To. :

DATE : 20 . . .

RoHS 1,2 and 3	Halogen Free

SPECIFICATION

PRODUCT : STARCAP

MODEL : DMS3R3224RS

WRITTEN	CHECKED	APPROVED

KORCHIP CORP.

KORCHIP B/D, 359, Manan-ro, Manan-gu, Anyang-si, Gyeonggi-do, KOREA

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Revision History

No.	Documentation	Check	Description of Revision	Approval	Date
1	S.H. Jeon (R&D)	K.B. Chung (Q.A.)	Initial Release	B.I. Lim (R&D)	Feb. 16, 2022

Manufacturer Information

Manufacturer : Korchip Corporation

Location : KORCHIP B/D, 359, Manan-ro, Manan-gu, Anyang-si, Gyeonggi-do, KOREA

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1. Scope

This specification applies to STARCAP(Electric Double Layer Capacitor), submitted to specified customer in cover page.

2. Part Number System

DMS	3R3	224	RS
①	②	③	④

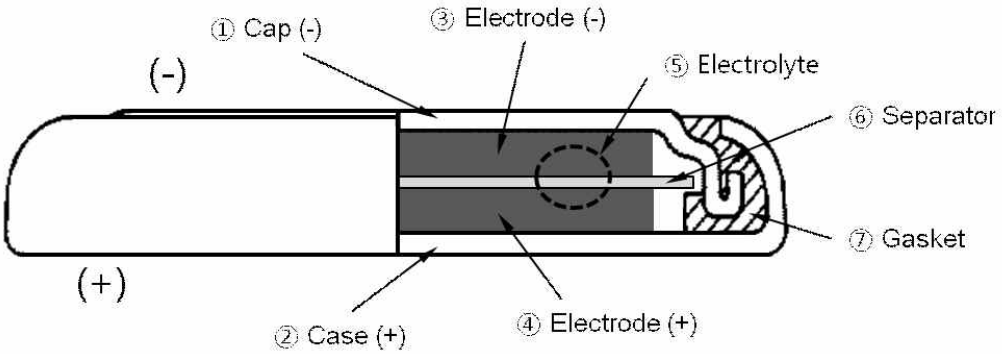
① Series Name : DMS
② Rated Voltage : 3.3VDC
③ Capacitance : 0.22 F (224 = 22 × 10^{+4} uF)
④ Product Identification Code

3. Photo

4. General Specifications

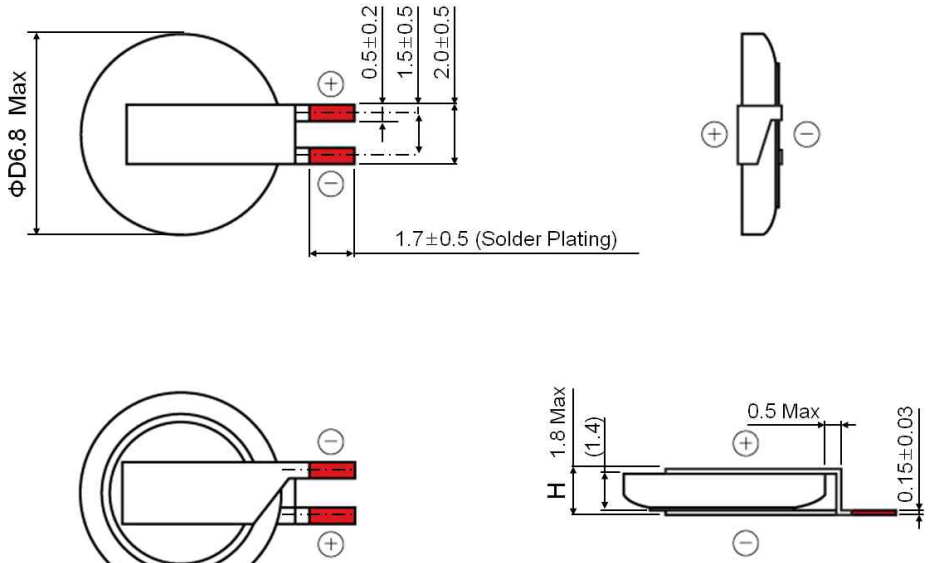
ITEMS	VALUE
Rated Voltage	3.3 VDC
Operating Temp.	-10 ~ +60 ℃
Capacitance (F)	0.22 F
Capacitance Tolerance	-20 ~ 80 %
Equivalent Series Resistance (ESR)	Less than 200Ω

5. Cell Structure

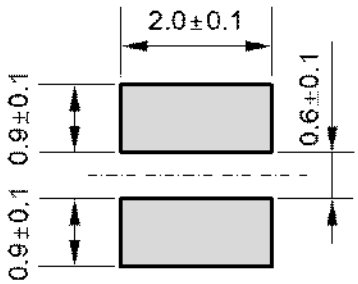


Part Name	Material
① Cap(-)	Stainless Steel
② Case(+)	Stainless Steel
③ Electrode(-)	Activated Carbon
④ Electrode(+)	Activated Carbon
⑤ Electrolyte	Organic Electrolyte
⑥ Separator	Glass Fiber
⑦ Gasket	Engineering Plastic

6. Product Dimensions



Recommendable PCB Layout (Unit : mm)

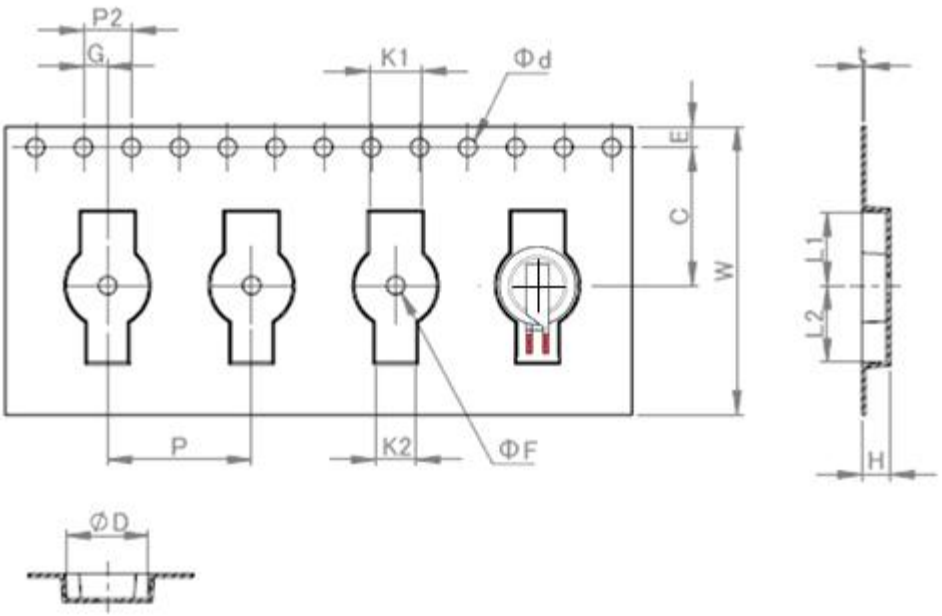


7. Reliability Specifications

<table>
<tr><th colspan="3">Item</th><th colspan="2">Specification</th><th>Test Condition</th></tr>
<tr><td rowspan="6">Temperature Characteristics</td><td>Capacitance Change</td><td rowspan="2">Step 2</td><td>Within ± 30% of Initial Value</td><td rowspan="6">Measure electrical characteristics after exposing STARCAP Capacitor to each temperature atmosphere for one(1) hour
<table><tr><th>Step</th><th>Temperature</th></tr><tr><td>1</td><td>20±2℃</td></tr><tr><td>2</td><td>-10±2℃</td></tr><tr><td>3</td><td>20±2℃</td></tr><tr><td>4</td><td>60±2℃</td></tr><tr><td>5</td><td>20±2℃</td></tr></table></td></tr>
<tr><td>ESR</td><td>5Times or less than Initial Value</td></tr>
<tr><td>Capacitance Change</td><td rowspan="2">Step 4</td><td>Within ± 30% of Initial Value</td></tr>
<tr><td>ESR</td><td>200Ω or less</td></tr>
<tr><td>Capacitance Change</td><td rowspan="2">Step 5</td><td>Within ± 10% of Initial Value</td></tr>
<tr><td>ESR Change</td><td>200Ω or less</td></tr>
<tr><td rowspan="2">Reflow Soldering Effect</td><td colspan="2">Capacitance</td><td>Spec. Value</td><td colspan="2" rowspan="2">Pb-Free Reflow Solder
Peak Temp. : 260± 5℃
Duration at Peak Temp. : 5±0.5℃</td></tr>
<tr><td colspan="2">Appearance</td><td>No Marked Defect</td></tr>
<tr><td rowspan="3">Humidity Resistance</td><td colspan="2">Capacitance Change</td><td>± 30% of Initial Value</td><td colspan="2" rowspan="3">Temp. : 40±2℃
Humidity : 90 ~ 95%RH
Time : 500±8 Hours
<u>No Voltage Applied</u></td></tr>
<tr><td colspan="2">ESR</td><td>2KΩ or less</td></tr>
<tr><td colspan="2">Appearance</td><td>No Marked Defect</td></tr>
<tr><td rowspan="2">Self Discharge Characteristics</td><td colspan="2" rowspan="2">Voltage</td><td rowspan="2">More than 1.8Vdc</td><td>Charging Condition</td><td>Voltage : 3.3Vdc
Current : 20㎃
Charge Time : 24 Hours</td></tr>
<tr><td>Self Discharge Condition</td><td>Duration : 24 Hours
Temp. : Less than 25℃
Humidity : Less than 70%RH</td></tr>
<tr><td rowspan="3">Vibration Resistance</td><td colspan="2">Capacitance</td><td>Spec. Value</td><td colspan="2" rowspan="3">Amplitude : 1.5㎜
Frequency : 10 ~ 55㎐
Direction : X, Y, Z 3 Directions
Test Time : 6 Hours</td></tr>
<tr><td colspan="2">ESR</td><td>Spec. Value</td></tr>
<tr><td colspan="2">Appearance</td><td>No Marked Defect</td></tr>
<tr><td>Terminal Strength</td><td colspan="2" rowspan="2">Appearance</td><td rowspan="2">Terminals shall not be separated</td><td colspan="2">Load 10N , 10±1 Sec.</td></tr>
<tr><td>Terminal Bend Strength</td><td colspan="2">Load 5N , Angle 90° , 1Cycle</td></tr>
<tr><td rowspan="3">Endurance</td><td colspan="2">Capacitance Change</td><td>Within ± 30% of Initial Value</td><td colspan="2" rowspan="3">Temp. : 60±2℃
Test Time : 1,000(+24,-0) Hours
Applied Voltage : 3.3Vdc</td></tr>
<tr><td colspan="2">ESR</td><td>2KΩ or less</td></tr>
<tr><td colspan="2">Appearance</td><td>No Marked Defect</td></tr>
<tr><td rowspan="3">Shelf Life</td><td colspan="2">Capacitance Change</td><td>Within ± 30% of Initial Value</td><td colspan="2" rowspan="3">Temp. : 60±2℃
Test Time : 1,000(+24,-0) Hours
<u>No Voltage Applied</u></td></tr>
<tr><td colspan="2">ESR</td><td>2KΩ or less</td></tr>
<tr><td colspan="2">Appearance</td><td>No Marked Defect</td></tr>
</table>

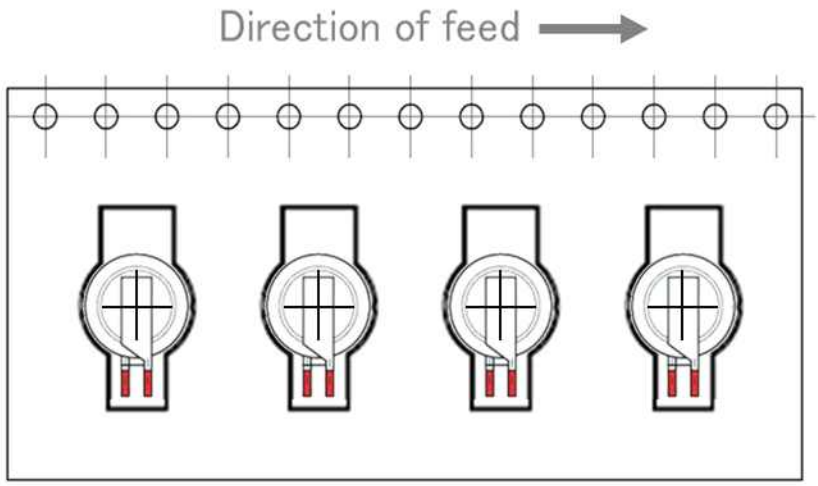
8. Packing Specifications

1) Carrier Tape

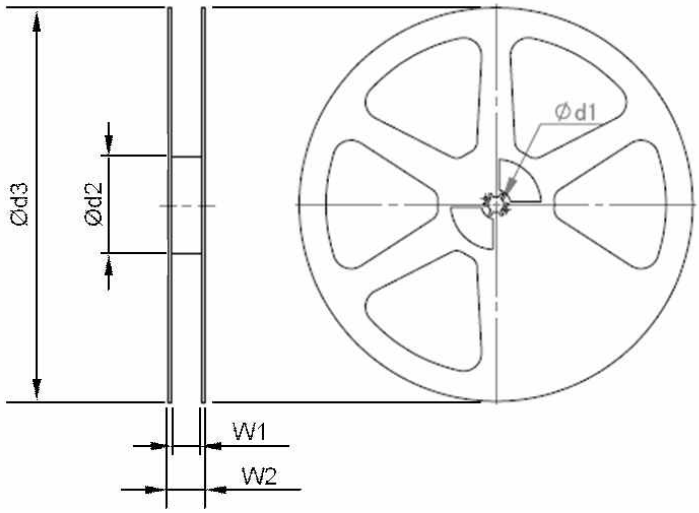


(Unit : mm)

Item	C	D	d	E	F	G	H	K1	K2	L1	L2	P	P2	t	W
Size	11.5	6.8	1.5	1.75	1.5	2.0	2.4	4.4	3.4	6.1	6.4	12.0	4.0	0.3	24.0
Tollerance	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.2	±0.2	±0.5	±0.5	±0.1	±0.1	±0.1	±0.3

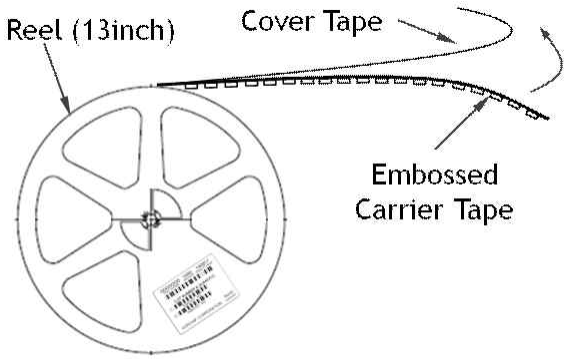


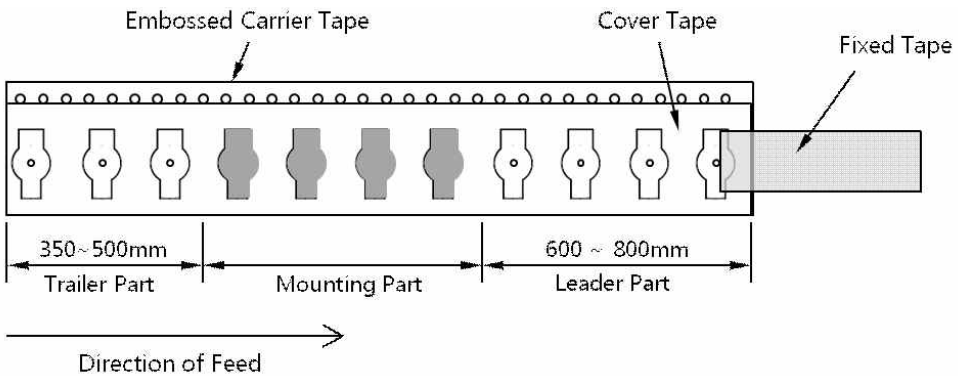
2) Reel



(Unit : mm)

W1	W2	Ød1	Ød2	Ød3
25±0.5	(29.5±1)	13±0.5	80±1	330±1 (13inch)





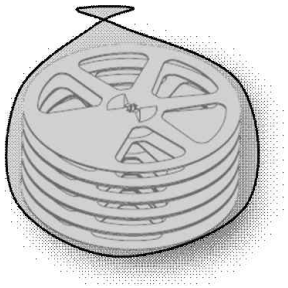
3) Box

Reel

2,000pcs/Reel

↓

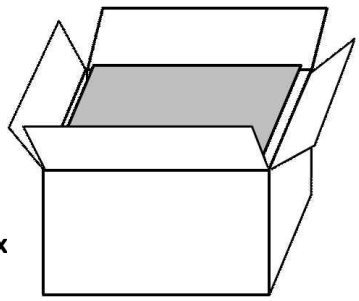
Bag



10Reels/Bag

↓

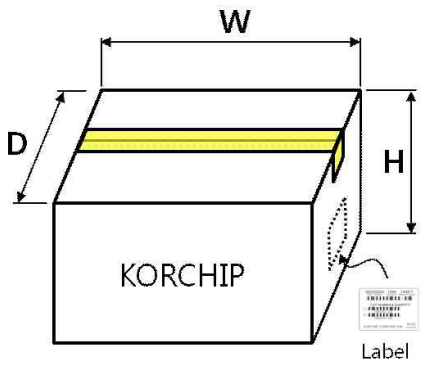
Box



20,000pcs/Box

	Unit	Reel	Bag	Box
Weight	0.22g	0.90kg	9.0kg	10kg
Qty. (pcs)	1	2,000	20,000	20,000

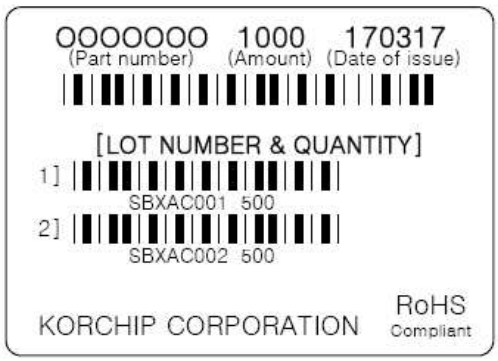
<Weight Information>



W	D	H
350mm	350mm	370mm

<Box Dimension>

9. Labeling Standards



← **(Example)**

Lot No. System

Ex.) S G X A C 002

① ② ③ ④ ⑤ ⑥

① Product Code : S (STARCAP)

② Production Year Code : A (2016), B (2017), C (2018), ... ,F (2021), G (2022)...

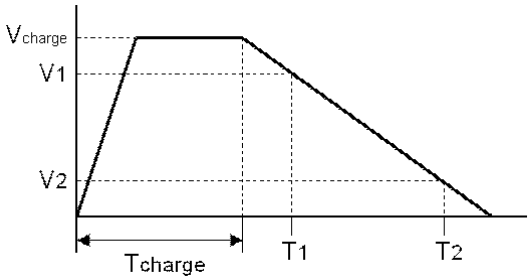
③ Factory Identification Code : X (Factory X)

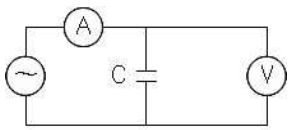
④ Production Month Code : A (Jan.), B (Feb.), ... , J (Oct.), K (Nov.), L (Dec.)

⑤ Production Date Code : 1 (1st), 2 (2nd), ... , 9 (9th), A (10th), B (11th), C (12th) ... Q (26th), R (27th), S (28th), ... , V (31th)

⑥ Lot Issuing Serial Code : 001 (First lot of a specific day), 002 (Second lot of a specific day), 003 (Third lot of a specific day)...

10. Measuring Method of Characteristics

<table>
<tr>
<td>Capacitance</td>
<td>
1) Charge the STARCAP with constant current I_{charge}(=1±0.1㎃) to V_{charge}(=3.3V) then keep charging for T_{charge}(=3000sec.)
2) Discharge the STARCAP with constant current I_{disch}(=0.5㎃) while measure the discharge time T_1, T_2 between V_1(=2.64V) and V_2(=1.32V).
3) Calculate capacitance using the following formula.


$C = \frac{I_{disch} \times (T_1 - T_2)}{V_1 - V_2}$
</td>
</tr>
<tr>
<td>Equivalent Series Resistance (ESR @1kHz)</td>
<td>
● Measure ESR by the LCR meter. (Frequency:1㎑, Bias Voltage : $0^{+0.05}$V)
or
● Calculte ESR using the following formula.


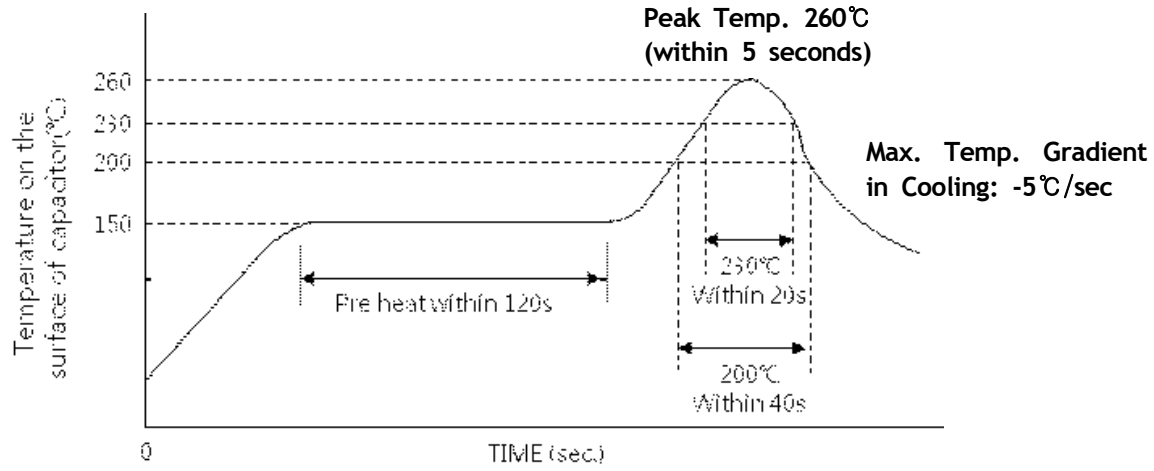
ESR[Ω] = V / i
R[Ω] = V[V] / I[A] * i[㎃] = I[A] x 10^{-3}
R : Internal resistance(ESR) [Ω]
V : Measured voltage between terminals [V]
i : Current 1mA(A.C.)
</td>
</tr>
<tr>
<td colspan="2">☞ The STARCAP should be shorted before each measurement as follows ;
Capacitance : 60 min. , ESR : 15 min. , LC : 15 min.</td>
</tr>
</table>

11. Mounting

1) Reflow Soldering

Excessive heat stress may result in the deterioration of the electrical characteristics of the capacitor and electrolyte leakage due to the rise in internal pressure.

Use the general reference chart then set soldering temperature and time.



The time of repeated reflow soldering must be two times or less.

Do not use reflow soldering when the cell voltage is above 0.3V.

2) Manual Soldering

For use of a soldering iron, it should not touch the cell body.

Temperature of the soldering iron should be less than **360℃**.

Soldering time for terminals should be less than **3(-0/+1) seconds.**

12. Cautions for Use

Please be careful for following points when you use Korchip's EDLC.

1) Do not apply more than rated voltage.

If you apply more than rated voltage, electrolyte in EDLC will be decomposed and its ESR increase. At the worst, it may be broken.

2) Do not use EDLC for ripple absorption.

3) Polarity

Please mount it in accordance with its polarity.

4) Operating environment and lifetime

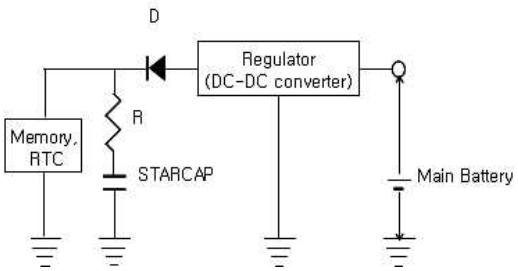
EDLC shows faster deterioration in high temperature operation. The lifetime of EDLC follows the general lifetime acceleration rule of double or half per every 10℃ of ambient temperature decrease or increase respectively. A large temperature difference in one day or humid operating environment results in dew condensation on the surface of EDLC and it may cause fast deterioration or electrolyte leakage of EDLC.

If the EDLC is used in an electronic or electrical device over a long period of time especially in high temperature or high humidity environment, please check it periodically and replace it when necessary.

5) Cleaning

Some detergent or high temperature drying causes deterioration of EDLC.
If you wash EDLCs, Consult us.

6) Following figure shows the general back-up circuit.



D : Diode to prevent the reverse current
R : Resistor to control the charging current

7) Short-circuit

DO NOT short-circuit between terminals of EDLCs without resistor.

8) Storage

In long term storage, please store EDLCs in following condition;

① TEMP. : 15 ~ 35 ℃

② HUMIDITY : Less than 60%RH

③ Non-dust, non-acidic and/or non-alkaline atmosphere

④ Avoid direct sun light, strong magnetic field

Storage period limit is one(1) year when an EDLC is stored in the above condition. Storage in improper condition may cause some damage on terminal surface or on outer tube of the EDLC.

If the storage period exceed one(1) year in the customer's warehouse, please contact the manufacturer.

9) Do not disassemble the EDLC. It contains electrolyte.

10) Series connection of EDLCs

Over-rated voltage may be applied to a single EDLC in series connection due to the deviation of capacitance and ESR of each EDLC. Please inform us if you are using EDLCs in series connection and please design so as not to apply over-rated voltage to each EDLC, and use EDLCs from a same lot.

11) The tips or edges of an EDLC terminals are very sharp. Please handle with care.

12) Industrial Application

Some industrial applications require a very high level of reliability to its parts including EDLCs. Therefore if the EDLC is to be used in an industrial application such as factory machinery, heavy electricity, etc. periodic inspection of EDLC is necessary. If there found any problem with the EDLC, please replace it.

13) Use of Functional Coating Chemicals

Some solvents of functional coating chemicals which applied on the same PCB with the STARCAP EDLC may cause undesired effects on the EDLC such as surface oxidation or electrolyte leakage. When apply those chemicals, be careful of not coating the EDLC's surface.

13. Environmental Management

All STARCAP products are RoHS 1, 2 and 3 compliant, Halogen Free and environment friendly.

Series	RoHS 1,2 directive (Pb, Cr+6, Hg, Cd, PBB, PBDE)	ELV directive (Pb, Cr+6, Hg, Cd)	PVC	Halogen Flame Retardant Free (Cl, Br)	RoHS 3 directive (DEHP, BBP, DBP, DIBP)	etc.
DMS	N.D.	N.D.	N.D.	N.D.	N.D.	

* N.D. : Not Detected or Within Permitted Range