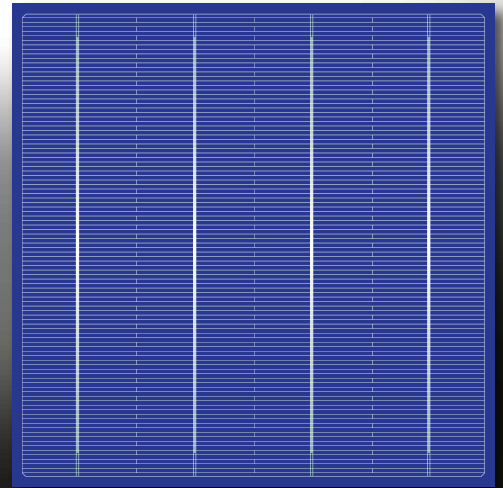




SAPPHIRE Series
Black Silicon Cell

M-156-4 ver.N



Multicrystalline Solar Cell

Features

- High-efficiency solar cells with an isotropically etched surface
- Silicon nitride anti-reflection coating
- Silver front contact bars and full surface aluminum back contact field

Performance and Quality

- Proper handling from incoming inspection through production, outgoing inspection and packaging
- 100% checked for reverse current and visual appearance
- Calibrated against Fraunhofer ISE
- RoHS compliance
- **100% PID Resistance**

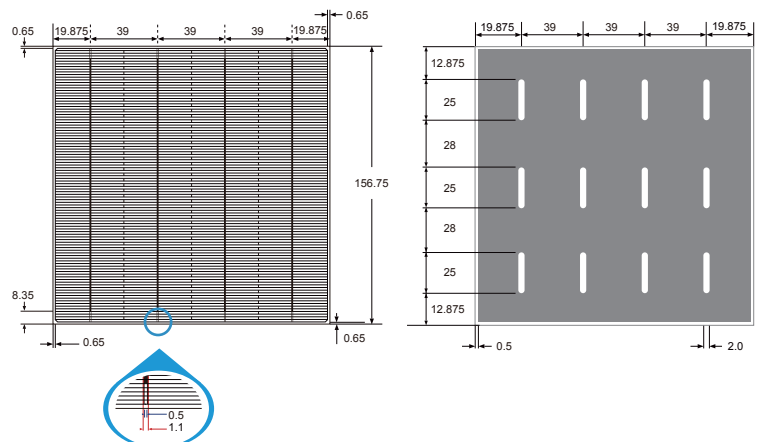
Packaging

- Minimize the risk of broken cells with special design
- Label with product information

Physical Characteristics

Dimension	156.75 mm x 156.75 mm ± 0.3 mm
Thickness (si)	180 μm - 20 / + 30 μm 200 μm ± 30 μm
Front Side (-)	Silicon nitride anti-reflection coating 1.1 mm silver busbar
Back Side (+)	Full surface aluminum back surface field 2.0 mm (silver) discontinuous soldering pads

Cell Layout



Black Silicon Cell

M-156-4 ver.N

Multicrystalline Solar Cell



Electrical Characteristics

Class	Efficiency Range (%)	Rated Power (Wp)	*Maximum Power Current (A)	*Short Circuit Current (A)	*Maximum Power Voltage (V)	*Open Circuit Voltage (V)
190	19.0-19.1	4.668	8.780	9.299	0.534	0.636
191	19.1-19.2	4.693	8.797	9.315	0.535	0.637
192	19.2-19.3	4.718	8.819	9.340	0.537	0.639
193	19.3-19.4	4.742	8.838	9.361	0.538	0.641
194	19.4-19.5	4.767	8.858	9.382	0.540	0.642
195	19.5-19.6	4.791	8.877	9.402	0.541	0.644
196	19.6-19.7	4.816	8.894	9.422	0.543	0.646
197	19.7-19.8	4.840	8.910	9.440	0.545	0.647
198	19.8-19.9	4.865	8.926	9.457	0.546	0.649
199	19.9-20.0	4.890	8.953	9.484	0.548	0.651
200	20.0-20.1	4.914	8.975	9.506	0.550	0.652
201	20.1-20.2	4.939	8.997	9.529	0.551	0.654
202	20.2-20.3	4.963	9.019	9.552	0.553	0.655

Test condition : 1000 W / m², AM 1.5, 25°C Power measuring tolerance: ±1.5% rel.

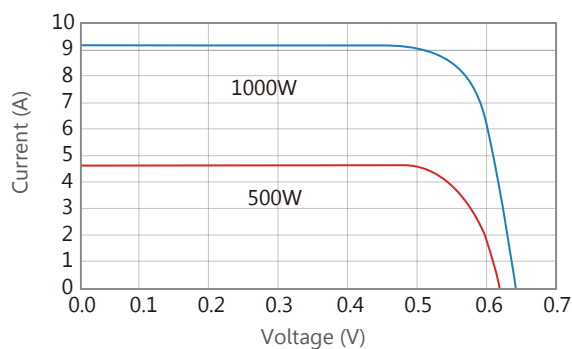
Temperature coefficients

Current (%/K)	0.0425
Voltage (%/K)	-0.3111
Power (%/K)	-0.3960

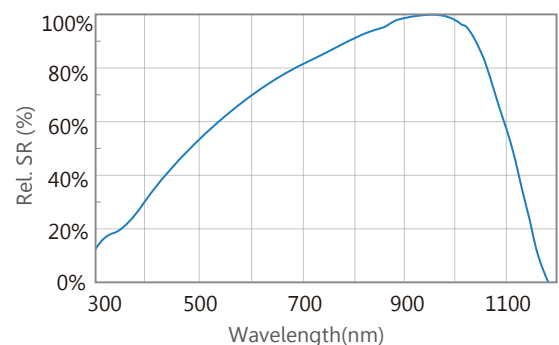
Light Intensity Dependence

Intensity [W/m ²]	Vmpp	I _{mpp}
1000	1.000	1.000
900	0.997	0.904
500	0.975	0.499
300	0.952	0.297
200	0.927	0.195

IV-Curve



Spectral Response



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