ES-B SERIES
photovoltaic panels

180, 190 & 195 W

evergreensolar®

MORE electricity

Our ES-B series panels have a tight power tolerance and consistently deliver more electricity than competitors in field tests.

GUARANTEED POWER[1]
The minimum guaranteed power is no less than 98% of the nameplate power.

INDEPENDENTLY VERIFIED POWER[2]
Four independent test labs regularly check panel power so you get the power we promise.

ANTI-REFLECTIVE GLASS
Delivering 2–3% more electricity compared to panels with standard glass.

HIGH RANKINGS IN FIELD TESTS[4]
Long-term Photon and TÜV field tests prove Evergreen panels produce more electricity (kWh/kW).

LESS impact

String Ribbon™ panels have the smallest carbon footprint and fastest energy payback of any silicon-based solar panel ever made.

SMALLEST CARBON FOOTPRINT[5]
Our String Ribbon™ wafers are made with a fraction of the emissions that result from making conventional silicon panels.

15-MONTH ENERGY PAYBACK[5]
Our panels begin generating truly clean electricity faster than any other silicon-based panel on the market.

100% CARDBOARD-FREE REUSABLE PACKAGING
Reduces disposal costs and on-site manpower while eliminating tons of landfill.

LEAD-FREE SOLAR CELLS
Our panels make clean electricity and the way we make them is clean too.

1 Guaranteed upon initial delivery of the panel to the customer, minimum power no less than 98% of nameplate rating, maximum power up to 2.5% above nameplate rating; **2** Evergreen power testers calibrated by taking the straight average of test data from NREL, TÜV Rheinland PTL, TÜV Rheinland Cologne and Fraunhofer ISE; **3** Based on comparing PTC/STC ratings of major competing multi-crystalline silicon panel brands published by the California Energy Commission in May 2009; **4** 2008 Module Tests conducted by Photon and published in Photon International February 2009, TÜV Rheinland tests run from April to September 2008

5 Evaluation completed by the Energy Research Foundation of the Netherlands (ECN), May 2009

STRING RIBBON™ SOLAR PANELS OFFERING EXCEPTIONAL PERFORMANCE AND INDUSTRY-LEADING ENVIRONMENTAL CREDENTIALS. IN SHORT, MORE ELECTRICITY AND LESS IMPACT.

*All Evergreen panels come with a 5 year workmanship and 25 year limited power warranty. For full details see the **Evergreen Solar Limited Warranty** available upon request or online. This product is certified to UL 1703, UL 4703, UL Fire Safety Class C, IEC 61215 Ed.2 and IEC 61730 Class A standards. **String Ribbon** is a trademark of Evergreen Solar, Inc. Evergreen Solar's wafer manufacturing technology is patented in the United States and other countries.*

ELECTRICAL characteristics

Standard Test Conditions (STC)[1]

	ES-B-180 -fa1/fb1*	ES-B-190 -fa1/fb1*	ES-B-195 -fa1/fb1*	
P_{mp}[2]	180	190	195	W
$P_{tolerance}$	-2/+3	-2/+2.5	-0/+2.5	%
$P_{mp,\ max}$	186.1	194.9	199.9	W
$P_{mp,\ min}$	176.4	186.2	195.0	W
P_{ptc}[3]	154.6	163.4	167.9	W
η_{min}	12.0	12.7	13.1	%
V_{mp}	17.1	17.4	17.6	V
I_{mp}	10.53	10.92	11.08	A
V_{oc}	21.3	21.5	21.7	V
I_{sc}	11.64	11.95	12.11	A

Nominal Operating Cell Temperature Conditions (NOCT)[4]

T_{NOCT}	45.9	45.9	45.9	°C
P_{max}	129.0	136.7	140.1	W
V_{mp}	15.4	15.5	15.6	V
I_{mp}	8.38	8.82	8.98	A
V_{oc}	19.45	19.83	20.12	V
I_{sc}	9.28	9.59	9.79	A

Low Irradiance

The typical relative reduction of panel efficiency at an irradiance of 200 W/m² both at 25°C cell temperature and spectrum AM 1.5 is 0%.

Temperature Coefficients

$\gamma\ P_{mp}$	-0.49	%/°C
$\beta\ V_{mp}$	-0.47	%/°C
$\alpha\ I_{mp}$	-0.02	%/°C
$\beta\ V_{oc}$	-0.34	%/°C
$\alpha\ I_{sc}$	+0.06	%/°C

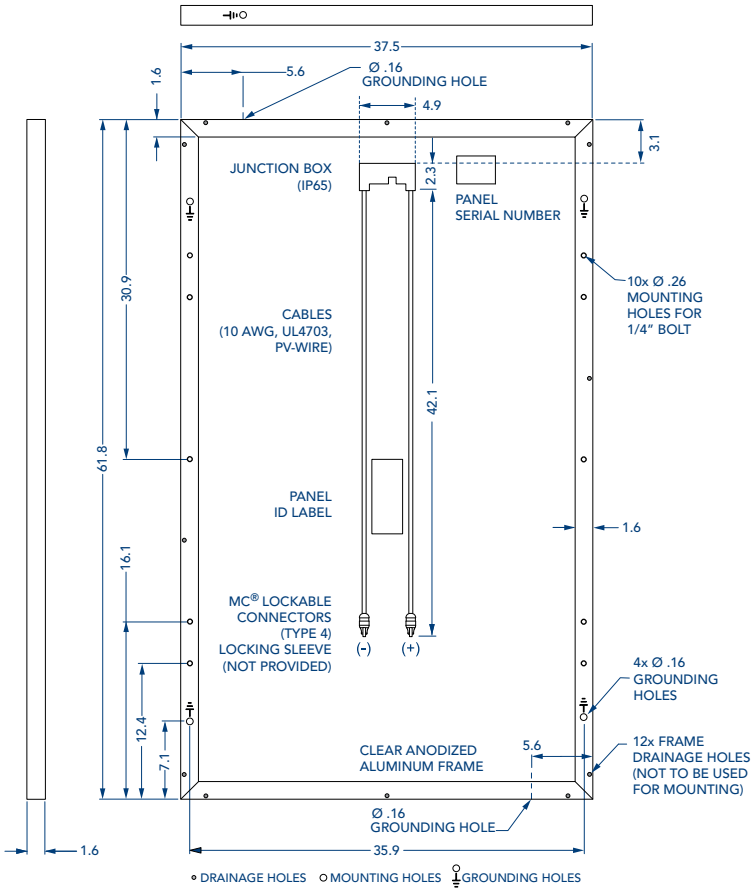
System Design

Series Fuse Rating	20 A
Maximum DC System Voltage (UL)	600 V
Maximum Combined Wind and Snow Load[5]	80 lbs/ft²
Hard Grounding of DC Negative Pole[6]	"fb1" panel type only

*__1__ 1000 W/m², 25°C cell temperature, AM 1.5 spectrum; __2__ Maximum power point or rated power; __3__ At PV-USA Test Conditions: 1000 W/m², 20°C ambient temperature, 1 m/s wind speed; __4__ 800 W/m², 20°C ambient temperature, 1 m/s wind speed, AM 1.5 spectrum; __5__ When the panel is mounted using Mounting Method A (offset mounting) with rails 12.4 in (±1 in) from each short side of the panel as described in the Mounting Guide for this product, __6__ See __Safety, Installation and Operation Manual__ for more detailed information. Local regulations may require electrical grounding of PV panels, irrespective of whether or not Evergreen Solar requires it; * f – framed, a – low voltage design which does not require electrical grounding and can be used in electrically ungrounded systems with transformer-less inverters, b – low voltage design which requires electrical grounding of the DC negative pole and cannot be used in ungrounded systems with transformer-less inverters, 1 – plain blue (untextured) cells.*

ELECTRICAL EQUIPMENT
CHECK WITH YOUR INSTALLER

MECHANICAL specifications



ALL DIMENSIONS IN INCHES; PANEL WEIGHT 40.1 LBS (18.2 KG)

The above drawing is a graphical representation of the product; for engineering quality drawings please contact Evergreen Solar. MC® is a registered trademark of Multi-Contact AG. Product constructed with 108 multi-crystalline silicon String Ribbon™ solar cells, anti-reflective tempered solar glass, EVA encapsulant, polymer back-skin and a silver anodized double-walled aluminum frame.

Product packaged 30 per pallet and tested to International Safe Transit Association (ISTA) Standard 2B. All specifications in this product information sheet conform to EN 50380. See the Evergreen Solar Safety, Installation and Operation Manual, Mounting Guide and Inverter Selection Guide for further information on approved installation and use of this product.

Due to continuous innovation, research and product improvement, the specifications in this product information sheet are subject to change without notice. No rights can be derived from this product information sheet and Evergreen Solar assumes no liability whatsoever connected to or resulting from the use of any information contained herein.

PARTNER

ES-B_180_190_195_US_010809; effective August 1st 2009

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