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S-Power MS1200 Datasheet	EBJ	LE00228 / 1.0
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S-Power MS1200 Datasheet

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1 S-Power

S-Power is a family of environmentally friendly, PFAS-free supercapacitors developed for applications requiring high power and excellent cycle life. This datasheet describes the S-Power MS1200 product variant.

1.1 Features

- Low ESR
- Compact and slim
- Aluminum tabs as standard or with optional copper solderable tabs

1.2 Ratings

Capacitance	1200	mF
Capacitance tolerance	-20 to 20	%
Rated voltage	2.5 / 2.7	VDC
Operating temperature	-20 to 60 / -20 to 25	°C

Table 1 Ratings table

2 Specifications

Product	S-Power MS1200
Configuration ID	EBJ
Article No	281

Table 2 Product specification

Note! Before working with the cell, it is strongly recommended to read and understand the S-Power handling instructions. These instructions are always provided when cells are ordered.

2.1 Physical

The data presented in this datasheet applies to the product variant illustrated in Figure 1. The overall dimensions, weight, and physical configuration of this product variant are provided in Figure 1 and Table 3.

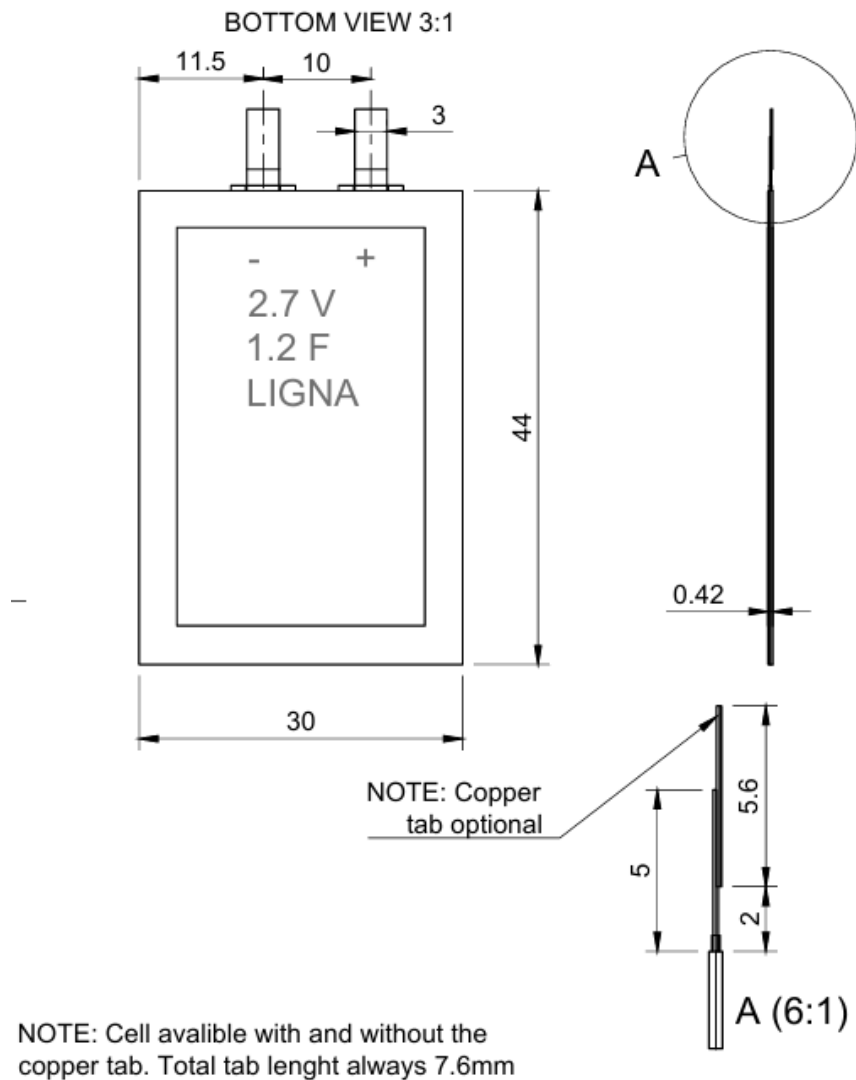


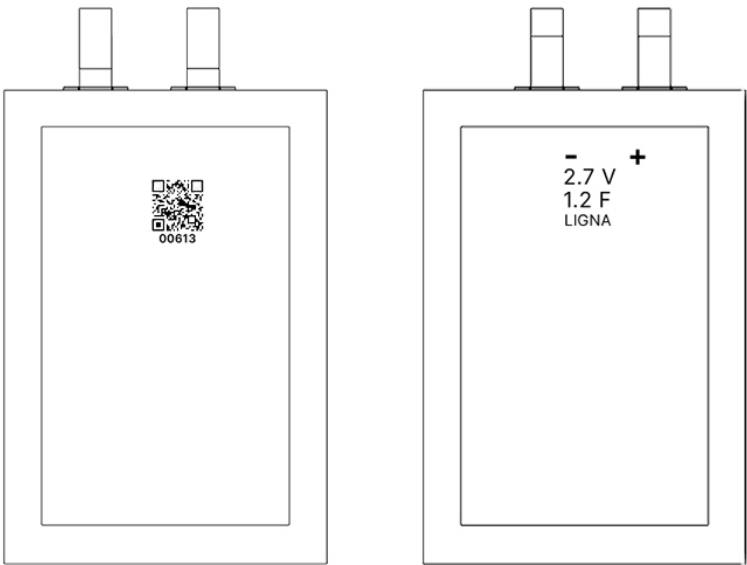
Figure 1 S-Power MS1200 layout

Parameter	Typical value	Unit
Width	30	mm
Height	44	mm
Thickness	0.45	mm
Terminal width	3	mm
Terminal thickness		
Al-tab	0.1	mm
Al/Cu-tab	0.2	mm
Mass	0.55	g

Table 3 Physical data

2.2 Product marking

Each cell is permanently marked with a QR code and a human-readable serial number to ensure product identification and traceability. The marking is centered and positioned 5 mm below the top edge of the cell.



Parameter	Content	Example
QR code content	YYWWXXXXXX (10 characters)	2628000613
Human-readable serial number	XXXXXX (6 digits)	000613

Table 4 Product identification

Where:

- YY = Year
- WW = Calendar week
- XXXXXX = Sequential serial number

2.3 Electrical

Typical electrical specifications at 20 °C are presented in Table 5 unless otherwise stated. Note that specifications in this table are subject to change.

Parameter	Denotation	Typical value	Unit
Rated voltage ¹	V_R	2.7	V (DC)
Rated capacitance ²	C	1.2	F
Internal resistance ²	DCESR	1.5	Ω
Equivalent series resistance ³	ESR	500	m Ω
Leakage current after 8 h @ V_R ⁴	DCL	6	μ A
Leakage current after 24 h @ V_R		2	
Leakage current after 168 h @ V_R		0.5	
Max. non-repetitive peak current ⁵	I_{peak}	0.58	A
Charge retention 24 hours ^{6a}		93	%
Charge retention 7 days ^{6b}		90	
Max energy ⁷	E_{max}	1.2	mWh
Cycle life ⁸		>500 000	Cycles

Table 5 Electrical specifications

Table 5 notes:

- ¹ At higher voltage lifetime and cycle life will be reduced while leakage increases. Operation at 2.7 V is supported at room temperature (typically 20–25 °C). For operation at elevated temperatures, the operating voltage must be limited to 2.5 V.
- ² a) Rated capacitance is determined based on IEC 62391-1:2022 method A, see [1]:

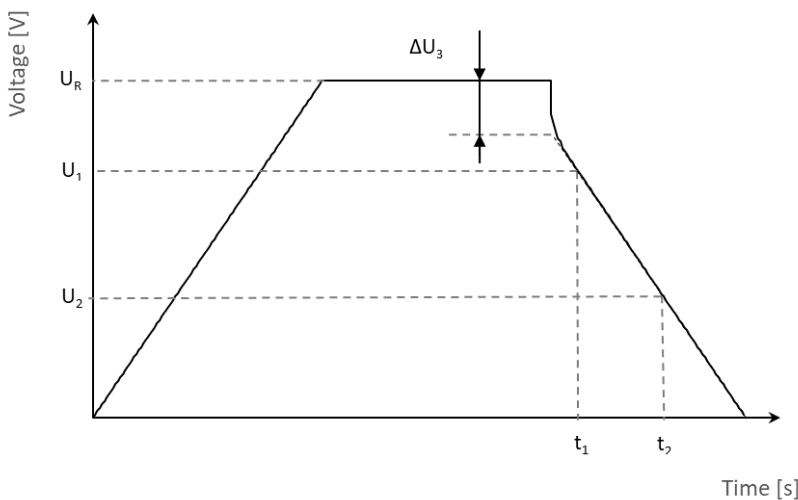


Figure 2 Charge/discharge characteristics between capacitor terminals in capacitance and internal resistance measurement

- U_1 is the measuring start voltage (V).
- U_2 is the measuring end voltage (V).
- t_1 is the time at which the terminal voltage of the capacitor reaches the value U_1 from the start of the discharge.
- t_2 is the time at which the terminal voltage of the capacitor reaches the value U_2 from the start of the discharge.
- ΔU_3 is the voltage drop, see standard for details how it is derived.
- Capacitance, C , is measured by charging at constant current $I_{CCC} = 35.5 \text{ mA}$ to V_R ; followed by charging at constant voltage $V_C = V_R$ for 30 min; and finally discharging using constant current $I_{CCD} = 13 \text{ mA}$. $U_1 = 0.8 \cdot U_R$ and $U_2 = 0.4 \cdot U_R$.

$$C = I_{CCD} \frac{t_2 - t_1}{U_1 - U_2} [F]$$

- Internal resistance, DCESR, is measured by charging at constant current $I_{CCC} = 35.5 \text{ mA}$ to V_R ; followed by charging at constant voltage $V_C = V_R$ for 30 min; and finally discharging using constant current $I_{CCD} = 130 \text{ mA}$.

$$DCESR = \frac{\Delta U_3}{I_{CCD}} [\Omega]$$

- 3 ESR measured at 1 kHz and $I_{RMS} = 2.0 \text{ mA}$.
- 4 Leakage current, DCL, measured after biasing at V_R for the specified time. Observe that the initial current can be higher.
- 5 I_{peak} is the current required to discharge the cell from V_R to $V_R/2$ in 1 s. Observe that it is not recommended to use this current for continuous operation.
- 6 Remaining charge measured after:
 - a) 8-hour constant voltage charge followed by 24 h self-discharge.
 - b) 24-hour constant voltage charge followed by 7 days self-discharge.
- 7 Max energy: $E_{max} = (\frac{1}{2} C \cdot V_R^2) / 3.6 [mWh]$
- 8 Cycle life can vary significantly for various applications and thus each case should be studied individually. A cycle is defined by constant current charge to V_R followed by discharge to $1/3 V_R$. Cycle life is determined based on capacitance and ESR. When capacitance has decreased by more than 20 % or ESR has increased by more than 100 % the cell is considered to have reached its end-of-life.

2.3.1 Capacitance vs temperature

Figure 3 illustrates how the capacitance varies with operating temperature. Data has been collected by exposing the cell to the following temperature profile; 20 → -20 → 60 → 20 °C. The cell is allowed to soak for 30 min at each temperature before any electrical characterization is performed. Data in Figure 3 is gathered when increasing temperature from -20 to 60 °C.

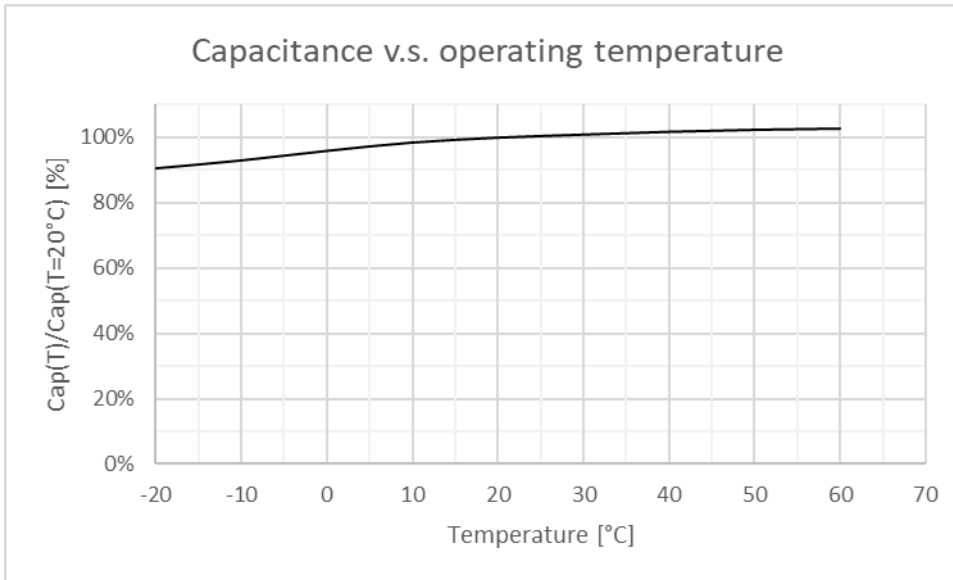


Figure 3 Capacitance vs. operating temperature

2.3.2 ESR vs temperature

The equivalent series resistance and its dependency on operating temperature is shown in Figure 4. The data is gathered using the same test and temperature protocol as for capacitance vs. temperature, presented in the previous section.

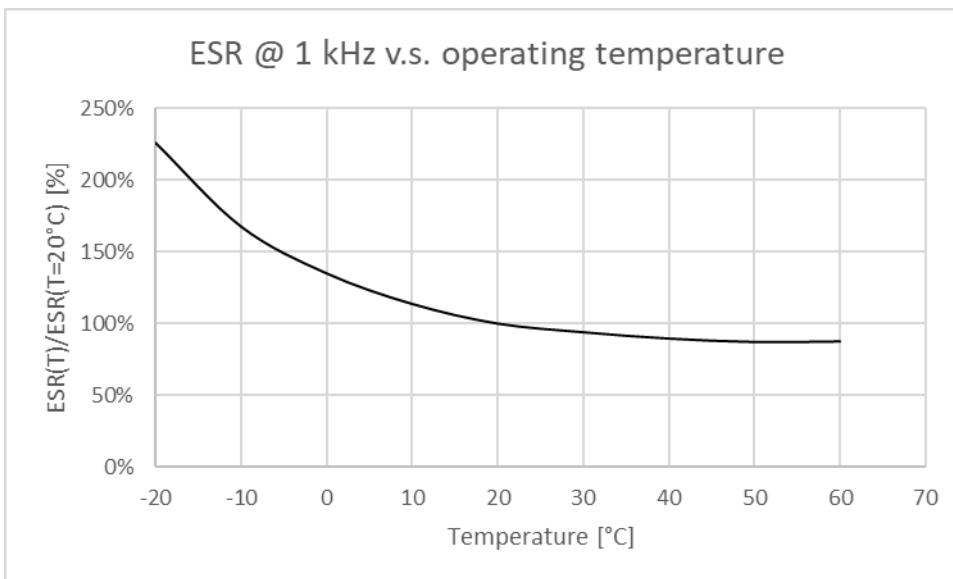


Figure 4 ESR vs. operating temperature

2.3.3 Charge retention

Charge retention measured after 24 h constant voltage charge at V_R is illustrated in Figure 5.

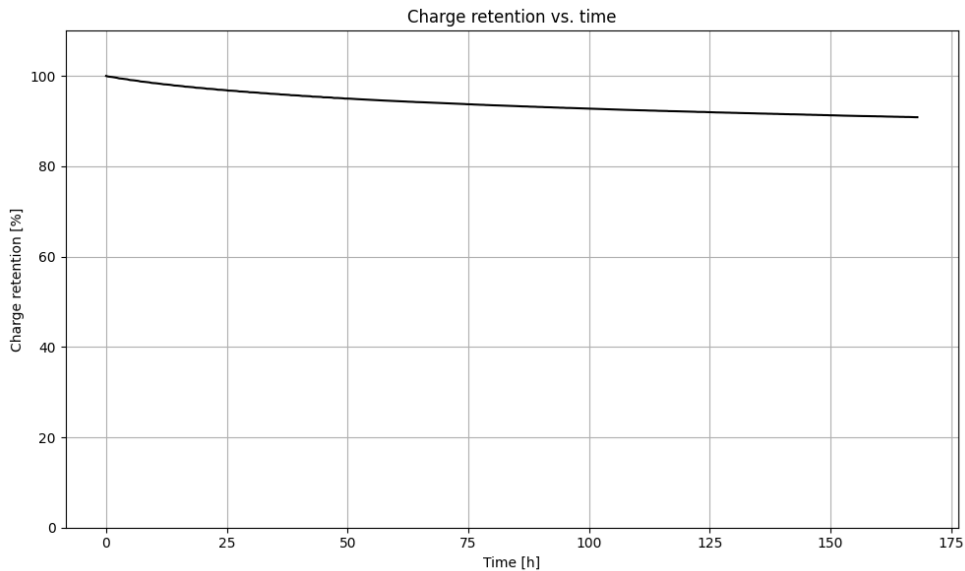


Figure 5 Charge retention at 20 °C

2.4 Environmental specifications

The operating environmental specifications are presented in Table 6 below.

It is recommended to store the cell at controlled indoor conditions below 30 °C. Longer exposure times to elevated temperatures may have a negative impact on lifetime. Rapid changes in temperature can cause condensation and shall consequently be avoided.

Parameter	Denotation	Conditions	Min	Typical	Max	Unit
Operating temperature	T_{op}		-20	RT	60	°C
Operating rel. humidity	RH_{op}	None condensing	0	45	85 *	%

(*) None condensing

Table 6 Environmental specifications

3 References

- [1] IEC 62391-1:2022 - Fixed electric double-layer capacitors for use in electric and electronic equipment - Part 1: Generic specification