TONGWEI SOLAR CELL DATASHEET

M1669BPERCBP Monocrystalline166 9BB Bifacial Solar Cell

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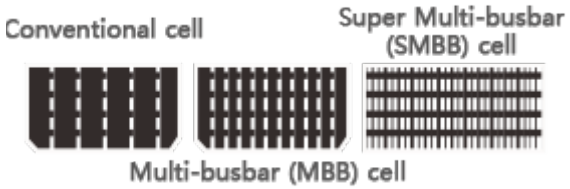
Tongwei has established 3 national first-class PV technology R&D centers and set up scientific research and technology teams led by industry experts, and is working to deepen the industry-university-research cooperation with universities and research institutes at home and abroad. Tongwei focuses on the cutting-edge technologies and independently developed first 1GW 210mm TNC mass production line and first large-size advanced metalization test line in the industry, and has been developing pilot test lines for new cells and mainstream module technologies. Tongwei has been injecting vitality into the industry development through continuous innovation.

Tongwei PV Technology System focused on the R&D and mass production of new technologies and new products (such as TNC and HJT) to further enhance the R&D and development of cross-generation and cutting-edge technologies in the industry (including HBC, perovskite, laminated cells/modules, PV+energy storage and other technologies). In the future, Tongwei will continue to consolidate our strengths of technological innovation, further enhance our overall competitiveness. While providing efficient and high-quality products for upstream and downstream partners, Tongwei will also contribute to the development of green energy and build a sustainable new ecology of the PV industry



Multi-busbar - reduced strings increase output, dense wires reduce losses

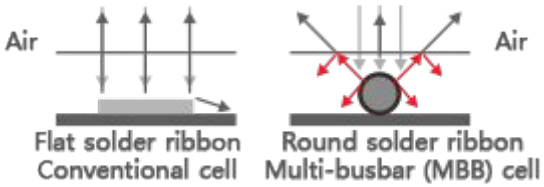
The grid lines are densely distributed, and the stress is uniform with SMBB design, Significantly reduce BOM cost, and the output power is 1-2W higher than that of MBB

Half-cell cut - reduce flow and loss

Current density is reduced by 1/2, internat power loss is reduced to 1/4 of conventional modules, and the rated output power is increased by 5-10w

Shading, not compromising energy Up-down symmetrical parallel module design, effectively reduce current mismatch due to shading. The power output is increased by 50%

Lossless Cutting Lossless laser cutting technology, no mechanical damage, smooth cutting surface without burrs. Low cell cracking risks, micro-cracking is reduced by more than 50%



New Solder Ribbon Adopt round-shaped solder ribbon, low shading area, Multiple reflections of incident light, power increased by 1-2W

High-Density Encapsulation Technology The 210 Series adopts advanced high-density encapsulation technology to ensure the perfect balance of efficiency and reliability. Module efficiency increased by more than 0.15%

Technical data and design

Dimensions	166mm*166mm± 0.3mm	TkVoltage：-0.36 %/K
Thickness	170±30μm	TkCurrent：+0.07%/K
Front(-)	9*0.1±0.05mm busbar (silver)，146 fingers Anti-broken grid design, blue anti-reflection film (silicon nitride)	TkPower：-0.38%/K
Back(+)	Back electrode width (silver) 1.4 ±0.5mm, back surface covered by fingers 150 fingers on the back, anti-broken grid design	Rsh≥35Ω，Irev2≤0.

Light intensity reliability

Intensity(W/m²)	1000	900	800	600	400
Uoc	1.000	0.996	0.991	0.988	0.962
Isc	1.000	0.903	0.803	0.602	0.403

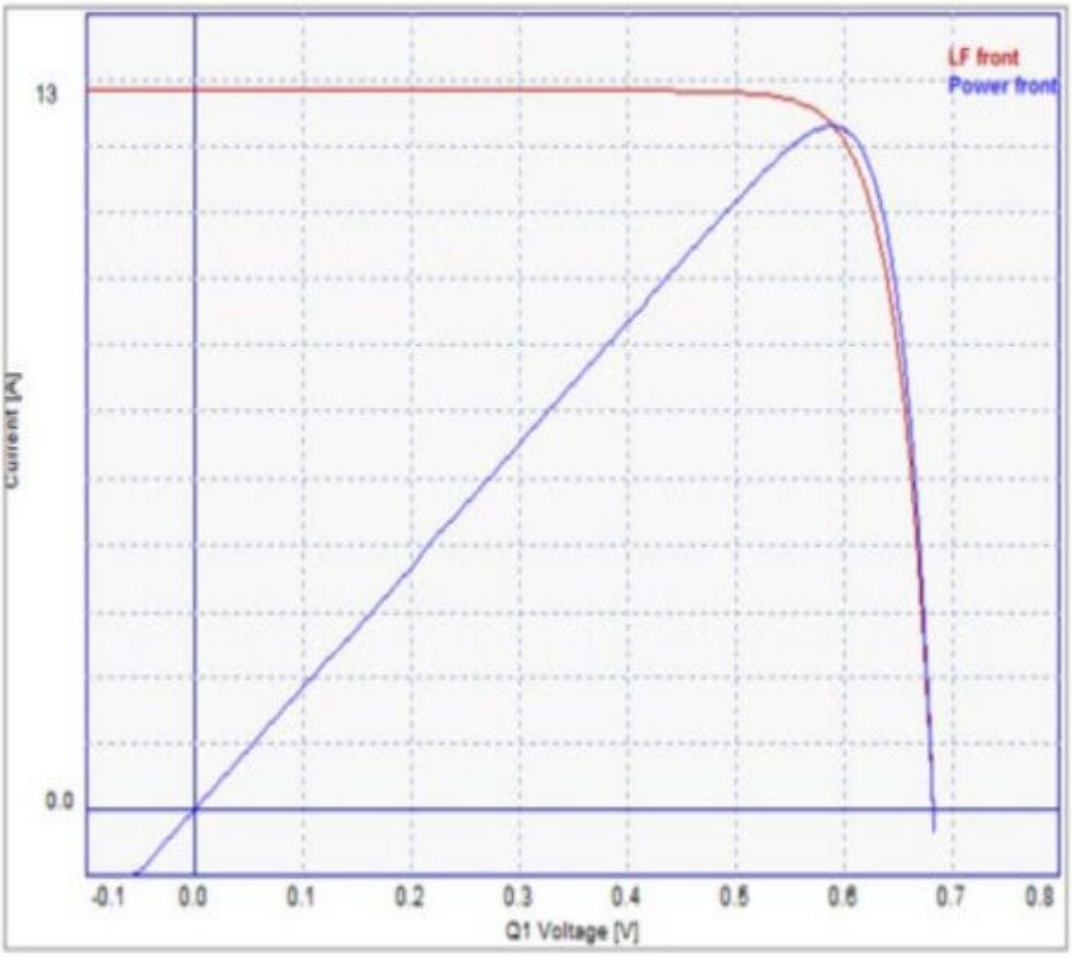
* Taking the Voc(Isc) tested at 1000W/m2 as the standard, test the decrease of Voc (Isc) with the light intensity.

Solderability

Minimum peeling strength ≥1.4N/mm

Results may vary depending on electrode, welding method, and conditions.

IV curve



Front electrical performance distribution

Efficiency code	Efficiency Eff(%)	Maximum output power Pmpp(W)	Maximum output voltage Umpp(V)	Maximum output current Impp(A)	Open-circuit voltage Uoc(V)	Short-circuit current Isc(A)	Fill factor FF(%)
TW-166M-233	23.3	6.39	0.5927	10.799	0.6929	11.284	81.71
TW-166M-232	23.2	6.36	0.5915	10.752	0.6917	11.261	81.65
TW-166M-231	23.1	6.33	0.5901	10.727	0.6905	11.246	81.51
TW-166M-230	23.0	6.31	0.5886	10.714	0.6893	11.230	81.48
TW-166M-229	22.9	6.28	0.5871	10.690	0.6881	11.216	81.36
TW-166M-228	22.8	6.25	0.5856	10.674	0.6869	11.201	81.24
TW-166M-227	22.7	6.22	0.5843	10.650	0.6856	11.187	81.14
TW-166M-226	22.6	6.20	0.5826	10.635	0.6847	11.172	81.00
TW-166M-225	22.5	6.17	0.5811	10.615	0.6835	11.158	80.88
TW-166M-224	22.4	6.14	0.5795	10.598	0.6823	11.142	80.78
TW-166M-223	22.3	6.11	0.5779	10.579	0.6811	11.128	80.66
TW-166M-222	22.2	6.09	0.5764	10.559	0.6793	11.121	80.57
TW-166M-221	22.1	6.06	0.5749	10.540	0.6789	11.103	80.38
TW-166M-220	22	6.03	0.5731	10.525	0.6776	11.090	80.26
TW-166M-219	21.9	6.00	0.5716	10.503	0.6765	11.073	80.15
TW-166M-218	21.8	5.98	0.5700	10.485	0.6753	11.057	80.04
TW-166M-217	21.7	5.95	0.5684	10.467	0.6742	11.042	79.91
TW-166M-216	21.6	5.92	0.5669	10.446	0.6729	11.028	79.80
TW-166M-215	21.5	5.89	0.5654	10.426	0.6717	11.011	79.70

Standard test conditions:1000W/m², AM1.5, 25℃
The above technical parameters are subject to technical changes and tests, and TW Solar reserves the right of final interpretation.

Back electrical performance distribution

Efficiency code	Efficiency Eff(%)	Maximum output power Pmpp(W)	Maximum output voltage Umpp(V)	Maximum output current Impp(A)	Open-circuit voltage Uoc(V)	Short-circuit current Isc(A)
TW-166M-16.2	>16%	4.44	0.5884	7.549	0.6788	8.019
TW-166M-15.7	15.5%-16%	4.30	0.5782	7.492	0.6688	7.940
TW-166M-15.2	>15%-15.5%	4.17	0.5721	7.335	0.6650	7.735
TW-166M-14.8	<15%	4.06	0.5657	7.173	0.6592	7.554

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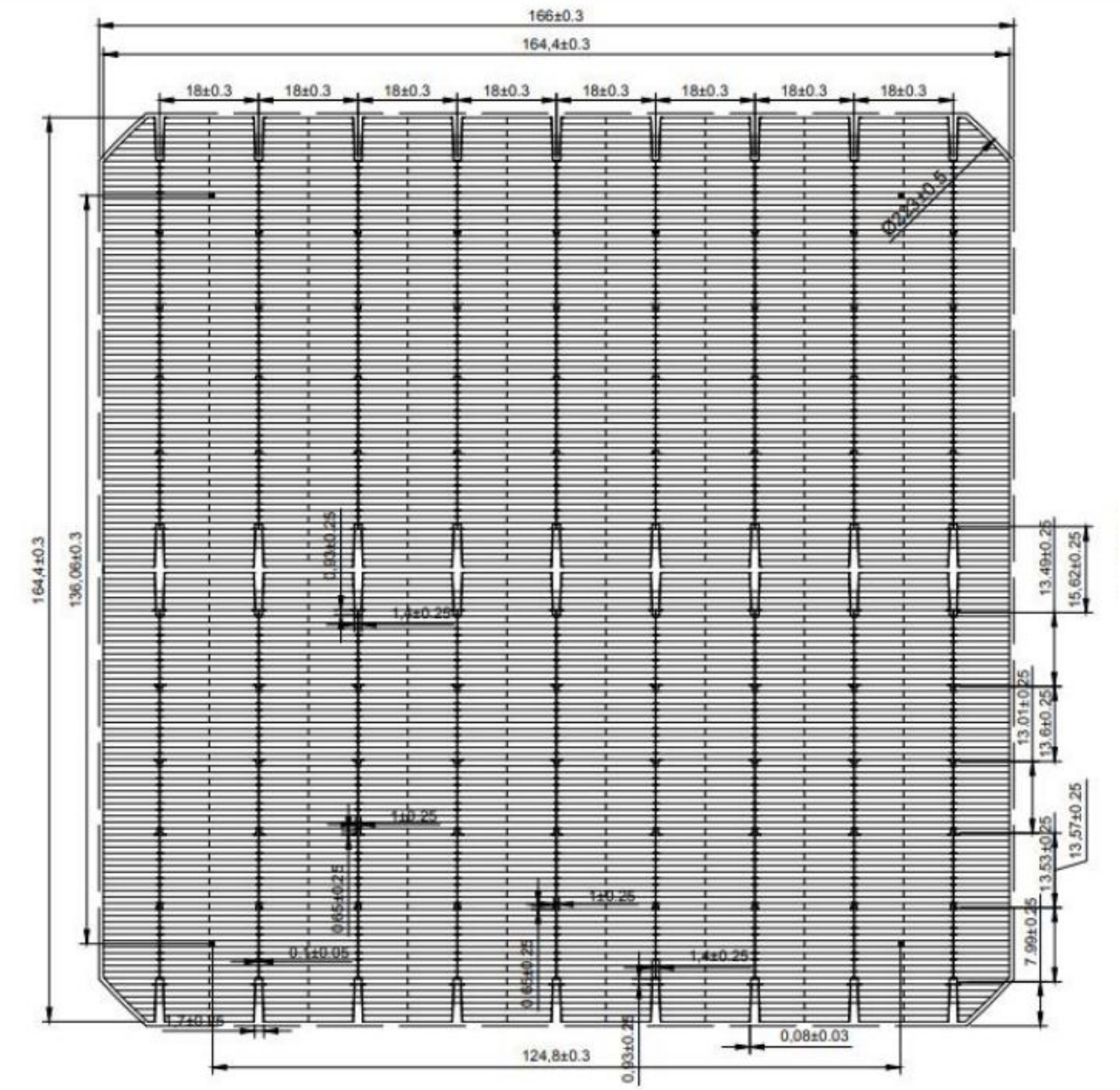
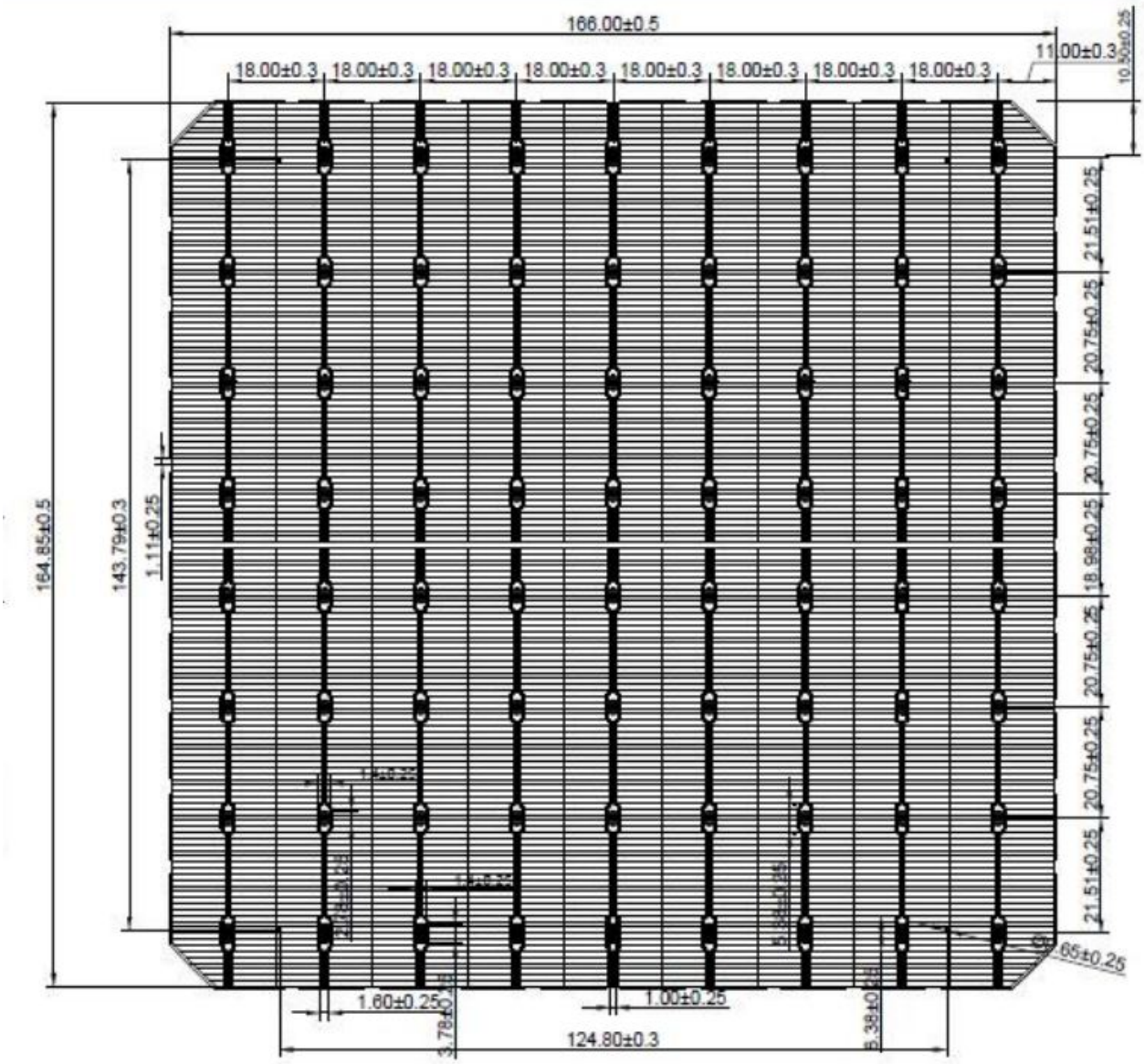

166±0.3
164,4±0.3
18±0.3
18±0.3
18±0.3
18±0.3
18±0.3
18±0.3
18±0.3
18±0.3
Ø22.2±0.5
164,4±0.3
136.06±0.3
0.93±0.25
1.4±0.25
13.49±0.25
15.62±0.25
13.01±0.25
13.6±0.25
13.57±0.25
13.53±0.25
7.99±0.25
1±0.25
0.65±0.25
1±0.25
0.65±0.25
0.1±0.05
1.4±0.25
1.7±0.05
0.08±0.03
124,8±0.3
0.93±0.25


166.00±0.5
18.00±0.3
18.00±0.3
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18.00±0.3
18.00±0.3
18.00±0.3
18.00±0.3
18.00±0.3
11.00±0.3
10.50±0.25
164.85±0.5
143.79±0.3
1.11±0.25
21.51±0.25
20.75±0.25
20.75±0.25
18.98±0.25
20.75±0.25
20.75±0.25
21.51±0.25
1.65±0.25
1.60±0.25
3.78±0.25
1.00±0.25
5.38±0.25
124.80±0.3