**Product:** TSM-NEG9R.2B

**Power Range:** 425–450 W

**Maximum Power Output:** 450 W

**Positive Power Tolerance:** 0/+5 W

**Maximum Efficiency:** 22.5%

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**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

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**Extended Vertex S+ Warranty**

- 1% 1st year max. degradation
- 0.4% Max. annual degradation from year 2 to 30
- 25 Years Product Workmanship Warranty

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**Comprehensive Products and System Certificates**

- IEC61215/IEC61730/IEC61701/IEC62716
- ISO 9001: Quality Management System
- ISO 14001: Environmental Management System
- ISO45001: Occupational Health and Safety Management System
- EU-28 WEEE COMPLIANT

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**More Electricity Output**

- 0.4% (Max. annual degradation)
- 0.45% (Max. annual degradation)
**Operational Temperature**
-40 to +85 ºC

**Maximum System Voltage**
1500 V DC (IEC)

**Modules per box:** 36 pieces
**Modules per 40’ container:** 936 pieces

**MECHANICAL DATA**

- **Temperatures:
  - Maximum: 43 ºC (±2 K)
  - Maximum System Voltage: 1500 V DC (IEC)
  - TS4 / MC4 EVO2+

- **Packaging Configuration:**
  - 280/350 mm

**ELECTRICAL DATA (STC)**

- **Peak Power, Wp:**
  - TSM-425: 425 Wp
  - TSM-430: 430 Wp
  - TSM-435: 435 Wp
  - TSM-440: 440 Wp
  - TSM-445: 445 Wp
  - TSM-450: 450 Wp

- **Power Tolerance, Wp:**
  - 0/+5

- **Maximum Power Voltage, V:**
  - TSM-425: 42.9 V
  - TSM-430: 43.2 V
  - TSM-435: 43.6 V
  - TSM-440: 44.0 V
  - TSM-445: 44.4 V
  - TSM-450: 44.6 V

- **Maximum Power Current, A:**
  - TSM-425: 9.92 A
  - TSM-430: 9.96 A
  - TSM-435: 9.99 A
  - TSM-440: 10.01 A
  - TSM-445: 10.05 A
  - TSM-450: 10.09 A

- **Open Circuit Voltage, V:**
  - TSM-425: 50.9 V
  - TSM-430: 51.4 V
  - TSM-435: 51.8 V
  - TSM-440: 52.2 V
  - TSM-445: 52.6 V
  - TSM-450: 52.9 V

- **Short Circuit Current, A:**
  - TSM-425: 10.56 A
  - TSM-430: 10.59 A
  - TSM-435: 10.64 A
  - TSM-440: 10.67 A
  - TSM-445: 10.71 A
  - TSM-450: 10.74 A

- **Module Efficiency:**
  - TSM-425: 21.3%
  - TSM-430: 21.5%
  - TSM-435: 21.8%
  - TSM-440: 22.0%
  - TSM-445: 22.3%
  - TSM-450: 22.5%

**ELECTRICAL DATA (NOCT)**

- **Maximum Power Voltage, V:**
  - TSM-425: 40.0 V
  - TSM-430: 40.4 V
  - TSM-435: 40.7 V
  - TSM-440: 41.0 V
  - TSM-445: 41.3 V
  - TSM-450: 41.6 V

- **Maximum Power Current, A:**
  - TSM-425: 8.09 A
  - TSM-430: 8.11 A
  - TSM-435: 8.15 A
  - TSM-440: 8.17 A
  - TSM-445: 8.20 A
  - TSM-450: 8.24 A

- **Open Circuit Voltage, V:**
  - TSM-425: 48.2 V
  - TSM-430: 48.7 V
  - TSM-435: 49.1 V
  - TSM-440: 49.4 V
  - TSM-445: 49.8 V
  - TSM-450: 50.1 V

- **Short Circuit Current, A:**
  - TSM-425: 8.51 A
  - TSM-430: 8.53 A
  - TSM-435: 8.57 A
  - TSM-440: 8.60 A
  - TSM-445: 8.63 A
  - TSM-450: 8.65 A

**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 mm²
- **Landscape:** 1100/1100 mm
- **Portrait:** 280/350 mm

**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)*