



TUNGHSU

Spirit series

M10 (182mm)

440W/445W/450W/455W/460W/465W

120 CELLS MBB HALF-CELL MONO PV MODULE

SINGLE GLASS REGULAR TYPE



440-465W

Tunghsu components with high efficiency and high reliability

- * Advanced production equipment, highly automated process control, world-class production technology
- * The company has a product research and development laboratory that meets the new ISO/IEC international standards
- * Excellent weak light performance, resistant to salt spray and ammonia corrosion.
- Passing the certification test of the PV standards.
- * Certified by international quality management and environmental management system
- * Application grade:A, Safe grade: II, Fireproofing grade:C

Comprehensive Products And System Certificates

IEC61215/IEC61730/UL1703/IEC61701/IEC62716

ISO 9001: Quality Management System

ISO 14001: Environmental Management System

ISO 45001: Occupation Health and Safety Management System

GB/T 23001-2017: Management system with Integration of Information Technology and Industrialization



High power output

Combined with MBB technology, Maximum power of 465w, efficiency 21.5%
Reduce BOS cost with higher power bin and 1500V system voltage



Higher power generation

Lower temperature coefficient (-0.35%) and lower working temperature bring more power generation
Half-cell technology brings stronger anti-shadow occlusion ability



High-efficiency PERC+ cell technology

Higher module power and efficiency, lower power attenuation



Certified to withstand the most challenging environmental conditions

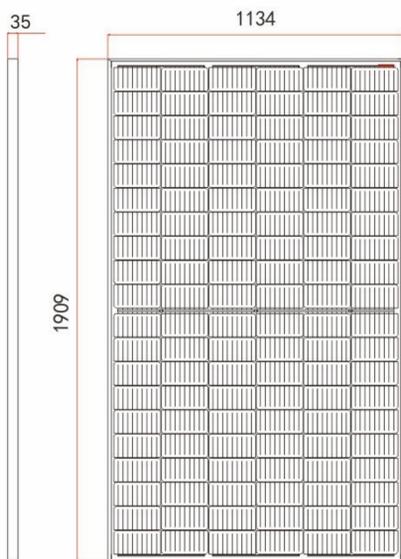
2400 Pa wind load
5400 Pa snow load

Industry-leading linear warranty

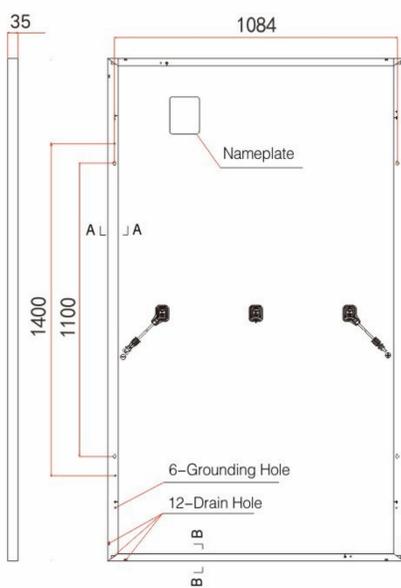
*15 Year Product Warranty *25Year Linear Power Warranty



DIMENSIONS OF PV MODULE(mm)

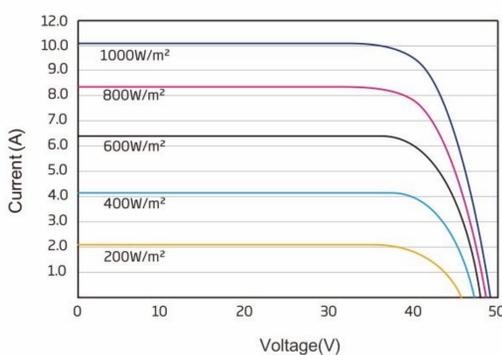


Front View

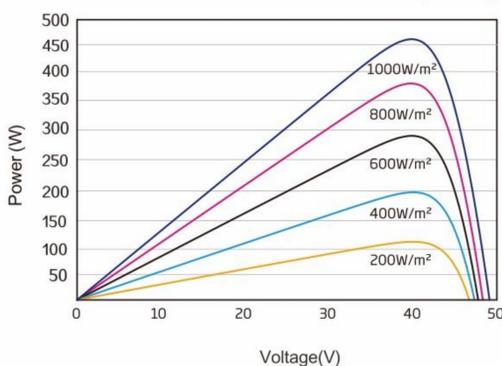


Back View

I-V CURVES OF PV MODULE(455W)



P-V CURVES OF PV MODULE(455W)



ELECTRICAL DATA (STC)

Peak Power Watts- P_{MAX} (Wp)	440	445	450	455	460	465
Power Output Tolerance- P_{MAX} (W)	0 ~ +5					
Maximum Power Voltage- V_{MPP} (V)	34.25	34.45	34.65	34.85	35.05	35.25
Maximum Power Current- I_{MPP} (A)	12.85	12.92	12.99	13.06	13.13	13.20
Open Circuit Voltage- V_{OC} (V)	41.2	41.4	41.6	41.8	42.0	42.2
Short Circuit Current- I_{SC} (A)	13.57	13.64	13.71	13.78	13.85	13.92
Module Efficiency η_m (%)	20.3	20.6	20.8	21.0	21.3	21.5

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5.

ELECTRICAL DATA (NOCT)

Maximum Power- P_{MAX} (Wp)	329	333	337	341	345	349
Maximum Power Voltage- V_{MPP} (V)	31.86	32.06	32.26	32.46	32.66	32.86
Maximum Power Current- I_{MPP} (A)	10.33	10.39	10.45	10.51	10.57	10.63
Open Circuit Voltage- V_{OC} (V)	38.36	38.56	38.76	38.96	39.16	39.36
Short Circuit Current- I_{SC} (A)	10.89	10.95	11.01	11.08	11.14	11.20

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline (182X182mm)
Cell Orientation	120 cells (6 × 20)
Module Dimensions	1909 × 1134 × 35 mm (75.16 × 44.65 × 1.38 inches)
Weight	24.0 kg (64.30 lb)
Glass	3.2mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant Material	EVA
Backsheet	White
Frame	35 mm (1.38 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm (0.006 inches), Portrait: N 280mm/P 280mm(11.02/11.02inches) Landscape: N 1200 mm /P 1200 mm (47.24/47.24 inches)
Connector	MC4, QC4

NOCT (Nominal Operating Cell Temperature) 41°C (± 3°C)

Temperature Coefficient of P_{MAX} - 0.36%/°C

Temperature Coefficient of V_{OC} - 0.26%/°C

Temperature Coefficient of I_{SC} 0.04%/°C

Operational Temperature -40~+85°C

Maximum System Voltage 1500V DC (IEC)

Max Series Fuse Rating 25A

(DO NOT connect Fuse in Combiner Box with two or more strings in parallel connection)

WARRANTY

15 year Product Workmanship Warranty

25 year Linear Power Warranty

PACKAGING CONFIGURATION

Modules per box: 31 pieces

Modules per 40' container: 744 pieces

