SMALL SATELLITE SOLAR PANELS_

High Efficiency Solar Arrays For All Types Small Satellites and CubeSats

Figure: 100W solar panel for FalconSat-6 using PCB substrate and Spectrolab high efficiency cells, also showing on right solar panel protectors for integration.

MAIN FEATURES

- Solar panel sizes from as small as 20mm x 20mm to 1m x 1m.
- Our assembly processes are tried and tested on Carbon Fibre composite, Aluminium and PCB substrates.
- Clyde Space has developed a low-cost assembly method based on traditional techniques using heritage, space-qualified materials.
- All of our solar panels are assembled to a high quality and inspected to ESA standard.
- We keep stock of Spectrolab high efficiency solar cells enabling us to provide fast, quality, custom solutions (we have supplied custom panels as fast as 4 days).
- Our PCB substrates can incorporate MTQ coils and other sensors (temperature sensors are standard fit).
- Coarse and fine sun sensor on panel options available.
- Harnesses available in lengths; 30cm, 60cm & custom.
- Clyde Space also has capability to coverglass and interconnect bare solar cells, such as from Azur Space.

Figure: One of six solar panels for a Canadian small satellite on aluminium composite substrate using Azur Space cells coverglassed and interconnected by Clyde Space

SMALLSAT SOLAR PANEL OVERVIEW

Clyde Space solar array design and manufacturing techniques have been developed based on traditional solar array assembly techniques, but adapted to reduce assembly costs in order to meet the tighter budget needs of the small satellite community.

Unlike most solar panel manufacturers, Clyde Space also is also known for its high performance small satellite electrical power systems and batteries. This enables us to understand customer requirements and to advise on solar array configuration to achieve optimum power levels.

MANUFACTURING CAPABILITY

The Clyde Space capability extends to solar panels of approximately 1000mm x 1000mm and our design team will work with you to ensure that the solar panel design is robust and optimised for your mission. We supply 3D CAD models as standard to accelerate your design process.

Our laydown technique allows us to use a variety of cell sizes and types without the need to modify our assembly equipment and jigs. We have developed and tested processes using both soldering and welding of interconnects and inter-cell connections, which we deploy according to cell type and qualification status.

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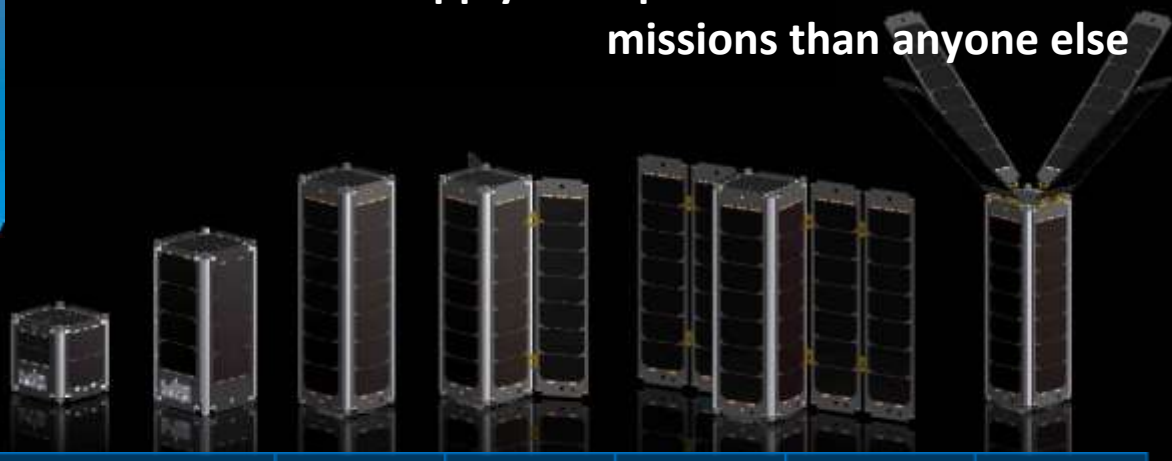
CubeSat Solar Panels

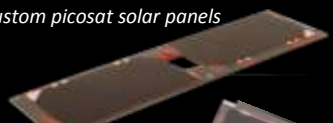
We supply solar panels for more CubeSat missions than anyone else



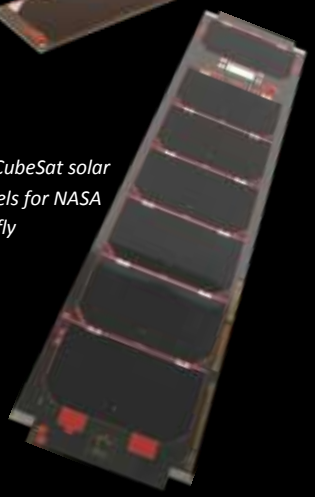
Nanosatellite solar panels for DLR

1U CubeSat solar panels for CPUT

Custom picosat solar panels



3U CubeSat solar panels for NASA Firefly



	1U		1.5U		2U		3U		6U	
Power @ 28°C & Mass	2.1W	42g	3.1W	48g	5.2W	69g	7.3W	135g	18.78W	290g*
Embedded MTQ Option & Mass (1.6mm PCB)	0.08Am^2	46g	0.11Am^2	57g*	0.14Am^2	82g	0.17Am^2	160g	0.4Am^2	340g*
(2.4mm PCB)	0.1Am^2	60g*	0.14Am^2	79g*	0.18Am^2	110g*	0.22Am^2	190g*	0.5Am^2	390g*
Single Deployed Power @28°C	4.2W		6.2W		10.4W		14.6W		37.5W	
2 Sided Deployed	6.2W		9.4W		15.6W		21.9W		56.3W	
Double Deployed Power @ 28°C	4.2W		6.2W		10.4W		14.6W		37.5W	
2 Sided Deployed	8.3W		12.5W		20.8W		29.2W		75W	

Note: thinner substrates are available to reduce mass (down to 0.4mm thickness. Double deployed has 0.7mm thick substrates).
** Estimated based on measured values of other similar sized panels.*

Clyde Space has now shipped almost 500 solar panels to customers all over the world. Our customers have asked us to develop, build and qualify panels using all kinds of solar cells and substrate materials. For CubeSat panels there are many advantages to using PCB and our experience with this approach means that we have a slick, well proven technique. To ensure good thermal design, we use copper fill on the top and bottom layers and flood the underside of the cells with vias for thermal conductivity purposes. There is no wiring on our panels and they produce a minimal magnetic field.

We can include any sensors, cut-outs or apertures into you may require, and will include coarse sun sensors and temperature sensors as standard

ENVIRONMENTAL TEST

All Clyde Space products are subject to qualification process before being released, including: Component TID radiation testing to 15krads following ECSS guidelines, Qualification thermal cycling, Vibration and shock to NASA GEVS. Test data can be found in the product User Manuals.

Clyde Space is ISO9001:2008 certified
Perform and inspect conventional and surface-mount solder assembly, repair and modification operations in conformance with;
ECSS-Q-ST-70-08, ECSS-Q-ST-70-28 & ECSS-Q-ST-70-38

For CubeSat missions requiring more power, we have developed self-contained deployable solar panels that require no spacecraft structure modification. Our deployed panels are available with cells on one or both faces. They have an active hold-down mechanism incorporating a thermal knife and timed driver.

DESIGN, ASSEMBLY, INTEGRATION AND TEST

To ensure ease of integration with your satellite and mission, Clyde Space provides a detailed 3D model (in .step format) and a detailed user manual with our products as standard. User Manuals and 3D models for standard products can be found at www.clyde-space.com

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