BOOSTCAP® Energy Storage Units

58 Farad / 15 Volts DC

Applicable for:

BPAK0350-15ER (103957)
BPAK0350-15EA (103958)
BMOD0350-15ER (104057)
BMOD0350-15EA (104058)

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1. Introduction

The BOOSTCAP® 58F/15V energy storage units are available in two models (packs and modules) with two different balancing schemes (resistive and active). Packs are provided with the ultracapacitor cells mounted to a PCB along with the balancing electronics. This assembly is then heat shrunk adding to the mechanical integrity of the unit. Pack 103957 (BPAK0350-15ER) is resistively balanced while pack 103958 (BPAK0350-15EA) is actively balanced. For the resistively balanced pack a resistor is placed in parallel with each ultracapacitor cell. Thus, the resistively balanced pack will have a continuous leakage on the energy storage unit. The actively balanced pack employs a linear voltage-balancing scheme, whereby the cell-to-cell leakage is dependent on the imbalance of the individual cells. When the cells are in balance the quiescent current is low and the leakage current of the ultracapacitor cells defines the pack leakage. The modules utilize the packs previously described with these packs contained within a rugged, aluminum enclosure. The modules provide further mechanical integrity with additional splash resistant protection. Module 104057 (BMOD0350-15ER) is resistively balanced while module 104058 (BMOD0350-15EA) is actively balanced.

BMOD0350-15

BPAK0350-15

Both models may be connected is series as required for higher voltage applications (29F/30V, 19F/45V, 14.5F/60V, etc.). The active balance circuit uses a four wire unit-to-unit balancing cable to keep the individual cell voltage balanced throughout the series string. The unit-to-unit balancing cable is not used when units are placed in parallel. The resistive balancing circuit does not require balancing cables to maintain the voltage balance. At no time should the balancing cable be connected across the jumpers of a single pack. See electrical installation.

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2. Unpacking

Inspect the shipping carton for signs of damage prior to unpacking the unit. If the shipping carton or the unit has signs of damage report it to the carrier immediately.

Remove the unit from the shipping carton and retain the shipping materials until the unit has been inspected and is determined to be operational (**NOTE:** The original shipping materials are approved for both air and ground shipment). The shipping container should contain, 1 energy storage unit, 1 user manual and 1 balance cable (active balanced models BPAK0350-15EA and BMOD0350-15EA only).

If the unit is found to be defective or any parts are missing, contact the factory. A Return Material Authorization (RMA) number must be issued prior to returning the unit for repair or replacement.

3. Installation

3.1 Mechanical

Units are mountable and operated in any orientation. The pack should be shock mounted within a protective enclosure. Care should be taken to prevent motion between the pack and the enclosure. This motion can wear through the shrink-wrap covering over time and expose electrically conductive surfaces.

Modules are provided with 4 clearance holes for mounting with either 8-32 or M4 screws. See data sheet for location of mounting holes. When several packs or modules are stacked in series for operating at higher voltage, care must be taken to ensure proper creepage distance in compliance with national standards for electrical shock and hazards.

3.2 Electrical

CAUTION: To avoid arcing and sparking the energy storage units should be in a discharged state and the system power disconnected during installation. The unit should be shipped discharged. It is recommended to first check the unit voltage to ensure minimum voltage is on the system.

CAUTION - DO NOT plug the unit-to-unit balance cable across the two outputs of a single unit. See the below figure. The resulting short circuit may damage the pack and (or) the balance cable.

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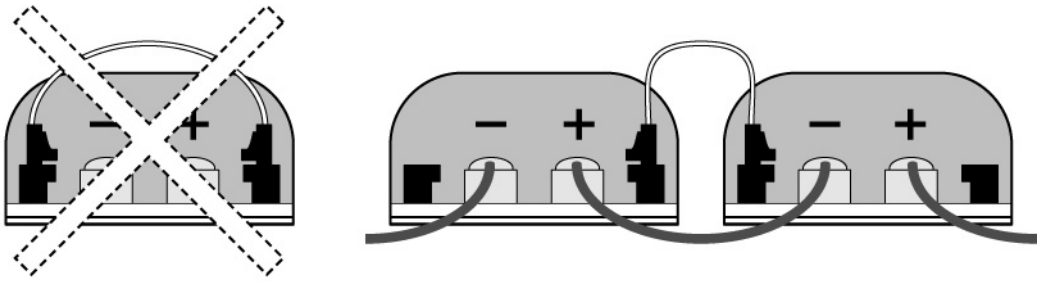
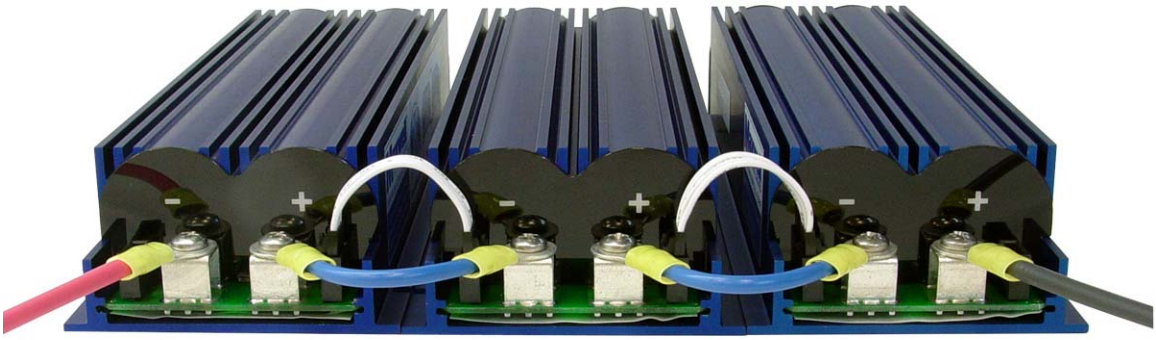


Do not short circuit **Correct Interconnection**

Electrical attachment to the units should be made with copper ring lugs rated for the expected current of the application. The energy storage units have a low ESR and care should be taken to select the appropriate copper wire connecting the energy storage unit to the application. Improper wire selection can enable the wire ESR to exceed the ESR of the unit. The unit has a typical AC ESR of .008 ohms. Forty inches of #12 gauge wire (20 inches each lead) would equal the resistance of the unit. To connect the unit 20 inches away and only add 10% to the ESR would require #2 gauge copper wire.

To provide the lowest possible ESR the energy storage units are not fused. The units store up to 6.5 kJ of energy with peak currents capable of exceeding 100's of amps. Care should be taken within the application to prevent excessive current flow for adjoining electronics within the application.

Units may be connected in series for higher voltage applications. Using the same gauge wire appropriate for the outputs, connect the positive output terminal of one module to the negative terminal of the next module. If the units have active balancing then plug the 4 wire cable into the connectors that are closest to the inter pack jumper connections. If the units have resistive balancing (versions –15ER) then no further balancing connections are required.



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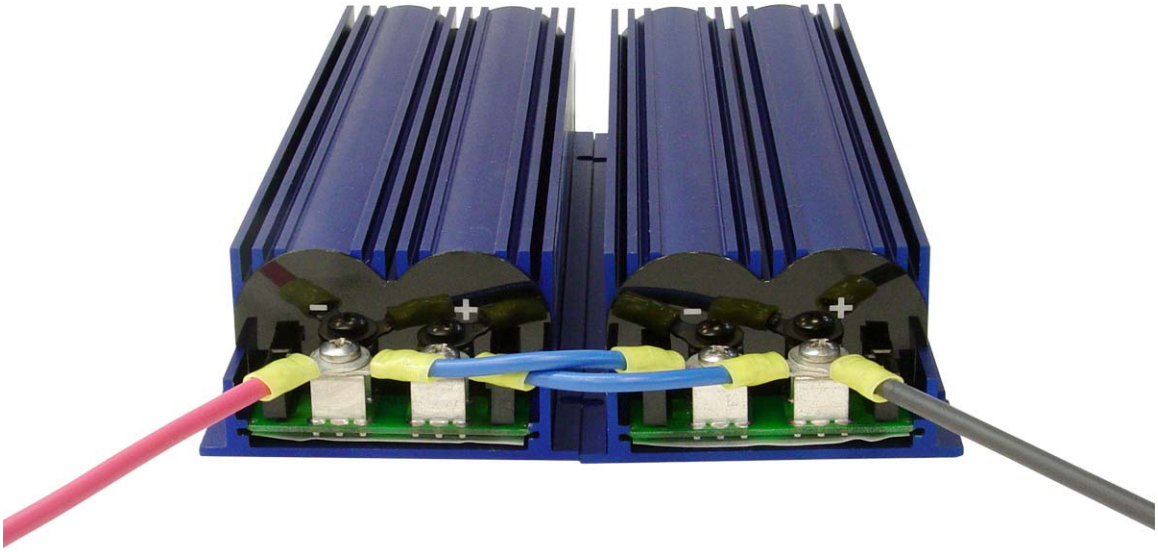
Units may be connected in parallel for higher energy storage applications. Using the same gauge wire appropriate for the outputs, connect the positive output terminals of the units together and the negative output terminals of the units together. The 4-wire cable is **not** used to connect parallel-arranged units.



3.3 Thermal

Low internal resistance of the energy storage units enables low heat generation within the units during use. As with any electronic components the cooler the part operates the longer the service life. In most applications natural air convection should provide adequate cooling. In severe applications requiring maximum service life some forced airflow may be required.

The thermal resistance, R_{th}, of the units has been experimentally determined assuming free convection at ambient (~ 25 ^{o}C). The R_{th} value provided on the data sheet is useful for determining the operating limits for the units. Using the R_{th} value a module temperature rise can be determined based upon any current and duty cycle. The temperature rise can be expressed by the following equation.

$$\Delta T = D_c \bullet R_{th} \bullet I^2 \bullet R$$

where: D_c = duty cycle
I = current AC or DC
R = resistance R_{ac} for AC current or R_{dc} for DC current

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This ΔT plus ambient should remain below the specified maximum operating temperature for the module. If forced cooling methods are employed, it is possible to operate the units at higher currents or duty cycles.

4. Accessories

Models BPAK0350-15EA and BMOD0350-15EA will be provided with the following inter unit 4 pin balancing cable.

1 – 1007200, 4 pin cable x 2 inches long.

5. Operation

Unit should be operated within specified voltage and temperature ratings. Determine whether current limiting is necessary on input/output based on current ratings of ancillary devices.

6. Safety

Do not operate unit above recommended voltage.
Do not operate unit above recommended temperature rating.
Do not touch terminals with conductors while charged. Serious burns, shock, or material fusing may occur.
Protect surrounding electrical components from incidental contact.
Provide sufficient electrical isolation when working above 50 V DC.

7. Maintenance

Periodically check the main power terminal connections. Retighten the terminal screws as necessary.

Prior to any handling, ensure energy storage unit is completely discharged. The stored energy and the voltage levels may be lethal if mishandling occurs.

8. Storage

The module can be stored in the original package discharged in a dry place. Discharge used module prior to stock or shipment. A wire across the terminals may be used to maintain short circuit after having discharged the unit.

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9. Disposal

Do not dispose of unit in trash. Dispose of according to local regulations.

10. Specifications

CAPACITANCE:	58 F +20%, initial
VOLTAGE:	15 Volts DC Max.
DC RESISTANCE:	19 mΩ Max., initial
AC RESISTANCE (@ 100Hz)	10 mΩ Max., initial
THERMAL RESISTANCE	1.84 °C/W
LEAKAGE CURRENT: (@ 25ºC – after 72 hours)	
-15EA models	1 mA
-15ER models	50 mA
TEMPERATURE:	
Operating	-40 to 65ºC
Storage	-40 to 70ºC
HUMIDITY:	
@ 25ºC	0 to 95% RH
@ 40ºC	0 to 80% RH
SIZE:	216 x 69 x 38 mm (BPAK models)
	218 x 85 x 44 mm (BMOD models)
WEIGHT:	500 g (BPAK models)
	680 g (BMOD models)
VOLUME:	0.57 L (BPAK models)
	0.69 L (BMOD models)

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