



Tangra™ S HD Black

N-Type High efficiency Bifacial Single Glass Module

TS-BBT48(435-450)-G11



Bifacial technology allows for the harvesting of up to an additional 30% energy from the rear side of the module.



30 years lifespan brings 10-30% additional power generation comparing with conventional P-type module.



N-type solar cell has no LID naturally which can increase power generation.



Excellent low irradiance performance.



Enhanced light trapping and optimized current collection contribute to the improvement of both module power output and reliability.



Industry leading lowest thermal coefficient of power.



Design optimized for lower operating current, resulting in minimized hot spot loss and improved temperature coefficient.

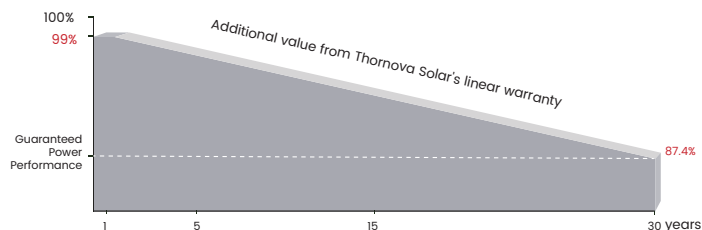


Certified to withstand: wind load (5400 Pa) and snow load (2400 Pa).



100% triple EL test enables remarkable reduction of module hidden crack rate.

LINEAR PERFORMANCE WARRANTY



15 years

Product quality & process guarantee

30 years

Linear power guarantee

0.40%

Annual degradation Over 30 years

COMPREHENSIVE CERTIFICATES



ISO 9001: Quality Management System

ISO 14001: Environmental Management System Standard

ISO 45001: International Occupational Health and Safety Assessment System Standard

* Different markets have different certification requirements. Also, the products are under rapid innovation. Please confirm the certification status with regional sales representatives.

RE INSURANCE

Warranty partner



* Optional performance warranty insurance. Please contact our local sales staff for more information.

ELECTRICAL CHARACTERISTICS

| Model of modules | TS-BBT48(435)-G11 | | TS-BBT48(440)-G11 | | TS-BBT48(445)-G11 | | TS-BBT48(450)-G11 | |
|---|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|
| | STC | NMOT | STC | NMOT | STC | NMOT | STC | NMOT |
| Peak power - P _{mp} (W) | 435 | 327 | 440 | 331 | 445 | 335 | 450 | 338 |
| Open circuit voltage - V _{oc} (V) | 34.49 | 32.77 | 34.67 | 32.94 | 34.85 | 33.11 | 35.03 | 33.28 |
| Short circuit current - I _{sc} (A) | 15.90 | 12.84 | 15.95 | 12.88 | 16.00 | 12.92 | 16.05 | 12.96 |
| MPP voltage - V _{mp} (V) | 29.54 | 27.51 | 29.72 | 27.68 | 29.90 | 27.88 | 30.08 | 27.96 |
| MPP current - I _{mp} (A) | 14.73 | 11.89 | 14.81 | 11.96 | 14.89 | 12.02 | 14.97 | 12.09 |
| Module efficiency - η _m (%) | 21.8 | | 22.0 | | 22.3 | | 22.5 | |

STC (Standard Testing Conditions): Irradiance 1000W/m², Cell Temperature 25 °C, Spectra at AM1.5

NMOT (Nominal Module Operating Temperature): Irradiance 800W/m², Ambient Temperature 20°C, Spectra at AM1.5, Wind at 1m/s

ELECTRICAL CHARACTERISTICS WITH DIFFERENT POWER BIN (REFERENCE TO 13.5% IRRADIANCE RATIO)

| | | | | |
|---|--------|-------|-------|-------|
| Peak power - P _{mp} (W) | 482 | 488 | 493 | 499 |
| Open circuit voltage - V _{oc} (V) | 34.49 | 34.67 | 34.85 | 35.03 |
| Short circuit current - I _{sc} (A) | 17.62 | 17.67 | 17.73 | 17.78 |
| MPP voltage - V _{mp} (V) | 29.54 | 29.72 | 29.90 | 30.08 |
| MPP current - I _{mp} (A) | 16.32 | 16.41 | 16.50 | 16.59 |
| Irradiance ratio (rear/front) | 13.5 % | | | |

STRUCTURAL CHARACTERISTICS

| | |
|--------------------------|--|
| Module dimension (L*W*H) | 69.37 x 44.65 x 1.38 inch (1762 x 1134 x 35 mm) |
| Weight | 46.30 lbs (21.0 kg) |
| Number of cells | 96 cells |
| Cell | N-type monocrystalline (7.17x8.27 inch (182x210 mm)) |
| Glass | Tempered, 3.2 mm AR, High transmittance, Low iron |
| Backsheet | Transparent black mesh backsheet |
| Frame | Anodized aluminum alloy |
| Junction box | IP68, 3 diodes |
| Output wire | 4.0 mm ² |
| Wire length | 300 mm / 1200 mm / Customized length |
| Connector | MC4 - EVO2 |
| Packing specification | 31 pcs/Pallet; 806 pcs/40'HQ |

OPERATING PARAMETERS

| | |
|------------------------------------|----------------------------|
| Power tolerance (W) | (0,+5) |
| Maximum system voltage (V) | 1500 |
| Maximum rated fuse current (A) | 30 |
| Current operating temperature (°C) | -40--+185 °F (-40--+85 °C) |
| Bifaciality | 80±10 % |

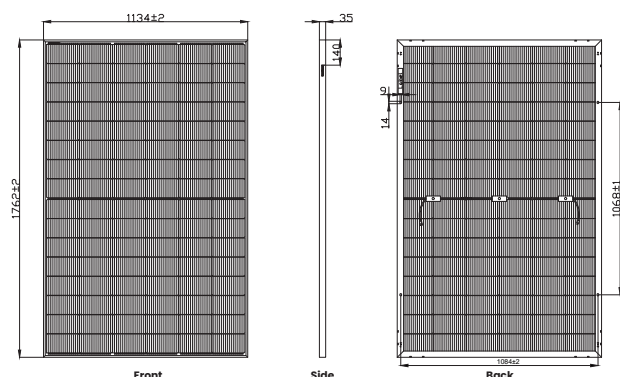
MECHANICAL LOADING

| | |
|--|------|
| Front side maximum static loading (Pa) | 5400 |
| Rear side maximum static loading (Pa) | 2400 |
| Hailstone test (mm) | 35 |

TEMPERATURE RATINGS

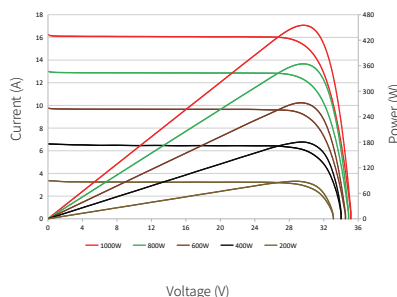
| | |
|---|-------------------------|
| Temperature coefficient (P _{max}) | -0.29 %/K |
| Temperature coefficient (V _{oc}) | -0.28 %/K |
| Temperature coefficient (I _{sc}) | +0.04 %/K |
| Nominal Module Operating Temperature | 109.4±35.6 °F (43±2 °C) |

MODULE DIMENSIONS (MM)

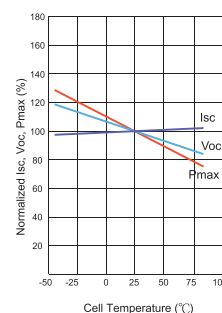


* The unmarked tolerance is ±1 mm
Length shown in mm

Characteristic curves (450W)



Temperature Dependence of I_{sc}, V_{oc}, P_{max}



Scan the QR code to get more information

Web: www.thornovasolar.com

E-mail: info@thornovasolar.com

* The parameters delineated within this datasheet, both technical and monetary, may exhibit variations contingent upon the region. Thornova Solar provides no warranty as to their absolute accuracy. Owing to our unceasing commitment to innovation, research, development, and product enhancement, Thornova Solar retains the discretion to amend any information encapsulated in this datasheet without any preceding notification. Clients are urged to procure the most recent iteration of this datasheet and incorporate it as an intrinsic component of the legally binding agreement ratified by both parties. The English rendition of this datasheet serves purely as a point of reference. Should discrepancies arise between the English text and versions rendered in other languages, the stipulations of the English version shall take precedence.

