



**BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE**

PRODUCT: TSM-XXXDEG21C.20

POWER RANGE: 640-665W

**665W**

MAXIMUM POWER OUTPUT

**0~+5W**

BINNING TOLERANCE

**21.4%**

MAXIMUM EFFICIENCY



**High customer value**

- Lower LCOE (Levelized Cost Of Energy), reduced BOS (Balance of System) cost, shorter payback time
- Lowest guaranteed first year and annual degradation;
- Designed for compatibility with existing mainstream system components



**High power Mono Perc up to 665W**

- Up to 21.4% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection



**High reliability**

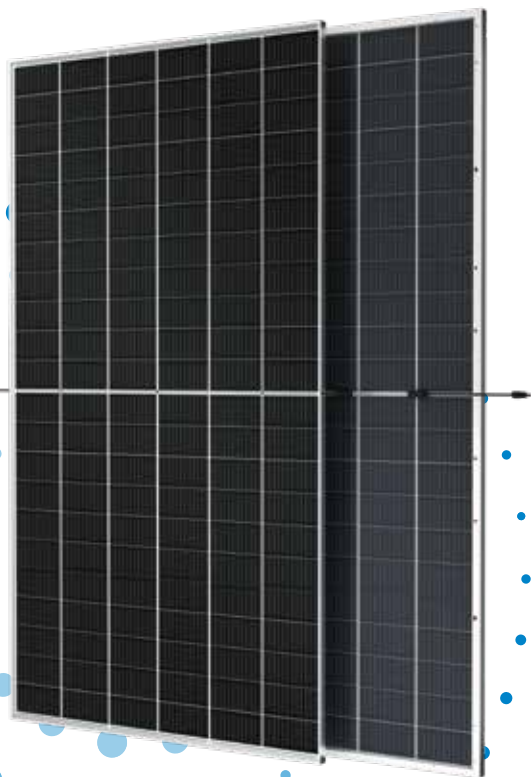
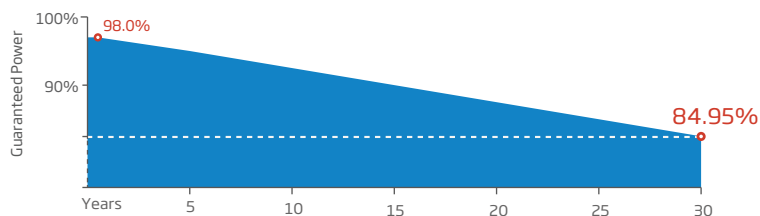
- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control and fire class rating C
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load



**High energy yield**

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature
- Up to 25% additional power gain from back side depending on albedo

**Trina Solar's Vertex Bifacial Dual Glass Performance Warranty**



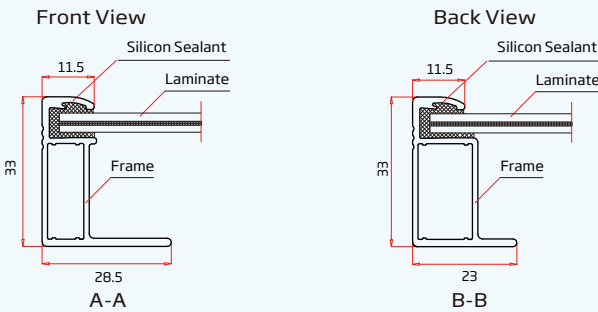
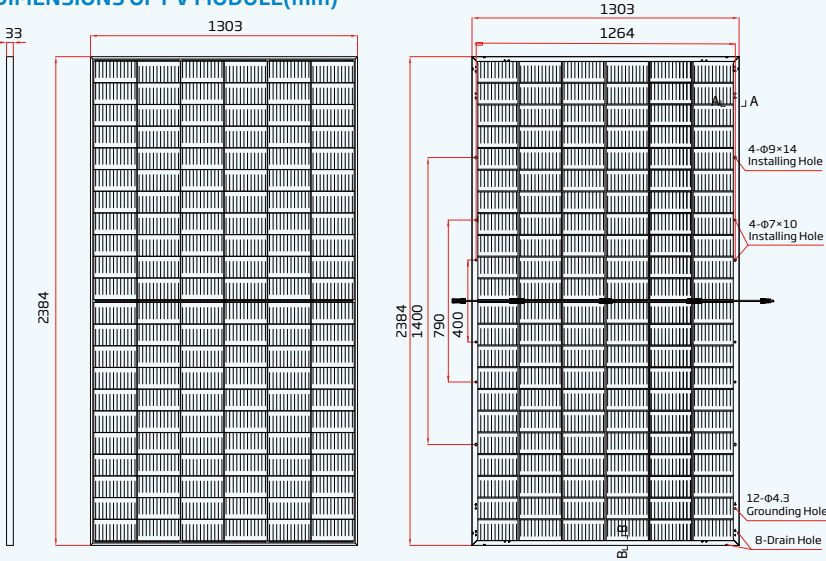
**Comprehensive Products and System Certificates**



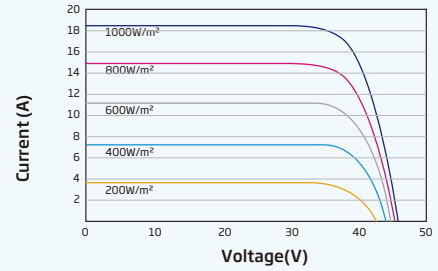
IEC61215/IEC61730/IEC61701/IEC62716/UL61730  
 ISO 9001: Quality Management System  
 ISO 14001: Environmental Management System  
 ISO14064: Greenhouse Gases Emissions Verification  
 ISO45001: Occupational Health and Safety Management System



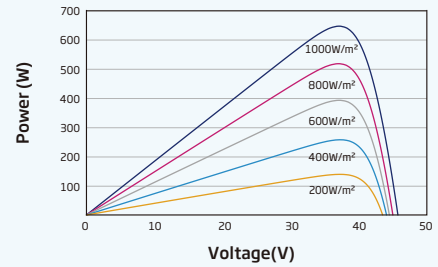
### DIMENSIONS OF PV MODULE(mm)



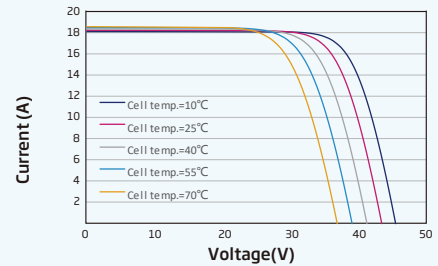
### I-V CURVES OF PV MODULE(650 W)



### P-V CURVES OF PV MODULE(650W)



### I-V CURVES OF PV MODULE(650 W)



### ELECTRICAL DATA (STC) TSM-XXXDEG21C.20(XXX=640-665)

Peak Power Watts-P <sub>MAX</sub> (Wp)*	640	645	650	655	660	665
Binning Tolerance-P <sub>MAX</sub> (W)	0 ~ +5					
Maximum Power Voltage-V <sub>MPP</sub> (V)	37.3	37.5	37.7	37.9	38.1	38.3
Maximum Power Current-I <sub>MPP</sub> (A)	17.19	17.23	17.27	17.31	17.35	17.39
Open Circuit Voltage-V <sub>OC</sub> (V)	45.1	45.3	45.5	45.7	45.9	46.1
Short Circuit Current-I <sub>SC</sub> (A)	18.26	18.31	18.35	18.40	18.45	18.50
Module Efficiency η <sub>m</sub> (%)	20.6	20.8	20.9	21.1	21.2	21.4

STC: Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25°C, Air Mass AM1.5. \*Measuring tolerance: ±3%.

### Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power -P <sub>MAX</sub> (Wp)	685	690	696	701	706	712
Maximum Power Voltage-V <sub>MPP</sub> (V)	37.3	37.5	37.7	37.9	38.1	38.3
Maximum Power Current-I <sub>MPP</sub> (A)	18.39	18.44	18.48	18.52	18.56	18.60
Open Circuit Voltage-V <sub>OC</sub> (V)	45.1	45.3	45.5	45.7	45.9	46.1
Short Circuit Current-I <sub>SC</sub> (A)	19.54	19.59	19.63	19.69	19.74	19.79
Irradiance ratio (rear/front)	10%					

Power Bifaciality:70±5%.

### ELECTRICAL DATA (NOCT)

Maximum Power-P <sub>MAX</sub> (Wp)	484	488	492	495	499	504
Maximum Power Voltage-V <sub>MPP</sub> (V)	34.7	34.9	35.1	35.2	35.4	35.6
Maximum Power Current-I <sub>MPP</sub> (A)	13.94	13.98	14.01	14.05	14.10	14.16
Open Circuit Voltage-V <sub>OC</sub> (V)	42.5	42.7	42.9	43.0	43.2	43.4
Short Circuit Current-I <sub>SC</sub> (A)	14.71	14.75	14.79	14.83	14.87	14.91

NOCT: Irradiance at 800W/m<sup>2</sup>, Ambient Temperature 20°C, Wind Speed 1m/s.

### MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	132 cells
Module Dimensions	2384×1303×33 mm (93.86×51.30×1.30 inches)
Weight	38.3 kg (84.4 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)
Frame	33mm(1.30 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm <sup>2</sup> (0.006 inches <sup>2</sup> ), Portrait: 350/280 mm(13.78/11.02 inches) Length can be customized
Connector	Staubli MC4 EVO2 / Trina Solar TS4 Plus / Trina Solar TS4

### TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P <sub>MAX</sub>	-0.34%/°C
Temperature Coefficient of V <sub>OC</sub>	-0.25%/°C
Temperature Coefficient of I <sub>SC</sub>	0.04%/°C

### MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC) 1500V DC (UL)
Max Series Fuse Rating	35A

### WARRANTY

12 year Product Workmanship Warranty  
30 year Power Warranty  
2% first year degradation  
0.45% Annual Power Attenuation

(Please refer to product warranty for details)

### PACKAGING CONFIGURATION

Modules per box: 33 pieces  
Modules per 40' container: 594 pieces