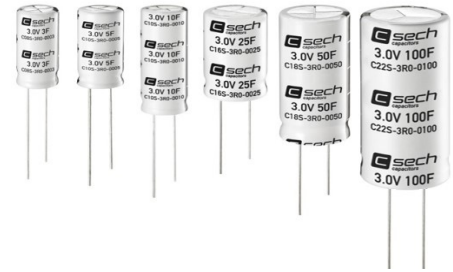


Product Datasheet

Small cell ultracapacitors – solderable type

- Rated voltage 3VDC
- 3 up to 100F capacitance
- High capacitance and low ESR
- High cycle life of 500'000 cycles
- Excellent DC life performance
- Anti-wetting design
- Small size



ELECTRICAL SPECIFICATIONS

Type	C08S-3R0-0003	C10S-3R0-0005	C10S-3R0-0010	C16S-3R0-0025	C18S-3R0-0050	C22S-3R0-0100
Rated Voltage V_R @ -40 - +65°C	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V	3.0 V
Rated Voltage V_R @ -40 - +85°C	2.5 V	2.5 V	2.5 V	2.5 V	2.5 V	2.5 V
Rated Capacitance C^2	3 F	5 F	10 F	25 F	50 F	100 F
Capacitance Tolerance ³	-10% / +20%	-10% / +20%	-10% / +20%	-10% / +20%	-10% / +20%	-10% / +20%
ESR, 1kHz ² (Typical Values)	45 mΩ (40 mΩ)	40 mΩ (27 mΩ)	25 mΩ (16 mΩ)	15 mΩ (12 mΩ)	10 mΩ (8 mΩ)	8 mΩ (7 mΩ)
ESR, DC ² (Typical Values)	70 mΩ (60 mΩ)	45 mΩ (39 mΩ)	40 mΩ (30 mΩ)	25 mΩ (18 mΩ)	15 mΩ (12 mΩ)	13 mΩ (12 mΩ)
Leakage Current I_L ⁴	0.010 mA	0.015 mA	0.030 mA	0.070 mA	0.15 mA	0.3 mA
Max Peak Current I_{Max} ⁵	3.7 A	6.1 A	10.7 A	23.1 A	42.9 A	65.2 A
Usable Continuous Current I_S ⁶	1.3A	1.6A	2.5A	3.4A	5.5A	10.7A
Stored Energy E^7	3.75 mWh	6.25 mWh	12.5 mWh	31 mWh	62.5 mWh	125 mWh
Energy Density E_d ⁸	2.34 Wh/kg	2.72 Wh/kg	3.57 Wh/kg	4.17 Wh/kg	4.63 Wh/kg	5.95 Wh/kg
Matched Impedance Power Density P_{dMax} ⁹	20.1 kW/kg	21.7 kW/kg	16.1 kW/kg	12.0 kW/kg	11.1 kW/kg	8.2 kW/kg

THERMAL CHARACTERISTICS

Type	C08S-3R0-0003	C10S-3R0-0005	C10S-3R0-0010	C16S-3R0-0025	C18S-3R0-0050	C22S-3R0-0100
Working Temperature	-40 ~ 65°C	-40 ~ 65°C	-40 ~ 65°C	-40 ~ 65°C	-40 ~ 65°C	-40 ~ 65°C
Temperature Characteristics	Capacitance change within ±5% of value at RT, ESR change within ±150% of value at RT					
Thermal Resistance R_{Th} ¹⁰	135 K/W	76K/W	39K/W	34K/W	22K/W	10K/W

LIFETIME CHARACTERISTICS

Type	C08S-3R0-0003	C10S-3R0-0005	C10S-3R0-0010	C16S-3R0-0025	C18S-3R0-0050	C22S-3R0-0100
DC Life at HT @ 65°C ¹¹	1000 hours					
DC Life at HT @ 85°C ¹¹	1000 hours @ max. 2.5V					
DC Life at RT ¹²	10 years					
Cycle Life ¹³	500'000 cycles					
Shelf Life ¹⁴	3 years					

SAFETY & ENVIRONMENTAL SPECIFICATIONS

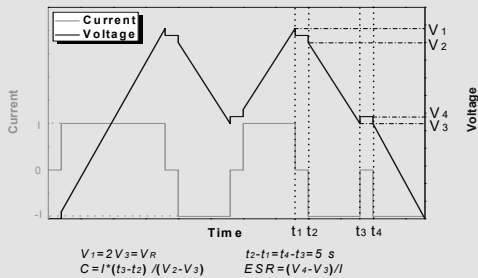
Type	C08S-3R0-0003	C10S-3R0-0005	C10S-3R0-0010	C16S-3R0-0025	C18S-3R0-0050	C22S-3R0-0100
Safety	RoHS, REACH and UL810					
Shock and vibration	MIL-STD-202, Method 213, Fig. 1, condition C; Method 204 (acc. AEC-Q200)					

PHYSICAL PARAMETERS

Type	C08S-3R0-0003	C10S-3R0-0005	C10S-3R0-0010	C16S-3R0-0025	C18S-3R0-0050	C22S-3R0-0100
Mass M	1.6 g	2.3 g	3.5 g	7.5 g	13.5 g	21.0 g
Terminals (wire leads)	Solderable ¹⁶	Solderable ¹⁶	Solderable ¹⁶	Solderable ¹⁶	Solderable ¹⁶	Solderable ¹⁶
Dimensions ¹⁷	Diameter D	8.0 mm	10.0 mm	10.0 mm	18.0 mm	22.0 mm
	Length L	20.0 mm	20.0 mm	30.0 mm	25.0 mm	45.0 mm
	Lead distance P	3.5 mm	5.0 mm	5.0 mm	7.5 mm	7.5 mm
	Lead diameter d	0.6 mm	0.6 mm	0.6 mm	0.8 mm	0.8 mm

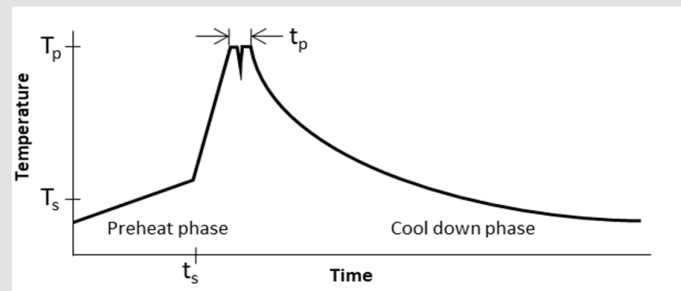
NOTES:

- 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.



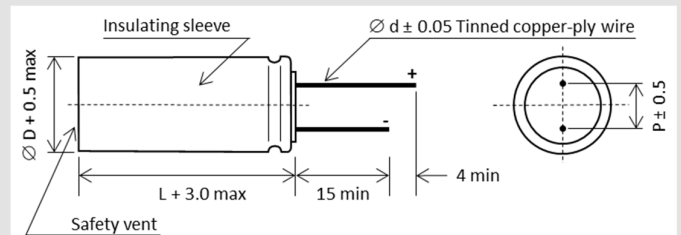
- Capacitance tolerance: Typical tolerance is +5%~+10%.
- Leakage current measurement procedure: 1) Charge the capacitor to the V_R with a constant current (0.075 A/F, if the calculated current is $>100A$, then apply 100A). 2) Hold the voltage at V_R for 72h. 3) The current to maintain V_R after 72 h is the leakage current.
- Max current: $I_{Max} = 0.5C * V_R / (\Delta t + ESR * C)$, discharge from V_R to $V_R/2$ in 1 second.
- Max constant working current: $I_{MCC} = \sqrt{\Delta T / (ESR * R_{Th})}$
- Stored energy: $E = 0.5C * V^2 / 3600$
- Energy density: $E_d = E / M$
- Matched impedance power density: $P_{dMax} = (0.25V_R^2 / ESR) / M$
- Thermal resistance ($\Delta T = 15^\circ C$): $R_{Th} = \Delta T / P$, where $P = ESR * I^2$
- DC life at high temperature HT: At $65^\circ C$ hold the capacitor charged at rated voltage for 1000h or at $85^\circ C$ at max. 2.5V for 1000h. The capacitance shall be $>70\%$ 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).
- Storage temperature: Storage in discharge state, $<35^\circ C$
- Shelf life: Stored uncharged at RT, $<50\% RH$

- Wave solder profile



Profile feature	Standard SnPb	Pb free
Preheat/soak temperature T_s	100°C	100°C
Preheat/soak time t_s	60 s	60 s
Peak temperature T_p	220 – 260°C	250 – 260°C
Time to peak temperature t_p	10s max, 5s max/wave	10s max, 5s max/wave
Ramp-down rate	2-5 K/s	2-5 K/s
Time solder process (RT to RT)	4 min	4 min

- Dimensions:



- 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
- Mounting recommendations:
- + Mounting without applying undue mechanical stress on the terminals
 - + Provide adequate spacing in between cells to secure required insulation strength
 - + Provide clearance around the safety vent and do not position anything above the safety vent that may be damaged in an event of vent rupture

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