

# ES-C SERIES

photovoltaic panels



110, 115, 120 & 125 W

## MORE electricity

Our highly reliable ES-C series panels are designed to provide better battery charging capability for off-grid applications than our major competitors.

### BETTER CHARGING CAPABILITY<sup>1</sup>

Higher voltages and temperature ratings to maintain charging under hot conditions.

### INDEPENDENTLY VERIFIED POWER<sup>2</sup>

Four independent test labs regularly check panel power so you get the power we promise.

### HIGH RANKINGS IN FIELD TESTS<sup>3</sup>

Long-term Photon and TÜV field tests prove Evergreen panels produce more electricity (kWh/kW).

### GUARANTEED FOR LONGER<sup>4</sup>

5 year workmanship and 25 year power warranty.



## 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<sup>5</sup>

Our String Ribbon™ wafers are made with a fraction of the emissions that result from making conventional silicon panels.

### 12-MONTH ENERGY PAYBACK<sup>5</sup>

Our panels begin generating truly clean electricity faster than any other silicon-based panel on the market.

### EFFICIENT, DURABLE PACKAGING

Designed for easy shipping in small or large quantities without the need for re-packaging.

### LEAD-FREE SOLAR CELLS

Our panels make clean electricity but the way we make them is clean too.

<sup>1</sup> - Maximum power voltage around 18V and temperature ratings over 90% based on PTC/STC; <sup>2</sup> - Power regularly calibrated by taking the straight average of test data from NREL, TÜV Rheinland PTL, TÜV Rheinland Cologne and Fraunhofer ISE; <sup>3</sup> - 2008 panel tests conducted by Photon and published in Photon International February 2009, TÜV Rheinland tests run from April to September 2008; <sup>4</sup> - For full details see the **Evergreen Solar Limited Warranty** available upon request or online.

<sup>5</sup> 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.

This product is designed to meet UL 1703, 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. Copyright © Evergreen Solar, Inc 2009.



CERTIFICATIONS PENDING

# ELECTRICAL characteristics

Standard Test Conditions (STC) <sup>1</sup>					
	ES-C-110 -fa2*	ES-C-115 -fa4*	ES-C-120 -fa2*	ES-C-125 -fa4*	
$P_{mp}^2$	110	115	120	125	W
$P_{tolerance}$	-5/+5	-5/+5	-5/+5	-5/+5	%
$P_{mp,max}$	115.5	120.8	126.0	131.1	W
$P_{mp,min}$	104.5	109.3	114.0	118.8	W
$P_{ptc}^3$	99.1	103.7	108.3	112.9	W
$\eta$	10.6	11.1	11.6	12.1	%
$V_{mp}$	16.75	17.92	17.27	18.36	V
$I_{mp}$	6.57	6.42	6.95	6.81	A
$V_{oc}$	20.92	22.30	21.34	22.63	V
$I_{sc}$	7.33	7.15	7.62	7.37	A

Nominal Operating Cell Temperature Conditions (NOCT) <sup>4</sup>					
	ES-C-110	ES-C-115	ES-C-120	ES-C-125	
$T_{NOCT}$	45.4	45.4	45.4	45.4	°C
$P_{mp}$	80.5	84.2	87.8	91.5	W
$V_{mp}$	15.33	16.40	15.80	16.80	V
$I_{mp}$	5.26	5.14	5.56	5.45	A
$V_{oc}$	19.14	20.40	19.53	20.71	V
$I_{sc}$	5.86	5.72	6.10	5.90	A

**Low Irradiance**

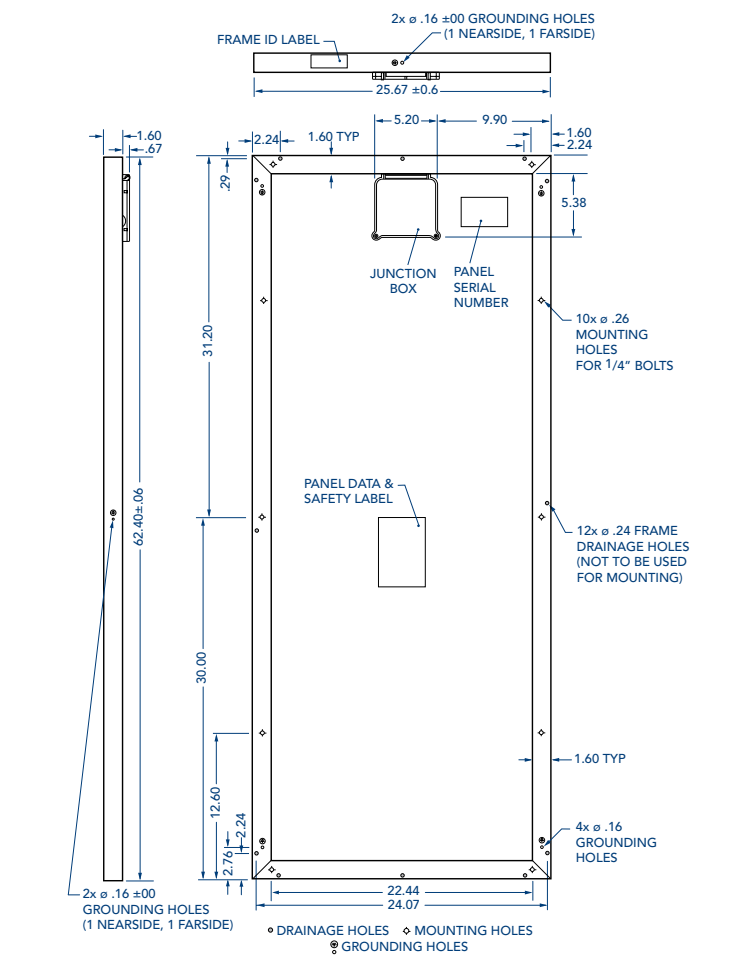
The typical relative reduction of panel efficiency at an irradiance of 200 W/m<sup>2</sup> both at 25°C cell temperature and spectrum AM 1.5 is 0%.

Temperature Coefficients		
$\gamma P_{mp}$	-0.43	%/°C
$\beta V_{mp}$	-0.40	%/°C
$\alpha I_{mp}$	-0.03	%/°C
$\beta V_{oc}$	-0.31	%/°C
$\alpha I_{sc}$	+0.05	%/°C

System Design	
Junction Box <sup>5</sup>	Conduit Ready
Allowable Cable Gauges	14 to 10 AWG
Series Fuse Rating <sup>6</sup>	15 A
Maximum DC System Voltage (UL)	600 V
Maximum Combined Wind and Snow Load <sup>7</sup>	60 lbs/ft <sup>2</sup>

**1** 1000 W/m<sup>2</sup>, 25°C cell temperature, AM 1.5 spectrum; **2** Maximum power point or rated power; **3** At PV-USA Test Conditions: 1000 W/m<sup>2</sup>, 20°C ambient temperature, 1 m/s wind speed; **4** 800 W/m<sup>2</sup>, 20°C ambient temperature, 1 m/s wind speed, AM 1.5 spectrum; **5** Four 1/2 inch knock-outs available for field wiring; **6** Also known as Maximum Reverse Current; **7** When the panel is mounted using Mounting Method A (offset mounting) with rails 15.6 in (±1 in) from each short side of the panel as described in the Mounting Guide for this product. \*f – framed, a – low voltage circuit design, 2 – matt blue (textured) cells, 150mm x 80mm. 4 – matt blue (textured) cells, 150mm x 77mm.

# MECHANICAL specifications



ALL DIMENSIONS IN INCHES; PANEL WEIGHT 27 LBS. (12.3 KG)

The above drawing is a graphical representation of the product; for engineering quality drawings please contact Evergreen Solar. Product constructed with 72 (-fa2 model) or 76 (-fa4 model) multi-crystalline silicon String Ribbon™ solar cells, tempered solar glass, EVA encapsulant, polymer back-skin and a clear anodized double-walled aluminum frame.

Product packaged 28 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](#) and [Mounting 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-C\_110\_120\_fa2\_115\_125\_fa4\_US\_010909; effective September 1<sup>st</sup> 2009

