TONGWEI SOLAR CELL DATASHEET TOPCON 182-16BB

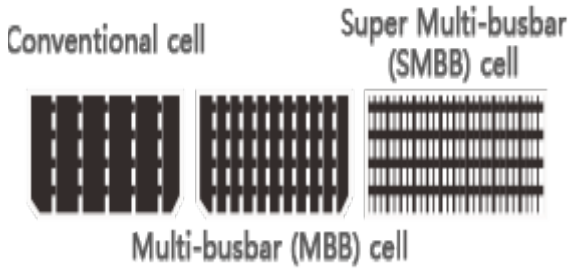
Monocrystalline 182x182 16BB Topcon Bifacial Solar Cell

www.atakale.com atakale@atakale.com +90 312 425 2200 Ankara/Turkey Cell Importer

The idea of TOPCON technology is that the metal does not come into direct contact with the wafer. TOPCON has an N-Type Silicon substrate and a thin tunneling oxide is applied, followed by a layer of highly doped with n or p poly silicon that contacts the metal at the ends. These tunneling oxide blocks one type of carrier and thus they are called passivating contacts. Compared to the Heterojunction technology (HJT) which has both amorphous and crystalline thin film the manufacturing process is completely different compared to TOPCN technology which is just one upgrade from the PERC structure by just adding a passivation oxide layer. By changing the substrate material from P-Type silicon to N-Type silicon material the existing PERC line in the market can be upgraded to TOPCON structure by just adding the tunneling passivation layer. This means there are capital/manufacturing costs compared to other technologies like HJT /IBC (interdigitated back contact) which requires a different type of architecture, which will be lower.

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



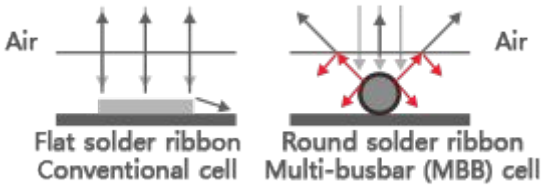
Multi-busbar - reduced strings increase output, dense wires reduce losses

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	182mm*182mm± 0.5mm Φ247mm±0.5mm	TkVoltage：-0.26 %/K
Thickness	180±20μm	TkCurrent：+0.046%/K
Front(-)	16*0.036±0.02mm busbar (silver)，132 Fingers， Blue (dark blue) anti-reflecting coating (SiNx)	TkPower：-0.32%/K
Back(+)	16*0.036±0.02mm busbar (silver)，130 Fingers， Blue (dark blue) anti-reflecting coating (SiNx)	Rsh≥35Ω，Irev2≤1A

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

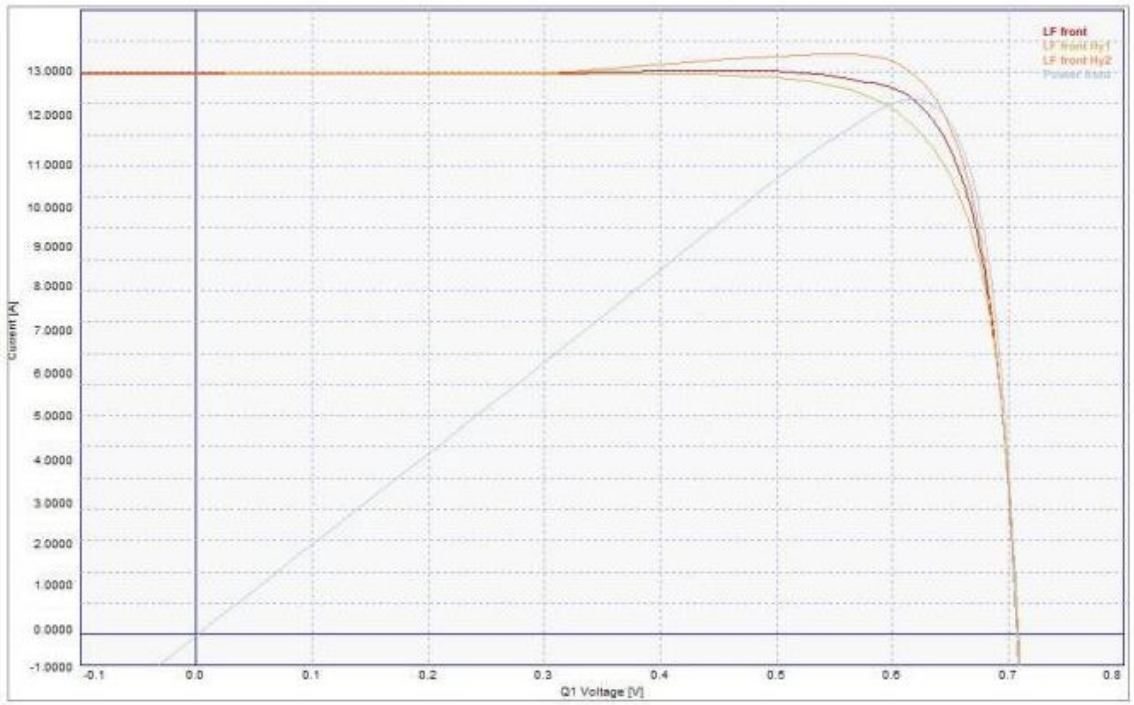
* Taking the Voc(Isc) tested at 1000W/m2 as the standard, test the decrease of Voc (Isc) with the light intensity.

Solderability

Minimum peeling strength	≥0.5N/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 power point voltage Vmpp(V)	Maximum power point current Impp(A)	Open-circuit voltage Uoc(V)	Short-circuit current Isc(A)	Fill factor FF(%)
TW-182M-247	24.7	8.155	0.622	13.111	0.712	13.787	83.11
TW-182M-246	24.6	8.122	0.620	13.091	0.711	13.776	83.03
TW-182M-245	24.5	8.089	0.619	13.068	0.709	13.759	82.92
TW-182M-244	24.4	8.056	0.617	13.031	0.707	13.755	82.81
TW-182M-243	24.3	8.023	0.617	12.999	0.705	13.752	82.72
TW-182M-242	24.2	7.990	0.615	12.992	0.703	13.750	82.62
TW-182M-241	24.1	7.957	0.614	12.960	0.701	13.734	82.59
TW-182M-240	24.0	7.924	0.612	12.948	0.699	13.730	82.53
TW-182M-239	23.9	7.891	0.610	12.936	0.698	13.707	82.44
TW-182M-238	23.8	7.858	0.608	12.925	0.697	13.687	82.35
TW-182M-237	23.7	7.825	0.606	12.913	0.696	13.663	82.26
TW-182M-236	23.6	7.792	0.604	12.901	0.695	13.643	82.14
TW-182M-235	23.5	7.759	0.602	12.889	0.694	13.615	82.09
TW-182M-234	23.4	7.726	0.600	12.877	0.693	13.592	81.99
TW-182M-233	23.3	7.693	0.598	12.865	0.692	13.577	8.85

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-182M-20.3	>20.5%	6.703	0.586	11.43	0.692	12.734
TW-182M-20.2	20.3%-20.5%	6.670	0.585	11.41	0.691	12.690
TW-182M-20.1	20.1$-20.3%	6.637	0.584	11.37	0.690	12.645
TW-182M-20.0	<20.1%	6.604	0.582	11.34	0.689	12.625

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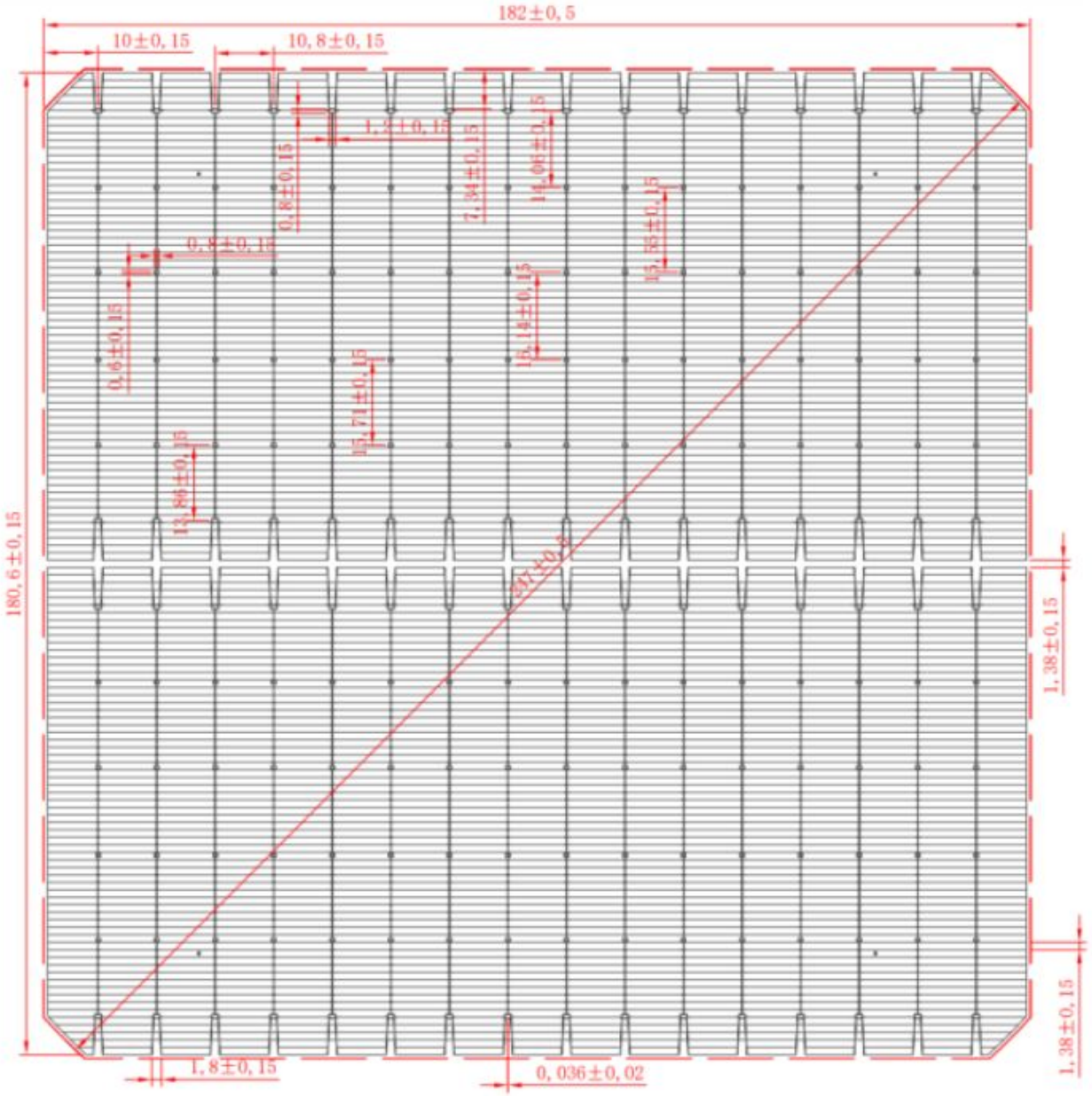
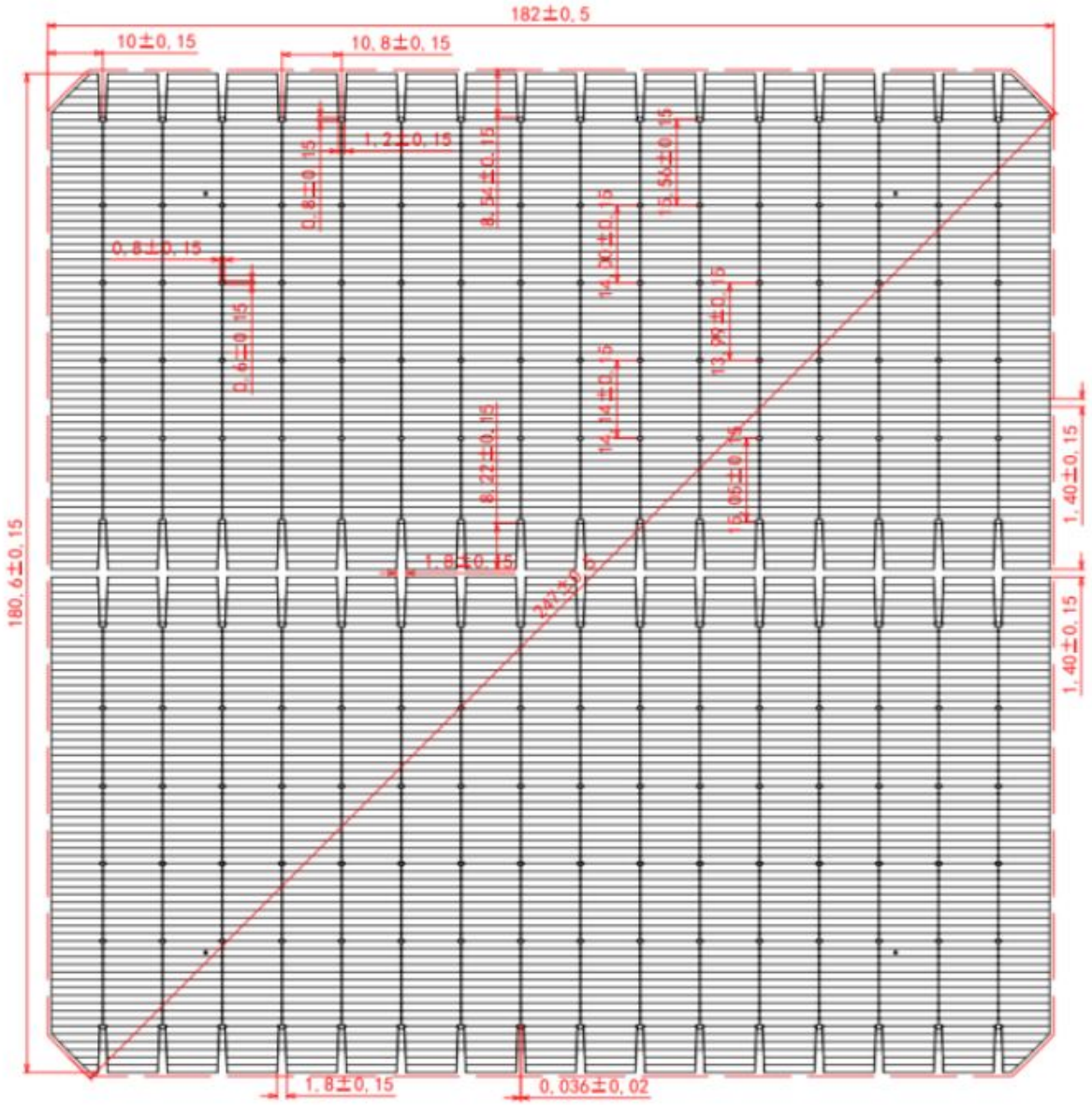

182±0,5
10±0,15
10,8±0,15
1,2±0,15
0,8±0,15
7,34±0,15
14,09±0,15
15,65±0,15
0,8±0,15
0,6±0,15
16,14±0,15
15,71±0,15
13,99±0,15
180,6±0,15
207±0,5
1,38±0,15
1,38±0,15
1,8±0,15
0,036±0,02


182±0.5
10±0.15
10.8±0.15
1.2±0.15
0.8±0.15
0.6±0.15
8.64±0.15
15.56±0.15
14.58±0.15
13.68±0.15
14.14±0.15
8.22±0.15
15.05±0.15
1.84±0.15
240±0.5°
180.6±0.15
1.40±0.15
1.40±0.15
1.8±0.15
0.036±0.02