Trinasolar

Vertex N PV Module
Introduction

210+N

Trinasolar

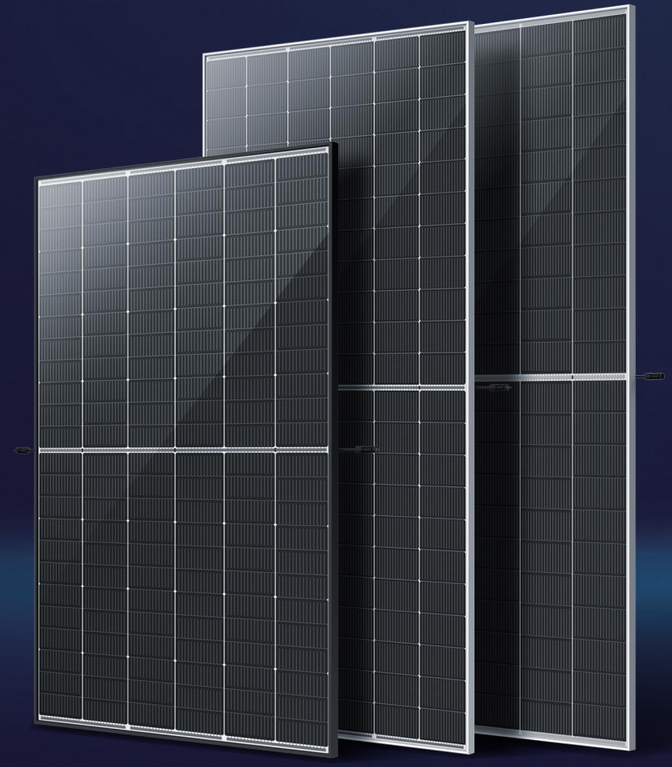
Power Beyond Solar

The World Leading PV and Smart Energy IoT Total Solution Provider

Trina Solar official website

Vertex Product information

For more information regrading Vertex module,
Please follow our social media accounts or scan the QR codes to visit us at our website.



Vertex N
PV Module

OUTLINE

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COMPANY INTRODUCTION

Trina Solar (688599.SH), founded in 1997, is mainly engaged in the research and development, production and sales of PV modules; power stations and system products; PV power generation, operation and maintenance services; development and sales of intelligent microgrids and multi-energy systems, as well as the operation of energy cloud platforms, etc., committing to lead the way in smart solar energy solutions for a net-zero future.

On June 10, 2020, Trina Solar issued the first A-shares on the Shanghai Sci-Tech Innovation Board, becoming the first company whose main business is photovoltaic products, photovoltaic systems and smart energy to be listed on the Shanghai Stock Exchange Science and Technology Innovation Board.

Globalization

Corporate & Regional Headquarters Regional Offices Manufacturing Base

No.1
210 mm module

170+
Regions/Countries

50,000+
Employees

70+ Countries
Global employees

By the end of 2023

BRAND REPUTATION

- Top 100 Innovator For Energy Transit
- Global New Energy Company Top 500
- Hurun China Top 500
- Fortune China Top 500
- China's Manufacturing Industry Top 500
- China's Private Company Top 500
- Red Dot Design Award
- World IoT Convention Top 500
- BloombergNEF 100% bankability World's Most Bankable Module Brand
- United Nations BlueSky Award for Leading Technology
- PV Module Reliability Scorecard Top Performer
- Boston Consulting Group Global Tech Challenger Top 100
- *China's Green Factory*
- *China Industry Award*
- *National Technological Invention Award*

R&D STRENGTH

Ground-breaking Innovations

Through constant innovation, Trina Solar continues to push the PV industry forward by creating greater grid parity of PV power and popularizing renewable energy. So far, Trina Solar's SKL has set or broken 25 world records in terms of PV cell conversion efficiency and module output power.

Industry standards led on or participated in **176**

Standards issued **125**

Patent and software copyright applications **4000+**

First to propose and publish **IEC international standards**

A Total of 25 World Records in PV Cell Efficiency & Module Output

25 Aug, 2022 210mm N-mono-modules aperture efficiency **24.24%**

24 Jul, 2022 210mm mono-PERC cell **24.5%**

23 Mar, 2022 210mm N-mono-i-TOPCon cell **25.5%**

22 Aug, 2021 210mm Mass Production PERC **23.56%**

21 Jun, 2021 210mm Vertex modules aperture efficiency **23.03%**

20 Nov, 2019 N-cast-mono-i-TOPCon cell **23.22%**

19 May, 2019 N-mono-i-TOPCon cell **24.58%**

18 Feb, 2018 156mm IBC cell **25.04%**

17 Dec, 2017 IBC Module **410.5W**

16 May, 2017 6-inch IBC cell **24.13%**

15 Dec, 2016 156mm Mono cell **22.61%**

2022 2021 2019 2018 2017

2011 2012 2014 2015 2016

01 Spet, 2011 Multi-Si Module **274.3W**

02 May, 2012 Multi-Si Module **284.7W**

03 Feb, 2014 2cm IBC cell **24.4%**

04 Apr, 2014 Mono-Si Module **326.3W**

05 May, 2014 156mm IBC cell **22.94%**

06 Oct, 2014 Mono-Si Module **335.2W**

07 Nov, 2014 156mm Multi-Si PERC cell **20.76%**

08 Nov, 2014 Mono-Si PERC cell **21.4%**

09 Dec, 2014 Multi-Si Module **321.5W**

10 Apr, 2015 Multi-Si Module Ap.Eff. **19.14%**

11 Nov, 2015 156mm Multi-Si cell **21.25%**

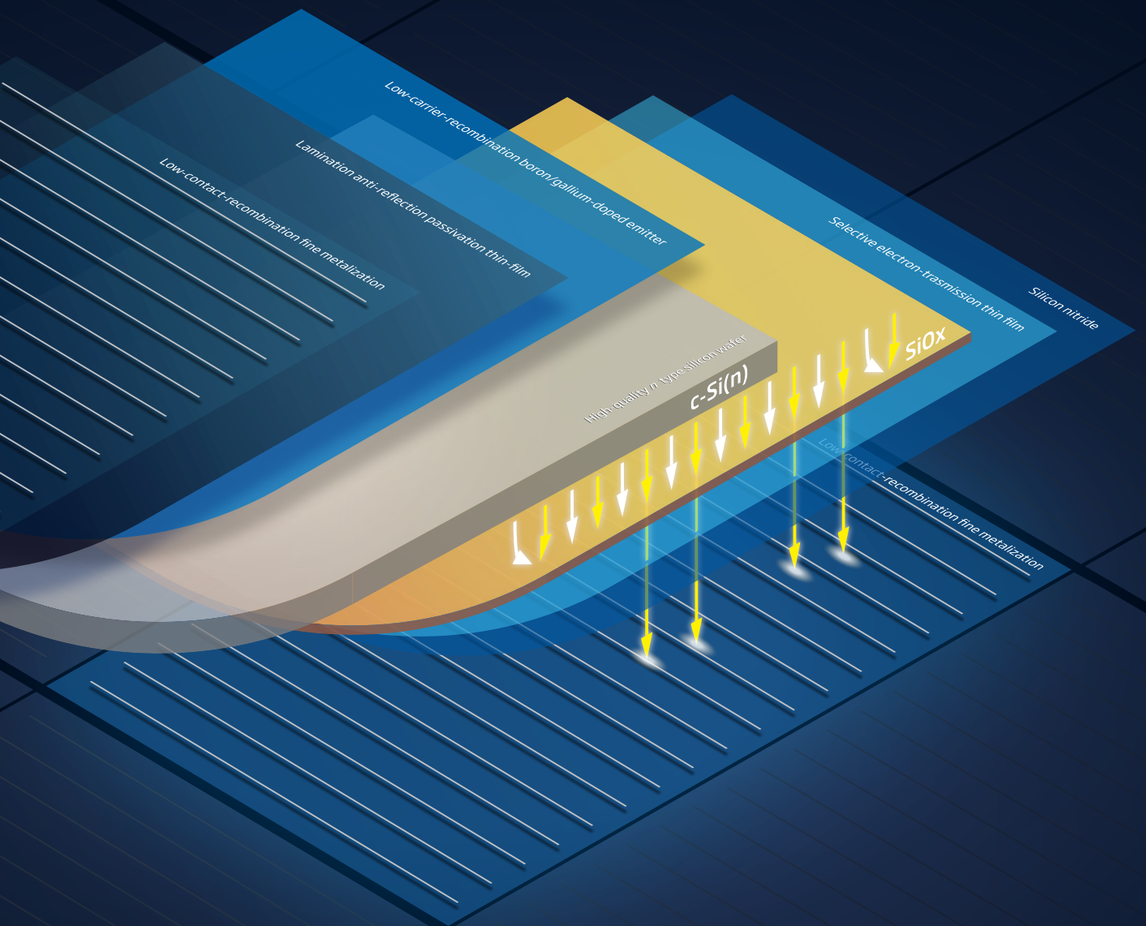
12 Dec, 2015 156mm Mono-Si cell **22.13%**

13 Apr, 2016 156mm IBC cell **23.5%**

14 Oct, 2016 Multi-Si Module Ap.Eff. **19.86%**

210+N PRODUCT TECHNOLOGY

n type i-TOPCon Technology Overview



With *n* type silicon wafer as substrate, The minority carrier life is higher than P type silicon wafer

n type silicon wafer as substrate, No boron-oxygen composite pair combined with advanced Cell preparation technology, LID degradation is significantly lower than P-type cell.

The passivated contact structure is adopted on the back, and the carrier transmission is based on the quantum tunneling effect, so the Cell has better temperature performance

Higher Power Generation

Higher bifaciality means that *n* type modules have higher power generation under the condition that the irradiation intensity receivedby the back side is the same. In different surface reflection scenarios, *n* type modules can obtain a power generation(per watt) gain of 3%-5%according to the simulated power generation results of typical system design as a reference.

Bifaciality **80% (±5%)**

210 Advanced Technology Platform

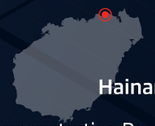
210/210R wafer
Innovative wafer shape based on 210 platform

MBB(Multi-Bus bar)
Multiple bus bar match large size wafer perfectly

High-density encapsulation technology
Minimized space between cell to cell to improve module Efficiency 0.2-0.3%

½ Cut with Non-destructive cutting
Higher reliability , Less Micro-Crack risk

Lower Power Degradation Long-term Degradation Field Test



Hainan
Outdoor Demonstration Base
1 Year

0.21%
Power Degradation Average

0.97%
Power Degradation Average

Changzhou
Hydropower Station
6 Years

The "Top Runner" project

Trina Solar dedicated to the *n* type battery technology for several years, and was selected for the"Top Runner"project in 2018, taking the lead in industrializing *n* type i-TOPCon batteries, providing 500MW i-TOPCon modules for the "Top Runner"projects in Tongchuan and Changzhi, and 135MW i-TOPCon modules for Yellow River Hydropower in 2020.

Vertex N SERIES

n type i-TOPCon technology with advanced 210 innovation platform

01
Ultra low degradation, 1% degradation in the first year, annual degradation 0.4%

02
Dual glass with high reliability, avoid micro-cracking, 30-year power guarantee

03
Excellent bifaciality and power generation 3% higer than PERC

04
Lower LCOE (Levelized Cost of Energy) and fully meet the different needs of utility and non-utility customers

05
Excellent compatibility for tracking system

720W
Maximum power up to

23.2%
Efficiency up to

Star Product for Residential Rooftops

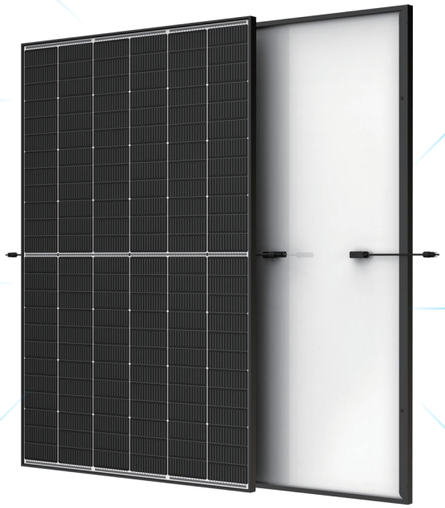
455W
Mono-facial Dual Glass

n type i-TOPCon technology with advanced 210mm innovative platform

Higher Power and Efficiency, More Energy Gain

Flexible Installation and Adaptation

1.6+1.6mm dual glass design



25 years product warranty, 30 years power warranty

Aesthetic appearance available (440W bifacial dual-glass)

IEC Fireproof Class A+C

11% lower carbon emission in production

Vertex S+

Electrical Data (STC)

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 ηm (%)	21.5	21.8	22.0	22.3	22.5	22.8

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

Full Black - Solar with Style

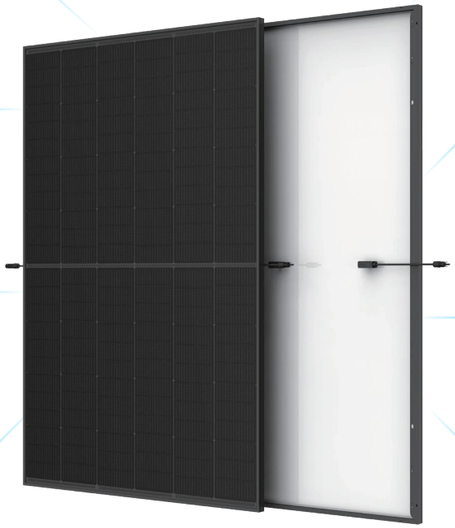
450W
Mono-facial Dual Glass

n type i-TOPCon technology with advanced 210mm innovative platform

Higher Power and Efficiency, More Energy Gain

Flexible Installation and Adaptation

1.6+1.6mm dual glass design



25 years product warranty, 30 years power warranty

Aesthetic appearance available (440W bifacial dual-glass)

IEC Fireproof Class A+C

11% lower carbon emission in production

Vertex S+

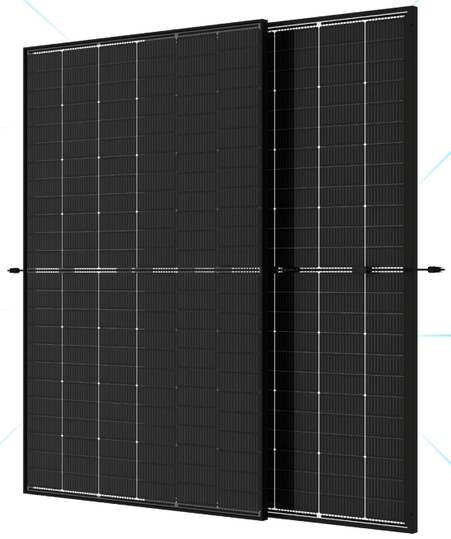
Electrical Data (STC)

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 ηm (%)	21.3	21.5	21.8	22.0	22.3	22.5

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

Clear Black - A New Black

445W
Bifacial Dual Glass



n type i-TOPCon technology with advanced 210mm innovative platform

Higher Power and Efficiency, More Energy Gain

Flexible Installation and Adaptation

1.6+1.6mm dual glass design

25 years product warranty, 30 years power warranty

Aesthetic appearance available (440W bifacial dual-glass)

IEC Fireproof Class A+C

11% lower carbon emission in production

Vertex S+

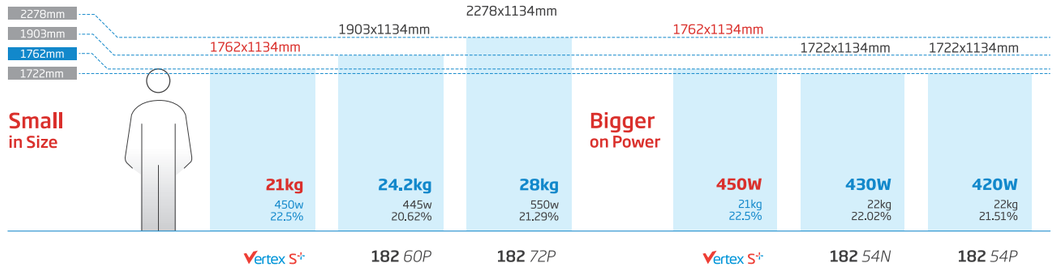
Electrical Data (STC)

Peak Power Watts-P_{MAX} (Wp)*	415	420	425	430	435	440	445
Power Tolerance-P_{MAX} (W)				0~+5			
Maximum Power Voltage-V_{MPP} (V)	42.1	42.5	42.9	43.2	43.6	44.0	44.3
Maximum Power Current-I_{MPP} (A)	9.86	9.89	9.92	9.96	9.99	10.01	10.05
Open Circuit Voltage-V_{OC} (V)	50.1	50.5	50.9	51.4	51.8	52.2	52.6
Short Circuit Current-I_{SC} (A)	10.50	10.53	10.56	10.59	10.64	10.67	10.71
Module Efficiency ηm (%)	20.8	21.0	21.3	215	21.8	22.0	22.3

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

Excellent Balance between Power, Size and Weight

1.76m module size, up to 40W+ power higher

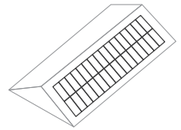


More Installation, Less Cost, and High Revenue

182-54P 420W
2rows16columns
13.44kW installed capacity

182-54N 430W
2rows16columns
13.76kW installed capacity

Vertex S+ 450W
2rows16columns
14.56kW installed capacity



For 25-year power generation on a south-faced sloping rooftop with size of 16.7m x 5.5m

The power generation in the 25 years could be **15.1%** more and the extra **57,826**kwh electricity gain can drive the EV for **404,377**km

power generation ⬆ **15.1%**
=
drive the EV **+ 404,377**km

Outstanding Mechanical Load

Positive mechanical load up to **5400Pa** with snow thickness of **50 cm***

Pass 35mm Hail Test according to IEC61215-2:2016

Negative mechanical load up to **4000Pa** with wind speed of 235km/h

Better frame design for Vertex S+:
- thicker frame profile
- stronger material strength
- larger frame chamber to disperse loading pressure

Vertex S+ is specially designed for working at extreme weather conditions thanks to its excellent mechanical performance.

Excellent balance of compatibility and value

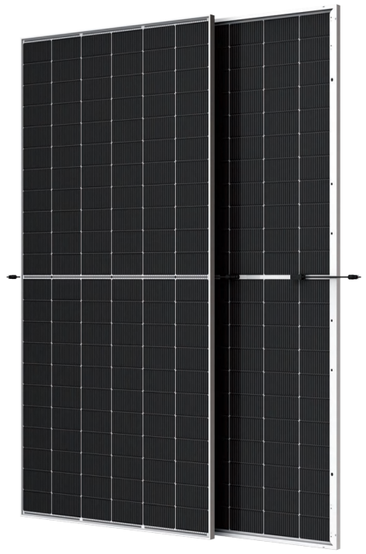
625W

Bifacial Dual Glass

Ultra-high Power Module for All Scenario

Higher power generation, Lower LCOE, Higher return on investment

High reliability, long warranty period



n **type i-TOPCon technology with advanced 210mm innovative platform**

Ultra low Degradation

Excellent Bifacial Power Generation Performance

Vertex N

Electrical Data (STC)

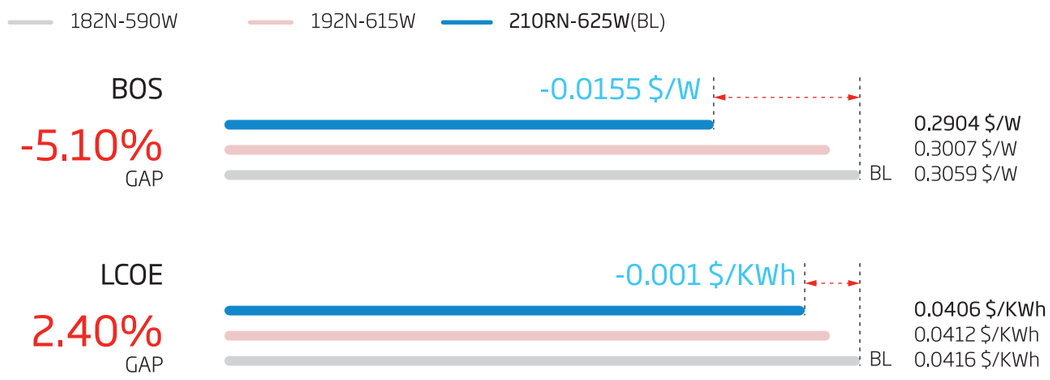
Peak Power Watts-P_{MAX} (Wp)*	590	595	600	605	610	615	620
Power Tolerance-P_{MAX} (W)				0~+5			
Maximum Power Voltage-V_{MPP} (V)	39.7	40.0	40.3	40.5	40.8	41.1	41.4
Maximum Power Current-I_{MPP} (A)	14.86	14.89	14.91	14.94	14.96	14.98	14.99
Open Circuit Voltage-V_{OC} (V)	47.8	48.1	48.4	48.7	49.0	49.3	49.6
Short Circuit Current-I_{SC} (A)	15.72	15.76	15.80	15.83	15.86	15.89	15.91
Module Efficiency ηm (%)	21.8	22.0	22.2	22.4	22.6	22.8	23.0

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

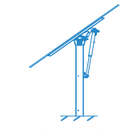
BOS & LCOE Comparison

Location: State of Texas, America

Module type	182N-72p-590W	192RN-72p-615W	**210RN-66p-625W**
BOS ($/W)	0.3059	0.3007	0.2904
BOS GAP	0.0155	0.0103	BL
LCOE($/KWh)	0.0416	0.0412	0.0406
LCOE GAP	0.001	0.0006	BL

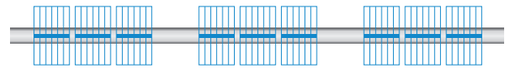


Excellent Compatibility for Tracking System

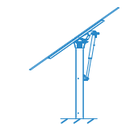


210RN-625W

1 tracker is connected with 3 strings (3 * 29), 18,125W/string and 54,375W/tracker.The length of the tracker is about 101 meters

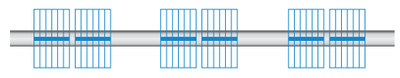


The string power is increased by 14.1%



182N-590W

1 tracker is connected with 3 strings (3 * 27), 15,930W/string and 47,790W/tracker.The length of the tracker is about 94 meters



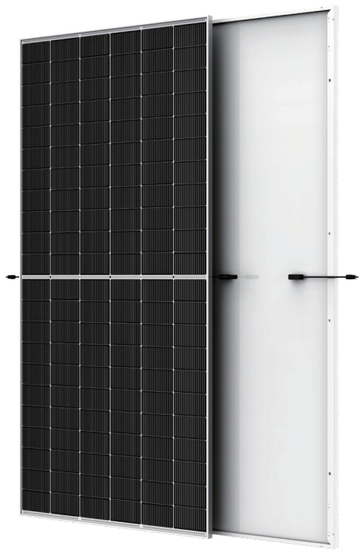
Baseline

Power comparison between Vertex N modules and typical 182*n* type modules

Golden Size Mono-facial module

625W

Mono-facial Mono Glass



Ultra-high Power Module for All Scenario

Higher power generation, Lower LCOE, Higher return on investment

High reliability, long warranty period

n **type i-TOPCon technology with advanced 210mm innovative platform**

Ultra low Degradation

Excellent Power Generation Performance

Vertex N

Electrical Data (STC)

Peak Power Watts-P_{MAX} (Wp)*	595	600	605	610	615	620	625
Power Tolerance-P_{MAX} (W)				0~+5			
Maximum Power Voltage-V_{MPP} (V)	40.0	40.3	40.5	40.8	41.1	41.4	41.6
Maximum Power Current-I_{MPP} (A)	14.89	14.91	14.94	14.96	14.98	14.99	15.00
Open Circuit Voltage-V_{OC} (V)	48.1	48.4	48.7	49.0	49.3	49.6	49.8
Short Circuit Current-I_{SC} (A)	15.76	15.80	15.83	15.86	15.89	15.91	15.93
Module Efficiency ηm (%)	22.0	22.2	22.4	22.6	22.8	23.0	23.1

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

BOS Cost Reduction

Location: Melbourne, Australia

Inverter type: string inverter

Mounting type: fixed 1P

Module type: backsheet

Application: C&I rooftop, 1100V system

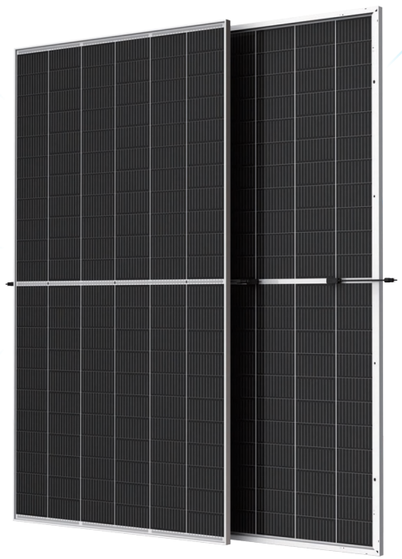
610W VS 580W

Item	Module type	210R-66N 610W	182-72N 580W
Module	Module power	610W	580W
	Module size (mm)	2382*1134	2278*1134
Mounting	Installation	fixed 1P@37°	fixed 1P@37°
	Pitch	N-S 3.95m	N-S 3.78m
Inverter	Inverter type	GW110K-HT	GW110K-HT
Layout	Module per string	19	17
	String power	11590W	9860W
	String per table	1	1
	Table length (m)	21.9	19.6
	String number	87	102
	Module number	1653	1734
BOS Comparison	Total BOS (USD/W)	0.1339	0.1429
	BOS saving (USD/W)	-0.0091	Baseline
	BOS saving (%)	6%	Baseline

Ground-mounted Power Station “The Star of LCOE”

720W

Bifacial Dual Glass



High power up to 720W and high efficiency up to 23.2%

Lower LCOE and higher return on investment

High reliability, long warranty period

***n* type i-TOPCon technology with advanced 210mm innovative platform**

Ultra low Degradation

Excellent Bifacial Power Generation Performance

Vertex N

Electrical Data (STC)

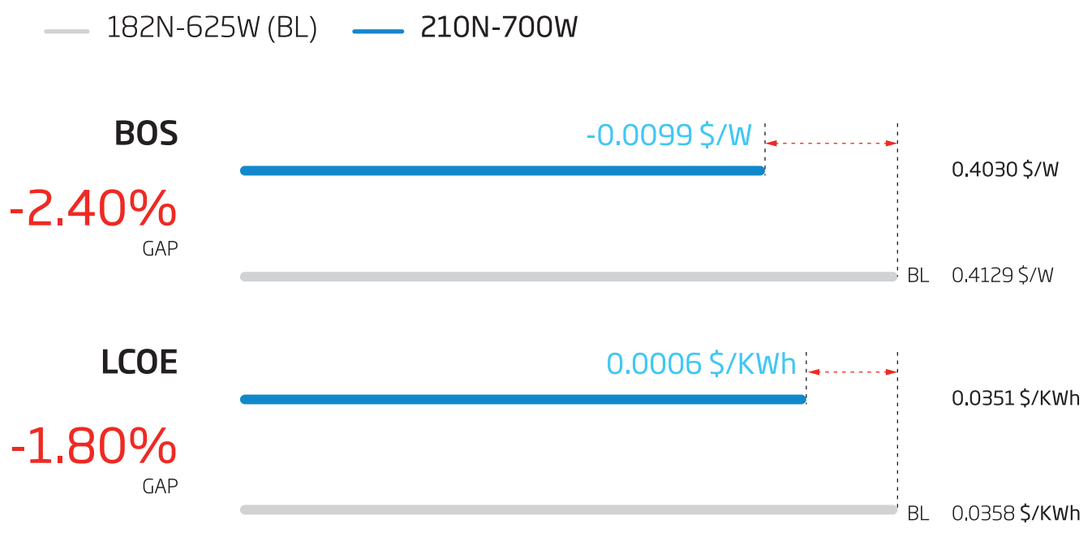
Peak Power Watts-P_{MAX} (Wp)*	695	700	705	710	715	720
Power Tolerance-P_{MAX} (W)			0~+5			
Maximum Power Voltage-V_{MPP} (V)	40.3	40.5	40.7	40.9	41.1	41.3
Maximum Power Current-I_{MPP} (A)	17.25	17.29	17.33	17.36	17.40	17.44
Open Circuit Voltage-V_{OC} (V)	48.3	48.6	48.8	49.0	49.2	49.4
Short Circuit Current-I_{SC} (A)	18.28	18.32	18.36	18.40	18.44	18.49
Module Efficiency ηm (%)	22.4	22.5	22.7	22.9	23.0	23.2

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

System Advantage Analysis

Location:Rio Verde, Brazil

Item	Module type	182N-72p-620W	**210N-66p-700W**
Capacity(MW)	Pitch	125	125
Mounting	Installation	Trina TrackerVanguard 1P	Trina TrackerVanguard 1P
	pitch	7.0m	6.8m
Layout	Module/string	28	31
	String power	15500W	20300W
	String number	197	200
	Module number	199976	178560
BOS Comparison	Total BOS ($/W)	0.4129	0.4030
	BOS GAP	BL	-0.0099
LCOE Comparison	Total LCOE ($/KWh)	0.0358	0.0.351
	LCOE GAP	BL	0.0006



Mono-facial High Power Module for C&I Roofs

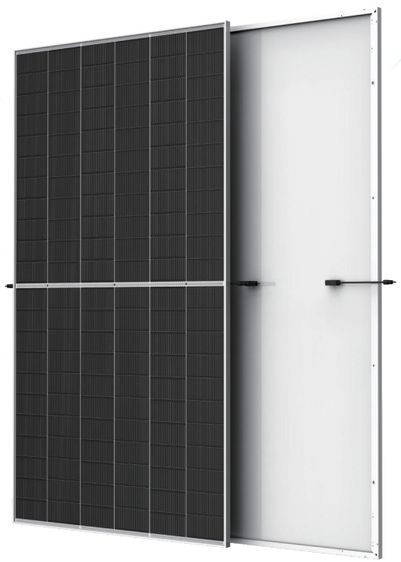
720W

Mono-facial Mono Glass

High power up to 720W and high efficiency up to 23.2%

Lower LCOE and higher return on investment

High reliability, long warranty period



n type i-TOPCon technology with advanced 210mm innovative platform

Ultra low Degradation

Excellent Power Generation Performance

Vertex N

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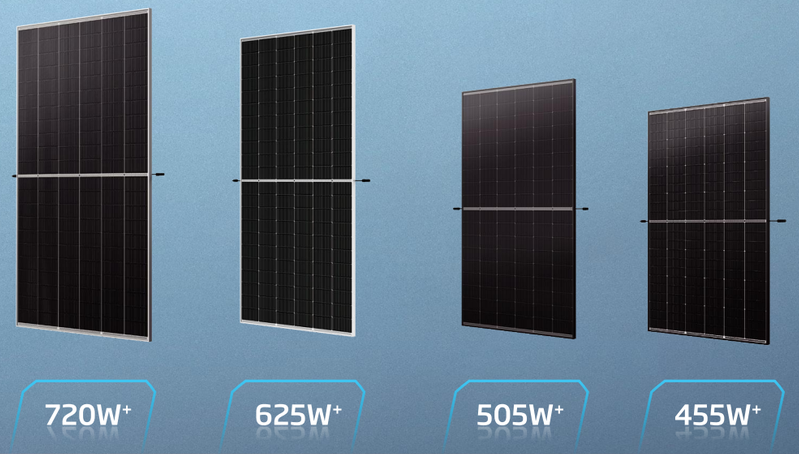
Vertex N



720W+ 625W+ 505W+ 455W+

Vertex S+

GERMAN DESIGN AWARD 2024

Capacity

n型i-TOPCon

40GW

2017 2018 2019 2020 2022 **2023** 2024

2024_A