FG-SM6-22: 7.7W (3V) Solar Submodule

FG-SM6-22: 7.7 Watt (3V) Solar Submodule for fabricating portable products

The FG-SM6-22 is the perfect solar cell building block for Portable Solar Charger products which keep your personal electronics and smaller devices running when plug power is not available.

- Approximately 240 W/kg power density further enables applications for lightweight, flexible, and convenient power
- Incorporates the already-proven CIGS thin-film PowerFLEX® with an improved interconnect technology
- 7.7 Watt submodule weighs only 32 grams
- Top and bottom materials are clear PET to ensure encapsulant adhesion
- NOTE: Products sold with a limited initial performance and workmanship warranty

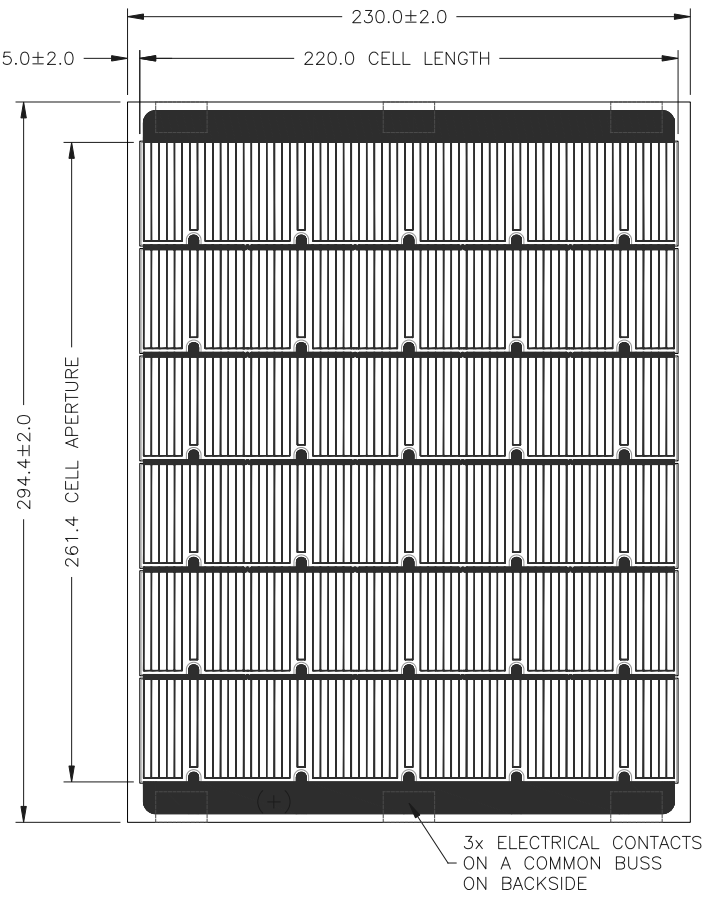
Product Specifications

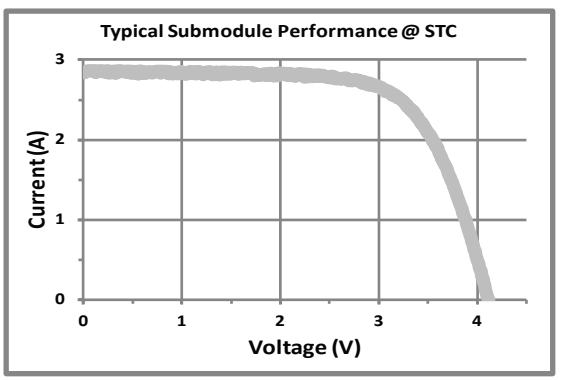
Electrical Characteristics @ STC*	
Rated Power (W)	**7.7**
Rated Voltage at Maximum Power Point (V)	3.2
Rated Current at Maximum Power Point (A)	2.4
Open Circuit Voltage (V)	4.0
Short Circuit Current (A)	2.8

Physical Characteristics	
Overall Dimensions, mm	230 x 294 x 0.28
Aperture Dimensions, mm	220 x 261
Aperture Area, cm^2	574
Weight, grams	32
Power to Weight Ratio, W/kg	≈240

Thermal Characteristics	
Temperature Coefficient for Power (%/°C)	-0.43
Temperature Coefficient for Voltage (%/°C)	-0.38
Temperature Coefficient for Voc (%/°C)	-0.33
Temperature Coefficient for Isc (%/°C)	-0.03
Cell Temperature Operating Range (°C)	-40 to 85
Voltage, Open Circuit @ -40°C (V)	5.0

*Electrical Characteristics - tested at Standard Test Conditions (STC): irradiance level 1000W/m^2, spectrum AM 1.5 and cell temperature 25° C. Tolerance +/-15%.





© Global Solar® Energy, Inc. Global Solar®, PowerFLEX®, and PowerFLEX Technology® are trademarks of Global Solar® Energy, Inc.

FG-SM6-22: 7.7W (3V) Solar Submodule

PRODUCT DESIGN GUIDELINES AND TECHNICAL SUPPORT OVERVIEW

Technical Support

For customers who integrate these submodules into their products, Global Solar Energy can provide technical and engineering support including:

- Guidelines for selection of materials and structure configuration
- Guidelines for processing
- Assistance with equipment specifications
- Assistance with custom product designs and considerations

General Guidelines

Storage and Handling of Submodules

- Storage environment should be less than 35°C for submodules packaged in the original moisture barrier bags
- Storage environment once the moisture barrier package is opened should not exceed 30°C and 55% RH
- Once the moisture barrier package is opened, product lamination is recommended within 3 days
- DO NOT bend submodules on final product to less than 30cm diameter unless validated by your reliability testing

Processing of Submodules

- Most EVAs or thermoplastics used in the photovoltaic industry can generally be used to encapsulate these submodules to front sheets and backsheets that include ETFE, ECTFE, PET, nylon, etc...
- Voids inside the submodules are normal and do not significantly affect performance
- Typical vacuum lamination methods and temperatures will eliminate these voids in the final product
- DO NOT process above 160°C - Recommended minimum temperature for best adhesion and void reduction is 145°C for more than 12 minutes
- Use proper soldering techniques, no flux stronger than mildly activated (RMA); use minimum time/temperature required to flow solder (e.g. solder type SAC 305= ~700°F for <~ 1 Second)

Testing of Submodules and Modules

- With Copper Indium Gallium diSelenide (CIGS) technology there is often a small increase in efficiency after exposure to sunshine for a few hours or days
- It is our recommendation to test the electrical performance on a representative set of your product after a 3 day exposure outdoors (sunny days) to ensure a proper product nameplate rating. This outdoor exposure can be done while product is operating near Vmp or at Voc

Product Readiness and Reliability

- All product designs should be tested for reliability, including material compatibility and mechanical stress fatigue.
- Accelerated testing should include stresses relevant to the expected application environment and to the product warranty and useful life expectation.
- Stress testing would normally include outdoor exposure, 85°C extended exposure, 85°C to -40°C thermal cycling, UV exposure, humidity exposure at module temperatures anticipated (e.g. 75°C, 25% RH). Performance loss, warping, and discoloration are typical metrics

Product Design

- Ensure that the maximum power point voltage (Vmp) is a good match to the load when product is at operating temperature (i.e. corrected using temperature coefficient)
- Ensure that the open circuit voltage (Voc) matches the load at extreme cold temperatures (i.e. correct for temperature coefficient)
- When designing new products, ensure that ratings of conductors, electronics, controllers, and load are consistant with the short-circuit current (Isc)

Guidelines for Final Product Use

- These submodules are generally designed for use with portable consumer products where the customer expectation would not require long-term exposure to harsh environments. However, if suitable vapor barrier protection is part of the finished product, extended lifetimes can be easily achieved
- The simplist portable products fabricated without the protection of vapor barriers, would generally be expected to be used periodically and then cleaned and stored until the next use

Global Solar® is a leading manufacturer of Copper Indium Gallium diSelenide (CIGS) thin-film solar on a flexible substrate. With a plant in Tucson (Arizona, USA), Global Solar® operates with a total of 40MW of production capacity. An average cell efficiency above 14% makes the company the world leader in CIGS efficiency on flexible substrate in large scale production. Sold worldwide in multiple applications, including flexible laminates, solar shingles, glass modules and portable chargers.

GLOBAL SOLAR®
A Hanergy Company

Global Solar® Energy, Inc.
8500 South Rita Road,
Tucson, Arizona, 85747, USA
Phone: +1 (520) 546-6313
Fax: +1 (520) 546-6318
info@globalsolar.com
www.globalsolar.com

© Global Solar® Energy, Inc. Global Solar®, PowerFLEX®, and PowerFLEX Technology® are trademarks of Global Solar® Energy, Inc.

04-Nov-16 Doc No. 1000615 rev D, P2