

# Vertex S<sup>+</sup>

**N-type i-TOPCon DUAL GLASS**  
Monocrystalline module

PRODUCT: TSM-NEG9R.28

PRODUCT RANGE: 430-455W

## 455W

MAXIMUM POWER OUTPUT

## 0~+5W

POSITIVE POWER TOLERANCE

## 22.8%

MAXIMUM EFFICIENCY



### Small in size, bigger on power

- Up to 455W, 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
- Reduce installation cost with higher power bin and efficiency
- Boost performance in warm weather with low temperature coefficient and operating temperature



### Dual-glass Design, more secure and sustainable

- Upgraded dual glass of Vertex S, less prone to micro-cracks and scratches on the back during installation
- Excellent fire rating, weather resistance, salt spray, sand dust, ammonia performance which is fully applicable in coastal, high temperature, humidity area and harsh environment



### Ultra-low Degradation, longer warranty, higher output

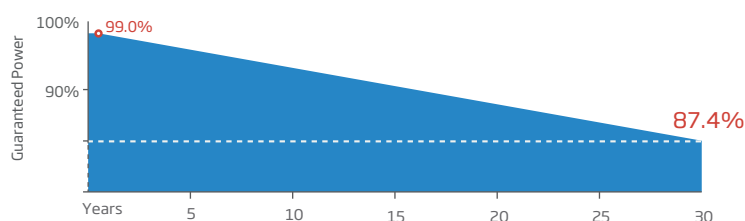
- First-year degradation 1% and annual degradation at 0.4%
- Up to 15 years product warranty and 30 years power warranty



### Universal solution for residential and C&I rooftops

- Easy for integration, designed for compatibility with existing mainstream inverters and diverse mounting systems
- Perfect size and low weight for handling and installation
- Most valuable solution on low load capacity rooftops (weight similar to backsheet version)
- Mechanical performance up to 5400 Pa positive load and 4000 Pa negative load

### Trina Solar's Dual Glass Performance Warranty



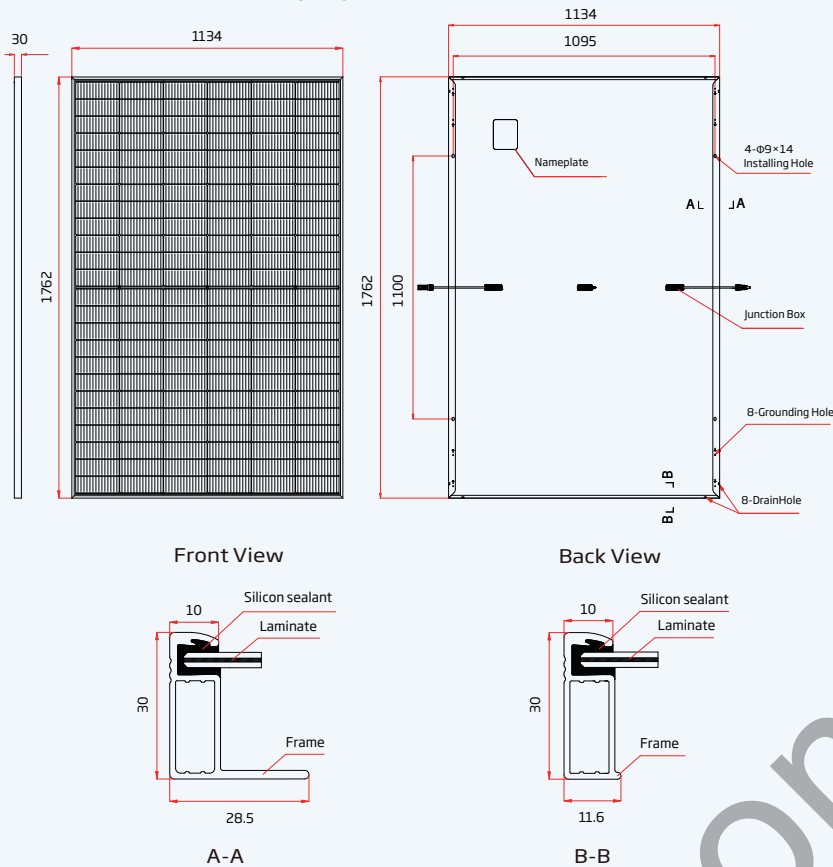
### Comprehensive Products and System Certificates



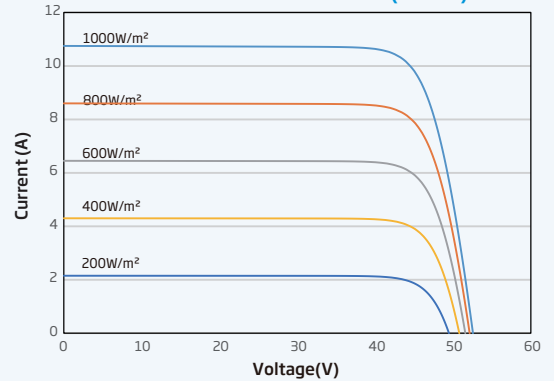
IEC61215/IEC61730/IEC61701/IEC62716  
ISO 9001: Quality Management System  
ISO 14001: Environmental Management System  
ISO14064: Greenhouse Gases Emissions Verification  
ISO45001: Occupational Health and Safety Management System

**Trina**solar

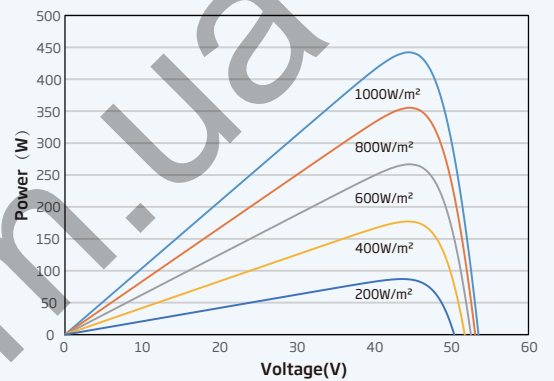
## DIMENSIONS OF PV MODULE(mm)



## I-V CURVES OF PV MODULE(445W)



## P-V CURVES OF PV MODULE(445W)



## ELECTRICAL DATA (STC)

| Peak Power Watts-P <sub>MAX</sub> (Wp)*    | 430    | 435   | 440   | 445   | 450   | 455   |
|--------------------------------------------|--------|-------|-------|-------|-------|-------|
| Power Tolerance-P <sub>MAX</sub> (W)       | 0 ~ +5 |       |       |       |       |       |
| Maximum Power Voltage-V <sub>MPP</sub> (V) | 43.2   | 43.6  | 44.0  | 44.3  | 44.6  | 45.0  |
| Maximum Power Current-I <sub>MPP</sub> (A) | 9.96   | 9.99  | 10.01 | 10.05 | 10.09 | 10.11 |
| Open Circuit Voltage-V <sub>OC</sub> (V)   | 51.4   | 51.8  | 52.2  | 52.6  | 52.9  | 53.4  |
| Short Circuit Current-I <sub>SC</sub> (A)  | 10.59  | 10.64 | 10.67 | 10.71 | 10.74 | 10.77 |
| Module Efficiency $\eta_m$ (%)             | 21.5   | 21.8  | 22.0  | 22.3  | 22.5  | 22.8  |

STC: Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25°C, Air Mass AM1.5. \*Measuring tolerance:  $\pm 3\%$ .

## ELECTRICAL DATA (NOCT)

| Maximum Power-P <sub>MAX</sub> (Wp)        | 329  | 333  | 337  | 341  | 344  | 348  |
|--------------------------------------------|------|------|------|------|------|------|
| Maximum Power Voltage-V <sub>MPP</sub> (V) | 40.7 | 41.0 | 41.4 | 41.7 | 42.0 | 42.3 |
| Maximum Power Current-I <sub>MPP</sub> (A) | 8.08 | 8.12 | 8.14 | 8.17 | 8.19 | 8.22 |
| Open Circuit Voltage-V <sub>OC</sub> (V)   | 48.7 | 49.1 | 49.5 | 49.9 | 50.2 | 50.6 |
| Short Circuit Current-I <sub>SC</sub> (A)  | 8.54 | 8.58 | 8.60 | 8.63 | 8.66 | 8.68 |

NOCT: Irradiance at 800W/m<sup>2</sup>, Ambient Temperature 20°C, Wind Speed 1m/s.

## MECHANICAL DATA

|                      |                                                                                                                                                        |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Solar Cells          | N-type i-TOPCon Monocrystalline                                                                                                                        |
| No. of cells         | 144 cells                                                                                                                                              |
| Module Dimensions    | 1762×1134×30 mm (69.37×44.65×1.18 inches)                                                                                                              |
| Weight               | 21.8kg (48.06 lb)                                                                                                                                      |
| Front Glass          | 1.6 mm (0.06 inches), High Transmission, AR Coated Heat Strengthened Glass                                                                             |
| Encapsulant material | POE/EVA                                                                                                                                                |
| Back Glass           | 1.6mm(0.06 inches), Heat Strengthened Glass                                                                                                            |
| Frame                | 30mm (1.18 inches) Anodized Aluminium Alloy, Black                                                                                                     |
| J-Box                | IP 68 rated                                                                                                                                            |
| Cables               | Photovoltaic Technology Cable 4.0mm <sup>2</sup> (0.006 inches <sup>2</sup> ),<br>Portrait: 350/280 mm(13.78/11.02 inches)<br>Length can be customized |
| Connector            | MC4 EV02 / EV02A / TS4 Plus / TS4*                                                                                                                     |

\*Please refer to regional datasheet for specified connector.

## TEMPERATURE RATINGS

|                                             |                                |
|---------------------------------------------|--------------------------------|
| NOCT (Nominal Operating Cell Temperature)   | 43°C ( $\pm 2^\circ\text{C}$ ) |
| Temperature Coefficient of P <sub>MAX</sub> | -0.29%/°C                      |
| Temperature Coefficient of V <sub>OC</sub>  | -0.24%/°C                      |
| Temperature Coefficient of I <sub>SC</sub>  | 0.04%/°C                       |

## WARRANTY

|                                      |
|--------------------------------------|
| 15 year Product Workmanship Warranty |
| 30 year Power Warranty               |
| 1% first year degradation            |
| 0.4% Annual Power Attenuation        |

(Please refer to product warranty for details)

## MAXIMUM RATINGS

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

## PACKAGING CONFIGURATION

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