

DATA SHEET

| | |
|----------|--|
| PRODUCTS | Green-Cap (Electric Double Layer Capacitor) |
| ITEM | DS 2.7V 5F (Ø10 × L20) Part No. DS5U505W10020BB |
| REMARK | |
| COMPANY | SAMWHA ELECTRIC |
| TEL | 82-43-261-0200 |
| ADDRESS | 3, Bongmyeong-ro, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, Korea |

Approved by *k. c. Eom*



Technical team manager

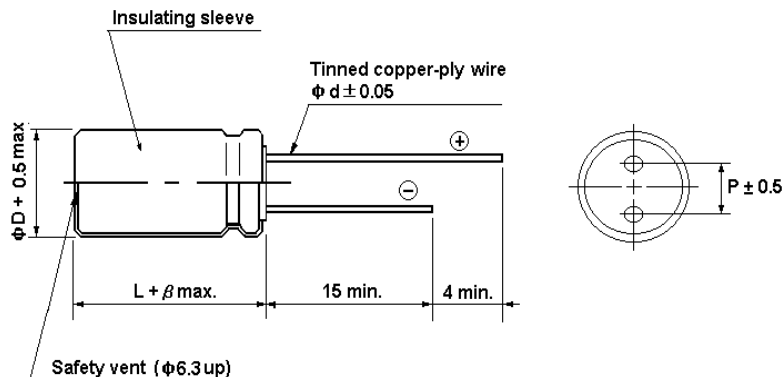
- Green-Cap is brand of SAMWHA's electric double layer capacitor(EDLC).
- Electric double layer capacitor(EDLC) is a next generation energy storage device.

DS5U505W10020BB

FEATURE

- Endurance : 2.7V 65°C 1000hours
- The small size and high capacitance, low resistance
- Charge and discharge efficiency are higher than in batteries

DIMENSIONS



| ϕD | L | P | ϕd | β |
|----------|----|-----|----------|---------|
| 10 | 20 | 5.0 | 0.6 | 2.0 |

PRODUCTS SPECIFICATION

| Rated Voltage | Capacitance (F) | ESR, 1kHz (m Ω) | ESR, DC (m Ω) | L/C(72hr) (mA Max.) | Specific Energy | | Weight (g) | Volume (m ℓ) | Dimension $\phi D \times L$ (mm) |
|---------------|-----------------|-------------------------|-----------------------|---------------------|-----------------|--------|------------|--------------------|----------------------------------|
| | | | | | (Wh/kg) | (Wh/L) | | | |
| 2.7 | 5 | 45 | 60 | 0.014 | 2.41 | 3.22 | 2.1 | 1.6 | 10 \times 20 |

PRODUCTS CHARACTERISTIC

| CAPACITANCE | |
|--|----------------|
| Nominal Capacitance | 5 F |
| Capacitance tolerance | 0 ~ +20% |
| VOLTAGE | |
| Rated voltage | 2.7V |
| Surge voltage | 2.85V |
| TEMPERATURE | |
| Operating temperature range | -40~+65°C |
| Storage temperature range | -40~+65°C |
| Temperature characteristics | |
| Capacitance change | ±5% (at 20°C) |
| Internal resistance change | ±50% (at 20°C) |
| RESISTANCE | |
| AC ESR(1KHz) | 45 mΩ |
| DC ESR | 60 mΩ |
| CURRENT | |
| Leakage current After 72hr at 25°C. Initial leakage current can be higher. | 0.014 mA |
| Maximum continuous current | 0.33A |
| Maximum peak current (1 sec.) | 5.2 A |

| ENDURANCE | |
|--|--------------------------------|
| Endurance After 1,000hr application of rated voltage at 65°C | |
| Capacitance change | Within ±30% of specified value |
| Internal resistance change | Within 100% of specified value |
| Life test After 10 years at rated voltage and 25°C | |
| Capacitance change | < 30% |
| Internal resistance change | < 100% |
| CYCLES | |
| Capacitors cycles between rated voltage under constant current at 25°C (500,000cycles) | |
| Capacitance change | < 30% |
| Internal resistance change | < 100% |
| MARKING | |
| SAMWHA trade mark & series identification | |
| Rated voltage | |
| Capacitance value (Marking) | |
| Sleeve color : Black | |
| Print color : Gold | |

PERFORMANCE

Test environmental conditions

- Ambient temperature : $25 \pm 2^{\circ}\text{C}$, Relative humidity : 60~70%, Air pressure : 86~106kPa

| No | ITEM | TEST CONDITION | SPECIFICATION | | | | | | | | | | | | | | | |
|------|--|--|--|-----------------------------------|------|---|------------|--|---|-------------|-----|---|------------|--------|---|------------|------|--|
| 1 | Rated voltage | | See the table "PRODUCTS CHARACTERISTIC" | | | | | | | | | | | | | | | |
| 2 | Capacitance (tolerance) | To see measure method (See No. 11) | See the table "PRODUCTS CHARACTERISTIC" | | | | | | | | | | | | | | | |
| 3 | Internal resistance | To see measure method (See No. 12) | See the table "PRODUCTS CHARACTERISTIC" | | | | | | | | | | | | | | | |
| 4 | Leakage current (After 72hr at 25°C) | To see measure method (See No. 13) | See the table "PRODUCTS CHARACTERISTIC" | | | | | | | | | | | | | | | |
| 5 | Temperature characteristics | <table border="1"> <thead> <tr> <th>STEP</th> <th>TEMPERATURE($^{\circ}\text{C}$)</th> <th>TIME</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>Step-1 Capacitance, ESR and leakage current shall be measured.</p> <p>Step-2, 4 After the capacitor being stored for 2hours, capacitance and ESR and leakage current shall be measured.</p> <p>Step-3 After the capacitor being stored for 15min, capacitance and ESR and leakage current shall be measured.</p> | STEP | TEMPERATURE($^{\circ}\text{C}$) | TIME | 1 | 20 ± 2 | | 2 | -40 ± 2 | 2hr | 3 | 20 ± 2 | 15 min | 4 | 65 ± 2 | 2 hr | <ul style="list-style-type: none"> Capacitance change within $\pm 5\%$ of initial value Internal resistance change $\leq 50\%$ of initial value Leakage current \leq specified value |
| STEP | TEMPERATURE($^{\circ}\text{C}$) | TIME | | | | | | | | | | | | | | | | |
| 1 | 20 ± 2 | | | | | | | | | | | | | | | | | |
| 2 | -40 ± 2 | 2hr | | | | | | | | | | | | | | | | |
| 3 | 20 ± 2 | 15 min | | | | | | | | | | | | | | | | |
| 4 | 65 ± 2 | 2 hr | | | | | | | | | | | | | | | | |
| 6 | Resistance to soldering heat | <ul style="list-style-type: none"> Solder : HSE-02 SR-34 Flux : 25% by weight of rosin in methanol Solder temperature : $260 \pm 5^{\circ}\text{C}$ Immersion depth : 2.0 mm Immersion speed : 25 ± 2.5 mm/sec. | <ul style="list-style-type: none"> No visible damage Capacitance change within $\pm 10\%$ of initial value Internal resistance change $\leq 20\%$ of initial value Leakage current \leq specified value | | | | | | | | | | | | | | | |

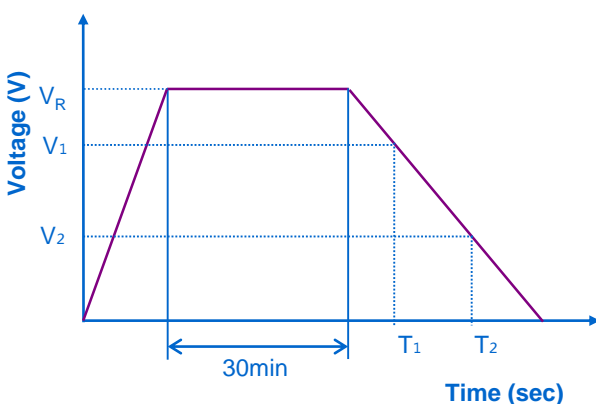
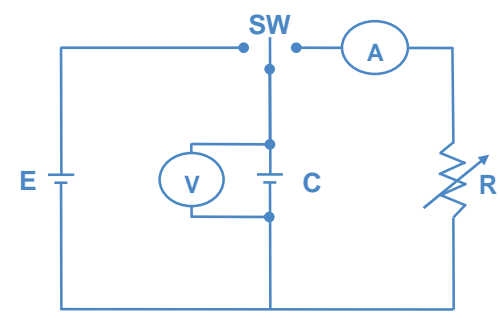
PERFORMANCE

Test environmental conditions

- Ambient temperature : $25 \pm 2^\circ\text{C}$, Relative humidity : 60~70%, Air pressure : 86~106kPa

| No | ITEM | TEST CONDITION | SPECIFICATION | | | | | | | | | | | | | | | |
|------|---|--|---|------------|-------------|---|-------------------------|------------|---|-----------------------|--------------|---|---|---------------------|---|------------------------------------|--------------|---|
| 7 | Endurance | <ul style="list-style-type: none"> • Temperature : $65^\circ\text{C} \pm 2^\circ\text{C}$ • Applied voltage : rated voltage • Duration : 1000 +72/-0 hours | <ul style="list-style-type: none"> • No visible damage • Capacitance change within $\pm 30\%$ of specified value • Internal resistance change $\leq 100\%$ of specified value • Leakage current \leq specified value | | | | | | | | | | | | | | | |
| 8 | Shelf life | <ul style="list-style-type: none"> • Temperature : $65^\circ\text{C} \pm 2^\circ\text{C}$ • Duration : 1000 +72/-0 hours | <ul style="list-style-type: none"> • No visible damage • Capacitance change within $\pm 30\%$ of specified value • Internal resistance change $\leq 100\%$ of specified value • Leakage current \leq specified value | | | | | | | | | | | | | | | |
| 9 | Cycle life | <table border="1"> <thead> <tr> <th>STEP</th> <th>VOLTAGE(V)</th> <th>TIME (sec.)</th> </tr> </thead> <tbody> <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 $\times 1/2$</td> <td>about(20 ± 1)</td> </tr> <tr> <td>4</td> <td>Rest to Rated Voltage $\times 1/2$</td> <td>10 ± 0.5</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Cycle : 500,000 cycles | STEP | VOLTAGE(V) | TIME (sec.) | 1 | Charge to Rated Voltage | 20 ± 1 | 2 | Rest to Rated Voltage | 10 ± 0.5 | 3 | Discharge to Rated Voltage $\times 1/2$ | about(20 ± 1) | 4 | Rest to Rated Voltage $\times 1/2$ | 10 ± 0.5 | <ul style="list-style-type: none"> • No visible damage • Capacitance change within $\pm 30\%$ of specified value • Internal resistance change $\leq 100\%$ of specified value • Leakage current \leq specified value |
| STEP | VOLTAGE(V) | TIME (sec.) | | | | | | | | | | | | | | | | |
| 1 | Charge to Rated Voltage | 20 ± 1 | | | | | | | | | | | | | | | | |
| 2 | Rest to Rated Voltage | 10 ± 0.5 | | | | | | | | | | | | | | | | |
| 3 | Discharge to Rated Voltage $\times 1/2$ | about(20 ± 1) | | | | | | | | | | | | | | | | |
| 4 | Rest to Rated Voltage $\times 1/2$ | 10 ± 0.5 | | | | | | | | | | | | | | | | |
| 10 | Damp heat (steady state) | <ul style="list-style-type: none"> • Temperature : $40 \pm 2^\circ\text{C}$ • Relative humidity : 90%~95% • Duration : 240 ± 8 hours | <ul style="list-style-type: none"> • No visible damage • Capacitance change within $\pm 30\%$ of specified value • Internal resistance change $\leq 100\%$ of specified value • Leakage current \leq specified value | | | | | | | | | | | | | | | |

Measuring Method Of Characteristics

| | | |
|----|-----------------|---|
| 11 | Capacitance | <p>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 1mA/F. ($V_1 = 0.8 \times V_R$, $V_2 = 0.4 \times V_R$) 4) The capacitance can be obtained by the following equation.</p> $C = \frac{I \times (T_2 - T_1)}{V_1 - V_2} \text{ (F)}$   |
| 12 | ESR | <p>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.</p> |
| 13 | Leakage current | <p>1) Charging is performed by constant current followed by constant voltage charging 2) Charging is performed for duration of 72 hours at rated voltage. 3) Then, Leakage current is measured by current measurement equipment.</p> |

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