



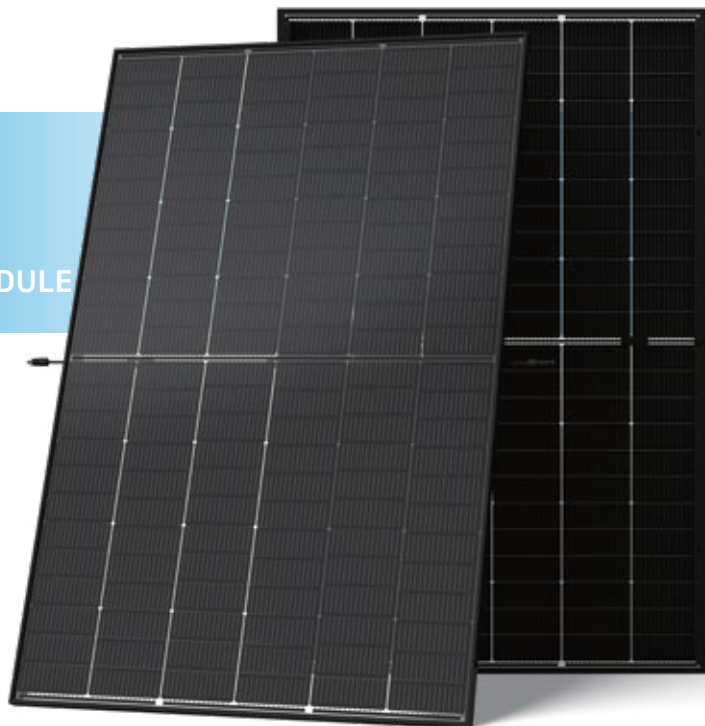
N-type i-TOPCon

BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE

TSM-XXXNEG9RC.27 425-450W

450_W / MAXIMUM
POWER OUTPUT

22.5% / MAXIMUM
EFFICIENCY



High Customer Value

- Clear black, designed with aesthetics in mind, suitable for residential and C&I rooftop
- Perfect size and low weight for handling and installation
- Compatible with mainstream inverters and diverse mounting systems
- Mechanical test loads up to 5400 Pa front side and 4000 Pa back side
- Certified lifetime carbon footprint assessment



High reliability with light double glass

- Less prone to micro-cracks and scratches on the back side
- Excellent fire rating, weather resistance, Sustainable in harsh environments and extreme weather conditions
- Fire Class rating C, Safety Class II
- Up to 25 years product warranty and 30 years power warranty



High power up to 450W

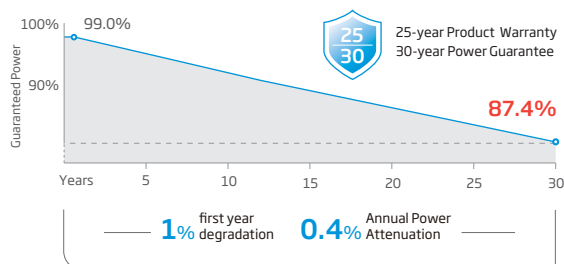
- Up to 22.5% module efficiency, on 210 innovative platform
- Patented i-TOPCon technology with continuous efficiency improvement, including contact resistance reduction, rear reflection enhancement and edge quality repairment



High energy yield

- Excellent low irradiation performance, validated by 3rd party
- Lower temperature efficient (-0.29%/°C) and lower working temperature
- Higher bifaciality, with up to 10%~20% additional power gain from back side depending on albedo

Performance Warranty



(*Please refer to Limited Warranty Supplement that applies to TSM-***NEG9R.28, TSM-***NEG9RC.27, Products supplied and installed within Australia & New Zealand.)

**Power degradation values above apply to frontside, refer to product warranty for power degradation for backside and other details)

Comprehensive Products and System Certificates

IEC61215/IEC61730

ISO 9001: Quality Management System

ISO 14001: Environmental Management System

ISO14064: Greenhouse Gases Emissions Verification

ISO45001: Occupational Health and Safety Management System

ISO14067: Product Carbon Footprint Limited Assurance

ISO14025: Environmental Product Declaration



ELECTRICAL DATA (STC & NOCT & BNPI) TSM-XXXNEG9RC.27 (XXX=425-450)

Testing Condition	STC	NOCT	BNPI	STC	NOCT	BNPI	STC	NOCT	BNPI	STC	NOCT	BNPI	STC	NOCT	BNPI	STC	NOCT	BNPI
Peak Power Watts- $P_{MAX}(W_p)^*$	425	325	471	430	329	476	435	333	482	440	337	488	445	341	493	450	344	499
Power Selection (W)	0 ~ +5																	
Maximum Power Voltage- V_{MPP} (V)	42.9	40.4	42.9	43.2	40.7	43.2	43.6	41.0	43.6	44.0	41.4	44.0	44.3	41.7	44.3	44.6	42.0	44.6
Maximum Power Current- I_{MPP} (A)	9.92	8.06	10.98	9.96	8.08	11.03	9.99	8.12	11.05	10.01	8.14	11.08	10.05	8.17	11.13	10.09	8.19	11.18
Open Circuit Voltage- V_{oc} (V)	50.9	48.3	50.9	51.4	48.7	51.4	51.8	49.1	51.8	52.2	49.5	52.2	52.6	49.9	52.6	52.9	50.2	52.9
Short Circuit Current- I_{sc} (A)	10.56	8.51	11.70	10.59	8.54	11.73	10.64	8.58	11.79	10.67	8.60	11.82	10.71	8.63	11.87	10.74	8.66	11.90
Module Efficiency η_m (%)	21.3			21.5			21.8			22.0			22.3			22.5		

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. BNPI: Irradiance: front 1000W/m², rear 135W/m², Temperature 25°C, Air Mass AM1.5
 *Measuring tolerance: $P_{max} \pm 3\%$, $V_{oc} \pm 3\%$ and $I_{sc} \pm 5\%$

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%
Peak Power Watts- $P_{MAX}(W_p)$	446	468	452	473	457	479	462	484	467	490	473	495
Maximum Power Voltage- V_{MPP} (V)	42.9	42.9	43.2	43.2	43.6	43.6	44.0	44.0	44.3	44.3	44.6	44.6
Maximum Power Current- I_{MPP} (A)	10.42	10.91	10.46	10.96	10.49	10.99	10.51	11.01	10.55	11.06	10.59	11.10
Open Circuit Voltage- V_{oc} (V)	50.9	50.9	51.4	51.4	51.8	51.8	52.2	52.2	52.6	52.6	52.9	52.9
Short Circuit Current- I_{sc} (A)	11.09	11.62	11.12	11.65	11.17	11.70	11.20	11.74	11.25	11.78	11.28	11.81

ϕP_{max} : 80% \pm 7%; ϕV_{oc} : 100% \pm 3%; ϕI_{sc} : 80% \pm 7%

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature) 43°C ($\pm 2^\circ\text{C}$)

Temperature Coefficient of P_{MAX} -0.29% / $^\circ\text{C}$

Temperature Coefficient of V_{oc} -0.24% / $^\circ\text{C}$

Temperature Coefficient of I_{sc} 0.04% / $^\circ\text{C}$

Due to different testing methods, the actual performances might differ from the declared specifications.

MAXIMUM RATINGS

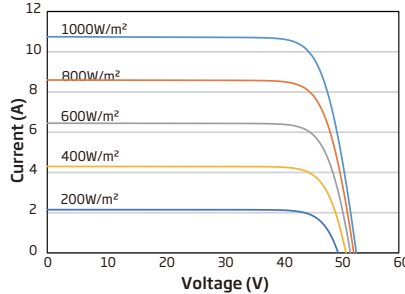
Operational Temperature -40~+70°C

Maximum System Voltage 1500V DC (IEC)

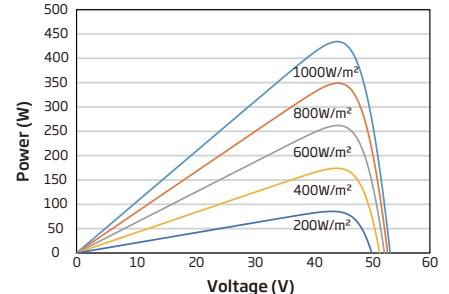
Max Series Fuse Rating 25A

CURVES OF PV MODULE

I-V CURVES OF PV MODULE (440W)

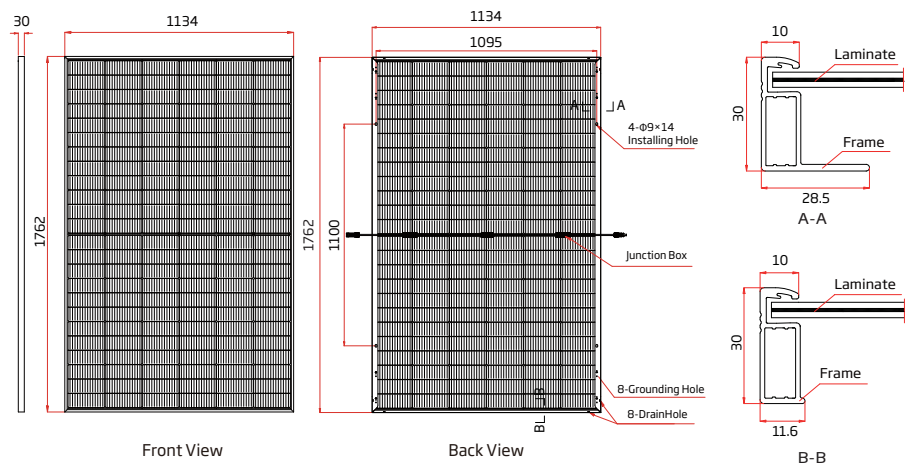


P-V CURVES OF PV MODULE (440W)



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 (48.06lb)
Front Glass	1.6 mm (0.06 inches) AR Coating Heat Strengthened Glass
Back Glass	1.6mm (0.06 inches), Heat Strengthened 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) Length: 1100/1100 mm (43.3/43.3 inches)
Connector	Stabuli PV-KST4-EV02/xy_UR; PV-KBT4-EV02/xy_UR PV-KST4-EV02A/xy; PV-KBT4-EV02A/xy
Packaging	Modules per box: 36 pieces Modules per 40' container: 936 pieces



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CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
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 Version number: TSM_AUS_EN_2024_B
 Country of Origin: China