

450 W

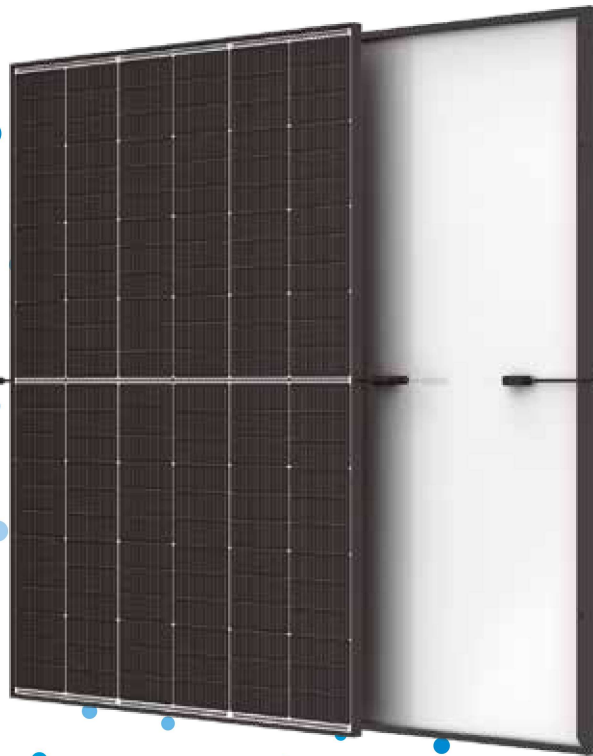
MAXIMUM POWER OUTPUT

0/+5 W

POSITIVE POWER TOLERANCE

22.5 %

MAXIMUM EFFICIENCY



Small in size, bigger on power

- Generates up to 450 W, 22.5 % 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

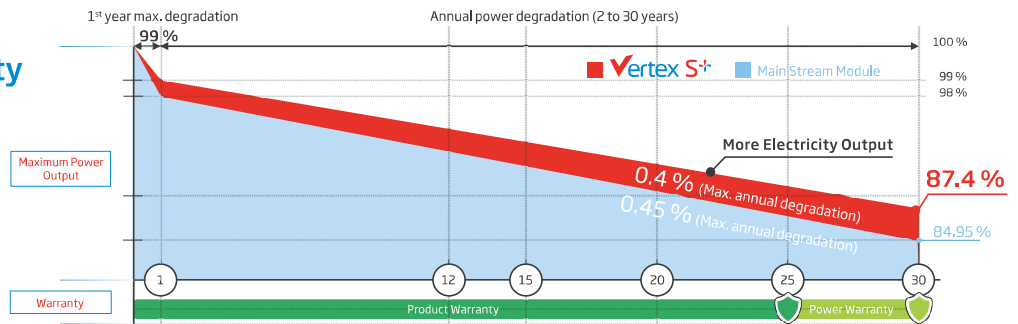
- Designed for compatibility with existing mainstream inverters, optimizers and mounting systems
- Perfect size and low weight for easy handling. Optimized transportation cost
- Flexible installation solutions for system deployment

Extended Vertex S+ Warranty

1 %
1st year max. degradation

0.4 %
Max. annual degradation from year 2 to 30

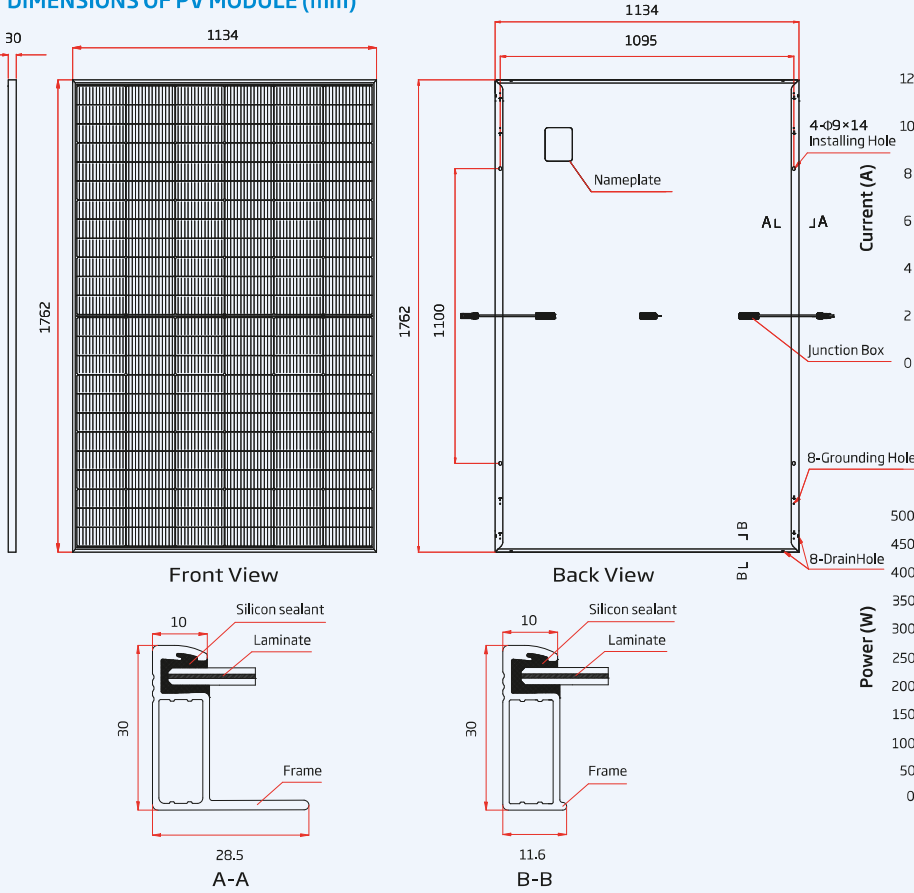
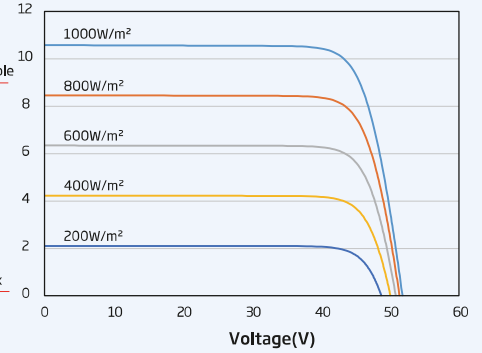
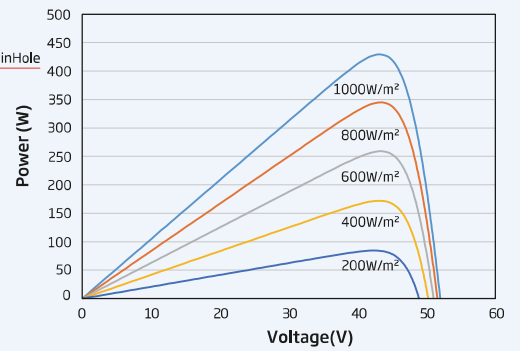
25 Years
Product Workmanship Warranty



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 (440 W)

P-V CURVES OF PV MODULE (440 W)

ELECTRICAL DATA (STC)

| | TSM-425 NEG9R,28 | TSM-430 NEG9R,28 | TSM-435 NEG9R,28 | TSM-440 NEG9R,28 | TSM-445 NEG9R,28 | TSM-450 NEG9R,28 |
|--------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| 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,28 | TSM-430 NEG9R,28 | TSM-435 NEG9R,28 | TSM-440 NEG9R,28 | TSM-445 NEG9R,28 | TSM-450 NEG9R,28 |
|--------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Maximum Power- P_{MAX} (Wp) | 324 | 328 | 332 | 335 | 339 | 343 |
| Maximum Power Voltage- V_{MPP} (V) | 40.0 | 40.4 | 40.7 | 41.0 | 41.3 | 41.6 |
| Maximum Power Current- I_{MPP} (A) | 8.09 | 8.11 | 8.15 | 8.17 | 8.20 | 8.24 |
| Open Circuit Voltage- V_{OC} (V) | 48.2 | 48.7 | 49.1 | 49.4 | 49.8 | 50.1 |
| Short Circuit Current- I_{SC} (A) | 8.51 | 8.53 | 8.57 | 8.60 | 8.63 | 8.65 |

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 K) |
| Temperature Coefficient of P_{MAX} | -0.30 %/ K |
| Temperature Coefficient of V_{OC} | -0.24 %/ 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

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 |