

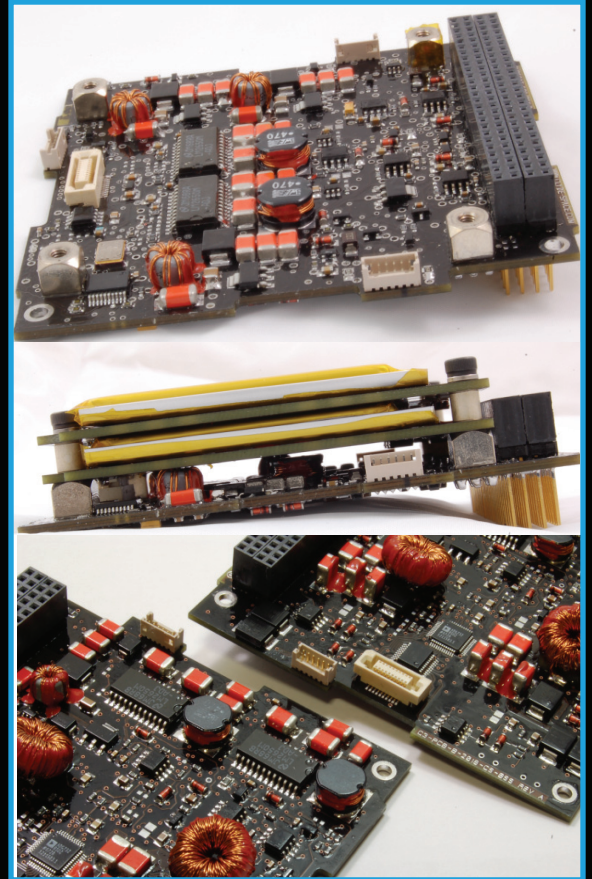


## MAIN FEATURES

- CubeSat and CubeSat Kit compatible.
- 3.3V, 5V and Raw Battery buses are provided.
- Flexible design: different solar cell types/string lengths.
- Can interface to up to 6 solar arrays; one per spacecraft facet
- Active Maximum Power Point Tracking of solar arrays.
- Compatible with Lithium Ion and Lithium Polymer batteries. (We also supply Cubesat batteries).
- Telemetry and telecommand via I2C interface.
- Bus over-current and battery under-voltage protection.
- USB battery charger.
- Compatible with dead launch via separation switches.

## APPLICATIONS

- CubeSat and CubeSat Kit satellites.
- Nanosatellites with a power requirement from 1W to 20W orbit average power.



## Technical Description (also see 'Block Diagram' on the next page).

### BCR

There are 3 Battery Charge Regulators (BCRs). Each BCR connects to solar panels on opposing sides of the spacecraft (only one of these panels can be in sunlight). Each BCR has a dedicated active Maximum Power Point tracker.

Each BCR uses a high efficiency power stage and is rated to 3W/8W scaled to match the connected solar array. A simple charge pump powers the low level electronics from input voltages as low as 3.5V.

A centralised End of Charge Voltage controller provides 'constant current/constant voltage' charge regime suitable for lithium ion and lithium polymer batteries. (A simple modification adapts this for NiCd and NiMH).

BCR 3 has the ability to interface to the 5V USB line from the main connector. This allows battery charge via USB and EGSE power to the spacecraft during test.

### BATTERY

A Clyde Space lithium polymer battery can be integrated as a daughter board (battery can be purchased separately).

### TLM/TC

Telemetry and telecommand functionality is handled by a dedicated I2C compatible microcontroller. Telemetry channels include array and battery currents, voltages and temperatures. Telecommands provide reset/run capability on each power bus.

### PCU

Synchronous rectifiers provide high efficiency dc-dc converters to regulate to 5V and 3.3V from the raw battery voltage.

An automatic light mode of operation provides seamless operation from zero load.

### PROTECTIONS

An over-current on any of the 3 buses triggers the timed disconnection of the power bus in question.

An unloading function disables the outputs when the battery voltage is less than 6.5V, re-activating once the battery recovers to 7.5V.



Performance Specifications (Performances can be adapted to mission specific needs).

SYSTEM UNIT	PERFORMANCES	
	1U	3U
<b>3W BCR</b>	Input voltage: 3.5V to 8V depending on mission configuration. Output voltage: 10V max. Output current: 0.5A max Efficiency: ~90%	
<b>8W BCR</b>		Input voltage: 3.5V to 15V depending on mission configuration. Output voltage: 10V max. Output current: 1.2A max Efficiency: ~90%
<b>PCU</b>	Input voltage: 9V maximum Efficiency: >90% Output voltage: 5V and 3.3V +/- 1% over lifetime and temperature Output current: 20mA to 1A (3.3V) and 1.2A (5V) Light mode: zero to 20mA output current with a 2.4% output voltage ripple	Input voltage: 9V maximum Efficiency: >90% Output voltage: 5V and 3.3V +/- 1% over lifetime and temperature Output current: 20mA to 1.2A (3.3V) and 1.2A (5V) Light mode: zero to 20mA output current with a 2.4% output voltage ripple
<b>Power System Mechanical Details</b>	Mass: 73g without battery stand-offs; 82g with battery stand-offs. Volume: typical dimensions (for above spec): 95mm (l) x 90mm (w) x 15mm (d).	Mass: 86g Volume: typical dimensions (for above spec): 95mm (l) x 90mm (w) x 15mm (d).
<b>Connectors</b>	Two 52 PIN SMATEC ESQ-126-39-G-D connectors, to the CubeSat Kit specification. Three 6 PIN HIROSE H3324-ND connectors for Solar Array connections. For Pin outs, please contact us.	

Please contact us with your specific requirements ([enquiries@clyde-space.com](mailto:enquiries@clyde-space.com)).

## Block Diagram

