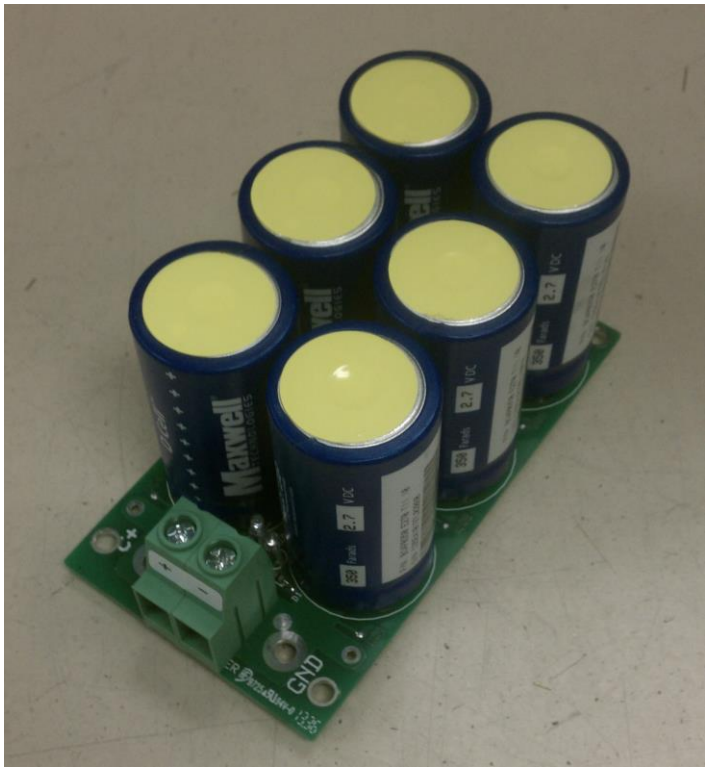
UCAP16-58
ULTRACAPACITOR MODULE

The Intronics Power Inc. **UCAP16-58** Ultracapacitor Module is a versatile high power energy storage subsystem with applications in many fields.

FEATURES

- Consists of six series connected 350 Farad ultracapacitors
- Includes individual cell balancing circuitry
- Operating Temperature Range -40 to +65 degrees C
- 5800 watt max surge power
- High current capability printed circuit board
- High current screw connector



APPLICATIONS

- Remote site monitoring
- Solar energy storage
- Battery augmentation
- Vehicle electrical system stabilization
- Regenerative energy capture
- Solar powered electric gates
- Remote weather stations
- Highway emergency telephones and signage

1400 PROVIDENCE HIGHWAY • BUILDING 2 NORWOOD, MASSACHUSETTS 02062-5015
PHONE: 781-551-5500 FAX: 781-551-5555

GENERAL

Ultracapacitors are similar to other capacitors, except they have much greater capacitance, and are generally rated at 2.7 volts or less. Therefore, they are generally connected in series for higher voltage applications. To ensure that each individual ultracapacitor in such a series configuration is not charged above its rated voltage, a cell balancing circuit is often included.

OVERVIEW

The Intronics **UCAP16-58** module consists of six series connected 350 farad ultracapacitors with individual cell balancing circuitry. This module is intended for use as part of larger systems where reliable energy storage is essential.

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The printed circuit board has extra thick (4oz) copper and high current screw type terminals. It can be used with solder connections, ring terminals and screws, as well as the high current screw terminal connector.

ENERGY STORAGE

This module has a capacitance of 58.3 farads at a maximum rated voltage of 16.4V. The stored energy of a capacitor is $1/2CV^2$, so if fully charged to 16.4V, this module will store 7840 joules (watt seconds). If charged to one voltage (V1) and discharged to a lower voltage (V2), the stored and released voltage is the difference between $1/2C(V1)^2$ and $1/2C(V2)^2$ or $1/2C(V1-V2)^2$. So for example, charging the module to 16V and discharging it to 11V will mean the storage and release of 728 joules.

The module will store and release electrical energy reliably and efficiently. Due to the balancing circuit the self discharge of a fully charged module is relatively high when fully charged, but rapidly decreases to very low level after one or two days (Chart 1)

BALANCING CIRCUIT

The balancing circuit consists of high efficiency LED in series with a silicon diode connected across each ultracapacitor in the module. The exponential forward VI characteristics of the LED and diode leaks current at approximately 20 mA from any ultracapacitor in the module when its voltage approaches its maximum rating of 2.7V. If the external power source can deliver more than 20 mA to the module, some form of external voltage limiting will be necessary. The balancing circuit will only balance the voltage between ultracapacitors in the module. It will not limit the module voltage.

Another benefit of the balancing circuit design is that the LEDs in the circuit will give a rough indication of the charge state of the module. If the LEDs are bright, the module is fully charged. If they are dim, it is above approximately 12V. If one or more LED is significantly different from the others, it may indicate a failed or marginal ultracapacitor.

SELF DISCHARGE

The balancing circuit is designed to leak current from each individual ultracapacitor as its voltage approaches the its maximum rated voltage of 2.7V. Thus, ultracapacitors that are higher charged will leak more than ultracapacitors that are less charged, thus balancing the total module voltage equally between all the ultracapacitors in the module. As the ultracapacitor voltage decreases, the leakage falls off rapidly, becoming less than 1% per day when the module voltage is under 13.4V (Chart 2).

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SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

Maximum Voltage 17.1V
Maximum Short Circuit Current 840 Amps

CONNECTIONS

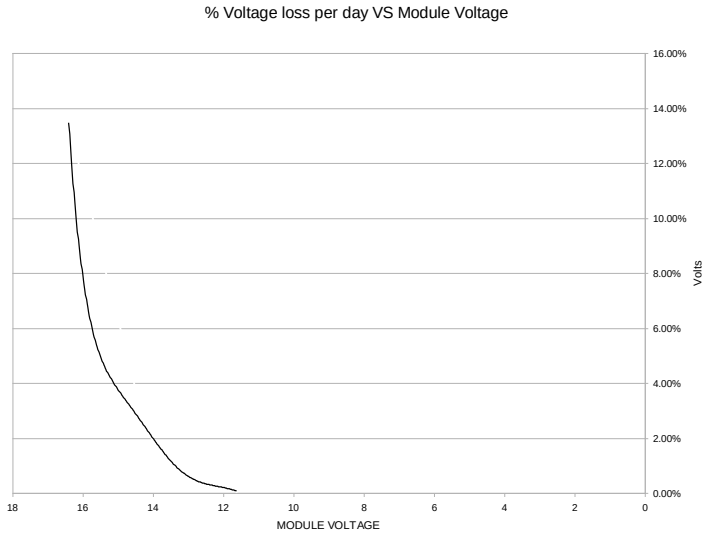
Connector Wire Entry .216” x. 225” (Accepts #4 AWG wire)
PCB Wire Solder Hole .100” dia (accepts #10 AWG wire)
PCB Terminal Lug Hole .193” dia (accepts #10 screw)

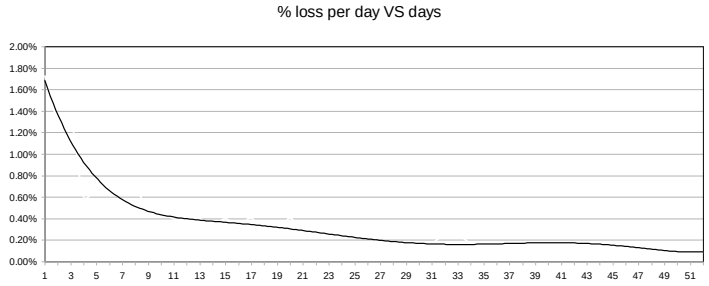
PHYSICAL

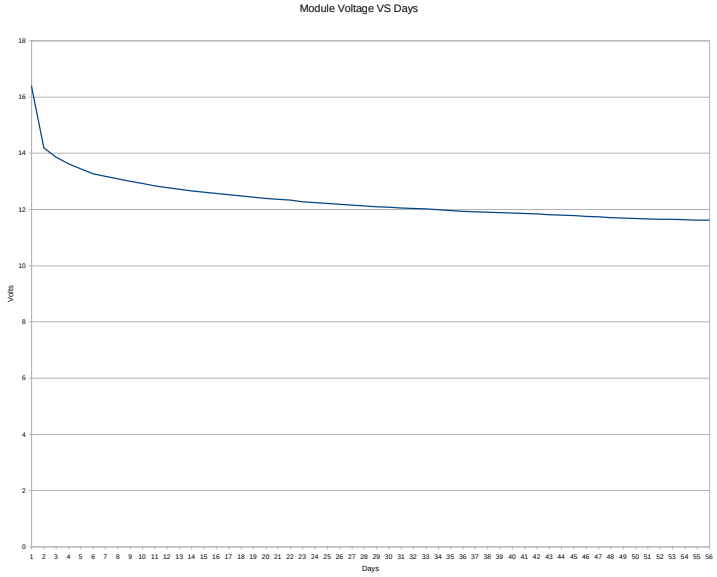
PCB Copper Laminate 4 oz/sq ft
PCB Mounting Holes 4 X .193” dia (accept #10 screw)
Dimensions 5” x 2.8” x 2.7” high
Weight 1.0 lb (.45 Kg)

NORMAL OPERATING CONDITIONS

Voltage 0-16.4V
Max Continuous Current 21 Amps RMS
Max Peak Current (1 second, non repetitive) 220 Amps
Storage Temperature Range -40 to +70 degrees C
Operating Temperature Range -40 to +65 degrees C
Stored energy 7650 joules (2.12 WH)
Max Output Power 5856 Watts
Dimensions 5” x 2.8” x 2.7” high
Weight 1.0 lb (.45 Kg)







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