PRELIMINARY DATA SHEET

SkelCap
supercapacitor

The SkelCap supercapacitor series brings the benefits of our patented production technology to a form factor most commonly found in industry. These cells are developed for a variety of applications and offer very high power and excellent lifetime characteristics.

+ Capacitance 3400 F
+ Extreme power density
+ Durable and safe aluminum casings
+ German quality
+ Weldable terminals
+ High cycle life >1,000,000 cycles
+ High temperature tolerance
+ RoHS compliant

Electrical

	Value	Unit
Product code	--	
Rated voltage	3.0	V
Rated capacitance	3400	F
Initial capacitance	>3600	F
ESR (DC 10ms ESR ≈ AC 100Hz), rated/initial	0.12/0.10±0.02	mOhm
ESR (DC 1s ESR ≈ AC 0.1Hz), rated/initial	0.14/0.12±0.02	mOhm
Maximum peak current, for 1 second	3.5	kA
Leakage current at 3.0 V, 25 °C and 8 h, max)	<50	mA
Leakage current at 3.0 V, 25 °C and 72 h, max)	<10	mA

Energy, based on rated capacitance

Stored energy	4.25	Wh
Specific energy	8.0	Wh/kg
Energy density	10.9	Wh/L

Power

Power, matched impedance	18.7	kW
Specific power, matched impedance	35.2	kW/kg
Power density, matched impedance	47.9	kW/L

Standards and certifications

Vibration specifications	ISO 16750-3, Table 14, Table 12
Certifications	RoHS

Temperature and Life

	Value	Unit
Operating temperature range		
Minimum	-40	°C
Maximum	+65	°C
Storage temperature range (uncharged)		
Minimum	-40	°C
Maximum	+65	°C
Life		
End of life (EoL) ESR	200% of rated	
EoL capacitance	80% of rated	
Storage life @ RT, uncharged	10	years
Cycle life @ RT, between V_R and $V_R/2$	1,000,000	cycles

Safety

Short circuit current (For informational purposes - do not use as operating current.)	21.5	kA

Physical parameters

	Value	Unit
Mass. typical (±10g)	0.537	kg
Volume	0.399	L
Diameter (-0,2…+0,3mm), including label)	60.2	mm
Length (±0.3mm)	138	mm
Terminal Diameter, Top/Bottom	18/22	mm
Terminal Length	3.2	mm

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(1) Maximum peak current (1 sec) = $\frac{½\ CV}{C \times ESR + 1s}$ (2) $E_{stored} = \frac{½\ CV^2}{3600}$ (3) $E_{max} = \frac{½\ CV^2}{3600 \times mass}$

(4) $E_{max} = \frac{½\ CV^2}{3600 \times volume}$ (5) $P_{max} = \frac{V^2}{4 \times ESR}$ (6) $P_{max} = \frac{V^2}{4 \times ESR \times mass}$

(7) $P_{max} = \frac{V^2}{4 \times ESR \times volume}$ (8) $I_{max} = \sqrt{\frac{\Delta T}{ESR \times R_{th}}}$

(9) The stated maximum peak current should not be exceeded during use. If the limit is to be exceeded by the customer, Skeleton must be consulted beforehand and give approval for the exceeded power load. Typical value represents the mean production sample value
Rated value represents the absolute minimum capacitance or maximum ESR value of production sample.

Standard markings

+ Name of manufacturer, part number, serial number, rated voltage
+ Rated capacitance, negative and positive terminals, warning marking
+ Total energy in watt-hours
+ Electrolyte material used

Notes

+ Testing instructions available on www.skeletontech.com
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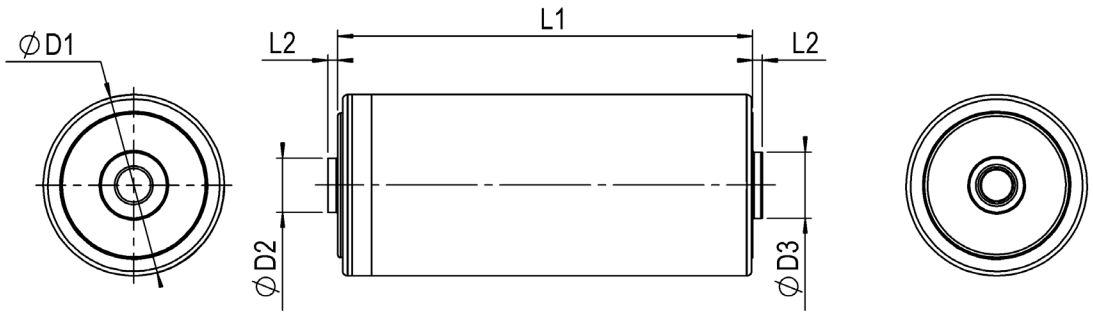
Dimensions:

D1	60.2 +/- 0.2mm (incl. label)
L2	3.2 +/- 0.2mm
L1	138.0 +/- 0.3mm
D2	22.0 +/- 0.1mm
D3	18.0 +/- 0.03mm



SkelCap
supercapacitor

The SkelCap supercapacitor series brings the benefits of our patented production technology to a form factor most commonly found in industry. These cells are developed for a variety of applications and offer very high power and excellent lifetime characteristics.

+ Capacitance 3400 F
+ Extreme power density
+ Durable and safe aluminum casings
+ Non-Threaded terminals
+ High cycle life >1,000,000 cycles
+ RoHS & UL810A compliant

General Specifications*	Value	Unit
Rated voltage V_R	3.0	V
Specific energy	8.4	Wh/kg
Nominal specific power	26.0	kW/kg
Practical specific power	21.0	kW/kg

Standards and certifications

Vibration Specification	ISO 16750-3, Table 12
Shock Resistance	IEC60068-2-27 Shock Test
Certifications	RoHS
Standards	REACH, UL 810A

General	Value	Unit
Product code	6710048	
Rated capacitance	3400	F
DC 1s ESR, rated at 50A	0.21	mΩ
DC 10ms ESR, rated at 50A	0.17	mΩ
Maximum peak current, for 1 second [1, 9]	3035	A
Leakage current (At 3.0 V, 25 °C, and 72 hours, max)	<8.0	mA

Energy

Energy [2]	4.25	Wh
Specific energy [3]	8.4	Wh/kg
Energy density [4]	10.9	Wh/L

Temperature and Life	Value	Unit
Operating temperature range		
Minimum	-40	°C
Maximum	+65	°C
Storage temperature range (uncharged)		
Minimum	-40	°C
Maximum	+50	°C
Life		
Lifetime @ V_R and +65 °C Capacitance decrease 20% against rated value; 1s ESR increase 100% against rated value	1500	Hours
Storage life @ RT, uncharged	10	Years
Cyclelife @ RT, between V_R and $V_R/2$	1,000,000	Cycles

Power

Nominal power, calculated from 10 ms ESR (for comparison)		
Specific power, matched Impedance [6]	26.0	kW/kg
Power density, matched Impedance [7]	34.0	kW/L
Practical power, calculated from 1 s ESR (for engineering)		
Power, matched impedance [5]	10.7	kW
Specific power, matched Impedance [6]	21.0	kW/kg
Power density, matched impedance [7]	27.5	kW/L

Safety

Short circuit current (For informational purposes - do not use as operating current.)	18.8	kA

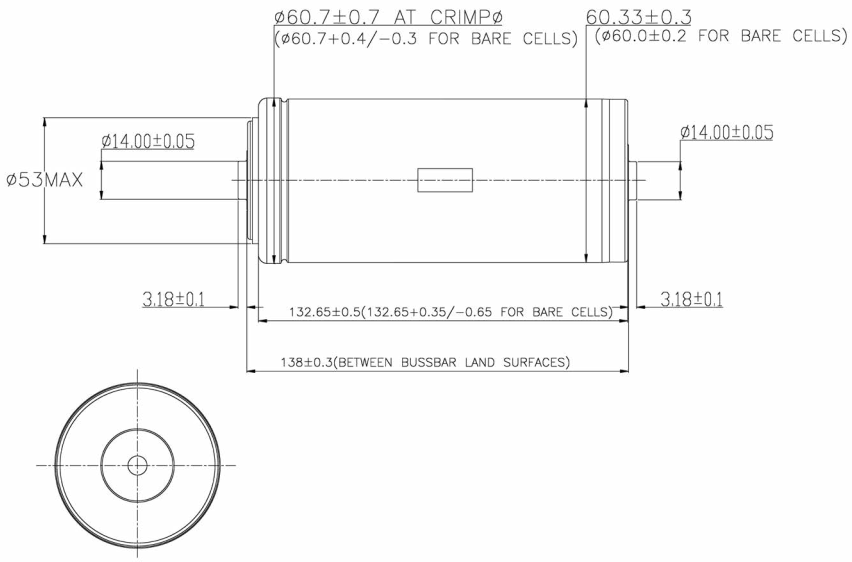
Physical parameters	Value	Unit
Mass. Typical	0.51	kg
Volume	0.39	L
Diameter	60	mm
Length	138	mm

Thermal (based on DC 1s ESR)	Value	Unit
Thermal resistance, R_{ca}, typical	3.35	°C/W
Thermal capacitance, C_{th}, typical	0.6	kJ/°C
Max continuous current, ΔT = 15°C [8]	150	A
Max continuous current, ΔT = 40°C [8]	244	A

(1) Maximum peak current (1 sec) = $\frac{½\,CV}{C \times ESR + 1s}$ (2) $E_{stored} = \frac{½\,CV^2}{3600}$ (3) $E_{max} = \frac{½\,CV^2}{3600 \times mass}$

(4) $E_{max} = \frac{½\,CV^2}{3600 \times volume}$ (5) $P_{max} = \frac{V^2}{4 \times ESR}$ (6) $P_{max} = \frac{V^2}{4 \times ESR \times mass}$

(7) $P_{max} = \frac{V^2}{4 \times ESR \times volume}$ (8) $I_{max} = \sqrt{\frac{\Delta T}{ESR \times R_{th}}}$



(9) The stated maximum peak current should not be exceeded during use. If the limit is to be exceeded by the customer, Skeleton must be consulted beforehand and give approval for the exceeded power load.
Typical value represents the mean production sample value
Rated value represents the absolute minimum capacitance or maximum ESR value of production sample.

Standard markings

+ Name of manufacturer, part number, serial number, rated voltage
+ Rated capacitance, negative and positive terminals, warning marking
+ Total energy in watt-hours
+ Electrolyte material used

Notes

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PRELIMINARY DATA SHEET

SkelCap
supercapacitor

+ Capacitance 5000 F
+ Extreme power density
+ Durable and safe aluminum casings
+ Weldable terminals
+ High cycle life >1,000,000 cycles
+ High temperature tolerance (operating and storage)
+ German quality
+ RoHS compliant

General

	Value	Unit
Rated voltage V_R	3	V
Rated capacitance	5000	F
Initial capacitance, typical	5200	F
DC 10ms ESR rated	0.14	mΩ
DC 1s ESR rated	0.20	mΩ
ESR (IEC62391-1), rated	0.20	mΩ
Maximum peak current, for 1 second [1, 9]	3.8	kA

Standards and certifications

Vibration Specification	ISO 16750-3, Table 12 Table 14
Certifications	RoHS

Physical parameters

Mass, typical (± 3-6 g, from small to large size)	0.565	kg
Volume	0.390	L
Diameter (± 0.2 mm, including label), D1	60.2	mm
Length (± 0.3 mm), L1	138	mm
Terminal diameter, D2	12	mm
Terminal length, L2	3.2	mm

Power

	Value	Unit
Nominal power, calculated from 10ms ESR (for comparison)		
Power, matched impedance [5]	16.1	kW
Specific power, matched impedance [6]	28.4	kW/kg
Power density, matched impedance [7]	41.2	kW/L
Nominal power, calculated from 1s ESR (for engineering)		
Power, matched impedance [5]	11.2	kW
Specific power, matched impedance [6]	19.9	kW/kg
Power density, matched impedance [7]	28.9	kW/L

Temperature and Life

Operating temperature range

Minimum	-40	°C
Maximum	+65	°C

Storage temperature range (uncharged)

Minimum	-40	°C
Maximum	+50	°C

Life

Capacitance decrease 20% from rated value;
resistance increase 100% from rated value

Storage life @ RT, uncharged	10	Years
Cyclelife @ RT, between V_R and $V_R/2$	1,000,000	Cycles

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Energy

	Value	Unit
Energy [2]	6.3	Wh
Specific energy [3]	11.1	Wh/kg
Energy density [4]	16.0	Wh/L

Safety

	Value	Unit
Short circuit current (For informational purposes - do not use as operating current.)	21.4	kA

Thermal (based on DC 1s ESR)

	Value	Unit
Thermal resistance given ΔT = 30°C, R_{th}	3	°C/W
Thermal capacitance, C_{th}, typical	634	J/°C
Max continuous current [10], ΔT = 15°C [8]	158	A
Max continuous current [10], ΔT = 30°C [8]	224	A
Max continuous current [10], ΔT = 40°C [8]	258	A

(1) Maximum peak current (1 sec) = $\frac{½\ CV}{C \times ESR + 1s}$ (2) $E_{stored} = \frac{½\ CV^2}{3600}$ (3) $E_{max} = \frac{½\ CV^2}{3600 \times mass}$

(4) $E_{max} = \frac{½\ CV^2}{3600 \times volume}$ (5) $P_{max} = \frac{V^2}{4 \times ESR}$ (6) $P_{max} = \frac{V^2}{4 \times ESR \times mass}$

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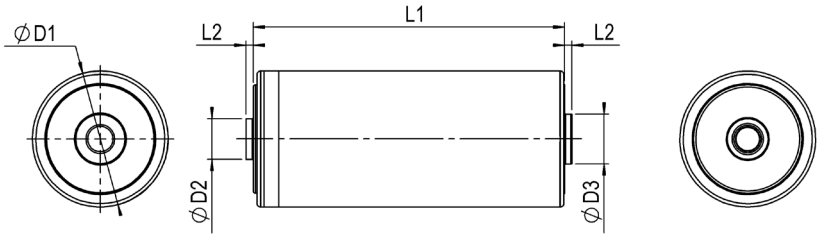

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*Power values calculated using DC 10ms ESR ≈ AC 100Hz.

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