

## Product Datasheet

### ESS Module

- Rated voltage 130VDC
- 104F capacitance
- Ultra-low ESR
- Stackable 19" rack design
- Laser welded connections
- Innovative cell management
- Integrated voltage and temperature monitoring
- CAN bus communication



#### ELECTRICAL SPECIFICATIONS

Type	M35W-130-0104
Rated Voltage $V_R$	130.00 V
Surge Voltage $V_S^1$	134.40 V
Rated Capacitance $C^2$	104 F
Capacitance Tolerance <sup>3</sup>	0% / +20%
DC ESR <sup>2</sup>	14 mΩ
Leakage Current $I_L^4$	<30 mA
Constant Current ( $\Delta T = 15^\circ C$ ) <sup>5</sup> passive cooling	72 A
Constant Current ( $\Delta T = 15^\circ C$ ) <sup>5</sup> active air cooling 60 CFM	152 A
Max Current $I_{Max}^6$	2.7 kA
Short Current $I_S^7$	9.2 kA
Stored Energy $E^8$	243 Wh
Energy Density $E_d^9$	7.3 Wh/kg
Usable Power Density $P_d^{10}$	4.5 kW/kg
Impedance Match Power Density $P_{dMax}^{11}$	9.0 kW/kg

#### THERMAL CHARACTERISTICS

Type	M35W-130-0104
Working Temperature	-40 ~ 65°C
Storage Temperature <sup>12</sup>	-40 ~ 70°C
Thermal Resistance $R_{Th}^{13}$ Passive cooling	0.205°C/W
Thermal Resistance $R_{Th}^{13}$ Active air cooling 60 CFM	0.046°C/W
Thermal Capacitance $C_{Th}^{14}$	36.0 kJ/°C

#### LIFETIME CHARACTERISTICS

Type	M35W-130-0104
DC Life at High Temperature <sup>15</sup>	1500 hours
DC Life at RT <sup>16</sup>	10 years
Cycle Life <sup>17</sup>	1'000'000 cycles
Shelf Life <sup>18</sup>	4 years

#### SAFETY & ENVIRONMENTAL SPECIFICATIONS

Type	M35W-130-0104
Safety	RoHS, REACH
Vibration	Seismic Standard IEC 60068-3-3 Zone 3
Rated insulation voltage (maximum series voltage)	1500 VDC

#### MONITORING AND CELL VOLTAGE MANAGEMENT (CMS)

Type	M35W-130-0104
Connector	Phoenix MCV1.5/8-GF-3.81

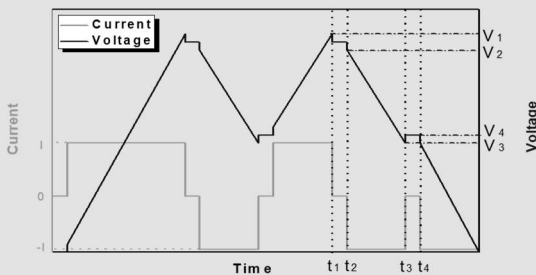
Auxiliary power supply	24V ± 10% 5W
Cell Voltage Monitoring and Management <sup>19</sup>	Microprocessor based, individual cell balancing
Temperature Sensor	4x NTC (10kOhm @25°C)
Communication interface	CAN bus 2.0A

### PHYSICAL PARAMETERS

<b>Type</b>	<b>M35W-130-0104</b>
Mass M, typical	32.6 kg
Power Terminals	M8 <sup>20</sup>
Dimensions <sup>21</sup> Length	555 mm
Width	483 mm
Height	150 mm

### NOTES:

- Surge voltage  $V_S$ : Absolute maximum voltage, non-repetitive. The duration must not exceed 1 second.
- Capacitance C: The test current is 0.075 A/F, if the calculated current is >100A, then apply 100A.



$$V_1 = 2 V_3 = V_R \quad t_2 - t_1 = t_4 - t_3 = 0.1 \text{ s}$$

$$C = I * (t_3 - t_2) / (V_2 - V_3) \quad ESR = (V_4 - V_3) / I$$

- Capacitance tolerance: Typical tolerance is +5%~+10%.
- Leakage current measurement procedure: 1) Charge the capacitor to the  $V_R$  with a constant current (0.075 A/F, if the calculated current is >100A, then apply 100A). 2) Hold the voltage at  $V_R$  for 72h. 3) The current to maintain  $V_R$  after 72 h is the leakage current.  
Leakage current may be greater if balancing is activated.
- Max constant working current:  $I_{MCC} = \sqrt{\Delta T / (ESR * R_{Th})}$
- Max current:  $I_{Max} = 0.5C * V_R / (\Delta t + ESR * C)$ , discharge from  $V_R$  to  $V_R/2$  in 1 second.
- Short current:  $I_S = V_R / ESR$
- Stored energy:  $E = 0.5C * V^2 / 3600$
- Energy density:  $E_d = E / M$
- Usable power density:  $P_d = 0.125V_R^2 / (ESR * M)$
- Impedance match power density:  $P_{dMax} = 0.25V_R^2 / (ESR * m)$
- Storage temperature: Storage in discharge state.
- Thermal resistance:  $R_{Th} = \Delta T / P$ , where  $P = ESR * I^2$
- Thermal capacitance is indicated for the whole module.
- DC life at high temperature: Hold the capacitor charged at rated voltage at 65°C for 1500h. The capacitance shall be >80% of the rated value, the ESR shall be <200% of the rated value.

- DC life at RT: Hold the capacitor charged at rated voltage at room temperature RT, the capacitance shall be >80% of the rated value, the ESR shall be <200% of the rated value.
- Cycle life: Charge and discharged the capacitor in the range between  $V_R$  and  $V_R/2$ . 5 seconds waiting period between charge and discharge. The constant test current is 0.075 A/F (if the calculated current >100A, then apply 100A).
- Shelf life: Discharged and no load applied at RT.
- See detailed CMS datasheet and user manual.
- The maximum torque is 15Nm for M8.
- 19" rack module with a height of 4U



#### Notes:

Standard markings:

- + Name of manufacturer, part number, serial number
- + Rated voltage and capacitance, negative and positive terminals, warning marking
- + Stored energy in watt-hours

The contents of this document are subject to change without notice. SECH accepts no liability for the accuracy or credibility of the values and information contained in this document.