



DATA SHEET

| | |
|--------------------|---|
| NAME | HYBRID CAPACITOR |
| ITEM | 2.8V 250F(Ø22 × L45) Part No. CL2R8257W22045SNBLT |
| APPLICATION | - |
| REMARK | - |
| COMPANY | SAMWHA CAPACITOR |
| TEL | 82 31 330 5922 |
| ADDRESS | 227, Gyeonggidong-ro, Namsa-myeon, Cheoin-gu, Youngin-si, Gyeonggi-do, Korea |

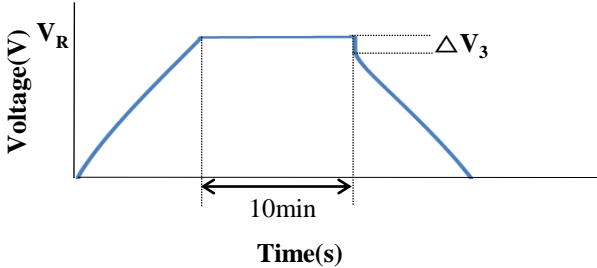
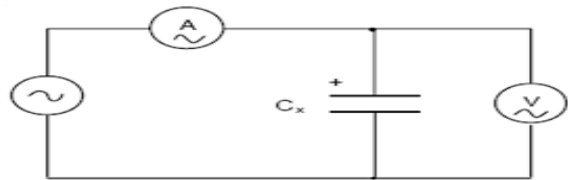


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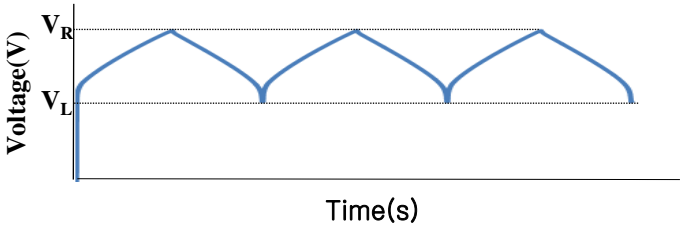
| Item | Unit | Specification |
|--|-------------|---------------------------------|
| Capacitance (25℃) | F | 250 |
| Capacity(25℃, 2.8~1.6V) | Ah | 0.09 |
| Usable Energy Density(25℃, 2.8~1.6V) | Wh | 0.17 |
| Rated Voltage, V_R | V | 2.8 |
| Max. Current | A | 3 |
| ESR (DC / AC,1kHz) | mΩ | <19 / <14 |
| Usable Specific Power(P_d) | W/kg | 2550 |
| Dimensions | mm | 22Φ x 45mm |
| Weight | kg | 0.019 |
| Operating Temperature Range | ℃ | -20 ~ +40 |
| Capacitance Change | % | Within ±40% of initial value |
| Internal Resistance Change | % | Less than 200% of initial value |
| Max. Leakage Current, L_C (after 72h) | mA | <0.9 |
| Cycle Life(25℃) | cycle | 50,000 |

1. Electrical Performance

| No | Item | Unit | Specification | Test Conditions and Methods |
|----|-------------------------------|------|---------------|--|
| 1 | Capacitance at 20°C | F | 250 | <p style="text-align: right;">[Samwha Standard]</p> $C = \frac{I \times (T_2 - T_1)}{V_1 - V_2} \quad (F)$ <ol style="list-style-type: none"> 1) Charging is performed by constant current followed by constant voltage charging. 2) Charging is performed for duration of 30 minutes a 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. |
| 2 | Capacitance Tolerance at 20°C | % | -10 / +20 | - |
| 3 | Rated voltage | V | 2.8 | - |
| 4 | Leakage current after 72 hour | mA | <0.9 | <p style="text-align: right;">[Samwha Standard]</p> <p>The hybrid capacitor is charged with the rated voltage for 72hours. Then, leakage current is measured by current measurement equipment.</p> |

| No | Item | | Unit | Specification | Test Conditions and Methods |
|----|---------------------------|-------------|-------|---------------|--|
| 5 | Internal resistance (ESR) | DC | mΩ | <19 | <p>[Samwha Standard]</p>  $R_D = \frac{\Delta V_3}{I}$ |
| | | AC 1kHz | mΩ | <14 | <p>[IEC 62391-1]</p>  $R_A = \frac{\Delta V}{I}$ <ol style="list-style-type: none"> 1) The internal resistance R_a of a capacitor shall be calculated by the above formula. 2) The frequency of the measuring voltage shall be 1kHz. 3) The AC current shall be from 1mA to 10mA. |
| 6 | Operating temperature | | °C | -20 ~ +40 | Operating temperature range shall be -20 ~ +40°C. |
| 7 | Energy density | Gravimetric | Wh/kg | 9.4 | 2.8~1.6V |
| 8 | Power density | Gravimetric | W/kg | 2550 | - |

2. Reliability

| No | Item | | Unit | Specification | Test Conditions and Methods | | | | | | | | | | | |
|---------------------------------|--|--|----------------------------|-------------------|---|---|---------------------------------|--|--------------|---|--------------|------|--------------|--------|--------------|------|
| 1 | Temperature Characteristic | | Capacitance change | % | Within $\pm 40\%$ of initial specified value at $+20^\circ\text{C}$ | <p>[Samwha Standard]</p> <table border="1" data-bbox="1078 294 1769 525"> <thead> <tr> <th>Temperature($^\circ\text{C}$)</th> <th>Keep Time</th> </tr> </thead> <tbody> <tr> <td>$+ 20 \pm 2$</td> <td>-</td> </tr> <tr> <td>$- 20 \pm 2$</td> <td>2 hr</td> </tr> <tr> <td>$+ 20 \pm 2$</td> <td>15 min</td> </tr> <tr> <td>$+ 40 \pm 2$</td> <td>2 hr</td> </tr> </tbody> </table> <p>Measure electrical characteristics after exposing capacitor to each temperature atmosphere for 2 hours or 15min.</p> | Temperature($^\circ\text{C}$) | Keep Time | $+ 20 \pm 2$ | - | $- 20 \pm 2$ | 2 hr | $+ 20 \pm 2$ | 15 min | $+ 40 \pm 2$ | 2 hr |
| Temperature($^\circ\text{C}$) | | | Keep Time | | | | | | | | | | | | | |
| $+ 20 \pm 2$ | - | | | | | | | | | | | | | | | |
| $- 20 \pm 2$ | 2 hr | | | | | | | | | | | | | | | |
| $+ 20 \pm 2$ | 15 min | | | | | | | | | | | | | | | |
| $+ 40 \pm 2$ | 2 hr | | | | | | | | | | | | | | | |
| | | | Internal resistance change | % | Less than 200 % of initial specified value at $+20^\circ\text{C}$ | | | | | | | | | | | |
| 2 | Shelf life after 1000 hours no load test same as endurance | | % | Same as endurance | <p>[Samwha Standard]</p> <p>Temperature : $40\pm 2^\circ\text{C}$ Duration : 1000 $+72/-0$ hour</p> | | | | | | | | | | | |
| 3 | Cycle life (at 25°C) | | Cycle | Cycle | 50,000 | <p>[Samwha Standard]</p>  <p>where V_R is the rated voltage of 2.8V V_L is the low voltage of 1.6V</p> <p>Condition the capacitor at $25\pm 3^\circ\text{C}$ until thermal equilibrium is reached. Initialize the voltage on the capacitor at $V_L(1.6\text{V})$. Then charge the capacitor at a current 40A to V_R. Maintain voltage V_R on the capacitor for 10 ± 0.50 s. Then discharge the capacitor to V_L at current 40A. Hold at V_L for 10 ± 0.50 s. This defines a cycle(see Figure). Repeat this cycle throughout the testing.</p> | | | | | | | | | | |
| | | | | | Capacitance change | | % | Within $\pm 30\%$ of initial specified value | | | | | | | | |
| | | | | | Internal resistance change | | % | Less than 200 % of initial specified value | | | | | | | | |

| No | Item | Unit | Specification | Test Conditions and Methods | |
|----|-----------|----------------------------|---------------|---|---|
| 4 | Damp heat | Capacitance change | % | Within ± 30 % of initial specified value | [Samwha Standard] Temperature : 40 ± 2 °C Relative humidity : 90%~95% Duration : 240 ± 8 hours |
| | | Internal resistance change | % | Within ± 200 % of initial specified value | |

3. Dimensions

| Part number | Capacitance (F) | Dimension(mm) | | | | |
|---------------------|-----------------|---------------|---------------|-----------------|-----------------|-----------------|
| | | D (± 1) | L (± 2) | g (± 0.2) | t (± 0.1) | i (± 0.1) |
| CL2R8257W22045SNBLT | 250F | 22 | 45 | 10 | 0.8 | 1.5 |

