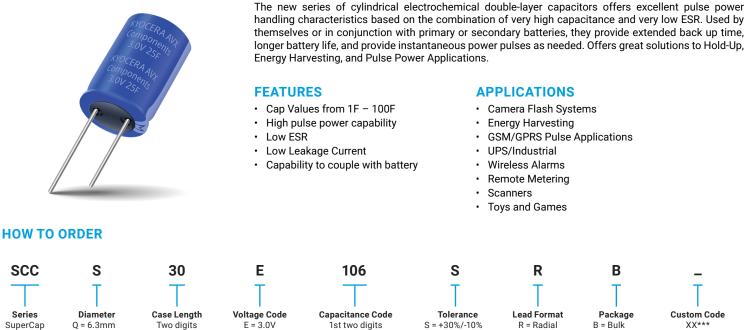
3.0V SCC Series High Capacitance Cylindrical SuperCapacitors





Q = 6.3mm R = 8mm S = 10 mmT = 12.5mm U = 16mm V = 18mm

Cylindrical

Two digits represent case length in mm



1st two digits represent significant figures 3rd digit represents multiplier (number of zeros to follow)

S = +30%/-10%

B = Bulk T = Tray**

XX***

Inquire about availability * Inquire about availability for Bend and Trimming

QUALITY INSPECTION

Parts are tested for Life Cycle, high temperature load life, temperature characteristics, vibration resistance, and humidity characteristics. See page 2 for more information.

TERMINATION

These SuperCapacitors are compatible with hand soldering and wave soldering processes, so long as appropriate precautions are followed. See page 4 for more information.

OPERATING TEMPERATURE

-40°C to +65°C @ 3.0V -40°C to +85°C @ 2.5V



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3.0V SCC Series High Capacitance Cylindrical SuperCapacitors

RATINGS & PART NUMBER REFERENCE

Part Number	Diameter (mm)	Length (mm)	Rated Capacitance (F)	Capacitance Tolerance	Rated Voltage (V)	Rated Temperature (°C)	DCL Max @ 72 Hrs (µA)	ESR Max @ 1000 Hz (mΩ)	ESR Max @ DC (mΩ)	Peak Current (A)	Power Density (W/kg)	Max Energy (Wh)	Energy Density (Wh/kg)
	Radial Lead												
SCCR12E105SRB	8	12	1	+30%/-10%	3.0/2.5*	65/85*	6	180	860	0.81	1322	0.0013	1.32
SCCR16E205SRB	8	16	2	+30%/-10%	3.0/2.5*	65/85*	10	100	360	1.74	2609	0.0025	2.17
SCCR20E335SRB	8	20	3.3	+30%/-10%	3.0/2.5*	65/85*	12	95	280	2.57	2660	0.0041	2.84
SCCR25E505SRB	8	25	5	+30%/-10%	3.0/2.5*	65/85*	15	85	220	3.57	2888	0.0063	3.68
SCCS20E505SRB	10	20	5	+30%/-10%	3.0/2.5*	65/85*	15	70	170	4.05	3025	0.0063	2.98
SCCS25E705SRB	10	25	7	+30%/-10%	3.0/2.5*	65/85*	24	60	150	5.12	2769	0.0088	3.37
SCCS30E106SRB	10	30	10	+30%/-10%	3.0/2.5*	65/85*	30	50	75	8.57	4645	0.0125	4.03
SCCT20E106SRB	12.5	20	10	+30%/-10%	3.0/2.5*	65/85*	30	50	75	8.57	4235	0.0125	3.68
SCCT30E156SRB	12.5	30	15	+30%/-10%	3.0/2.5*	65/85*	50	40	60	11.84	4000	0.0188	4.17
SCCU25E256SRB	16	25	25	+30%/-10%	3.0/2.5*	65/85*	60	27	50	16.67	2959	0.0313	4.28
SCCU30E356SRB	16	30	35	+30%/-10%	3.0/2.5*	65/85*	72	20	40	21.88	3103	0.0438	5.03
SCCV40E506SRB	18	40	50	+30%/-10%	3.0/2.5*	65/85*	75	18	20	37.50	4154	0.0625	4.81
SCCV60E107SRB	18	60	100	+30%/-10%	3.0/2.5*	65/85*	260	15	18	53.57	2904	0.1250	6.05

*with appropriate voltage derating operating temperature can be extended to 85°C

Capacitance Tolerance Code	P**	S	М	К	R	E
Tolerance	0%~+100%	-10%~+30%	±20%	±10%	0%~20%	-10%~0%

**Inquire about availability

QUALIFICATION TEST SUMMARY

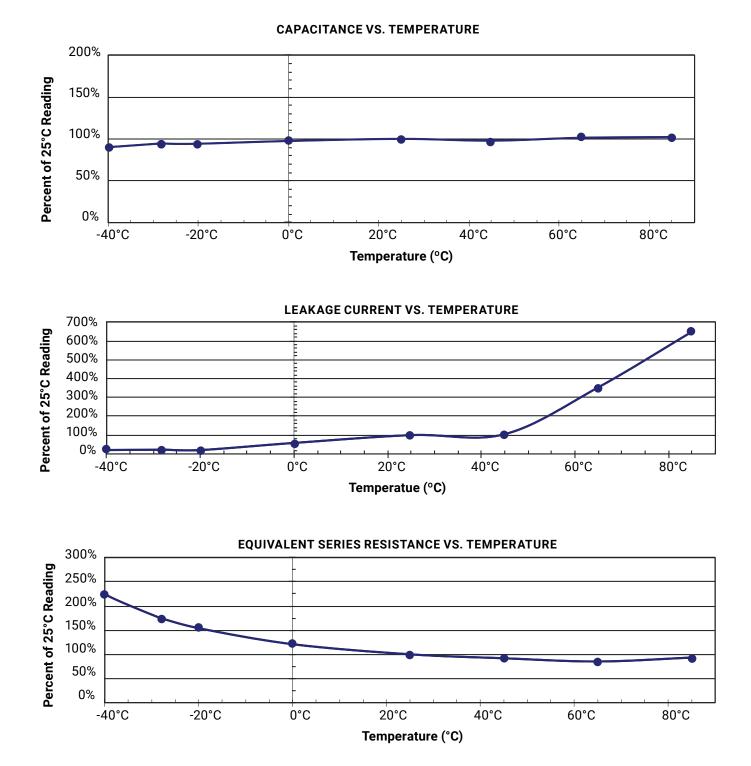
Test	Test Method	Parameter	Limits
Life Cycle	Capacitors are cycled between rated voltage and half-rated voltage under constant current at +25°C for 500,000 cycles	Capacitance ESR Appearance	≥70% of spec value ≤200% of spec value No remarkable defects
High Temperature Load Life	Temperature: +65°C Voltage: Rated Voltage Test Duration: 1,000 hours	Capacitance ESR Appearance	≥70% of spec value ≤200% of spec value No remarkable defects
Storage Temperature Characteristics	Storage Duration: 2 years No Load Temperature: +35°C	Capacitance ESR Appearance	≥70% of spec value ≤200% of spec value No remarkable defects
Vibration Resistance	Frequency: 10 ~ 55Hz		≥70% of spec value ≤200% of spec value No remarkable defects
Humidity	Humidity Fumidity Humidity Femperature: +60°C Test Duration: 1,000 hours		≥70% of spec value ≤200% of spec value No remarkable defects

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QUALITY AND RELIABILITY

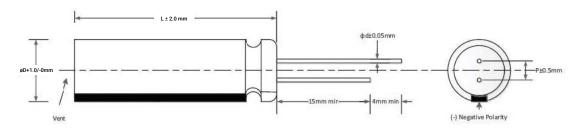


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MECHANICAL SPECIFICATIONS

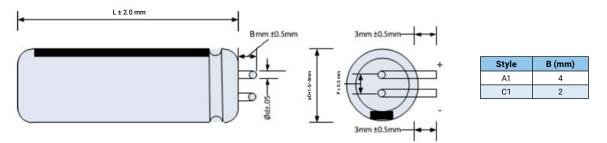
RADIAL LEAD TYPE 1F - 100F



P (mm)	d (mm)		
2.3	0.6		
3.2	0.6		
5.0	0.6		
5.5	0.6*		
7.3	0.8		
8.0	0.8		
	2.3 3.2 5.0 5.5 7.3		

*For parts with Diameter (D)=12.5mm: If Length \leq 30mm, Lead Diameter (d)=0.6mm If Length \geq 35mm, Lead Diameter (d)=0.8mm

RADIAL BENT LEAD TYPE



SOLDERING RECOMMENDATIONS

When soldering SuperCapacitors to a PCB, the temperature & time that the body of the SuperCapacitor sees during soldering can have a negative effect on performance. We advise following these guidelines:

- Do not immerse the SuperCapacitors in solder. Only the leads should come in contact with the solder.
- Ensure that the body of the SuperCapacitor is never in contact with the molten solder, the PCB or other components during soldering.
- Excessive temperatures or excessive temperature cycling during soldering may cause the safety vent to burst or the case to shrink or crack, potentially damaging the PCB or other components, and significantly reduce the life of the capacitor.

PRECAUTION: For all products with shrink wrap sleeves, washing in any type of cleaning agent is prohibited. During all soldering processes, it's recommended to protect the shrink wrap from any kind of liquid (including but not limited to: water, strong acid, strong alkali, strong oxidizing solutions, and strong solvents) to avoid the risk of damage, cracking, and fading of the outer shrink wrap.

HAND SOLDERING

Keep distance between the SuperCapacitor body and the tip of the soldering iron and the tip should never touch the body of the capacitor. Contact between SuperCapacitor body and soldering iron will cause extensive damage to the SuperCapacitor, and change its electrical properties. It is recommended that the soldering iron temperature should be less than 350°C, and contact time should be limited to less than 4 seconds. Too much exposure to terminal heat during soldering can cause heat to transfer to the body of the SuperCapacitor, potentially damaging the electrical properties of the SuperCapacitor.

WAVE SOLDERING/ SELECTIVE WAVE SOLDERING

Only use wave soldering or selective wave soldering on Radial type SuperCapacitors. The PCB should be preheated only from the bottom and for less than 60 seconds, with temperature at, or below, 100°C on the top side of the board for PCBs equal to or greater than 0.8 mm thick.

Wave Soldering						
Solder Temperature (°C)	Suggested Solder Time (s)	Maximum Solder Time (s)				
220	7	9				
240	7	9				
250	5	7				
260	3	5				

Selective Wave Soldering						
Solder Temperature (°C)	Suggested Solder Time (s)	Maximum Solder Time (s)				
290	2	4				

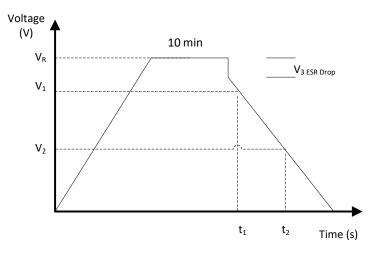
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TEST METHODS

IEC CAPACITANCE TEST METHOD

Procedure: Charge module under constant current to rated voltage at room temperature, then hold 10 minutes on charge under constant voltage. After 10 minutes, discharge under constant current (as shown in chart below), recording voltage at V₁, V₂, and time intervals at t₁ and t₂. Use the capacitance formula to determine cap value.



- I Discharge Current, $4 \times C \times V_{R}$ (mA)
- V_P Rated Voltage (V)
- V_1 Initial Test Voltage, 80% Of V_p (V)
- V₂ Final Test Voltage, 40% Of V_P (V)
- t₁ Initial Test Time (s)
- T₂ Final Test Time (s)

$$C = \frac{I \times (t_2 - t_1)}{V1 - V2}$$

DC ESR MEASUREMENT

A six-step $\text{ESR}_{\scriptscriptstyle DC}$ test method is illustrated to the right and carried out as follows:

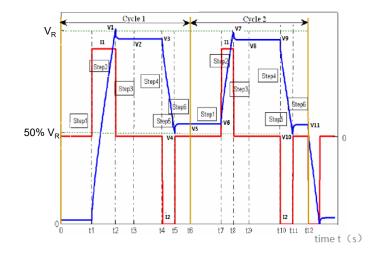
- Rest 10 Seconds ٠
- Charge under constant current (I_1) to rated voltage (V_R)
- Rest 5 seconds
- Rest 10 seconds, record $\rm V_{_3}$ and $\rm t_{_4}$
- Discharge under constant current (I₂) to half rated voltage, Record I₂, V₄, And t₅

- Rest 2 seconds, record V₅ And t₆ Repeat steps 1-6 recording \mathring{I} , V, And t accordingly, finally discharging to below 0.1V under constant current (I_2) .

Formulas to calculate:

- Two cycle discharge capacitances: $C_{dch1} = I_2 \times \frac{(t_5 t_4)}{V_3 V_4}$; $C_{dch2} = I_2 \times \frac{(t_{11} t_{10})}{(V_9 V_{10})}$
- Discharge capacitance: $C_{dch} = \frac{(C_{dch1} + C_{dch2})}{2}$
- Two cycle discharge DC ESR: $ESR_{dch1} = \frac{(V_5 V_4)}{I_2}; ESR_{dch2} = \frac{(V_{11} V_{10})}{I_2}$ Discharge DC ESR: $ESR_{dch} = \frac{(ESR_{dch1} + ESR_{dch2})}{2}$

Note: I, = I_g = 75mA/F, the rated capacitance in the chart means discharge capacitance, and DC ESR (ESR_{pc}) means discharge DC resistance.



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TEST METHODS (continued)

MAXIMUM CONTINUOUS CURRENT

• This is the maximum current when temperature rise of the supercapacitor during its operation is less than 15°C

MAXIMUM PEAK CURRENT

• This is the maximum current during 1 second time interval (dt)

WATT DENSITY

• Watt Density = $(0.12*V^2 / R_{pc}) / mass$

ENERGY DENSITY

• Energy Density = (1/2 CV²) / (3600*mass)

POLARITY AND REVERSE VOLTAGE

For product consistency and optimum performance, it is recommended that the capacitor be connected with polarity indicated. Reversing polarity could result in permanent damage to the circuit including much higher leakage current for a short duration of time and the life time of the supercapacitors will be reduced.

LIFE TIME AND TEMPERATURE PERFORMANCE

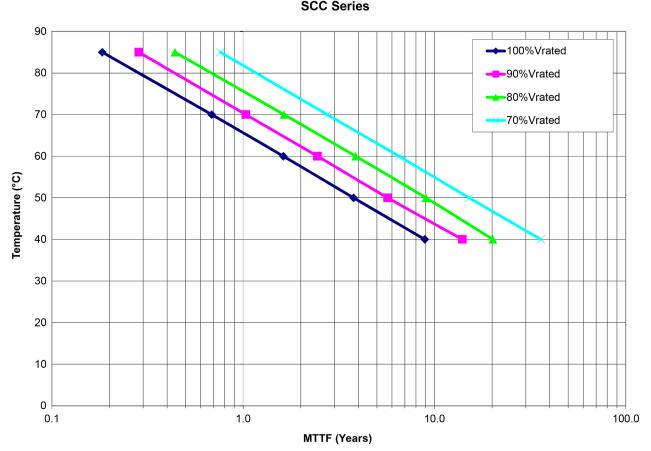
The life of a supercapacitor is impacted by a combination of operating voltage and the operating temperature according to the following Time to Failure equation:

 $t \propto V^n \times e^{\left(\frac{-Q}{kT}\right)}$

where V is the operating voltage, Q is the activation energy in electron volts (eV), k is the Boltzmann constant in eV, and T is the operating temperature in Kelvin (K). Typical values for the voltage exponent, n, is between 2.5-3.5, and Q is between 1.0-1.2 eV in the normal operating temperature range of -40° to 65° C.

The industry standard for supercapacitor end of life is when the equivalent series resistance, ESR, increases to 200% of the specified value and the capacitance drops by 30% from specified value. Typically a supercapacitor shows an initial "jump" in the ESR value and then levels off. If the supercapacitors are exposed to excessive temperatures the ESR will show a continuous degradation (increase). In the extreme case, if the temperature or voltage are substantially higher than the rated specifications, this could result in the part venting and the product showing a faster degradation of capacitance and ESR, which may be many times the specified value.

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Expected Lifetime at Various Voltages SCC Series

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