

Description

The Protected Supercapacitor Module is an energy storage device that contains two 350 F supercapacitors connected in series.

The module provides advanced protection of supercapacitors. They are protected against over-voltage, over-current and reverse voltage. The protection increases the safety and prolongs the lifetime of supercapacitors out-of-the-box.

A 2.54 mm pitch female connector provides the connection to the supercapacitors and to the overvoltage alarm signal. The protection circuit is encased in a custom made enclosure to prevent any contact with the terminals of the supercapacitors.

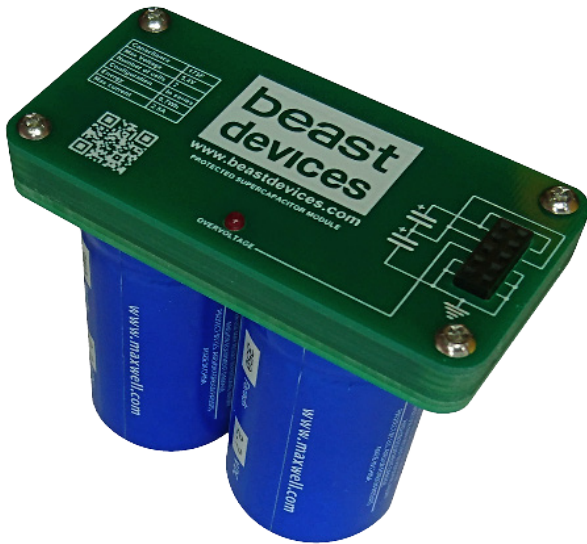


FIGURE 1 Top view.

Electrical characteristics

Parameter	Max	Typ	Min	Unit
Capacitance per supercapacitor			350	F
Nominal voltage per supercapacitor		2.70		V
Capacitance per module			175	F
Nominal voltage per module		5.40		V
Energy per module			708	mWh
Self-discharge current	0.60			mA
Overvoltage protection threshold, T = +25C	2.81	2.76	2.72	V
Overvoltage protection threshold, T = -40 to +60C	2.82	2.76	2.71	V
Overvoltage protection hysteresis		0.2		V
Overcurrent protection threshold, T = +25C	5.2		3.0	A
Overcurrent protection threshold, T = -40 to +60C	4.15		2.15	A
Engaged overcurrent protection leakage current, T = -40 to +60C		0.25		A
Reverse voltage protection threshold, T = +25C	-0.28	-0.35	-0.43	V
Reverse voltage protection threshold, T = -40C to + 60C	-0.15	-0.35	-0.50	V

Absolute Maximum Ratings

Parameter	Max	Typ	Min	Unit
CAP1, CAP2	24		-40	V

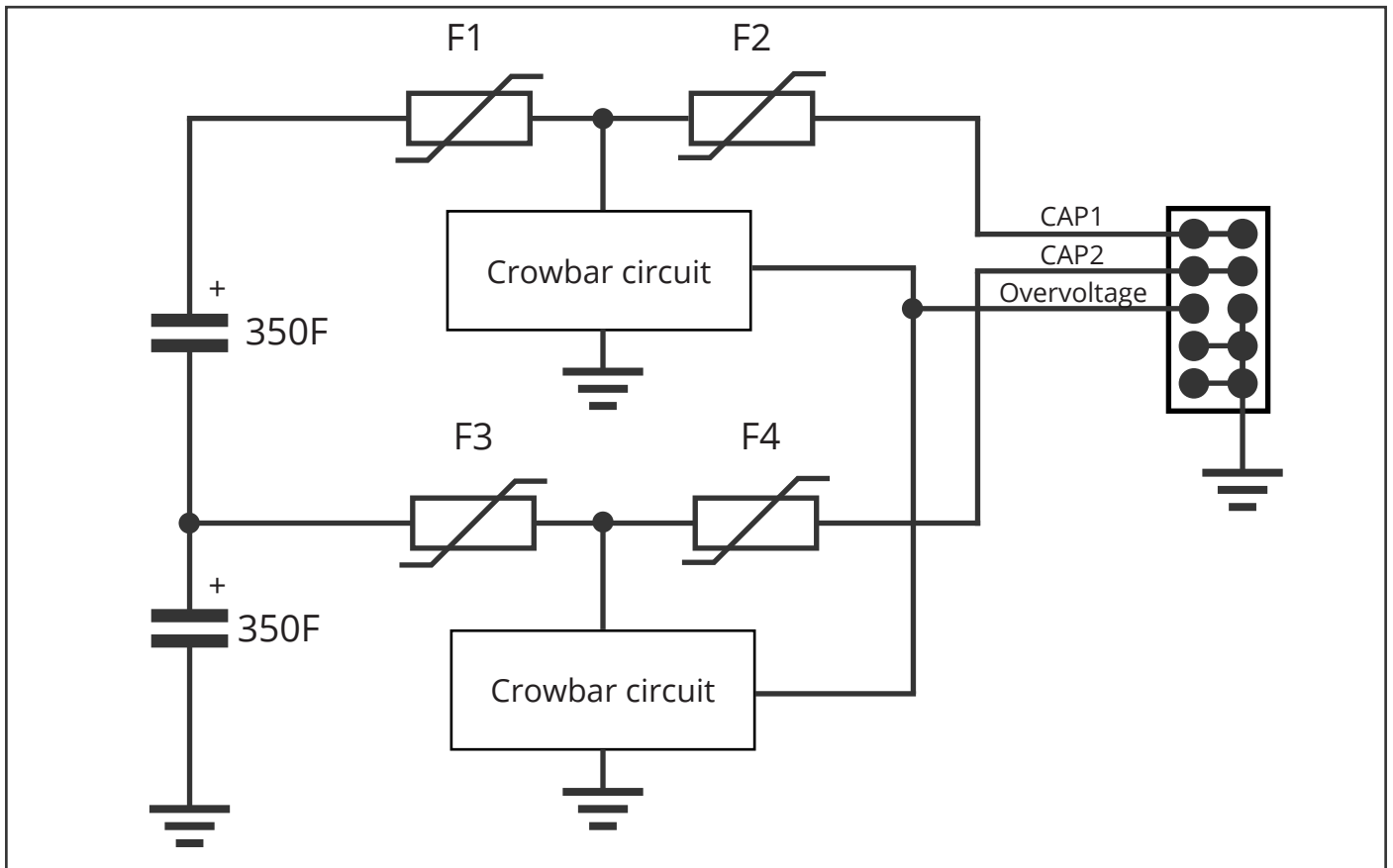


FIGURE 2 Block diagramm.

OPERATION

The Protected Supercapacitor Module contains two supercapacitors which are connected in series. To ensure a safe operation, three stages of protection are provided:

- over-voltage protection,
- over-current protection,
- reverse voltage protection.

OVER-VOLTAGE PROTECTION

The over voltage protection protects each cell from being over-charged above 2.76 V typically. The protection is based on crowbar circuit.

When the over-voltage occurs on either of the supercapacitors, the fuses F1 and F3 always trip, temporarily disconnecting supercapacitors from the charger. When in a tripped state, supercapacitors slowly discharge with a typical current of 250 mA until the lower hysteresis voltage of 2.56V typically is reached on both supercapacitors.

Fuses F2 and F4 trip only if the current from charger exceeds 3 to 5.2 A. If fuses F2 and/or F4 have tripped, the charger should be disconnected and reconnected to continue a normal operation.

OVER-CURRENT PROTECTION

In case the charging current or current drawn from the either of the supercapacitors exceeds 3 to 5.2A, one of the fuses or several fuses will trip, limiting the current to typically 250 mA. In case of over-current the charger or the load needs to be disconnected and reconnected to continue a normal operation.

REVERSE VOLTAGE PROTECTION

In case the reverse voltage of typically -0.35 V is exceeded on either of the supercapacitors the current is bypassed, protecting the supercapacitors from damage.

A reverse voltage can be reached in several cases. For example, incorrect polarity can be applied. In another case, if the voltage of the supercapacitors is unbalanced, then during the discharge the supercapacitor with the lowest voltage can reach a voltage below 0 V.

CONNECTOR

The connection to the supercapacitors and the over-voltage alarm is provided through a commonly used 2.54 mm pitch female connector (see Figure 2). The connections are clearly illustrated on the casing of the module as well.

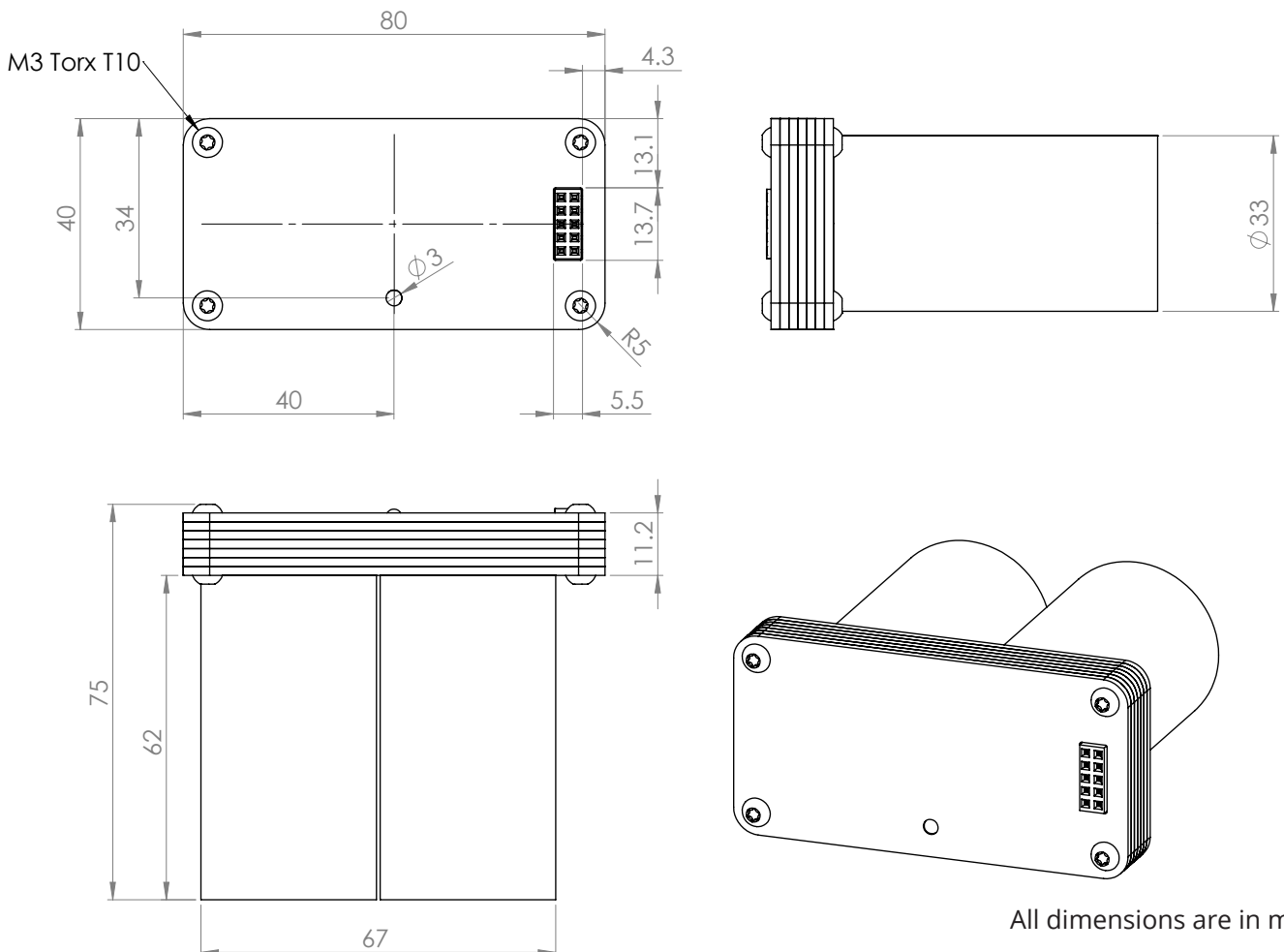


FIGURE 3 Dimensions.