C O N T E N T S

1. Application

The specification applies to electric double layer capacitors used in electronic equipment.

2. Part Number System

DRL 155 S 0T F 12 RR

- DRL — Series
- 155 — Capacitance (2.1)
- S — Tolerance (2.4)
- 0T — Voltage (2.2)
- F — Diameter (2.5)
- 12 — Case Length (2.6)
- RR — Type (2.3)

2.1 Capacitance code

Code	**155**
Capacitance (F)	1.5

2.2 Rated voltage code

Code	**0T**
Voltage (W.V.)	2.7

2.3 Type

Code	**RR**
Type	Bulk

2.4 Capacitance tolerance

"S" stands for -20% ~ +50%

2.5 Diameter

Code	**F**
Diameter	8

2.6 Case length

12=12mm

3. Characteristics

Standard atmospheric conditions

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows:

Ambient temperature: 15°C to 35°C
Relative humidity : 25% to75%
Air Pressure : 86kPa to 106kPa

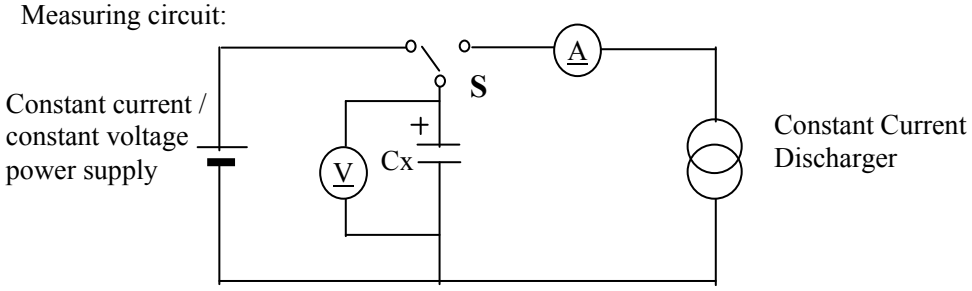
If there is any doubt about the results, measurement shall be made within the following conditions:

Ambient temperature: 20°C ± 2°C
Relative humidity : 60% to 70%
Air Pressure : 86kPa to 106kPa

Operating temperature range

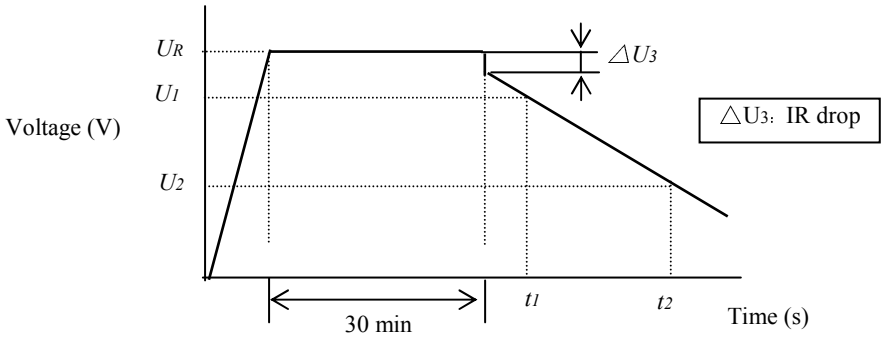
The ambient temperature range at which the capacitor can be operated continuously at rated voltage is -40°C to 70°C.

<table>
<tr><th colspan="2">ITEM</th><th>PERFORMANCE</th></tr>
<tr><td>3.1</td><td>Rated voltage (WV)

Surge voltage (SV)</td><td>
<table>
<tr><td>WV (V.DC)</td><td>2.7</td></tr>
<tr><td>SV (V.DC)</td><td>2.8</td></tr>
</table>
</td></tr>
<tr><td>3.2</td><td>Nominal capacitance (Tolerance)</td><td>
<Condition>
Constant current discharge method:
Measuring circuit:


Key
Ⓐ d.c. ammeter
Ⓥ d.c. voltmeter
S changeover switch
Cx capacitor under test
Figure 1- Circuit for constant current discharge method

Measuring method
a) Set the d.c.voltage at the rated voltage (U_R)
b) Set the constant current value of the constant current discharger to the discharge current specified in Table 1.
c) Turn the switch S to the d.c.power supply ,apply voltage and charge for 30 min after the constant current / constant voltage power supply has achieved the rated voltage.
d) After a charge for 30 min has finished ,change over the switch S to the constant current discharger ,and discharge with a constant current.
e) Measure the time t_1 and t_2 where the voltage between capacitor terminals at the time of discharge reduces from U_1 to U_2 as shown in Figure 2 ,and calculate the capacitance value by the following formula:
</td></tr>
</table>

3.2	Nominal capacitance (Tolerance)	**<Condition>**  **Figure 2- Voltage characteristic between capacitor terminals** $$C = \frac{Ix(t_2-t_1)}{U_1-U_2}$$ Where *C* is the capacitance(F); *I* is the discharge current (A); U_1 is the measurement starting voltage (V); U_2 is the measurement end voltage (V); t_1 is the time from discharge start to reach U_1 (s); t_2 is the time from discharge start to reach U_2 (s). f) The discharge current I and the voltages U_1 and U_2 at the time of discharge voltage drop shall be as per Table 1 .The method classification shall be in accordance with the individual standards. **Table 1 – Discharge conditions** Charge time: 30 min *I*(mA): 4 x CU_R U_1: The value to be 80% of the charging voltage (0.8xU_R) U_2: The value to be 40% of the charging voltage (0.4xU_R) NOTE C_R is the rated capacitance in F(Farad),and U_R is the rated voltage in V (Volt)

<table>
<tr><td>3.3</td><td>ESR</td><td><Condition>
Measuring frequency :1kHz
Measuring temperature:20±2℃
Measuring point : 2mm max from the surface of a sealing resin on the lead wire.
<Criteria>
(20℃)Less than the initial limit:
ESR≤400mΩ</td></tr>
<tr><td>3.4</td><td>Leakage current</td><td><Condition>
1. Ambient temperature: 25℃ ± 2℃.
2.The electrification time:72H
3. Desistance value of protective resistor less than 1Ω.
<Criteria>
Less than the initial limit(25℃ ± 2℃):
I≤ 0.009mA
I is the Leakage current</td></tr>
<tr><td>3.5</td><td>Temperature characteristic</td><td><Condition>
<table>
<tr><th>STEP</th><th>Temperature(℃)</th><th>Item</th><th>Characteristics</th></tr>
<tr><td>1</td><td>20±2</td><td>Capacitance、ESR</td><td>----------</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">-40+3</td><td>△C/C</td><td>Within ±30% of initial capacitance</td></tr>
<tr><td>ESR</td><td>Less than or equal to 4 times of the value of item 3.3</td></tr>
<tr><td>3</td><td>Keep at 15 to 35℃ for 15 minutes or more</td><td>---------</td><td>---------</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">70±2</td><td>△C/C</td><td>Within ±30% of initial capacitance</td></tr>
<tr><td>ESR</td><td>The limit specified in 3.3</td></tr>
</table>
a. ESR -40℃/ ESR 20℃: ESR ratio at 1kHz;
b. ΔC/C 20℃: Capacitance change ;</td></tr>
</table>

3.6	Load life test	**<Condition>** The Capacitor is stored at a temperature of 70 ±2 °C with rated voltage for 1000 +48/0 hours .The result should meet the following table: **<Criteria>** Item: Performance Capacitance Change: Within ±30% of initial capacitance ESR: Less than or equal to 4 times of the value of item 3.3 Appearance: No visible damage and no leakage of electrolyte
3.7	Damp heat test	**<Condition>** Humidity Test: The capacitor shall be exposed for 240±48 hours in an atmosphere of 90~95%RH at 40±2℃, the characteristic change shall meet the following requirement. **<Criteria>** Item: Performance Capacitance Change: Within ±30% of initial capacitance ESR: Less than or equal to 4 times of the value of item 3.3 Appearance: No visible damage and no leakage of electrolyte

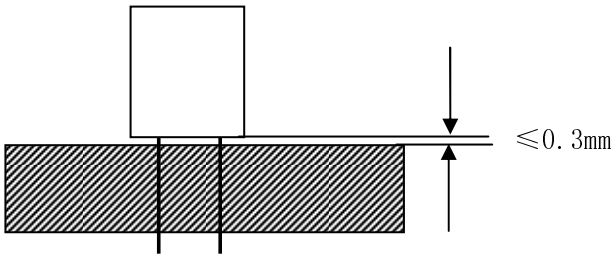
<table>
<tr>
<td>3.8</td>
<td>Lead strength</td>
<td>
a) Lead pull strength
A static load force shall be applied to the terminal in the axial direction and acting in a direction away from the body for 10±1 s.
<table>
<tr><th>Lead wire diameter (mm)</th><th>Load force (N)</th></tr>
<tr><td>d ≤0.5</td><td>5</td></tr>
</table>
b) Lead bending
When the capacitor is placed in a vertical position and the weight specified in the table above is applied to one lead and then the capacitor is slowly rotated 90^0 to a horizontal position and then returned to a vertical position thus completing bends for 2~3seconds.
The additional bends are made in the opposite direction
<table>
<tr><th>Lead wire diameter (mm)</th><th>Load force (N)</th></tr>
<tr><td>d ≤0.5</td><td>2.5</td></tr>
</table>
Performance: The characteristic shall meet the following value after a) or b) test.
<table>
<tr><td>Item</td><td>Performance</td></tr>
<tr><td>Capacitance Change</td><td>Within ±30% of initial capacitance</td></tr>
<tr><td>Appearance</td><td>No visible damage Legible marking and no leakage of electrolyte</td></tr>
</table>
</td>
</tr>
<tr>
<td>3.9</td>
<td>Resistance to vibration</td>
<td>
Frequency: 10 to 55 Hz (1minute interval / 10 → 55 → 10Hz
Amplitude: 0.75mm(Total excursion 1.5mm)
Direction :X、 Y、 Z （3 axes）
Duration: 2hours/ axial (Total 6 hours)
The capacitors are supported as the following Fig2


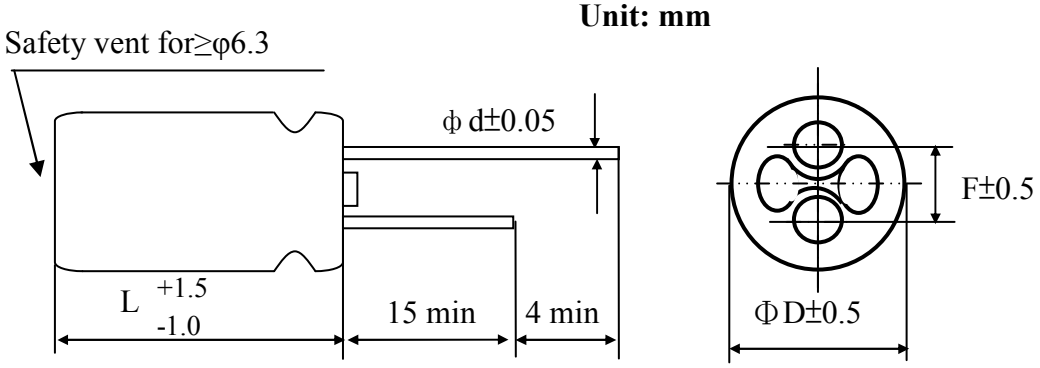
Fig2
Performance: Capacitance value shall not show drastic change compared to the initial capacitance when the value is measured within 30 minutes. Prior to the completion of exam, Capacitance difference shall be within ±10% compared to the initial value the exam.
</td>
</tr>
</table>

3.10	Solderability	The capacitor shall be tested under the following conditions: Solder : Sn-3Ag-0.5Cu Soldering temperature: 245±3°C Immersing time : 2.0±0.5s Immersing depth : 1.5~ 2.0mm from the root. Flux : Approx .25% rosin Performance: At least 75% of the dipped portion of the terminal shall be covered with new solder.
3.11	Resistance to soldering heat	A) Solder bath method Lead terminals of a capacitor are placed on the heat isolation board with thickness of 1.6±0.5mm. It will dip into the flux of isopropylaehol solution of colophony. Then it will be immersed at the surface of the solder with the following condition: Solder : Sn-3Ag-0.5Cu Soldering temperature : 260 ±5°C Immersing time : 5±0.5s Heat protector: t=1.6mm glass –epoxy board B) Soldering iron method Bit temperature : 350 ±10°C Application time : 3.5 ±0.5 s Heat protector: t=1.6mm glass –epoxy board For both methods, after the capacitor at thermal stability, the following items shall be measured:

Item	Performance
Capacitance Change	Within ±10% of initial capacitance
Appearance	No visible damage legible marking and no leakage of electrolyte

4. Product Dimensions

Unit: mm



φD	8
L	12
F	3.5
φd	0.5

5 . Notice item

（1）The capacitor has fixed polarity.

（2）The capacitor should be used under rated voltage.

（3）The capacitor should not be used in the charge and discharge circuit with high frequency.

（4）The ambient temperature affects the super capacitor life.

（5）Voltage reduction ΔV=IR will happen at the moment of discharge.

（6）The capacitor cannot be stored on the place with humidity over 85%RH or place with toxic gas.

（7）The capacitor should stored in the environment within -30℃~50℃ temperature and less than 60% relative humidity.

（8）If the capacitor is applied on the double-side PCB, the connection should not be around the place on which the super capacitor can contact.

（9）Don't twist capacitor or make it slanting after installing.

（10）Need avoid over heat on the capacitor during soldering (The temperature should be 260℃ with the time less than 5s during soldering on 1.6mm printed PCB.)

（11）There is voltage balance problem between each capacitor unit during series connection between super capacitor.