

Product Datasheet

Large cell modules

- Rated voltage 18, 36 and 54VDC
- 500F, 250F and 166F capacitance
- High cycle life of 1 million cycles
- Excellent energy and power density
- Laser welded internal connections
- Robust and vibration proof design
- Active cell balancing
- Voltage and temperature monitoring



Picture shows 54V module type

ELECTRICAL SPECIFICATIONS

Type	M23W-018-0500	M23W-036-0250	M23W-054-0166
Rated Voltage V_R	18.00 V	36.00 V	54.00 V
Surge Voltage V_S^1	18.60 V	37.20 V	55.00 V
Rated Capacitance C^2	500 F	250 F	166 F
Capacitance Tolerance 3	0% / +20%	0% / +20%	0% / +20%
DC ESR 2	<2 mΩ	<4 mΩ	<6 mΩ
Leakage Current I_L^4	<12 mA	<12 mA	<12 mA
Constant Current ($\Delta T = 15^\circ C$) 5	104 A	87 A	79 A
Max Current I_{Max}^6	2.2 kA	2.2 kA	2.2 kA
Short Current I_S^7	9 kA	9 kA	9 kA
Stored Energy E^8	22.5 Wh	45 Wh	67.5 Wh
Energy Density E_d^9	3.9 Wh/kg	4.0 Wh/kg	4.4 Wh/kg
Usable Power Density P_d^{10}	3.5 kW/kg	3.6 kW/kg	4 kW/kg
Matched Impedance Power Density P_{dMax}^{11}	7 kW/kg	7.2 kW/kg	8 kW/kg

THERMAL CHARACTERISTICS

Type	M23W-018-0500	M23W-036-0250	M23W-054-0166
Working Temperature	-40 ~ 65 °C	-40 ~ 65 °C	-40 ~ 65 °C
Storage Temperature 12	-40 ~ 70 °C	-40 ~ 70 °C	-40 ~ 70 °C
Thermal Resistance R_{Th}^{13}	0.7 °C/W	0.5 °C/W	0.4 °C/W
Thermal Capacitance C_{Th}^{14}	4'200 J/°C	9'945 J/°C	13'000 J/°C

LIFETIME CHARACTERISTICS

Type	M23W-018-0500	M23W-036-0250	M23W-054-0166
DC Life at High Temperature 15	1500 hours	1500 hours	1500 hours
DC Life at RT 16	10 years	10 years	10 years
Cycle Life 17	1'000'000 cycles	1'000'000 cycles	1'000'000 cycles
Shelf Life 18	4 years	4 years	4 years

SAFETY & ENVIRONMENTAL SPECIFICATIONS

Type	M23W-018-0500	M23W-036-0250	M23W-054-0166
Safety	RoHS, REACH	RoHS, REACH	RoHS, REACH
Vibration	IEC60068-2-6	IEC60068-2-6	IEC60068-2-6
Shock	IEC60068-2-28, 29	IEC60068-2-28, 29	IEC60068-2-28, 29

MONITORING AND CELL VOLTAGE MANAGEMENT

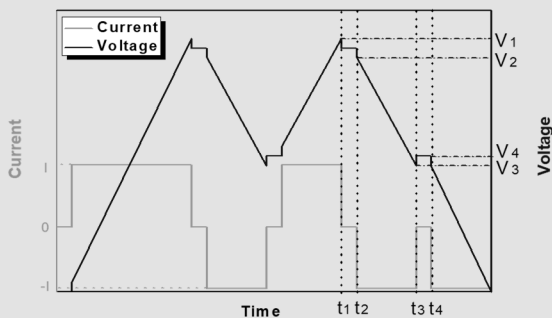
Type	M23W-018-0500	M23W-036-0250	M23W-054-0166
Internal Temperature Sensor	NTC 3950 10kΩ	NTC 3950 10kΩ	NTC 3950 10kΩ
Temperature Interface	Analog	Analog	Analog
Connector	Deutsch DTM04-4P	Deutsch DTM04-4P	Deutsch DTM04-4P
Cell Voltage Monitoring and Management	CMS	CMS	CMS

PHYSICAL PARAMETERS

Type	M23W-018-0500	M23W-036-0250	M23W-054-0166
Mass M	5.8 kg	11.3 kg	15.2 kg
Terminals	M8 ¹⁹	M8 ¹⁹	M10 ¹⁹
Dimensions ²⁰ Length	425 mm	425 mm	425 mm
Width	68 mm	132 mm	198 mm
Height	183.6 mm	183.6 mm	183.6 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.

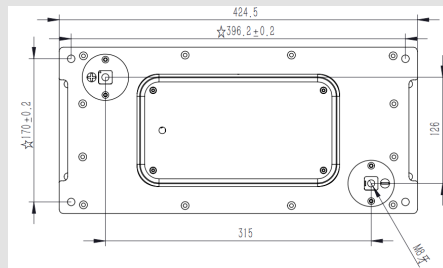


$$V_1 = 2V_3 = V_R \quad t_2 - t_1 = t_4 - t_3 = 0.1 \text{ s}$$

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

- 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.
- 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 circuit current: $I_S = V_R / ESR$
- Stored energy: $E = 0.5C * V^2 / 3600$
- Energy density: $E_d = E / M$
- Usable power density: $P_d = (0.12V_R^2 / ESR) / M$
- Matched impedance power density: $P_{dMax} = (0.25V_R^2 / ESR) / M$
- 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.
- The maximum torque is 25Nm for M10, 14-18Nm for M8
- Dimensions (pictures show M23W-054-0166 module):



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

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