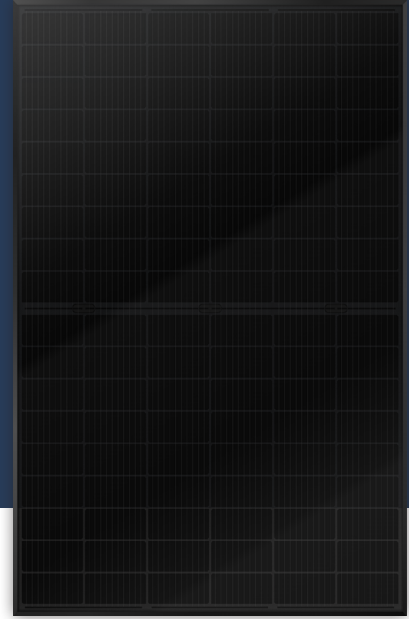


# 400-415 W

High Efficiency Bifacial Single Glass PERC Module

**TS-BB54** **X Version** **All Black**



Bifacial technology enables additional energy harvesting from the rear side (up to 25%).



Excellent low irradiance performance.



Better light trapping and current collection to improve module power output and reliability.



Industry leading lowest thermal coefficient of power.



Optimized electrical design and lower operating current for reduced hot spot loss and better temperature coefficient.

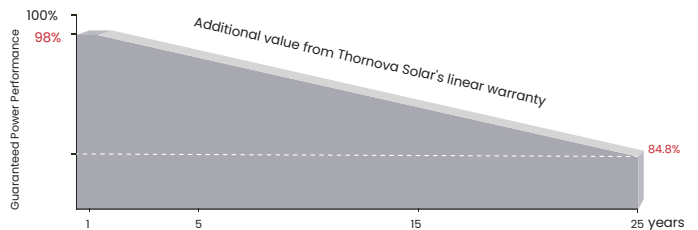


Certified to withstand: wind load (2400 Pa) and snow load (5400 Pa).



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

## COMPREHENSIVE CERTIFICATES



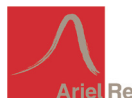
ISO 9001: Quality Management System

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



## ELECTRIC CHARACTERISTICS

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
Maximum power - $P_{mp}$ (W)	400	298	405	302	410	305	415	309
Open-circuit voltage - $V_{oc}$ (V)	37.18	34.95	37.33	35.09	37.68	35.42	37.79	35.59
Short-circuit current - $I_{sc}$ (A)	13.39	10.85	13.44	10.89	13.59	11.01	13.72	11.12
Maximum power voltage - $V_{mp}$ (V)	31.42	29.22	31.55	29.35	31.84	29.61	31.94	29.72
Maximum power current - $I_{mp}$ (A)	12.74	10.21	12.84	10.29	12.88	10.31	13.01	10.42
Module efficiency - $\eta_m$ (%)	20.5 %		20.7 %		21.0 %		21.3 %	

**STC** (Standard Testing Conditions): Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25 °C, Spectra at AM1.5

**NOCT** (Nominal Operating Cell Temperature): Irradiance 800W/m<sup>2</sup>, Ambient Temperature 20°C, Spectra at AM1.5, Wind at 1m/s

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

Maximum power - $P_{mp}$ (W)	438	443	449	454
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
Maximum power voltage - $V_{mp}$ (V)	31.42	31.55	31.84	31.94
Maximum power 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 30 mm (67.80 x 44.65 x 1.18 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	(F) Tempered, 3.2 mm AR, High transmittance, Low iron (B) Black mesh backsheet
Frame	Anodized aluminum alloy
Junction box	IP68, 3 diodes
Output wire	4.0 mm <sup>2</sup>
Wire length	300 mm/customized
Connector	MC4 Compatible
Packing Specification	36 pcs/Pallet, 828 pcs/40'HQ

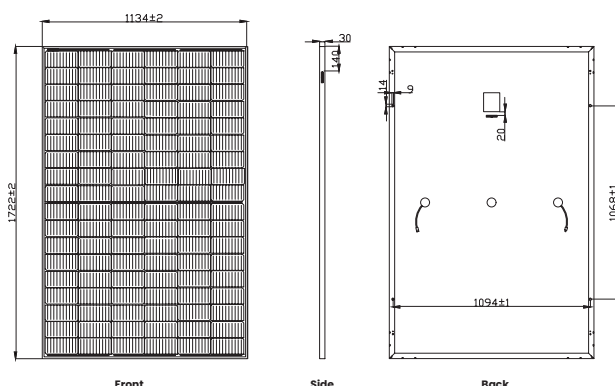
## OPERATING PARAMETERS

Power tolerance (W)	(0,+5)
Maximum system voltage (V)	1500
Maximum rated fuse current (A)	30
Current operating temperature (°C)	-40~+85 °C
Mechanical load	5400 Pa / 2400 Pa

## TEMPERATURE RATINGS

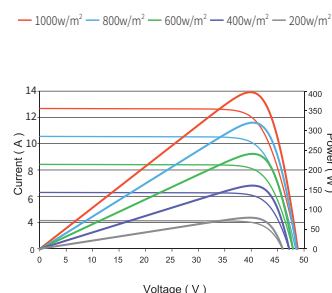
Temperature coefficient ( $P_{max}$ )	-0.35 %/°C
Temperature coefficient ( $V_{oc}$ )	-0.26 %/°C
Temperature coefficient ( $I_{sc}$ )	+0.046 %/°C
Nominal operating cell temperature	42±2 °C

## MODULE DIMENSIONS (MM)

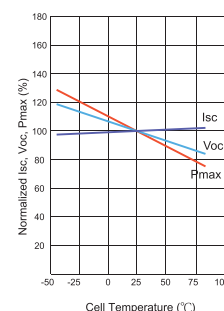


\* The unmarked tolerance is ±1 mm  
Length shown in mm

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



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



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# THORNOVA solar

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