

SPRUCE LINE™ photovoltaic modules



A range of high quality poly-crystalline solar panels for on-grid markets offering exceptional performance, extraordinary versatility and industry-leading environmental credentials based on our cutting-edge String Ribbon™ wafer technology.

- Best-in-class performance ratings proven by field installations
- Get up to 104% of rated power with a guaranteed minimum of 98%
- 5 year workmanship and 25 year power warranty for ultimate peace of mind*
- More installation versatility with our extensive range of mounting options
- Higher strength with wind and snow loads guaranteed up to 80 lbs/ft²
- Qualified to all major industry certifications and regulatory standards
- Smallest carbon foot-print leading the fight against global warming
- Quickest energy payback time for the maximum energy conservation
- Cardboard-free product for minimal on-site waste and disposal cost



*For full details see the **Evergreen Solar Limited Warranty** available on request or online.

This product is qualified to UL 1703, UL Fire Safety Class C, IEC 61215 Ed.2, TÜV Safety Class 2 and CE
String Ribbon and Spruce Line are trademarks of Evergreen Solar Inc. String Ribbon is also a patented technology of Evergreen Solar Inc.

Electrical Characteristics

Standard Test Conditions (STC)¹

Tolerance on rated power of 98 to 104% (-2 to +4%)

		ES-170 RL or SL*	ES-180 RL or SL*	ES-190 RL or SL*
P_{mp}^2	(W)	170	180	190
$P_{mp, max}$	(W)	176.3	186.1	195.9
$P_{mp, min}$	(W)	166.6	176.4	186.2
P_{ptc}^3	(W)	150.6	159.7	168.8
V_{mp}	(V)	25.3	25.9	26.7
I_{mp}	(A)	6.72	6.95	7.12
V_{oc}	(V)	32.4	32.6	32.8
I_{sc}	(A)	7.55	7.78	8.05

Nominal Operating Cell Temperature Conditions (NOCT)⁴

		ES-170	ES-180	ES-190
P_{mp}	(W)	120.4	129.0	136.7
V_{mp}	(V)	22.7	23.3	23.8
I_{mp}	(A)	5.30	5.53	5.75
V_{oc}	(V)	29.3	29.8	30.3
I_{sc}	(A)	5.94	6.20	6.46
T_{NOCT}	(°C)	45.9	45.9	45.9

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, 1m/s wind speed, AM 1.5 spectrum

* RL model made in Germany; SL model made in USA.

Low Irradiance

The typical relative reduction of module efficiency at an irradiance of 200W/m² in relation to 1000W/m² both at 25°C cell temperature and spectrum AM 1.5 is 0%.

Temperature Coefficients

αP_{mp}	(%/ °C)	-0.49
αV_{mp}	(%/ °C)	-0.47
αI_{mp}	(%/ °C)	-0.02
αV_{oc}	(%/ °C)	-0.34
αI_{sc}	(%/ °C)	0.06

System Design

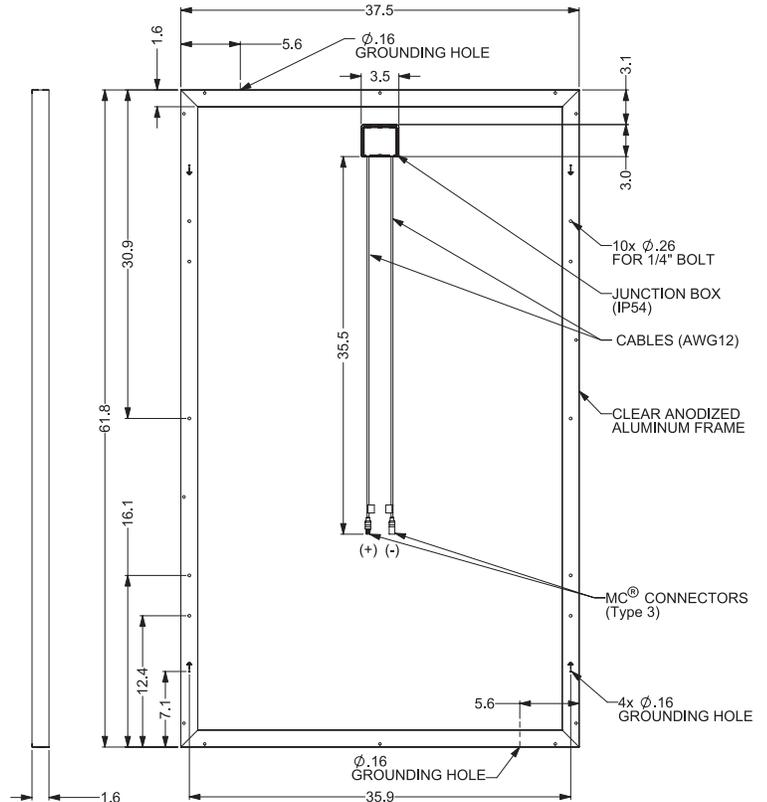
Series Fuse Rating ⁵	15 A
UL Rated System Voltage	600 V

⁵ Also known as Maximum Reverse Current



ELECTRICAL EQUIPMENT
CHECK WITH YOUR INSTALLER

Mechanical Specifications



All dimensions in inches; module weight 40.1 lbs

Product constructed with 108 poly-crystalline silicon solar cells, anti-reflective tempered solar glass, EVA encapsulant, Tedlar® back-skin and a double-walled anodized aluminum frame. Product packaging tested to International Safe Transit Association (ISTA) Standard 2B. All specifications in this product information sheet conform to EN50380. See the **Evergreen Solar Safety, Installation and Operation Manual** and **Mounting Design 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:

S190_US_010407; effective April 1st 2007