM-475 TSM-480 TSM-485 TSM-490 TSM-495 TSM-500 TSM-505
NEG18R.28 NEG18R.28 NEG18R.28 NEG18R.28 NEG18R.28 NEG18R.28 NEG18R.28

Peak Power Watts- P_{MAX} (Wp)*	475	480	485	490	495	500	505
Power Tolerance- P_{MAX} (W)	0/+5						
Maximum Power Voltage- V_{MPP} (V)	32.3	32.5	32.7	32.9	33.1	33.3	33.5
Maximum Power Current- I_{MPP} (A)	14.72	14.77	14.84	14.91	14.97	15.03	15.09
Open Circuit Voltage- V_{OC} (V)	39.0	39.2	39.4	39.6	39.8	40.1	40.3
Short Circuit Current- I_{SC} (A)	15.68	15.72	15.76	15.80	15.83	15.86	15.89
Module Efficiency η_m (%)	21.4	21.6	21.8	22.0	22.3	22.5	22.7

 STC: Irradiance 1000 W/m², Cell Temperature 25 °C, Air Mass AM 1.5. *Measuring tolerance: ±3%.

ELECTRICAL DATA (NOCT)
TSM-475 TSM-480 TSM-485 TSM-490 TSM-495 TSM-500 TSM-505
NEG18R.28 NEG18R.28 NEG18R.28 NEG18R.28 NEG18R.28 NEG18R.28 NEG18R.28

Maximum Power- P_{MAX} (Wp)	363	367	371	375	378	382	386
Maximum Power Voltage- V_{MPP} (V)	30.4	30.6	30.8	31.0	31.3	31.5	31.8
Maximum Power Current- I_{MPP} (A)	11.94	11.98	12.02	12.06	12.08	12.11	12.15
Open Circuit Voltage- V_{OC} (V)	36.9	37.2	37.4	37.6	37.7	38.0	38.3
Short Circuit Current- I_{SC} (A)	12.64	12.67	12.70	12.74	12.76	12.78	12.81

 NOCT: Irradiance at 800 W/m², Ambient Temperature 20 °C, Wind Speed 1 m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	108 cells
Module Dimensions	1961×1134×30 mm
Weight	23.5 kg
Front Glass	1.6 mm, High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	1.6 mm, Heat Strengthened Glass
Frame	30 mm Anodized Aluminium Alloy, Black
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0 mm ² Landscape: 1300/1300 mm Portrait: 280/350 mm*
Connector	TS4 / MC4 EVO2*

*Special order only.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P_{MAX}	-0.29%/°C
Temperature Coefficient of V_{OC}	-0.24%/°C
Temperature Coefficient of I_{SC}	0.04%/°C

MAXIMUM RATINGS

Operational Temperature	-40 to +85 °C
Maximum System Voltage	1500 V DC (IEC)
Max Series Fuse Rating	30 A

WARRANTY

 25 year Product Workmanship Warranty
 30 year Power Warranty
 1% first year degradation
 0.4% Annual Power Attenuation
 (Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box:	36 pieces
Modules per 40' container:	864 pieces

Vertex

BACKSHEET MONOCRYSTALLINE MODULE

PRODUCT: TSM-DE19R
POWER RANGE: 565-585 W

585 W

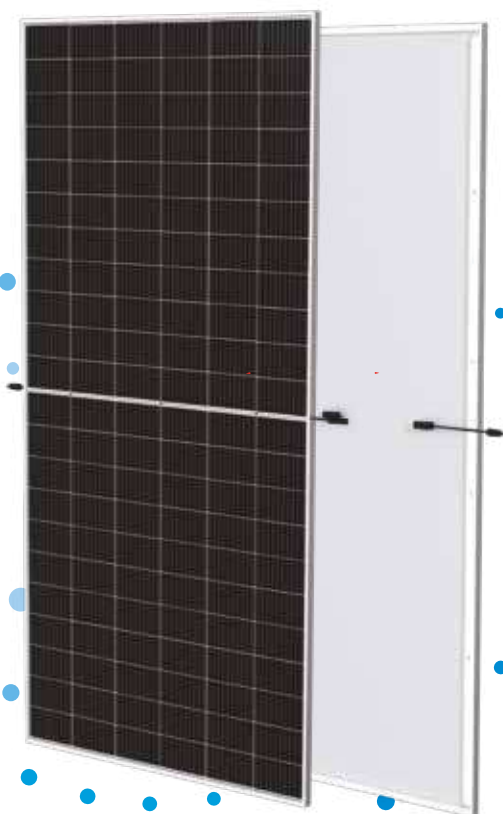
MAXIMUM POWER OUTPUT

0/+5 W

POSITIVE POWER TOLERANCE

21.7%

MAXIMUM EFFICIENCY



High power & efficiency

- Generates up to 585 W, 21.7 % module efficiency with high density interconnect technology
- Maximum energy harvest from rooftops



Easy design & installation on C&I rooftops

- Designed for high compatibility with mainstream inverters
- Mainstream rooftop mounting methods approved



Optimized system cost

- Lower cost of structure, cable and electrical equipment
- Reduced installation time and labor costs
- Shorter payback time



High reliability

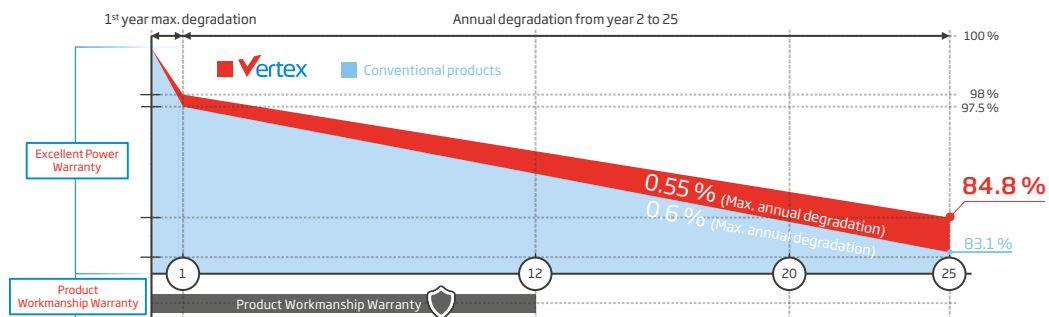
- Assembly in fully automated and state-of-the-art factories
- Beyond industry-standard hail test passed: 35 mm hail size
- Mechanical performance tested up to 5400 Pa positive load and 2400 Pa negative load

Vertex Warranty

2 %
1st year max. degradation

0.55 %
Max. annual degradation from year 2 to 25

12 Years
Product Workmanship Warranty



Comprehensive Product and System Certificates



IEC61215/IEC61730/IEC61701/IEC62716

ISO 9001: Quality Management System

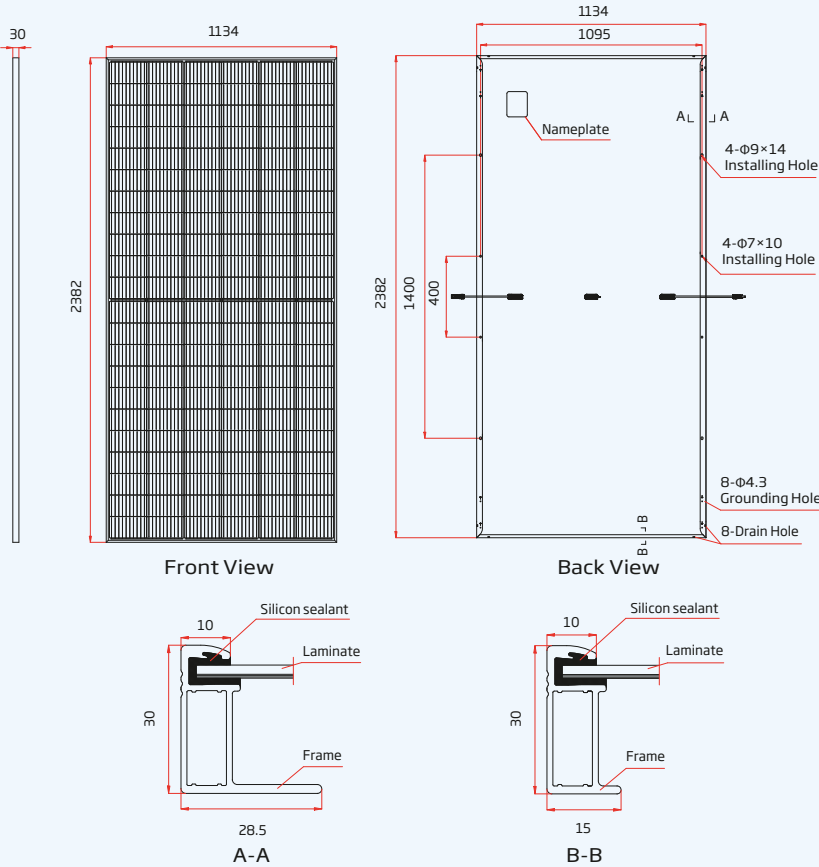
ISO 14001: Environmental Management System

ISO14064: Greenhouse Gases Emissions Verification

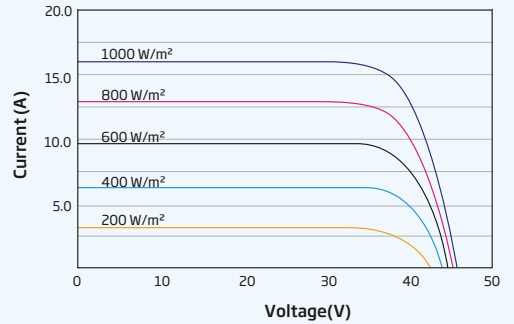
ISO45001: Occupational Health and Safety Management System



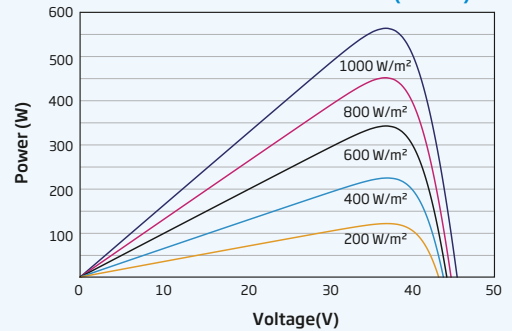
DIMENSIONS OF PV MODULE (mm)



I-V CURVES OF PV MODULE (575 W)



P-V CURVES OF PV MODULE (575 W)



ELECTRICAL DATA (STC)

	TSM-565 DE19R	TSM-570 DE19R	TSM-575 DE19R	TSM-580 DE19R	TSM-585 DE19R
Peak Power Watts-P _{MAX} (Wp)*	565	570	575	580	585
Power Tolerance-P _{MAX} (W)	0/+5	0/+5	0/+5	0/+5	0/+5
Maximum Power Voltage-V _{MPP} (V)	38.3	38.5	38.8	39.0	39.3
Maximum Power Current-I _{MPP} (A)	14.76	14.79	14.83	14.86	14.90
Open Circuit Voltage-V _{OC} (V)	45.6	45.8	46.1	46.3	46.6
Short Circuit Current-I _{SC} (A)	15.81	15.85	15.90	15.94	15.99
Module Efficiency η_m (%)	20.9	21.1	21.3	21.5	21.7

STC: Irradiance 1000 W/m², Cell Temperature 25 °C, Air Mass AM1.5. *Measuring tolerance: ±3%.

ELECTRICAL DATA (NOCT)

	TSM-565 DE19R	TSM-570 DE19R	TSM-575 DE19R	TSM-580 DE19R	TSM-585 DE19R
Maximum Power-P _{MAX} (Wp)	428	431	435	439	443
Maximum Power Voltage-V _{MPP} (V)	35.3	35.5	35.8	35.9	36.2
Maximum Power Current-I _{MPP} (A)	12.10	12.13	12.17	12.20	12.24
Open Circuit Voltage-V _{OC} (V)	42.9	43.1	43.4	43.6	43.9
Short Circuit Current-I _{SC} (A)	12.74	12.77	12.81	12.84	12.88

NOCT: Irradiance at 800 W/m², Ambient Temperature 20 °C, Wind Speed 1 m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	132 cells
Module Dimensions	2382 x 1134 x 30 mm
Weight	28.6 kg
Glass	3.2 mm, High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Backsheet	White
Frame	30 mm Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0 mm ² , Landscape: 1400/1400 mm Portrait: 280/350 mm*
Connector	TS4 Plus / TS4 / MC4 EV02 *

*Special order only.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43 °C (±2 K)
Temperature Coefficient of P _{MAX}	-0.34%/K
Temperature Coefficient of V _{OC}	-0.25%/K
Temperature Coefficient of I _{SC}	0.04%/K

MAXIMUM RATINGS

Operational Temperature	-40 to +85 °C
Maximum System Voltage	1500 V DC (IEC)
Max Series Fuse Rating	30 A

WARRANTY

12 Year product workmanship warranty
25 Year power warranty
2% First year degradation
0.55% Annual power degradation

(Please refer to the applicable limited warranty for details)

PACKAGING CONFIGURATION

Modules per box: 36 pieces
Modules per 40' container: 720 pieces



BACKSHEET MONOCRYSTALLINE MODULE

PRODUCT: TSM-DE21

POWER RANGE: 650 -670W

670W

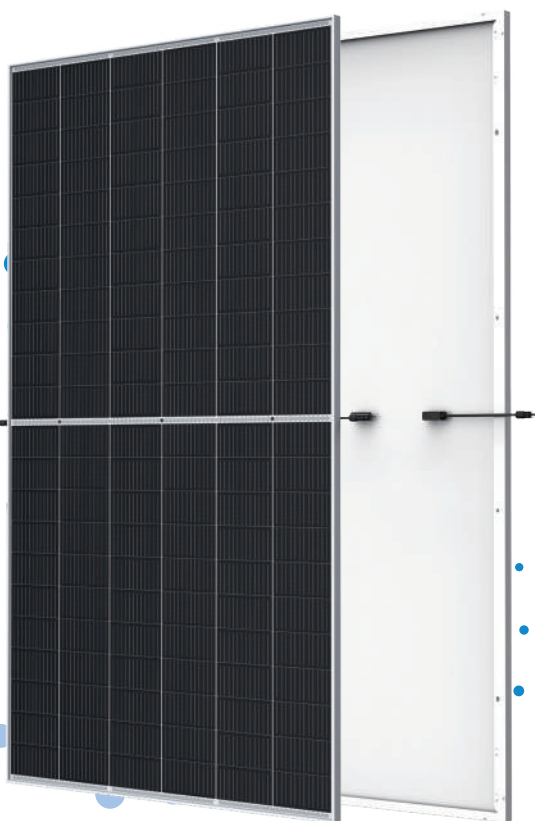
MAXIMUM POWER OUTPUT

0~+5W

POSITIVE POWER TOLERANCE

21.6%

MAXIMUM EFFICIENCY



High customer value

- Lower LCOE (Levelized Cost Of Energy), reduced BOS (Balance of System) cost, shorter payback time
- Lowest guaranteed first year and annual degradation;
- Designed for compatibility with existing mainstream system components



High power up to 670W

- Up to 21.6% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection



High reliability

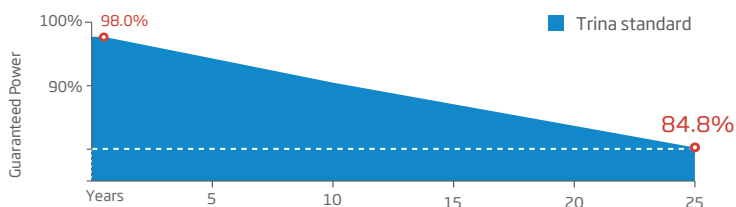
- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load



High energy yield

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature

Trina Solar's Backsheet Performance Warranty



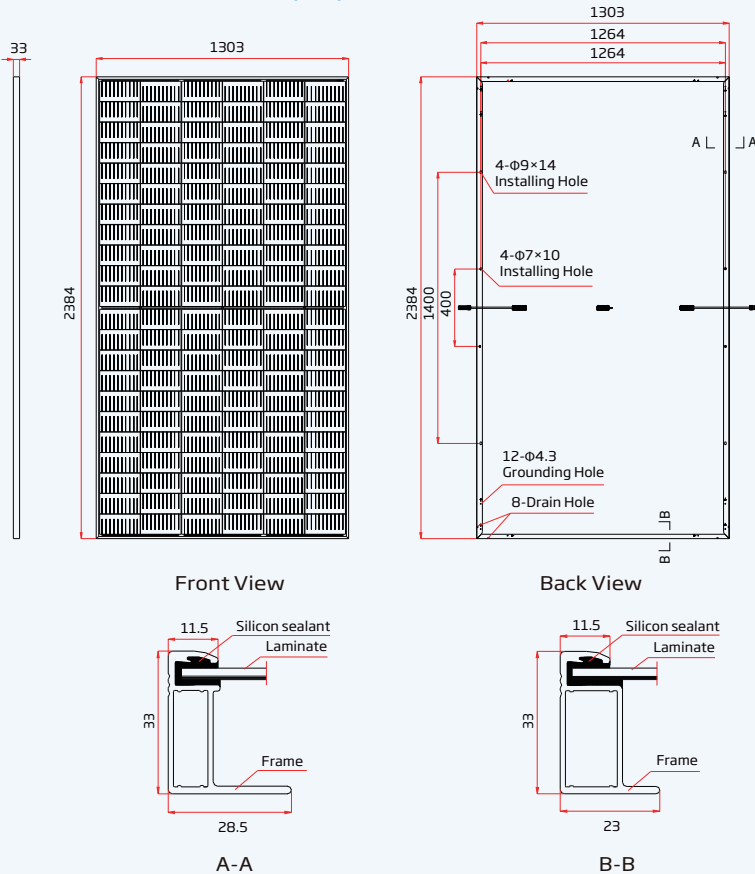
Comprehensive Products and System Certificates



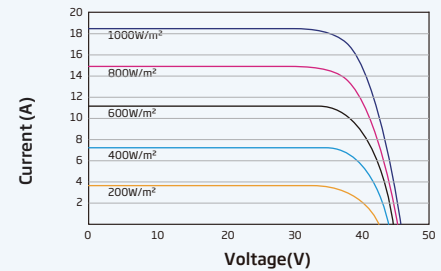
IEC61215/IEC61730/IEC61701/IEC62716
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System



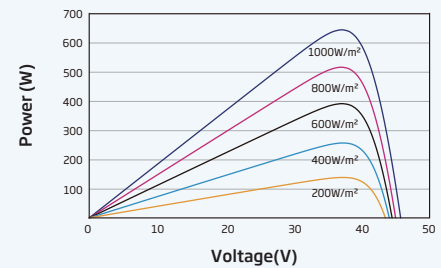
DIMENSIONS OF PV MODULE(mm)



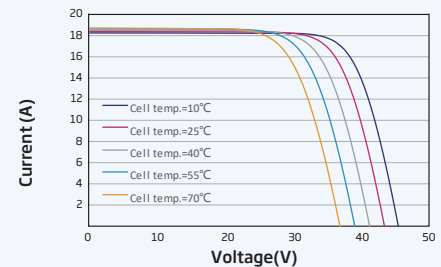
I-V CURVES OF PV MODULE(655 W)



P-V CURVES OF PV MODULE(655W)



I-V CURVES OF PV MODULE(655 W)



ELECTRICAL DATA (STC)

Parameter	650	655	660	665	670
Peak Power Watts-P _{MAX} (Wp)*					
Power Tolerance-P _{MAX} (W)			0 ~ +5		
Maximum Power Voltage-V _{MPP} (V)	37.4	37.6	37.8	38.0	38.2
Maximum Power Current-I _{MPP} (A)	17.39	17.43	17.47	17.51	17.55
Open Circuit Voltage-V _{OC} (V)	45.3	45.5	45.7	45.9	46.1
Short Circuit Current-I _{SC} (A)	18.44	18.48	18.53	18.57	18.62
Module Efficiency η _m (%)	20.9	21.1	21.2	21.4	21.6

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%.

ELECTRICAL DATA (NOCT)

Maximum Power-P _{MAX} (Wp)	492	496	500	504	508
Maximum Power Voltage-V _{MPP} (V)	34.9	35.1	35.3	35.4	35.6
Maximum Power Current-I _{MPP} (A)	14.09	14.13	14.17	14.22	14.26
Open Circuit Voltage-V _{OC} (V)	42.7	42.9	43.0	43.2	43.4
Short Circuit Current-I _{SC} (A)	14.86	14.89	14.93	14.96	15.01

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	132 cells
Module Dimensions	2384×1303×33 mm (93.86×51.30×1.30 inches)
Weight	33.3 kg (73.4 lb)
Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA
Backsheet	White
Frame	33mm(1.30 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm ² (0.006 inches ²), Portrait: 350/280 mm(13.78/11.02 inches) Length can be customized
Connector	MC4 EV02 / TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P _{MAX}	-0.34%/°C
Temperature Coefficient of V _{OC}	-0.25%/°C
Temperature Coefficient of I _{SC}	0.04%/°C

MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC) 1500V DC (UL)
Max Series Fuse Rating	30A

WARRANTY

12 year Product Workmanship Warranty
25 year Power Warranty
2% first year degradation
0.55% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box: 33 pieces
Modules per 40' container: 594 pieces



BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE

PRODUCT: TSM-DEG19RC.20

PRODUCT RANGE: 560-580W

580W

MAXIMUM POWER OUTPUT

0~+5W

POSITIVE POWER TOLERANCE

21.5%

MAXIMUM EFFICIENCY



High customer value

- Lower LCOE (Levelized Cost Of Energy), reduced BOS (Balance of System) cost, shorter payback time
- Lower first year and annual degradation
- Designed for compatibility with existing mainstream system components
- Higher return on Investment



High power up to 580W

- Up to 21.5% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection



High reliability

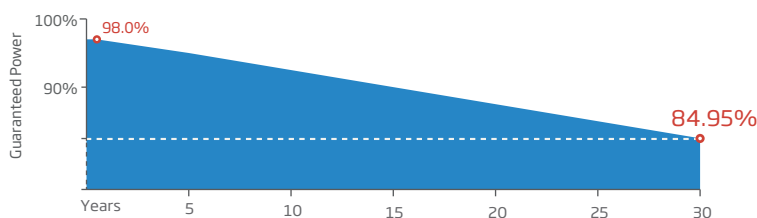
- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load



High energy yield

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature
- Up to 25% additional power gain from back side depending on albedo

Trina Solar's Vertex Bifacial Dual Glass Performance Warranty



Comprehensive Products and System Certificates



IEC61215/IEC61730/IEC61701/IEC62716

ISO 9001: Quality Management System

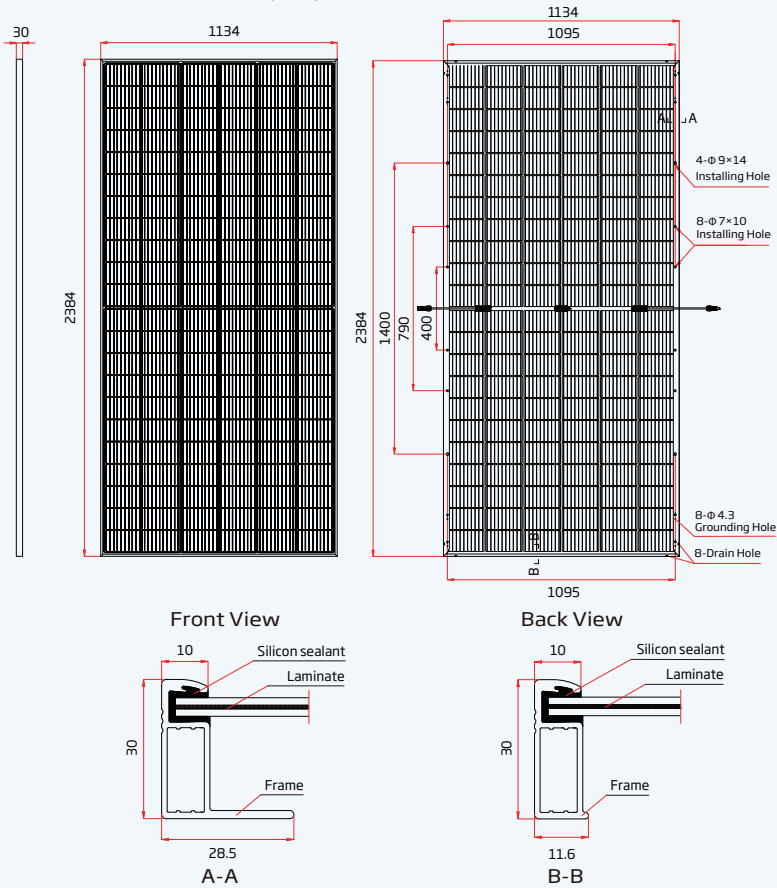
ISO 14001: Environmental Management System

ISO14064: Greenhouse Gases Emissions Verification

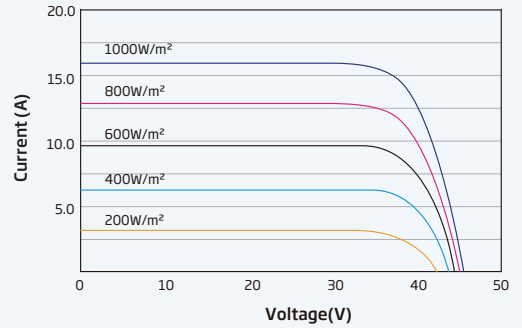
ISO45001: Occupational Health and Safety Management System



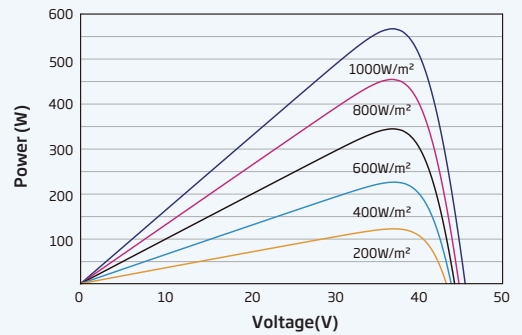
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE(570 W)



P-V CURVES OF PV MODULE(570 W)



ELECTRICAL DATA (STC)

Peak Power Watts - P_{MAX} (Wp)*	560	565	570	575	580
Power Tolerance- P_{MAX} (W)	0 ~ +5				
Maximum Power Voltage - V_{MPP} (V)	37.9	38.2	38.4	38.7	38.9
Maximum Power Current - I_{MPP} (A)	14.76	14.80	14.84	14.87	14.91
Open Circuit Voltage - V_{OC} (V)	45.2	45.5	45.7	46.0	46.2
Short Circuit Current - I_{SC} (A)	15.86	15.90	15.93	15.97	16.01
Module Efficiency η_m (%)	20.7	20.9	21.1	21.3	21.5

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power - P_{MAX} (Wp)	599	605	610	615	620
Maximum Power Voltage - V_{MPP} (V)	37.9	38.2	38.4	38.7	38.9
Maximum Power Current - I_{MPP} (A)	15.81	15.83	15.88	15.90	15.94
Open Circuit Voltage - V_{OC} (V)	45.2	45.5	45.7	46.0	46.2
Short Circuit Current - I_{SC} (A)	16.97	17.01	17.05	17.09	17.13
Irradiance ratio (rear/front)	10%				

Power Bifaciality: 70±5%.

ELECTRICAL DATA (NOCT)

Maximum Power - P_{MAX} (Wp)	424	428	431	436	439
Maximum Power Voltage - V_{MPP} (V)	34.9	35.2	35.4	35.7	35.8
Maximum Power Current - I_{MPP} (A)	12.12	12.15	12.18	12.22	12.25
Open Circuit Voltage - V_{OC} (V)	42.6	42.8	43.0	43.3	43.5
Short Circuit Current - I_{SC} (A)	12.78	12.81	12.84	12.87	12.90

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	132 cells
Module Dimensions	2384×1134×30 mm (93.86×44.65×1.18 inches)
Weight	33.7 kg (74.3 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)
Frame	30mm(1.18 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm ² (0.006 inches ²) Portrait: 350/280 mm(13.78/11.02 inches) Length can be customized
Connector	MC4 EVO2 / TS4 Plus/ TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P_{MAX}	-0.34%/°C
Temperature Coefficient of V_{OC}	-0.25%/°C
Temperature Coefficient of I_{SC}	0.04%/°C

MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC)
Max Series Fuse Rating	35A

WARRANTY

- 12 year Product Workmanship Warranty
- 30 year Power Warranty
- 2% first year degradation
- 0.45% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

- Modules per box: 36 pieces
- Modules per 40' container: 720 pieces



BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE

PRODUCT: TSM-DEG21C.20

POWER RANGE: 645-665W

665W

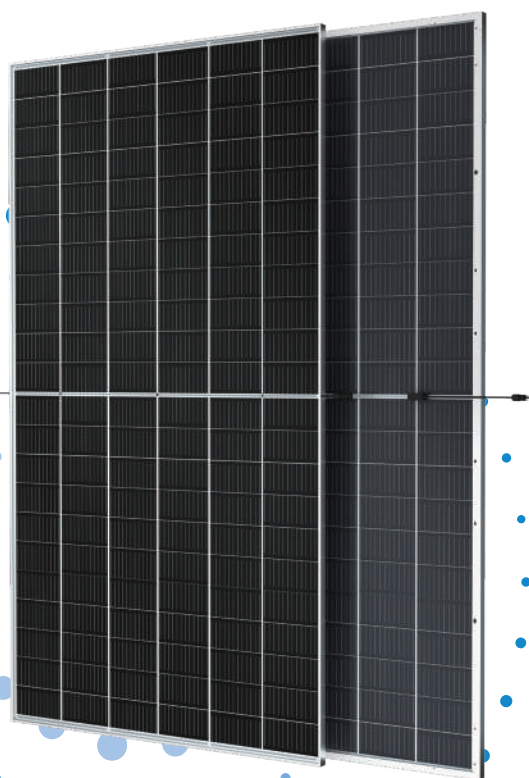
MAXIMUM POWER OUTPUT

0~+5W

POSITIVE POWER TOLERANCE

21.4%

MAXIMUM EFFICIENCY



High customer value

- Lower LCOE (Levelized Cost Of Energy), reduced BOS (Balance of System) cost, shorter payback time
- Lowest guaranteed first year and annual degradation;
- Designed for compatibility with existing mainstream system components



High power up to 665W

- Up to 21.4% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection



High reliability

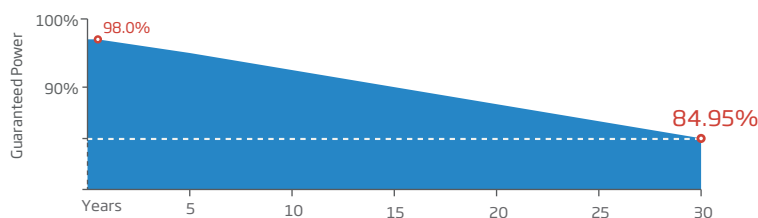
- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load



High energy yield

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature
- Up to 25% additional power gain from back side depending on albedo

Trina Solar's Vertex Bifacial Dual Glass Performance Warranty



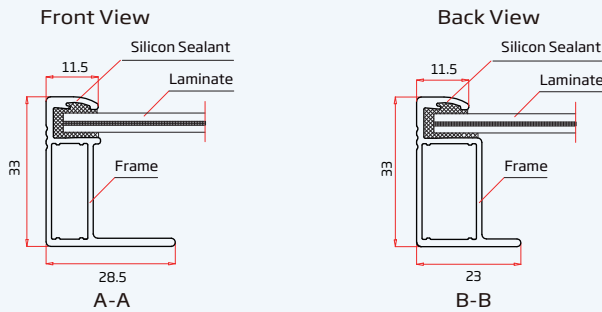
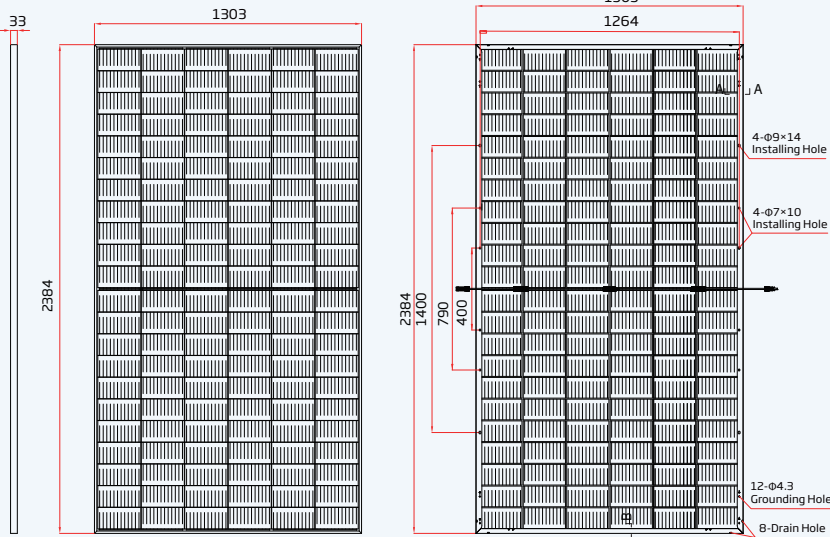
Comprehensive Products and System Certificates



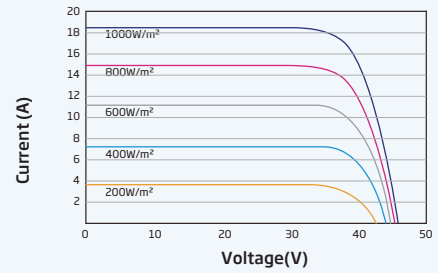
IEC61215/IEC61730/IEC61701/IEC62716/UL61730
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System



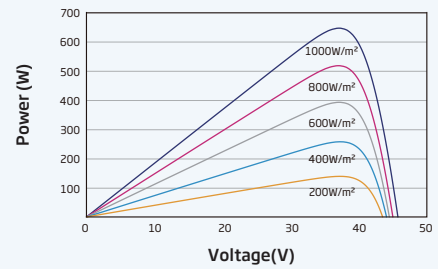
DIMENSIONS OF PV MODULE(mm)



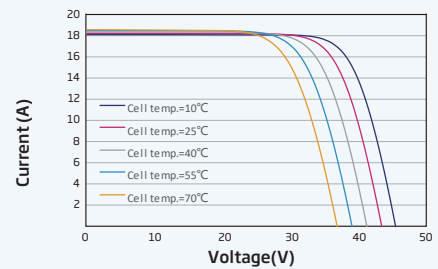
I-V CURVES OF PV MODULE(650 W)



P-V CURVES OF PV MODULE(650W)



I-V CURVES OF PV MODULE(650 W)



ELECTRICAL DATA (STC)

Peak Power Watts - P_{MAX} (Wp)*	645	650	655	660	665
Power Tolerance - P_{MAX} (W)	0 ~ +5				
Maximum Power Voltage - V_{MPP} (V)	37.5	37.7	37.9	38.1	38.3
Maximum Power Current - I_{MPP} (A)	17.23	17.27	17.31	17.35	17.39
Open Circuit Voltage - V_{OC} (V)	45.3	45.5	45.7	45.9	46.1
Short Circuit Current - I_{SC} (A)	18.31	18.35	18.40	18.45	18.50
Module Efficiency η_m (%)	20.8	20.9	21.1	21.2	21.4

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power - P_{MAX} (Wp)	690	696	701	706	712
Maximum Power Voltage - V_{MPP} (V)	37.5	37.7	37.9	38.1	38.3
Maximum Power Current - I_{MPP} (A)	18.44	18.48	18.52	18.56	18.60
Open Circuit Voltage - V_{OC} (V)	45.3	45.5	45.7	45.9	46.1
Short Circuit Current - I_{SC} (A)	19.59	19.63	19.69	19.74	19.79
Irradiance ratio (rear/front)	10%				

Power Bifaciality: 70±5%.

ELECTRICAL DATA (NOCT)

Maximum Power - P_{MAX} (Wp)	488	492	495	499	504
Maximum Power Voltage - V_{MPP} (V)	34.9	35.1	35.2	35.4	35.6
Maximum Power Current - I_{MPP} (A)	13.98	14.01	14.05	14.10	14.16
Open Circuit Voltage - V_{OC} (V)	42.7	42.9	43.0	43.2	43.4
Short Circuit Current - I_{SC} (A)	14.75	14.79	14.83	14.87	14.91

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	132 cells
Module Dimensions	2384×1303×33 mm (93.86×51.30×1.30 inches)
Weight	38.3 kg (84.4 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)
Frame	33mm(1.30 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm ² (0.006 inches ²), Portrait: 350/280 mm(13.78/11.02 inches) Length can be customized
Connector	MC4 EV02 / TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P_{MAX}	-0.34%/°C
Temperature Coefficient of V_{OC}	-0.25%/°C
Temperature Coefficient of I_{SC}	0.04%/°C

MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC) 1500V DC (UL)
Max Series Fuse Rating	35A

WARRANTY

12 year Product Workmanship Warranty
30 year Power Warranty
2% first year degradation
0.45% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box: 33 pieces
Modules per 40' container: 594 pieces

Vertex S

BACKSHEET MONOCRYSTALLINE MODULE

PRODUCT: TSM-DE09R.05
POWER RANGE: 405-425 W

425 W+

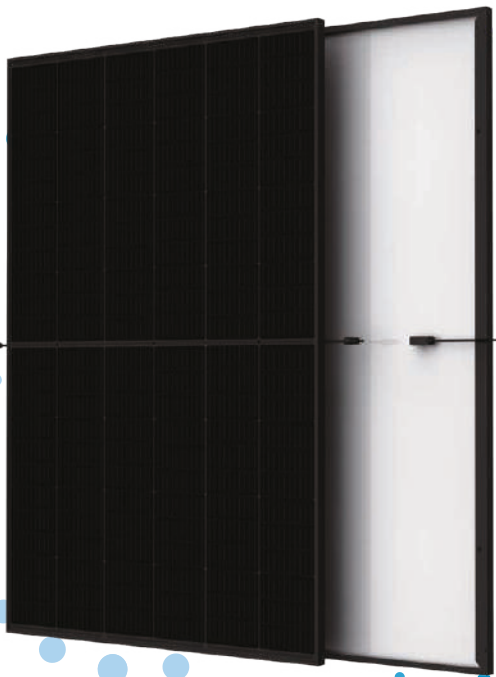
MAXIMUM POWER OUTPUT

0/+5 W

POSITIVE POWER TOLERANCE

21.3 %

MAXIMUM EFFICIENCY



Outstanding Visual Appearance

- Designed with aesthetics in mind
- Ultra-thin, virtually invisible busbars
- Excellent cell color control by machine selection



Small in size, big on power

- Generates up to 425 W, 21.3 % module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping, lower series resistance, improved current collection and enhanced reliability
- Excellent low light performance (IAM) with cell process and module material optimization



Optimal solution for residential rooftops

- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Perfect size and low weight for easy handling. Optimized transportation cost
- Reduces installation cost with higher power bin and efficiency
- Flexible installation solutions for system deployment



High Reliability

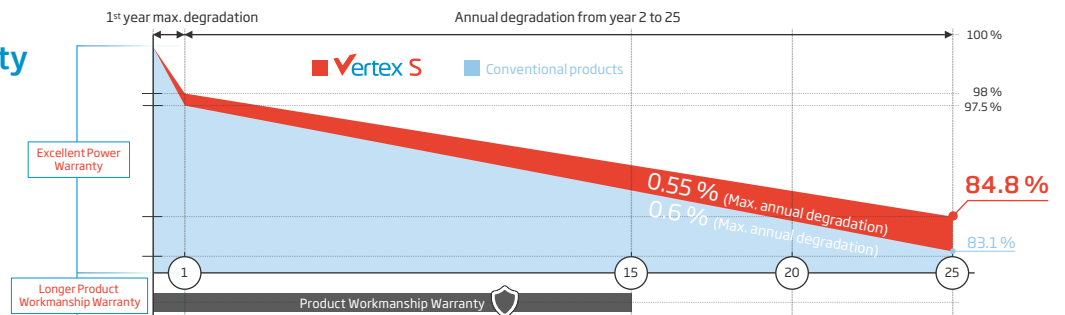
- Positive load up to 6,000 Pa (snow)
- Negative load up to 4,000 Pa (wind)

Extended Vertex S Warranty

2 %
1st year max. degradation

0.55 %
Max. annual degradation from year 2 to 25

15 Years
Product Workmanship Warranty

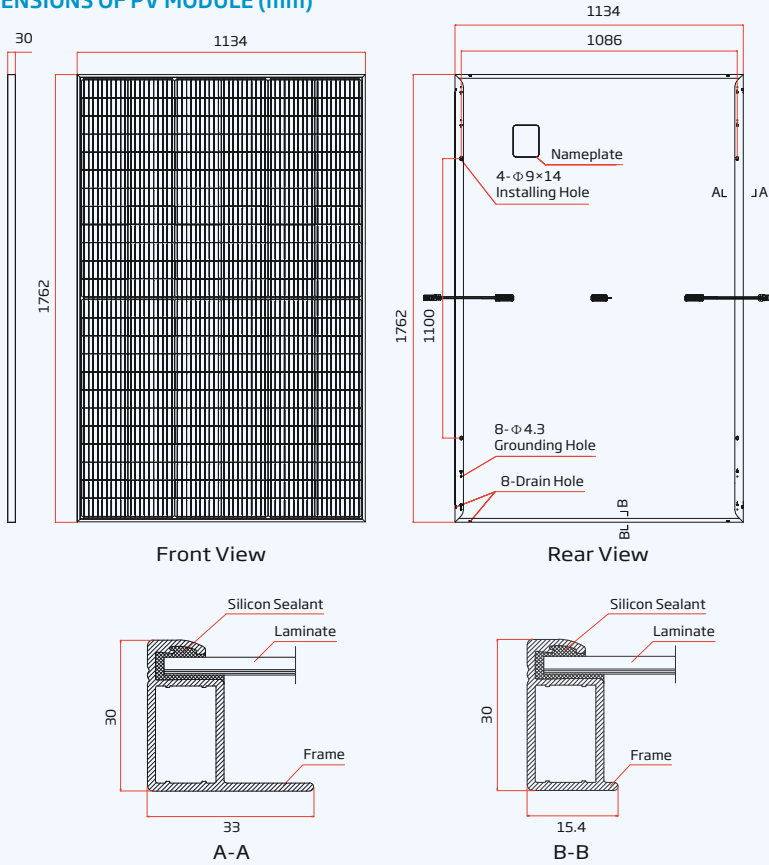


Comprehensive Product and System Certificates

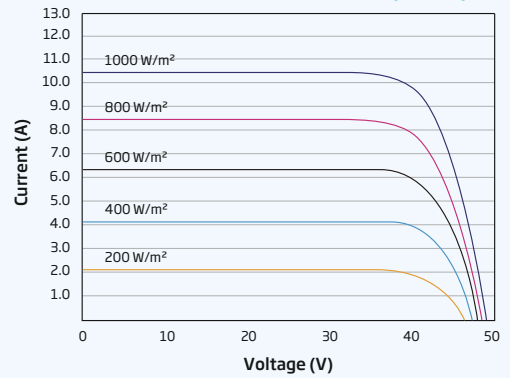


IEC61215/IEC61730/IEC61701/IEC62716
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Verification
ISO45001: Occupational Health and Safety Management System

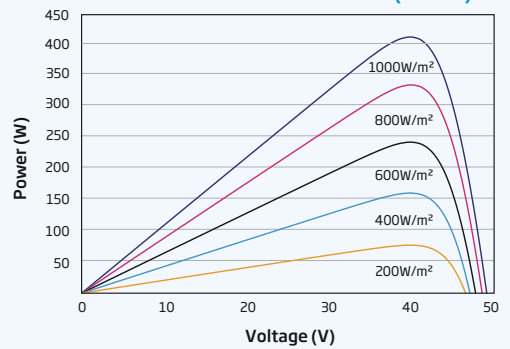
DIMENSIONS OF PV MODULE (mm)



I-V CURVES OF PV MODULE (415 W)



P-V CURVES OF PV MODULE (415 W)



ELECTRICAL DATA (STC)

	TSM-405 DE09R.05	TSM-410 DE09R.05	TSM-415 DE09R.05	TSM-420 DE09R.05	TSM-425 DE09R.05
Peak Power Watts- P_{MAX} (Wp)*	405	410	415	420	425
Power Tolerance- P_{MAX} (W)	0/+5	0/+5	0/+5	0/+5	0/+5
Maximum Power Voltage- V_{MPP} (V)	41.3	41.5	41.7	42.0	42.2
Maximum Power Current- I_{MPP} (A)	9.82	9.87	9.94	10.01	10.08
Open Circuit Voltage- V_{oc} (V)	49.7	49.8	50.0	50.1	50.2
Short Circuit Current- I_{sc} (A)	10.50	10.53	10.55	10.58	10.61
Module Efficiency η_m (%)	20.3	20.5	20.8	21.0	21.3

STC: Irradiance 1000 W/m², Cell Temperature 25°C, Air Mass AM1.5 *Measuring tolerance: ±3%

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	144 cells
Module Dimensions	1762×1134×30 mm
Weight	21.8 kg
Glass	3.2 mm, High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Backsheet	Black-White
Frame	30 mm Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0 mm ² Landscape: 1100/1100 mm Portrait: 280/350 mm*
Connector	TS4/MC4 EVO2*

*Special order only

ELECTRICAL DATA (NOCT)

	TSM-405 DE09R.05	TSM-410 DE09R.05	TSM-415 DE09R.05	TSM-420 DE09R.05	TSM-425 DE09R.05
Maximum Power- P_{MAX} (Wp)	306	309	312	317	321
Maximum Power Voltage- V_{MPP} (V)	38.3	38.5	38.7	39.2	39.5
Maximum Power Current- I_{MPP} (A)	7.99	8.03	8.07	8.10	8.13
Open Circuit Voltage- V_{oc} (V)	46.8	46.9	47.1	47.1	47.2
Short Circuit Current- I_{sc} (A)	8.46	8.49	8.50	8.53	8.55

NOCT: Irradiance at 800 W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2 K)
Temperature Coefficient of P_{MAX}	-0.34%/K
Temperature Coefficient of V_{oc}	-0.25%/K
Temperature Coefficient of I_{sc}	0.04%/K

MAXIMUM RATINGS

Operational Temperature	-40 to +85°C
Maximum System Voltage	1500 V DC (IEC)
Max Series Fuse Rating	20 A

WARRANTY

- 15 Year product workmanship warranty
- 25 Year power warranty
- 2% First year degradation
- 0.55% Annual power degradation

(Please refer to the applicable limited warranty for details)

PACKAGING CONFIGURATION

Modules per box	36 pieces
Modules per 40' container	936 pieces

Vertex S

BACKSHEET MONOCRYSTALLINE MODULE

PRODUCT: TSM-DE09R.08
POWER RANGE: 415-435 W

435 W+

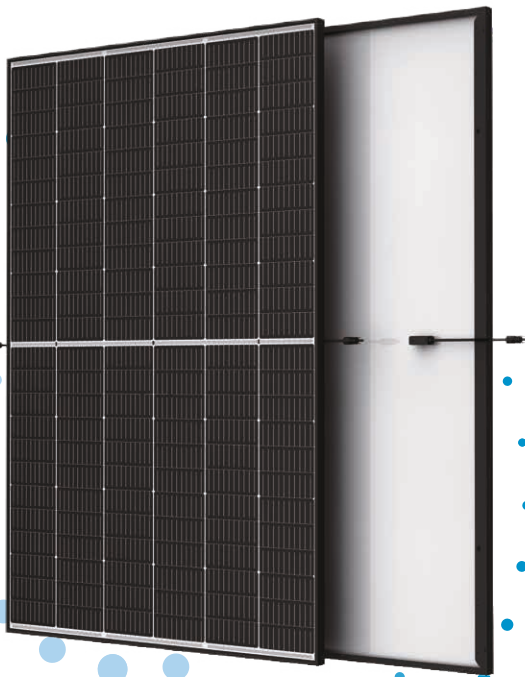
MAXIMUM POWER OUTPUT

0/+5 W

POSITIVE POWER TOLERANCE

21.8 %

MAXIMUM EFFICIENCY



Small in size, big on power

- Generates up to 435 W, 21.8 % module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping, lower series resistance, improved current collection and enhanced reliability
- Excellent low light performance (IAM) with cell process and module material optimization



Universal solution for residential and C&I rooftops

- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Perfect size and low weight for easy handling. Optimized transportation cost
- Reduces installation cost with higher power bin and efficiency
- Flexible installation solutions for system deployment



High Reliability

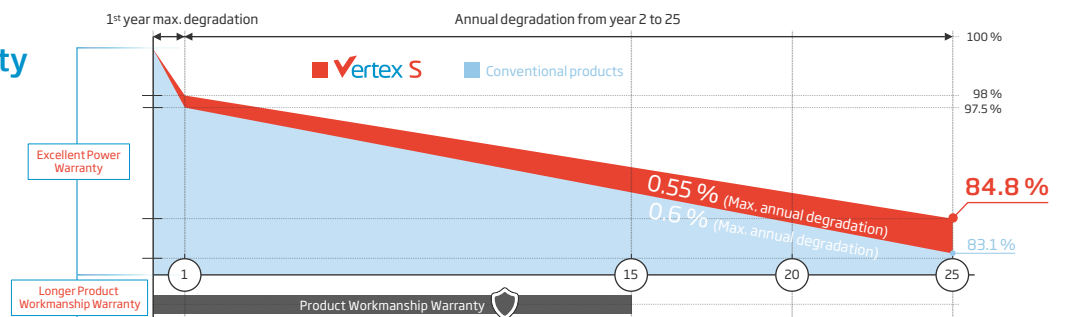
- Positive load up to 6,000 Pa (snow)
- Negative load up to 4,000 Pa (wind)

Extended Vertex S Warranty

2 %
1st year max. degradation

0.55 %
Max. annual degradation from year 2 to 25

15 Years
Product Workmanship Warranty



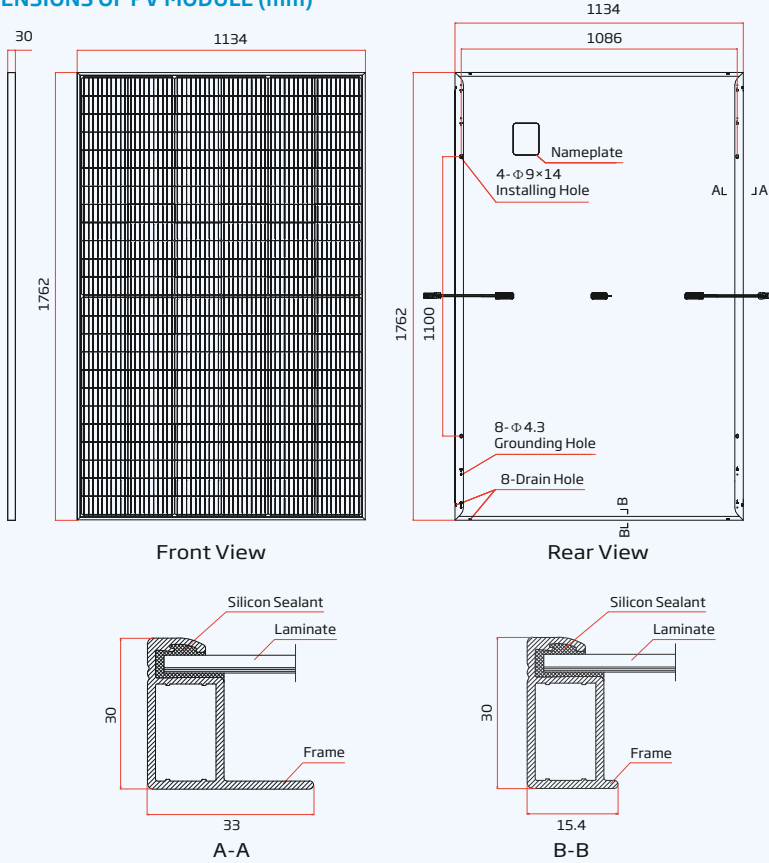
Comprehensive Product and System Certificates



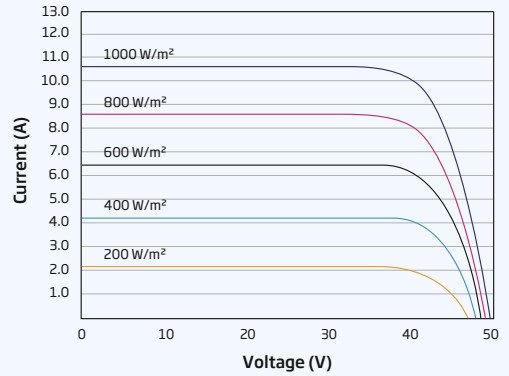
IEC61215/IEC61730/IEC61701/IEC62716
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System



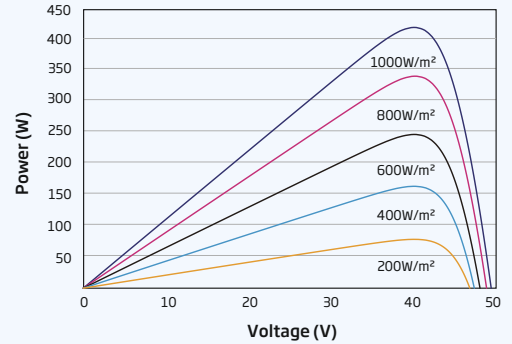
DIMENSIONS OF PV MODULE (mm)



I-V CURVES OF PV MODULE (425 W)



P-V CURVES OF PV MODULE (425 W)



ELECTRICAL DATA (STC)

	TSM-415 DE09R.08	TSM-420 DE09R.08	TSM-425 DE09R.08	TSM-430 DE09R.08	TSM-435 DE09R.08
Peak Power Watts- P_{MAX} (Wp)*	415	420	425	430	435
Power Tolerance- P_{MAX} (W)	0/+5	0/+5	0/+5	0/+5	0/+5
Maximum Power Voltage- V_{MPP} (V)	41.7	42.0	42.2	42.3	42.5
Maximum Power Current- I_{MPP} (A)	9.94	10.01	10.08	10.17	10.24
Open Circuit Voltage- V_{oc} (V)	50.0	50.1	50.2	50.3	50.4
Short Circuit Current- I_{sc} (A)	10.55	10.58	10.61	10.64	10.67
Module Efficiency η_m (%)	20.8	21.0	21.3	21.5	21.8

STC: Irradiance 1000 W/m², Cell Temperature 25°C, Air Mass AM1.5 *Measuring tolerance: ±3%

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	144 cells
Module Dimensions	1762×1134×30 mm
Weight	21.8 kg
Glass	3.2 mm, High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Backsheet	White
Frame	30 mm Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0 mm ² Landscape: 1100/1100 mm Portrait: 280/350 mm*
Connector	TS4/MC4 EVO2*

*Special order only

ELECTRICAL DATA (NOCT)

	TSM-415 DE09R.08	TSM-420 DE09R.08	TSM-425 DE09R.08	TSM-430 DE09R.08	TSM-435 DE09R.08
Maximum Power- P_{MAX} (Wp)	312	317	321	325	329
Maximum Power Voltage- V_{MPP} (V)	38.7	39.2	39.5	39.7	40.0
Maximum Power Current- I_{MPP} (A)	8.07	8.10	8.13	8.17	8.23
Open Circuit Voltage- V_{oc} (V)	47.1	47.1	47.2	47.4	47.5
Short Circuit Current- I_{sc} (A)	8.50	8.53	8.55	8.60	8.65

NOCT: Irradiance at 800 W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

TEMPERATURE RATINGS

NOCT(Nominal Operating Cell Temperature)	43°C (±2 K)
Temperature Coefficient of P_{MAX}	-0.34%/K
Temperature Coefficient of V_{oc}	-0.25%/K
Temperature Coefficient of I_{sc}	0.04%/K

MAXIMUM RATINGS

Operational Temperature	-40 to +85°C
Maximum System Voltage	1500 V DC (IEC)
Max Series Fuse Rating	20 A

WARRANTY

- 15 Year product workmanship warranty
- 25 Year power warranty
- 2% First year degradation
- 0.55% Annual power degradation

(Please refer to the applicable limited warranty for details)

PACKAGING CONFIGURATION

Modules per box	36 pieces
Modules per 40' container	936 pieces

445 W

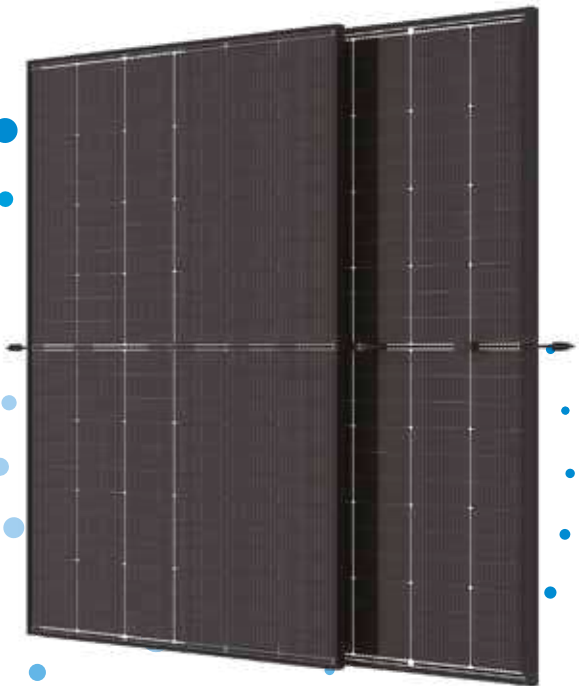
MAXIMUM POWER OUTPUT

0/+5 W

POSITIVE POWER TOLERANCE

22.3 %

MAXIMUM EFFICIENCY



Small in size, bigger on power

- Generates up to 445 W, 22.3 % module efficiency with high density interconnect technology
- Boost performance at high temperature environments with better thermal behavior



Transparent Dual-glass Design

- Designed with aesthetics in mind
- Excellent fire rating and resistance to harsh environmental conditions
- 5,400 Pa snow load and 4,000 Pa wind load (test loads)



Maximize Energy Harvest

- Higher bifaciality up to 85 %
- Up to 25 years product warranty and 30 years power warranty
- 1 % first-year degradation and 0.4 % annual degradation enabled by N-type technology



Universal solution for residential and C&I rooftops

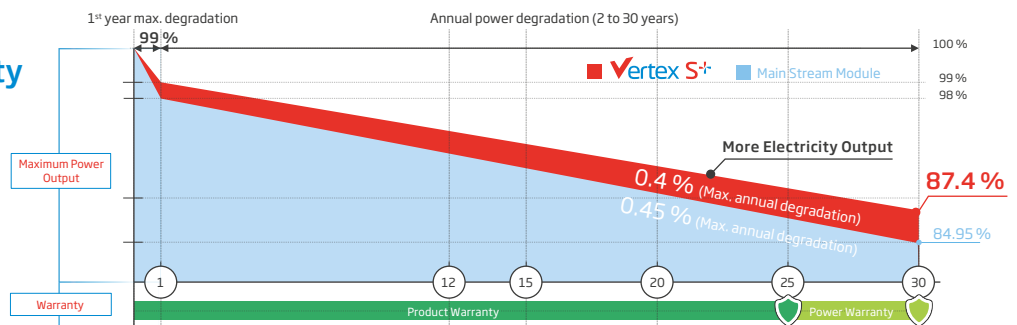
- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Perfect size and low weight for easy handling

Extended Vertex S+ Warranty

1 %
1st year max. degradation

0.4 %
Max. annual degradation from year 2 to 30

25 Years
Product Workmanship Warranty

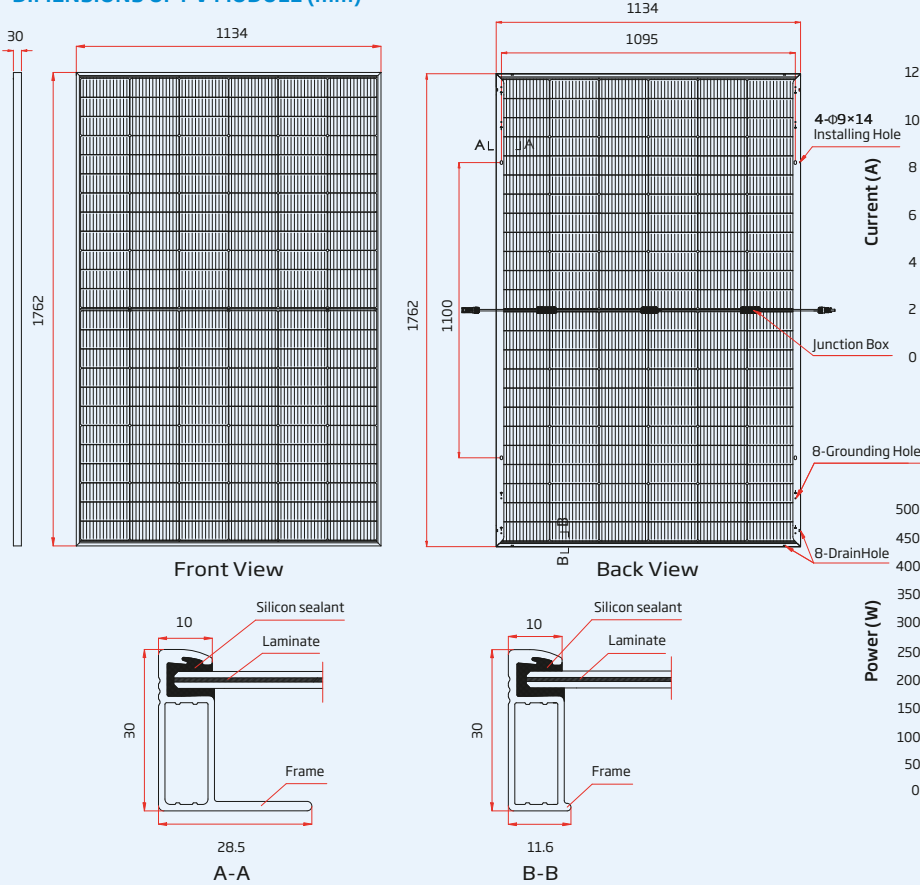
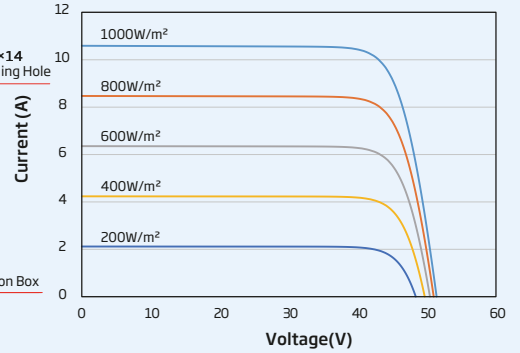
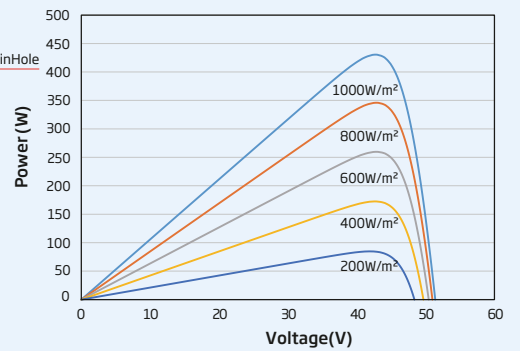


Comprehensive Products and System Certificates



IEC61215/IEC61730/IEC61701/IEC62716/UL61730
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System



DIMENSIONS OF PV MODULE (mm)

I-V CURVES OF PV MODULE (430 W)

P-V CURVES OF PV MODULE (430 W)

MECHANICAL DATA

Solar Cells	Monocrystalline	Frame	30 mm Anodized Aluminium Alloy, Black
No. of cells	144 cells	J-Box	IP 68 rated
Module Dimensions	1762×1134×30 mm	Cables	Photovoltaic Technology Cable 4.0 mm ² Landscape: 1100/1100 mm Portrait: 280/350 mm*
Weight	21.0 kg	Connector	TS4 / MC4 EVO2*
Front Glass	1.6 mm, High Transmission, AR Coated Heat Strengthened Glass		
Encapsulant material	POE/EVA		
Back Glass	1.6 mm, High Transmission, Heat Strengthened Glass		

*Special order only

ELECTRICAL DATA (STC & NOCT)

Testing Condition	TSM-415 NEG9RC.27		TSM-420 NEG9RC.27		TSM-425 NEG9RC.27		TSM-430 NEG9RC.27		TSM-435 NEG9RC.27		TSM-440 NEG9RC.27		TSM-445 NEG9RC.27	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Peak Power Watts-P _{MAX} (Wp)*	415	317	420	321	425	325	430	328	435	332	440	336	445	338
Power Tolerance-P _{MAX} (W)	0 ~ +5													
Maximum Power Voltage-V _{MPP} (V)	42.1	39.3	42.5	39.7	42.9	40.0	43.2	40.4	43.6	40.7	44.0	41.0	44.3	41.3
Maximum Power Current-I _{MPP} (A)	9.86	8.03	9.89	8.07	9.92	8.09	9.96	8.11	9.99	8.15	10.01	8.17	10.05	8.20
Open Circuit Voltage-V _{OC} (V)	50.1	47.6	50.5	47.9	50.9	48.3	51.4	48.8	51.8	49.2	52.2	49.5	52.6	49.9
Short Circuit Current-I _{SC} (A)	10.50	8.46	10.53	8.49	10.56	8.51	10.59	8.53	10.64	8.57	10.67	8.60	10.71	8.63
Module Efficiency-η _m (%)	20.8		21.0		21.3		21.5		21.8		22.0		22.3	

 STC: Irradiance 1000 W/m², Cell Temperature 25 °C, Air Mass AM1.5. NOCT: Irradiance at 800 W/m², Ambient Temperature 20 °C, Wind Speed 1 m/s. *Measuring tolerance: ±3%.

ELECTRICAL CHARACTERISTICS WITH DIFFERENT POWER BIN (reference to 5% & 10% backside power gain)

Parameter	5% Power Gain		10% Power Gain		5% Power Gain		10% Power Gain		5% Power Gain		10% Power Gain		5% Power Gain		10% Power Gain	
	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%
Total Equivalent power -P _{MAX} (Wp)	436	457	441	462	446	468	452	473	457	479	462	484	467	490		
Maximum Power Voltage-V _{MPP} (V)	42.1	42.1	42.5	42.5	42.9	42.9	43.2	43.2	43.6	43.6	44.0	44.0	44.3	44.3		
Maximum Power Current-I _{MPP} (A)	10.35	10.85	10.38	10.88	10.42	10.91	10.46	10.96	10.49	10.99	10.51	11.01	10.55	11.06		
Open Circuit Voltage-V _{OC} (V)	50.1	50.1	50.5	50.5	50.9	50.9	51.4	51.4	51.8	51.8	52.2	52.2	52.6	52.6		
Short Circuit Current-I _{SC} (A)	11.03	11.55	11.06	11.58	11.09	11.62	11.12	11.65	11.17	11.70	11.20	11.74	11.25	11.78		

Power Bifaciality: 80 ±5%.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43 °C (±2 °C)
Temperature Coefficient of P _{MAX}	-0.29 %/°C
Temperature Coefficient of V _{OC}	-0.24 %/°C
Temperature Coefficient of I _{SC}	0.04 %/°C

MAXIMUM RATINGS

Operational Temperature	-40 ~ +85 °C
Maximum System Voltage	1500 V DC (IEC)
Max Series Fuse Rating	25 A

WARRANTY

25 year Product Workmanship Warranty
 30 year Power Warranty
 1% first year degradation
 0.4% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box: 36 pieces
 Modules per 40' container: 936 pieces

Vertex N

N-type i-TOPCon bifacial dual glass
Monocrystalline module

PRODUCT: TSM-NEG21C.20
PRODUCT RANGE: 685-710W

710W

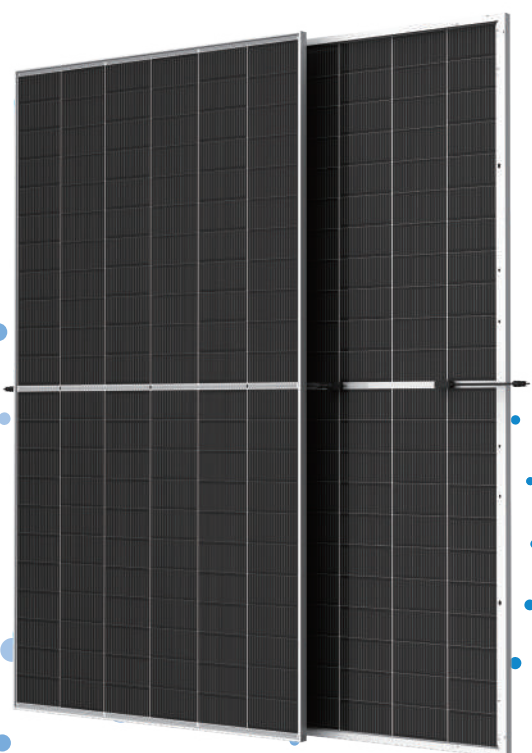
MAXIMUM POWER OUTPUT

0~+5W

POSITIVE POWER TOLERANCE

22.9%

MAXIMUM EFFICIENCY



High customer value

- The star of LCOE (Levelized Cost Of Energy) .Higher string power feature effectively reduces BOS (Balance of System)and LCOE
- More energy harvest with cutting-edge N-type i-TOPCon technology
- Designed for compatibility with existing mainstream system components



High power up to 710W

- Up to 22.9% module efficiency with high density interconnect technology
- SMBB (Super multi-busbar) technology for better light trapping effect, lower series resistance and improved current collection



High reliability

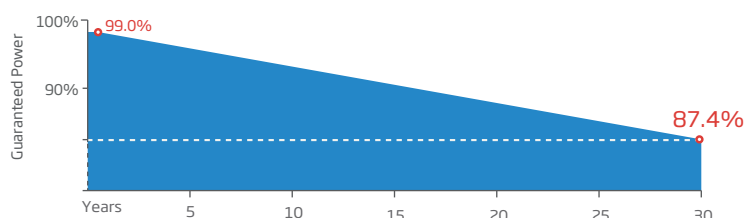
- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load



High energy yield

- Excellent product bifaciality and low irradiation performance, validated by 3rd party
- Lower degradation: 1% first year , 0.4% annually thereafter
- Lower temperature coefficient (-0.29%/°C)
- Up to 30% additional power gain from back side depending on albedo

Trina Solar's Vertex Bifacial Dual Glass Performance Warranty



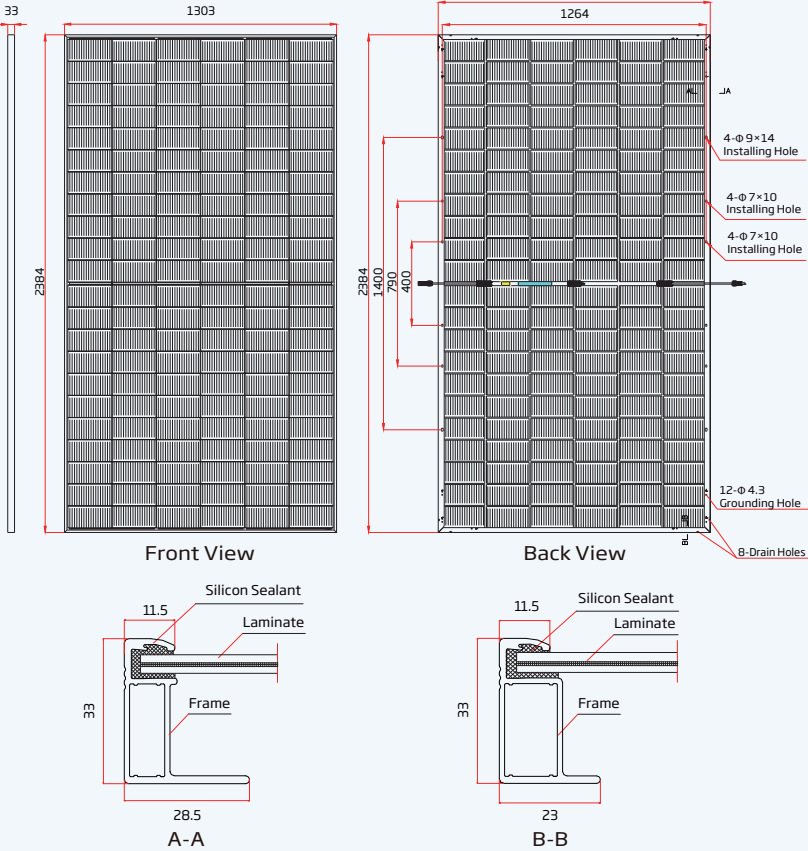
Comprehensive Products and System Certificates



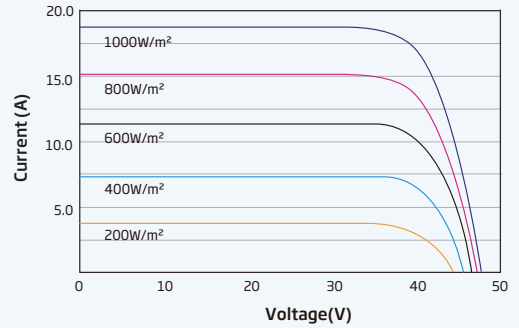
IEC61215/IEC61730/IEC61701/IEC62716
 ISO 9001: Quality Management System
 ISO 14001: Environmental Management System
 ISO14064: Greenhouse Gases Emissions Verification
 ISO45001: Occupational Health and Safety Management System



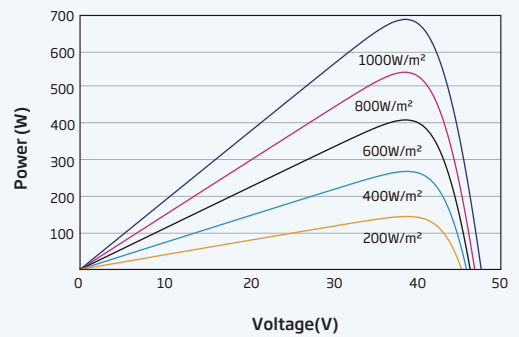
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE(695W)



P-V CURVES OF PV MODULE(695 W)



MECHANICAL DATA

Solar Cells	N-type Monocrystalline
No. of cells	132 cells
Module Dimensions	2384×1303×33 mm (93.86×51.30×1.30 inches)
Weight	38.3 kg (84.4 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)

Frame	33mm(1.30 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm ² (0.006 inches ²) Portrait: 350/280 mm(13.78/11.02 inches) Length can be customized
Connector	MC4 EVO2 / TS4 PLUS / TS4*

*Please refer to regional datasheet for specified connector.

ELECTRICAL DATA (STC & NOCT)

Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Peak Power Watts - P _{MAX} (Wp)*	685	522	690	526	695	531	700	534	705	540	710	543
Power Tolerance - P _{MAX} (W)	0 ~ +5											
Maximum Power Voltage - V _{MPP} (V)	39.8	37.4	40.1	37.7	40.3	37.9	40.5	38.0	40.7	38.3	40.9	38.5
Maximum Power Current - I _{MPP} (A)	17.19	13.93	17.23	13.95	17.25	14.00	17.29	14.04	17.33	14.08	17.36	14.12
Open Circuit Voltage - V _{OC} (V)	47.7	45.3	47.9	45.4	48.3	45.9	48.6	46.1	48.8	46.3	49.0	46.5
Short Circuit Current - I _{SC} (A)	18.21	14.67	18.25	14.71	18.28	14.72	18.32	14.76	18.36	14.80	18.40	14.83
Module Efficiency η _m (%)	22.1		22.2		22.4		22.5		22.7		22.9	

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5. NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 5% & 10% backside power gain)

Backside Power Gain	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%	5%	10%
Total Equivalent power - P _{MAX} (Wp)	719	754	725	759	730	765	735	770	740	776	746	781
Maximum Power Voltage - V _{MPP} (V)	39.8	39.8	40.1	40.1	40.3	40.3	40.5	40.5	40.7	40.7	40.9	40.9
Maximum Power Current - I _{MPP} (A)	18.05	18.91	18.09	18.95	18.11	18.98	18.15	19.02	18.20	19.06	18.23	19.10
Open Circuit Voltage - V _{OC} (V)	47.7	47.7	47.9	47.9	48.3	48.3	48.6	48.6	48.8	48.8	49.0	49.0
Short Circuit Current - I _{SC} (A)	19.12	20.03	19.16	20.08	19.19	20.11	19.24	20.15	19.28	20.20	19.32	20.24

Power Bifaciality: 80±5%.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P _{MAX}	-0.29%/°C
Temperature Coefficient of V _{OC}	-0.24%/°C
Temperature Coefficient of I _{SC}	0.04%/°C

MAXIMUM RATINGS

Operational Temperature	-40~+85° C
Maximum System Voltage	1500V DC (IEC) 1500V DC (UL)
Max Series Fuse Rating	35A

WARRANTY

- 12 year Product Workmanship Warranty
 - 30 year Power Warranty
 - 1% first year degradation
 - 0.40% Annual Power Attenuation
- (Please refer to product warranty for details)

PACKAGING CONFIGURATION

- Modules per box: 33 pieces
- Modules per 40' container: 594 pieces