

Battery Pack Fuse Calculations

ECE/ME 492 | Spring 2020

Last Revision: 4/26/2020

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The following calculations were carried out assuming a maximum cell voltage of 3.8V and an internal cell resistance of 2 milliohms. For the Littelfuse brand fuses, the voltage ratings are linked specifically with the interrupt current ratings.

High Current Fuse

Model	Mersen A3T300
Rated Voltage	160 V DC
Maximum Short Circuit Voltage	121.6 V (32 cells/2 packs in series)
Rated Current	300 A
Anticipated Maximum Current	~250 A
Interrupt Rating	50 kA
Maximum Short Circuit Current	$I_{sc} = \frac{V}{R_{sc}} = \frac{121.6V}{(32*0.002\Omega)} = 1900 \text{ A}$

All values are within their limits, so this fuse should be adequate.

Charging Path Fuses

Model	Littelfuse 0505020.MXP
Rated Voltage	500 VDC
Maximum Short Circuit Voltage	60.8 V (16 cells/1 packs in series)
Rated Current	20 A
Anticipated Maximum Current	17.4 A
Interrupt Rating	20 kA
Maximum Short Circuit Current	$I_{sc} = \frac{V}{R_{sc}} = \frac{60.8V}{(16*0.002\Omega)} = 1900 \text{ A}$

All values are within their limits, so this fuse should be adequate.

PacMan Power Fuses

Model	Littelfuse 0453.500MR
Rated Voltage	125 VDC
Maximum Short Circuit Voltage	60.8 V (16 cells/1 packs in series)
Rated Current	500 mA
Anticipated Maximum Current	~200 mA
Interrupt Rating	50 A
Maximum Short Circuit Current	$I_{sc} = \frac{V}{R_{sc}} = \frac{60.8V}{(16*0.002\Omega)} = 1900 \text{ A}$

Although the interrupt rating is not high enough to support the maximum theoretical short circuit current, these fuses are in series with and therefore protected by the charging fuses. This paired with the other specs indicates that this fuse should be adequate.

CellMan Balancing Fuses

Model	Littelfuse 0453010.MR
Rated Voltage	125 VDC
Maximum Short Circuit Voltage	3.8 V (1 cell)
Rated Current	10 A
Anticipated Maximum Current	5-7 A
Interrupt Rating	50 A (400 A at 32 VDC)
Maximum Short Circuit Current	$I_{sc} = \frac{V}{R_{sc}} = \frac{3.8V}{0.002\Omega} = 1900 \text{ A}$

Despite the adequate voltage and current ratings of this fuse, the interrupt rating is inadequate. This might require a change in fuse for this application.

Pack Active Indicator Fuses

Model	Littelfuse 0229.500MXP
Rated Voltage	125 VDC
Maximum Short Circuit Voltage	121.6 V (32 cells/2 packs in series)
Rated Current	500 mA
Anticipated Maximum Current	30 mA
Interrupt Rating	10 kA
Maximum Short Circuit Current	$I_{sc} = \frac{V}{R_{sc}} = \frac{121.6V}{(32*0.002\Omega)} = 1900 \text{ A}$

All values are within their limits, so this fuse should be adequate.