

# Product Datasheet

## 35mm Ø Ultracapacitors

- Rated voltage 3VDC
- 330F and 360F capacitance
- Highest power density based on ultra-low ESR
- High cycle life of 1 million cycles
- Hermetically sealed cell
- Most ruggedized cell based on all laser welded design
- Radial terminals for PCB mounting



### ELECTRICAL SPECIFICATIONS

Type	C35S-3R0-0330	C35S-3R0-0360
Rated Voltage V <sub>R</sub>	3.00 V	3.00 V
Surge Voltage V <sub>S</sub> <sup>1</sup>	3.10 V	3.10 V
Rated Capacitance C <sup>2</sup>	330 F	360 F
Capacitance Tolerance <sup>3</sup>	0% / +20%	0% / +20%
ESR <sup>2</sup> (DC, 10 Hz)	<1.2 mΩ	<1.8 mΩ
ESR <sup>2</sup> (AC, 1 kHz)	<0.9 mΩ	<1.4 mΩ
Leakage Current, typical I <sub>L</sub> <sup>4</sup>	<1 mA	<1 mA
Self-discharge Rate, typical <sup>5</sup>	<20%	<20%
Constant Current ( $\Delta T = 15^\circ\text{C}$ ) <sup>6</sup>	33 A	27 A
Max Current I <sub>Max</sub> <sup>7</sup>	355 A	328 A
Short Current I <sub>S</sub> <sup>8</sup>	2.5 kA	1.7 kA
Stored Energy E <sup>9</sup>	0.4 Wh	0.45 Wh
Energy Density E <sub>d</sub> <sup>10</sup>	5.9 Wh/kg	6.3 Wh/kg
Usable Power Density P <sub>d</sub> <sup>11</sup>	13 kW/kg	8.3 kW/kg
Matched Impedance Power Density P <sub>dMax</sub> <sup>12</sup> , 10 Hz ESR	27 kW/kg	17.4 kW/kg
Matched Impedance Power Density P <sub>dMax</sub> <sup>12</sup> , 1 kHz ESR	35.7 kW/kg	22.3 kW/kg

### THERMAL CHARACTERISTICS

Type	C35S-3R0-0330	C35S-3R0-0360
Working Temperature	-40 ~ 65°C	-40 ~ 65°C
Storage Temperature <sup>13</sup>	-40 ~ 55°C	-40 ~ 55°C
Thermal Resistance R <sub>Th</sub> <sup>14</sup>	11.7 K/W	11.7 K/W
Thermal Capacitance C <sub>Th</sub> <sup>15</sup>	82 J/K	85 J/K

### LIFETIME CHARACTERISTICS

Type	C35S-3R0-0330	C35S-3R0-0360
DC Life at High Temperature, 3V and 65°C <sup>16</sup>	1500 hours	1500 hours
DC Life at RT <sup>17</sup>	10 years	10 years
Cycle Life <sup>18</sup>	1'000'000 cycles	1'000'000 cycles
Shelf Life <sup>19</sup>	4 years	4 years

### SAFETY & ENVIRONMENTAL SPECIFICATIONS

Type	C35S-3R0-0330	C35S-3R0-0360
Safety	RoHS, REACH and UL810	RoHS, REACH and UL810
Vibration	ISO 16750 table 12	ISO 16750 table 12
Shock	IEC 60068-2-27	IEC 60068-2-27

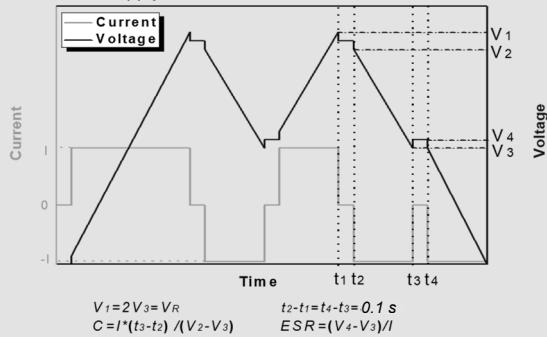
### PHYSICAL PARAMETERS

Type	C35S-3R0-0330	C35S-3R0-0360
Mass, typical M	70 g	72 g
Terminals (leads)	Solderable <sup>21</sup>	Solderable <sup>21</sup>

Dimensions <sup>20</sup>	Height	62.7 mm	62.7 mm
	Diameter	35.2 mm	35.2 mm

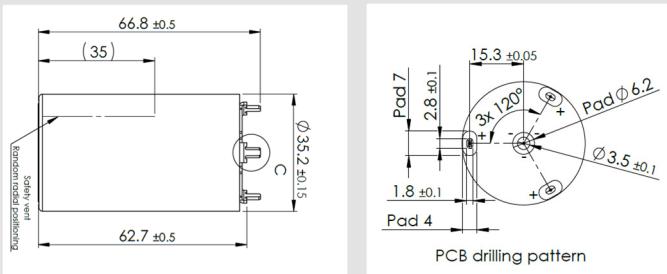
## NOTES:

- Surge voltage  $V_S$ : Absolute maximum voltage, non-repetitive. The duration must not exceed 1 second.
- Capacitance C: The test current is 0.1 A/F, if the calculated current is >100A, then apply 100A.



- Capacitance tolerance: Initially +10%~+30%.
- Leakage current measurement procedure: 1) Charge the capacitor to the  $V_R$  with a constant current (0.1 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.
- Self-discharge rate measurement procedure: 1) Charge the capacitor to  $V_R$  with a constant current (0.1 A/F, if the calculated current >100A, then apply 100A). 2) Hold the voltage at  $V_R$  for 8h. 3) Floating for 72h. 4) Measure the voltage after 72 h.
- 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:  $P_d = (0.12V_R^2 / ESR) / M$
- Matched impedance 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: For the whole capacitor
- DC life at high temperature: Hold the capacitor charged at specified voltage and temperature. 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 0.1 A/F (if the calculated current >100A, then apply 100A).
- Shelf life: Discharged and no load applied at RT.

20. Dimensions, potential indication, recommended PCB drilling pattern:



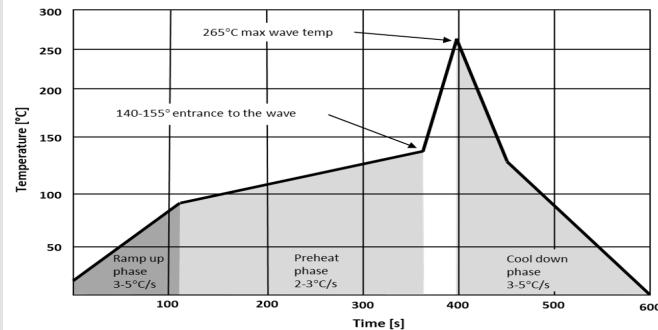
### Standard markings:

- Name of manufacturer, part number, serial number
- Rated voltage and capacitance, 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 next to the safety vent that may be damaged in an event of vent rupture

21. Recommended wave soldering profile for printed circuit assembly with use of lead-free alloy:



Total soldering process time from room temperature to peak temperature 265°C and cool down is 10 minutes max. The time to reach the required temperatures depends on the design of the application and on the power of pre-heating section of the soldering machine. All temperatures are measured on the cell leads on top of the PCB. Recommended thickness for PCB = 2.4 to 3.2 mm. Conformal coating is recommended.

Solder:	Lead-free (Sn96.5/Ag 3.0/Cu0.5) liquidus point 217°C
Recommended Flux	Kester 979T
Ramp Up Rate:	3°-5° C/sec. Max
Preheat:	140° to 155° C 2°-3° C/sec on top of board
Temperature entrance into wave:	140° to 155° C on top of board
Ramp to peak temp:	200°C/sec
Peak Temp:	265°C for 1.5 to 5 sec. Max
Cool Down Rate:	3°C-5°C /sec. Max
Conveyor Speed:	40-50 cm/min

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