THORNOVA solar

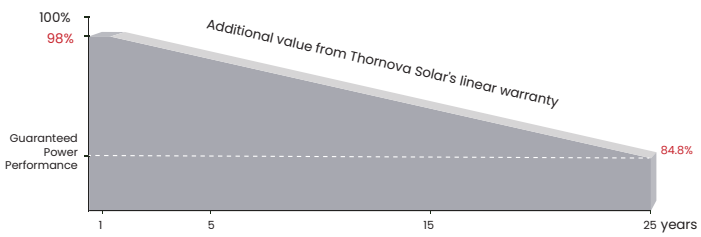
400-415 W

High Efficiency Bifacial Single Glass PERC Module

TS-BB54 X Version All Black

- Bifacial technology allows for the harvesting of up to an additional 25% energy from the rear side of the module.
- 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 (2400 Pa) and snow load (5400 Pa).
- 100% triple EL test enables remarkable reduction of module hidden crack rate.

LINEAR PERFORMANCE WARRANTY



25 years
Product quality & process guarantee

25 years
Linear power guarantee

0.55 %
Annual degradation Over 25 years

RE INSURANCE

Munich RE

Ariel Re

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

COMPREHENSIVE CERTIFICATES

Intertek

C SP US

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.

ELECTRIC CHARACTERISTICS

2×54 cells

Model of modules	TS-BB54(400)-X		TS-BB54(405)-X		TS-BB54(410)-X		TS-BB54(415)-X	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Peak power - P_{mp} (W)	400	298	405	302	410	306	415	310
Open circuit voltage - V_{oc} (V)	37.18	35.10	37.33	35.24	37.68	35.57	37.79	35.67
Short circuit current - I_{sc} (A)	13.39	10.82	13.44	10.86	13.59	10.98	13.72	11.08
MPP voltage - V_{mp} (V)	31.42	29.41	31.55	29.54	31.84	29.81	31.94	29.90
MPP current - I_{mp} (A)	12.74	10.14	12.84	10.22	12.88	10.25	13.01	10.35
Module efficiency - η_m (%)	20.48 %		20.74 %		21.00 %		21.25 %	

STC (Standard Testing Conditions): Irradiance 1000W/m², Cell Temperature 25 ℃, Spectra at AM1.5
NOCT (Nominal Operating Cell Temperature): Irradiance 800W/m², Ambient Temperature 20℃, 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)	438	443	449	455
Open circuit voltage - V_{oc} (V)	37.18	37.33	37.68	37.79
Short circuit current - I_{sc} (A)	14.66	14.71	14.87	15.02
MPP voltage - V_{mp} (V)	31.42	31.55	31.84	31.94
MPP current - I_{mp} (A)	13.94	14.05	14.10	14.24
Irradiance ratio (rear/front)	13.5 %			

STRUCTURAL CHARACTERISTICS

Module dimension (L*W*H)	1722 x 1134 x 35 mm (67.80 x 44.65 x 1.38 inch)
Weight	21.5 kg (47.40 lbs)
Number of cells	108 cells
Cell	PERC monocrystalline 182x91 mm (7.17 x 3.58 inch)
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 mm²
Wire length	1200 mm
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~+85 °C
Bifaciality	70±5%

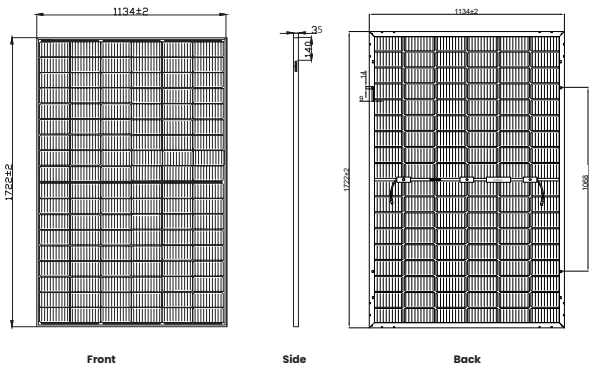
MECHANICAL LOADING

Front side maximum static loading (Pa)	5400
Rear side maximum static loading (Pa)	2400
Hailstone test (mm)	40

TEMPERATURE RATINGS

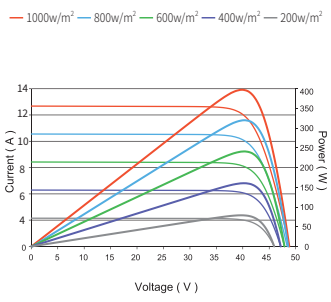
Temperature coefficient (P_{max})	-0.33 %/°C
Temperature coefficient (V_{oc})	-0.26 %/°C
Temperature coefficient (I_{sc})	+0.06 %/°C
Nominal operating cell temperature	45±2 °C

MODULE DIMENSIONS (MM)

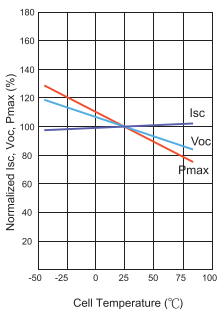


*** The unmarked tolerance is ±1 mm**
Length shown in mm

Current-Voltage & Power-Voltage Curves (400 W)



Temperature Dependence of Isc,Voc,Pmax



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