



**ELECTRIC DOUBLE LAYER CAPACITORS**  
**PRODUCT SPECIFICATION**  
規格書



<b>CUSTOMER :</b> (客戶) :	<b>DATE :</b> (日期) : 2021-03-09
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CATEGORY (品名)	: ELECTRIC DOUBLE LAYER CAPACITORS
DESCRIPTION (型号)	: DDL 6 V1.5F (φ9x17.5x25)
VERSION (版本)	: 01
Customer P/N	: /
SUPPLIER	: /

<b>SUPPLIER</b>	
<b>PREPARED</b> (拟定)	<b>CHECKED</b> (审核)
邓文文	付婷婷

<b>CUSTOMER</b>	
<b>APPROVAL</b> (批准)	<b>SIGNATURE</b> (签名)



**ELECTRIC DOUBLE LAYER CAPACITORS SPECIFICATIONS**  
***DDL SERIES***

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# ELECTRIC DOUBLE LAYER CAPACITORS SPECIFICATIONS

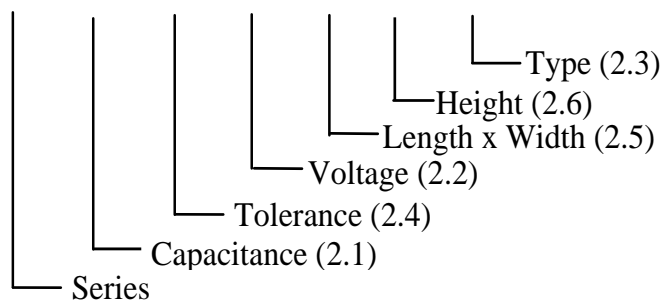
## DDL SERIES

### 1. Application

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

### 2. Part Number System

DDL 155 I 0L F 25 RR



#### 2.1 Capacitance code

<b>Code</b>	<b>155</b>
Capacitance (F)	1.5

#### 2.2 Rated voltage code

<b>Code</b>	<b>0L</b>
Voltage (W.V.)	6

#### 2.3 Type

<b>Code</b>	<b>RR</b>
Type	Bulk

#### 2.4 Capacitance tolerance

“I” stands for 0 ~ +50%

#### 2.5 Length x Width

<b>Code</b>	<b>F</b>
Length x Width	9x17.5

#### 2.6 Height

25=25mm

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### 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% to 75%

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 65°C.

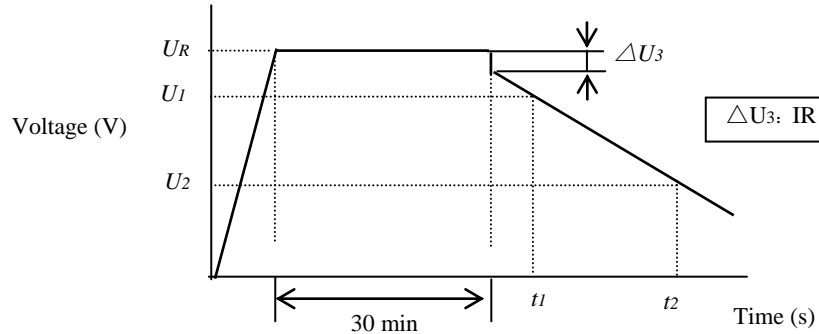
The ambient temperature range at which the capacitor can be operated continuously at 5V is -40°C to 85°C.

# ELECTRIC DOUBLE LAYER CAPACITORS SPECIFICATIONS DDL SERIES

ITEM		PERFORMANCE				
3.1	<p>Rated voltage (WV)</p> <p>Surge voltage (SV)</p>	<table border="1" style="margin: auto;"> <tr> <td style="padding: 5px;">WV (V.DC)</td> <td style="padding: 5px;">6</td> </tr> <tr> <td style="padding: 5px;">SV (V.DC)</td> <td style="padding: 5px;">6.6</td> </tr> </table>	WV (V.DC)	6	SV (V.DC)	6.6
WV (V.DC)	6					
SV (V.DC)	6.6					
3.2	<p>Nominal capacitance (Tolerance)</p>	<p><b>&lt;Condition&gt;</b>            Constant current discharge method:            Measuring circuit:</p> <div style="text-align: center;"> </div> <p>Key</p> <ul style="list-style-type: none"> <li><span style="border: 1px solid black; border-radius: 50%; padding: 2px;">A</span> d.c. ammeter</li> <li><span style="border: 1px solid black; border-radius: 50%; padding: 2px;">V</span> d.c. voltmeter</li> <li>S changeover switch</li> <li>Cx capacitor under test</li> </ul> <p style="text-align: center;"><b>Figure 1- Circuit for constant current discharge method</b></p> <p>Measuring method</p> <ol style="list-style-type: none"> <li>a) Set the d.c.voltage at the rated voltage (<math>U_R</math>)</li> <li>b) Set the constant current value of the constant current discharger to the discharge current specified in Table 1.</li> <li>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.</li> <li>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.</li> <li>e) Measure the time <math>t_1</math> and <math>t_2</math> where the voltage between capacitor terminals at the time of discharge reduces from <math>U_1</math> to <math>U_2</math> as shown in Figure 2 ,and calculate the capacitance value by the following formula:</li> </ol>				

# ELECTRIC DOUBLE LAYER CAPACITORS SPECIFICATIONS DDL SERIES

<Condition>



**Figure 2- Voltage characteristic between capacitor terminals**

$$C = \frac{I \times (t_2 - t_1)}{U_1 - U_2}$$

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)	$4 \times C U_R$
$U_1$	The value to be 80% of the charging voltage ( $0.8 \times U_R$ )
$U_2$	The value to be 40% of the charging voltage ( $0.4 \times U_R$ )
NOTE $C_R$ is the rated capacitance in F(Farad),and $U_R$ is the rated voltage in V (Volt)	

3.2

Nominal  
capacitance  
(Tolerance)

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3.3	ESR	<p><b>&lt;Condition&gt;</b>                      Measuring frequency :1kHz                      Measuring temperature:20±2°C                      Measuring point : 2mm max from the surface of a sealing resin on the lead wire.</p> <p><b>&lt;Criteria&gt;</b>                      (20°C)Less than the initial limit:                      AC ESR≤0.32 Ω                      DC ESR≤0.50 Ω</p>																								
3.4	Leakage current	<p><b>&lt;Condition&gt;</b>                      1. Ambient temperature: 25°C ± 2°C.                      2.The electrification time:72H                      3. Desistance value of protective resistor less than 1Ω .</p> <p><b>&lt;Criteria&gt;</b>                      Less than the initial limit(25°C ± 2°C):                      I≤0.005 mA                      I is the Leakage current</p>																								
3.5	Temperature characteristic	<p><b>&lt;Condition&gt;</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">STEP</th> <th style="width: 20%;">Temperature(°C)</th> <th style="width: 20%;">Item</th> <th style="width: 50%;">Characteristics</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">20±2</td> <td style="text-align: center;">Capacitance、ESR</td> <td style="text-align: center;">-----</td> </tr> <tr> <td rowspan="2" style="text-align: center;">2</td> <td rowspan="2" style="text-align: center;">-40+3</td> <td style="text-align: center;">Δ C/C</td> <td style="text-align: center;">Within ±30% of initial capacitance</td> </tr> <tr> <td style="text-align: center;">ESR</td> <td style="text-align: center;">Less than or equal to 4 times of the value of item 3.3</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">Keep at 15 to 35°C for 15 minutes or more</td> <td style="text-align: center;">-----</td> <td style="text-align: center;">-----</td> </tr> <tr> <td rowspan="2" style="text-align: center;">4</td> <td rowspan="2" style="text-align: center;">65±2</td> <td style="text-align: center;">Δ C/C</td> <td style="text-align: center;">Within ±30% of initial capacitance</td> </tr> <tr> <td style="text-align: center;">ESR</td> <td style="text-align: center;">The limit specified in 3.3</td> </tr> </tbody> </table> <p>a. ESR -40°C/ ESR 20°C: ESR ratio at 1kHz;                      b. ΔC/C 20°C: Capacitance change ;</p>	STEP	Temperature(°C)	Item	Characteristics	1	20±2	Capacitance、ESR	-----	2	-40+3	Δ C/C	Within ±30% of initial capacitance	ESR	Less than or equal to 4 times of the value of item 3.3	3	Keep at 15 to 35°C for 15 minutes or more	-----	-----	4	65±2	Δ C/C	Within ±30% of initial capacitance	ESR	The limit specified in 3.3
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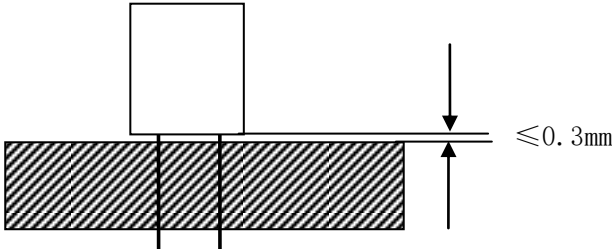
## DDL SERIES

3.6	Load life test	<p><b>&lt;Condition&gt;</b> The Capacitor is stored at a temperature of <math>65 \pm 2</math> °C with rated voltage for 1000 +48/0 hours .The result should meet the following table:</p> <p><b>&lt;Criteria&gt;</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Item</th> <th style="width: 50%;">Performance</th> </tr> </thead> <tbody> <tr> <td>Capacitance Change</td> <td>Within <math>\pm 30\%</math> 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>Appearance</td> <td>No visible damage and no leakage of electrolyte</td> </tr> </tbody> </table>	Item	Performance	Capacitance Change	Within $\pm 30\%$ 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
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3.7	Damp heat test	<p><b>&lt;Condition&gt;</b> Humidity Test: The capacitor shall be exposed for 240 <math>\pm 48</math> hours in an atmosphere of 90~95% RH at <math>40 \pm 2</math>°C, the characteristic change shall meet the following requirement.</p> <p><b>&lt;Criteria&gt;</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Item</th> <th style="width: 50%;">Performance</th> </tr> </thead> <tbody> <tr> <td>Capacitance Change</td> <td>Within <math>\pm 30\%</math> 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>Appearance</td> <td>No visible damage and no leakage of electrolyte</td> </tr> </tbody> </table>	Item	Performance	Capacitance Change	Within $\pm 30\%$ 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
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3.8	Lead strength	<p>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 <math>10 \pm 1</math> s.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <th style="width: 50%;">Lead wire diameter (mm)</th> <th style="width: 50%;">Load force (N)</th> </tr> <tr> <td style="text-align: center;"><math>d \leq 0.5</math></td> <td style="text-align: center;">5</td> </tr> </table> <p>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 <math>90^\circ</math> 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</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <th style="width: 50%;">Lead wire diameter (mm)</th> <th style="width: 50%;">Load force (N)</th> </tr> <tr> <td style="text-align: center;"><math>d \leq 0.5</math></td> <td style="text-align: center;">2.5</td> </tr> </table> <p>Performance: The characteristic shall meet the following value after a) or b) test.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <th style="width: 50%;">Item</th> <th style="width: 50%;">Performance</th> </tr> <tr> <td>Capacitance Change</td> <td>Within <math>\pm 30\%</math> of initial capacitance</td> </tr> <tr> <td>Appearance</td> <td>No visible damage Legible marking and no leakage of electrolyte</td> </tr> </table>	Lead wire diameter (mm)	Load force (N)	$d \leq 0.5$	5	Lead wire diameter (mm)	Load force (N)	$d \leq 0.5$	2.5	Item	Performance	Capacitance Change	Within $\pm 30\%$ of initial capacitance	Appearance	No visible damage Legible marking and no leakage of electrolyte
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3.9	Resistance to vibration	<p>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</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Fig2</p> <p>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 <math>\pm 10\%</math> compared to the initial value the exam.</p>
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# ELECTRIC DOUBLE LAYER CAPACITORS SPECIFICATIONS

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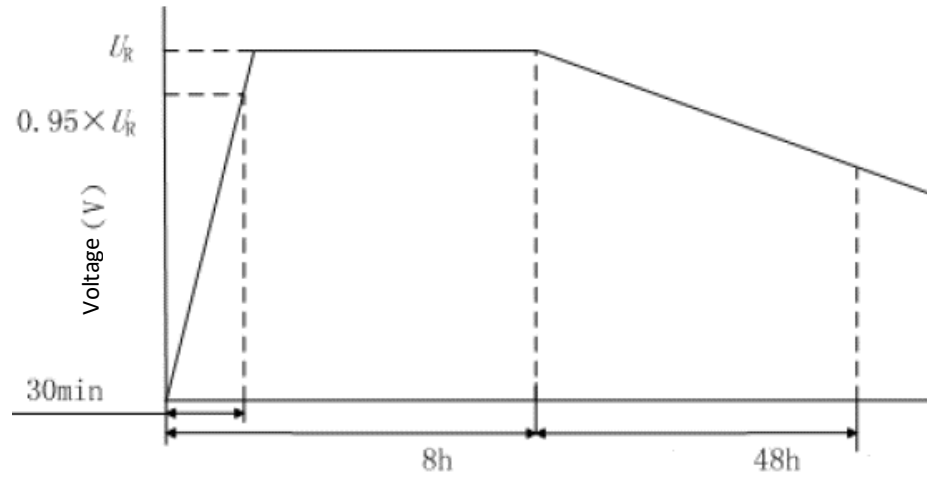
3.10	Solderability	<p>The capacitor shall be tested under the following conditions:</p> <p>Solder : Sn-3Ag-0.5Cu  Soldering temperature: 245±3°C  Immersing time : 2.0±0.5s  Immersing depth : 1.5~ 2.0mm from the root.  Flux : Approx .25% rosin</p> <p>Performance: At least 75% of the dipped portion of the terminal shall be covered with new solder.</p>						
3.11	Resistance to soldering heat	<p>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 isopropylalcohol 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</p> <p>B) Soldering iron method  Bit temperature : 350 ±10°C  Application time : 3.5 ±0.5 s  Heat protector: t=1.6mm glass –epoxy board</p> <p>For both methods, after the capacitor at thermal stability, the following items shall be measured:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Item</th> <th style="width: 50%;">Performance</th> </tr> </thead> <tbody> <tr> <td>Capacitance Change</td> <td>Within ±10% of initial capacitance</td> </tr> <tr> <td>Appearance</td> <td>No visible damage legible marking and no leakage of electrolyte</td> </tr> </tbody> </table>	Item	Performance	Capacitance Change	Within ±10% of initial capacitance	Appearance	No visible damage legible marking and no leakage of electrolyte
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## ELECTRIC DOUBLE LAYER CAPACITORS SPECIFICATIONS DDL SERIES

3.12

Self-discharge

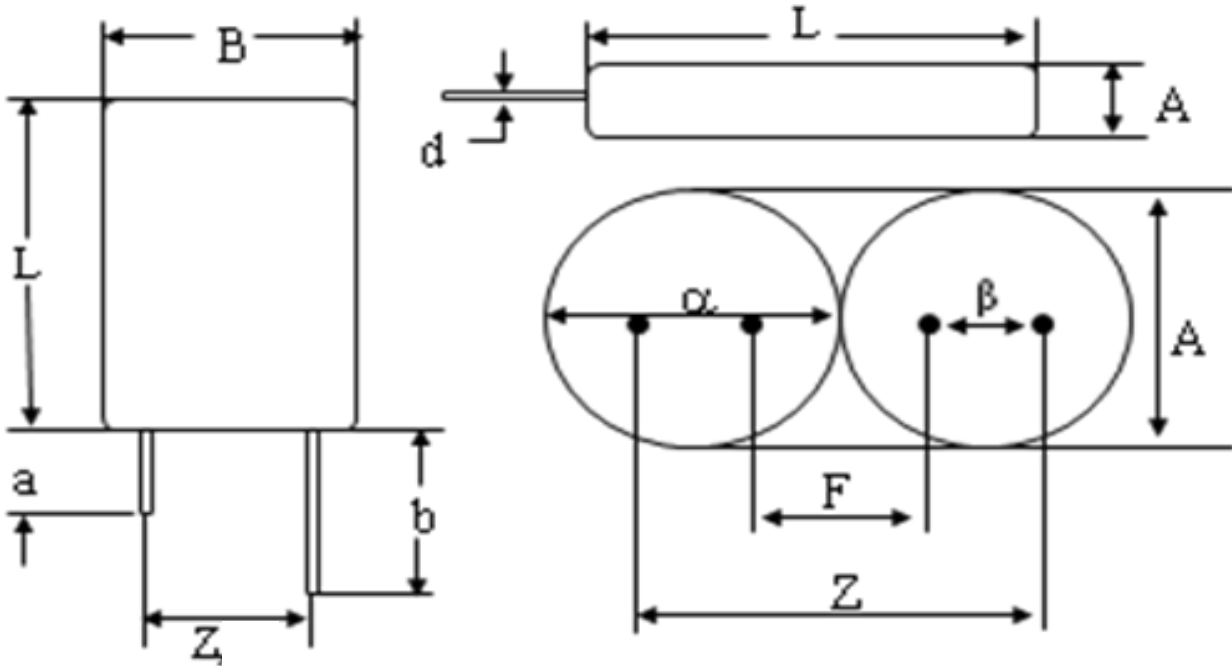
After the EDLC is fully charged under the specified conditions, if there's no external module, its self-discharge cut-off voltage after the specified 48 hours should be no less than 80% of the rated voltage.



# ELECTRIC DOUBLE LAYER CAPACITORS SPECIFICATIONS DDL SERIES

## 4. Product Dimensions

Unit: mm



注:长导针为正极  
Note: Longer lead is positive.

尺寸代码 Size code	A	B	L	d	a	b	$Z=\alpha+\beta$	$F=\alpha-\beta$
	max.	max.	max.	$\pm 0.05$	min.	min.	$\pm 0.50$	$\pm 0.50$
F25	9.0	17.5	25	0.60	15.0	19.0	11.80	4.80

## **ELECTRIC DOUBLE LAYER CAPACITORS SPECIFICATIONS**

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#### **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  $\Delta V=IR$  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  $-30^{\circ}\text{C}\sim 50^{\circ}\text{C}$  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  $260^{\circ}\text{C}$  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.