DATA SHEET

PRODUCTS	**Green-Cap** (Electric Double Layer Capacitor)
ITEM	DM 100V 10F Part No. DM10000100W01036
REMARK	

COMPANY	SAMWHA ELECTRIC
TEL	82-43-261-0200
ADDRESS	3, Bongmyeong-ro, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, Korea

DATA SHEET

Green-Cap

- Green-Cap is brand of SAMWHA's electric double layer capacitor(EDLC).
- Electric double layer capacitor(EDLC) is a next generation energy storage device.

DM10000100W01036

FEATURE

- 100V Operating Voltage
- High Power Density
- Low Internal Resistance
- Rapid charge and discharge
- Passive + Active Balancing and Overvoltage Protection of Individual Cell
- Overvoltage Alarm of Individual Cell

PRODUCT SPECIFICATION

Rated Voltage	Max Operating Voltage	Capacitance (F)	ESR, 1kHz (mΩ)	ESR, DC (mΩ)	Total Energy (Wh)	Max. Continuous Current (A)	Max Peak Current (A)	Self-discharge (%of initial V)	Weight (kg)	Dimension L x W x H (㎜)
100	108.0	10.0	126.0	180.0	13.91	22.9	178.7	50%; 10hours	8.0	290x109x268

PRODUCT CHARACTRISTIC

CAPACITANCE		
Nominal Capacitance		10.0F
Capacitance tolerance		0 ~ +20%
VOLTAGE		
Rated voltage		100 V
Max. operating voltage		108 V
TEMPERATURE		
Operating temperature range		-40~+65℃
Storage temperature range		-40~+70℃
Temperature characteristics	Capacitance change	±5% (at 20℃)
	Internal resistance	±50% (at 20℃)
INTERNAL RESISTANCE		
AC ESR (1Khz)		< 126.0 mΩ
DC ESR		< 180.0 mΩ
CURRENT		
Maximum continuous current		22.9 A
Maximum peak current (1 sec.)		178.7 A
Self-discharge (10hours RT;12hours charge and hold)		50%

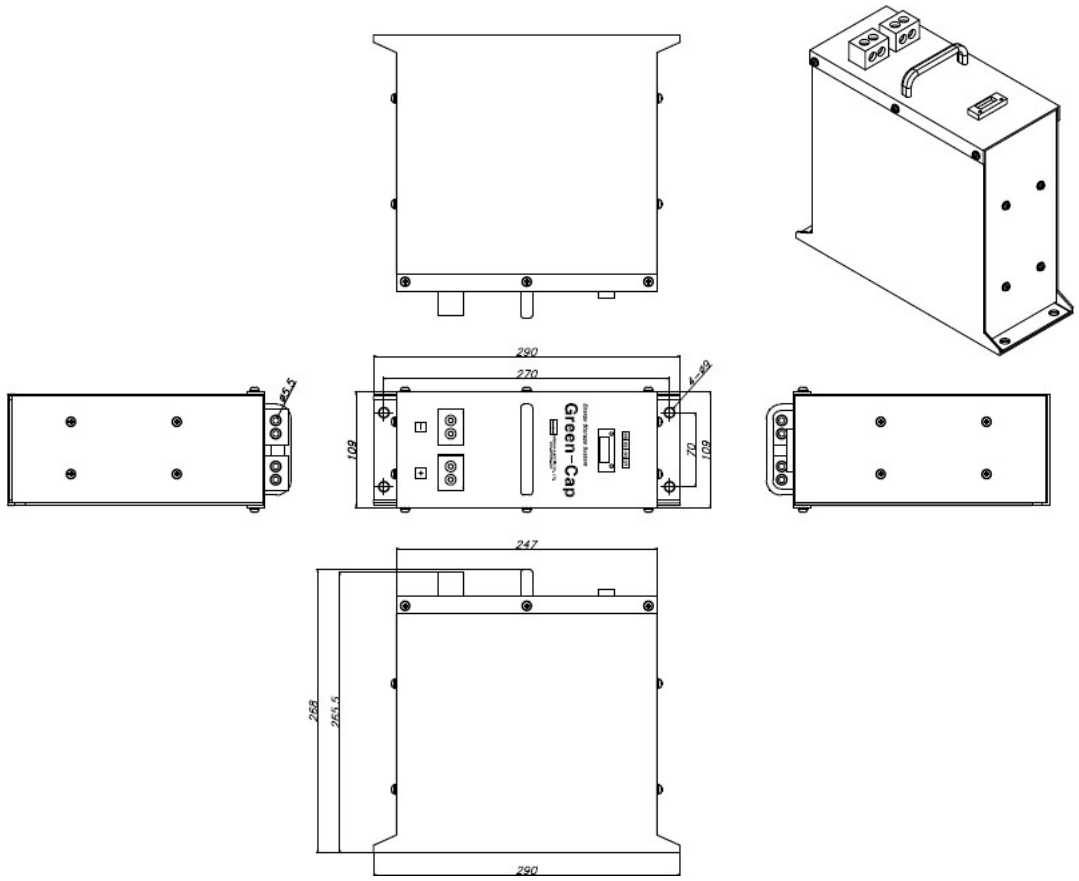
ENDURANCE	
Endurance After 1,500hr application of rated voltage at 65℃	
Capacitance change	Within ±30% of specified value
Internal resistance	Within 100% of specified value
Life test After 10 years at rated voltage and 25℃	
Capacitance change	< 30%
Internal resistance	< 100%
CYCLES	
Capacitors cycles between rated voltage under constant current at 25℃ (500,000cycles)	
Capacitance change	< 30%
Internal resistance	< 100%

SINGLE CELL PRODUCT CHARACTRISTIC

CAPACITANCE		
Nominal Capacitance		360F
Capacitance tolerance		0 ~ +20%
VOLTAGE		
Rated voltage		3.0 V
Surge voltage		3.2 V
TEMPERATURE		
Operating temperature range		-40~+65℃
Storage temperature range		-40~+70℃
Temperature characteristics	Capacitance change	±5% (at 20℃)
	Internal resistance	±50% (at 20℃)
RESISTANCE		
AC ESR (1KHz)		< 3.2 mΩ
DC ESR		< 3.8 mΩ
SIZE		
Weight (g)		71
Dimension (ΦxH) (mm)		35 x 60

ENDURANCE	
Endurance After 1,500hr application of rated voltage at 65℃	
Capacitance change	Within ±30% of specified value
Internal resistance	Within 100% of specified value
Life test **After 10 years at rated voltage and 25℃**	
Capacitance change	< 30%
Internal resistance	< 100%
CYCLES	
Capacitors cycles between rated voltage under constant current at 25℃ (500,000cycles)	
Capacitance change	< 30%
Internal resistance	< 100%

Dimension



L(mm)	W(mm)	H(mm)	Weight(kg)
290±1.0	109±1.0	268±2.0	8

PERFORMANCE

Test environmental conditions

- Ambient temperature : 25±2℃, Relative humidity : 60~70%, Air pressure : 86~106kPa

<table>
<tr><th>No</th><th>ITEM</th><th>TEST CONDITION</th><th>SPECIFICATION</th></tr>
<tr><td>1</td><td>Rated voltage</td><td></td><td>See the table “PRODUCTS CHARACTRISTIC”</td></tr>
<tr><td>2</td><td>Capacitance (tolerance)</td><td>To see measure method (See No. 11)</td><td>See the table “PRODUCTS CHARACTRISTIC”</td></tr>
<tr><td>3</td><td>Internal resistance</td><td>To see measure method (See No. 12)</td><td>See the table “PRODUCTS CHARACTRISTIC”</td></tr>
<tr><td>4</td><td>Temperature characteristics</td><td>
<table>
<tr><th>STEP</th><th>TEMPERATURE(℃)</th><th>TIME</th></tr>
<tr><td>1</td><td>20 ±2</td><td></td></tr>
<tr><td>2</td><td>-40 ±2</td><td>2hr</td></tr>
<tr><td>3</td><td>20 ±2</td><td>15 min</td></tr>
<tr><td>4</td><td>65 ±2</td><td>2 hr</td></tr>
</table>
Step-1
Capacitance, ESR and leakage current shall be measured.
Step-2, 4
After the capacitor being stored for 2hours, capacitance and ESR and leakage current shall be measured.
Step-3
After the capacitor being stored for 15min, capacitance and ESR and leakage current shall be measured.
</td><td>• Capacitance change within ±5% of initial value
• Internal resistance change ≤50% of initial value
• Leakage current ≤ specified value</td></tr>
</table>

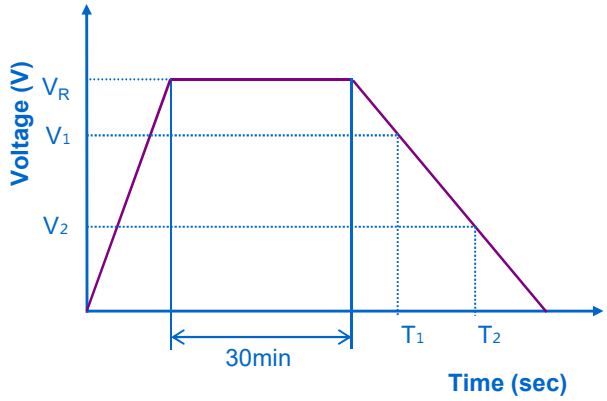
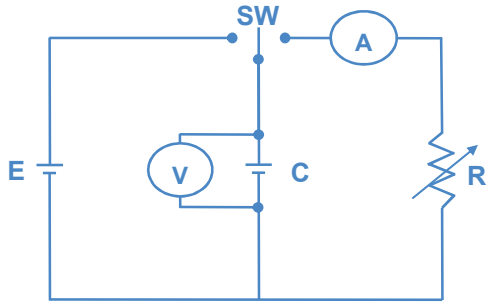
PERFORMANCE

Test environmental conditions

- Ambient temperature : 25±2℃, Relative humidity : 60~70%, Air pressure : 86~106kPa

<table>
<tr><th>No</th><th>ITEM</th><th>TEST CONDITION</th><th>SPECIFICATION</th></tr>
<tr><td>5</td><td>Endurance</td><td>• Temperature : 65℃ ±2℃
• Applied voltage : rated voltage
• Duration : 1500 +72/-0 hours</td><td>• No visible damage
• Capacitance change within ±30% of specified value
• Internal resistance change ≤ 100% of specified value
• Leakage current ≤ specified value</td></tr>
<tr><td>6</td><td>Shelf life</td><td>•Temperature : 70℃ ±2℃
• Duration : 1500 +72/-0 hours</td><td>• No visible damage
• Capacitance change within ±30% of specified value
• Internal resistance change ≤ 100% of specified value
• Leakage current ≤ specified value</td></tr>
<tr><td>7</td><td>Cycle life</td><td><table><tr><th>STEP</th><th>VOLTAGE(V)</th><th>TIME (sec.)</th></tr><tr><td>1</td><td>Charge to Rated Voltage</td><td>20 ± 1</td></tr><tr><td>2</td><td>Rest to Rated Voltage</td><td>10 ± 0.5</td></tr><tr><td>3</td><td>Discharge to Rated Voltage ×1/2</td><td>about(20 ± 1)</td></tr><tr><td>4</td><td>Rest to Rated Voltage ×1/2</td><td>10 ± 0.5</td></tr></table>• Cycle : 500,000 cycles</td><td>• No visible damage
• Capacitance change within ±30% of specified value
• Internal resistance change ≤ 100% of specified value
• Leakage current ≤ specified value</td></tr>
<tr><td>8</td><td>Damp heat
(steady state)</td><td>• Temperature : 40±2℃
• Relative humidity : 90%~95%
• Duration : 240±8 hours</td><td>• No visible damage
• Capacitance change within ±30% of specified value
• Internal resistance change ≤ 100% of specified value
• Leakage current ≤ specified value</td></tr>
</table>

Measuring Method Of Characteristics

9	Capacitance	1) Charging is performed by constant current followed by constant voltage charging. 2) Charging is performed for duration of 30 minutes at rated voltage. 3) Discharge use a constant current load device and measure the time for the terminal voltage to drop from V_1 to V_2 upon discharge at 4 x C x V mA. ($V_1 = 0.8 \times V_R$, $V_2 = 0.4 \times V_R$) 4) The capacitance can be obtained by the following equation. $C = \frac{I \times (T_2 - T_1)}{V_1 - V_2} (F)$  
10	ESR	The AC Resistance is used. 1) The Frequency of the measuring voltage shall be 1kHz. 2) The AC current shall be from 1 to 10mA.

• **Please contact SAMWHA Green-Cap directly for any technical specifications critical to application.**

Measuring Method Of Characteristics		
11	**Power Cable Connection**	1) Confirm cleanness of compression terminal. 2) Connecting a power cable, use standard size nut and spring washer. 3) A screw should be tightened with standard torque according to 'bolt' and 'nut' size. 4) Confirm the polarity of cable for correct connection.
12	**Caution**	1) In case more than two Green-Cap modules are connected in series, use capacitor module of the same specification supplied by the same company This is to prevent unbalances resulting from difference of capacitance and leakage current of Module. 2) In case more than two Green-Cap modules are connected in Series, each module should be connected together with equivalent voltage(0V) after those modules are discharged completely. 3) If the outside of a Module is wet, Do not touch it. 4) Never touch both capacitor terminals at the same time. 5) Do not open the case of Green-Cap Module. 6) Operate the Green-Cap module under the guaranteed range. 7) Before the module is stored, discharge the module completely, then Short the terminal.