To. :

DATE : 20 . . .

SPECIFICATION

PRODUCT : STARCAP

MODEL : DMS series

WRITTEN	CHECKED	APPROVED

KORCHIP CORP.

KORCHIP B/D, 817-38, Anyang 2-dong, Manan-gu, Anyang-si, Gyeonggi-do, KOREA

TEL : 82 - 31 - 361 - 8000

FAX : 82 - 31 - 361 - 8080

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Revision History

No.	Documentation	Check	Description of Revision	Approval	Date
1	Sung-Eun Kim (R&D)	Kee-Bok Chung (Q.A.)	Initial Release of Standard Specifications	Byong-il Lim (R&D)	Mar. 31, 2014

Manufacturer Information

Manufacturer : Korchip Corporation

Location : KORCHIP B/D, 817-38, Anyang 2-dong, Manan-gu, Anyang-si, Gyeonggi-do, KOREA

Tel. : +82-31-361-8000

Fax. : +82-31-361-8080

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 *(Example)*
① ② ③

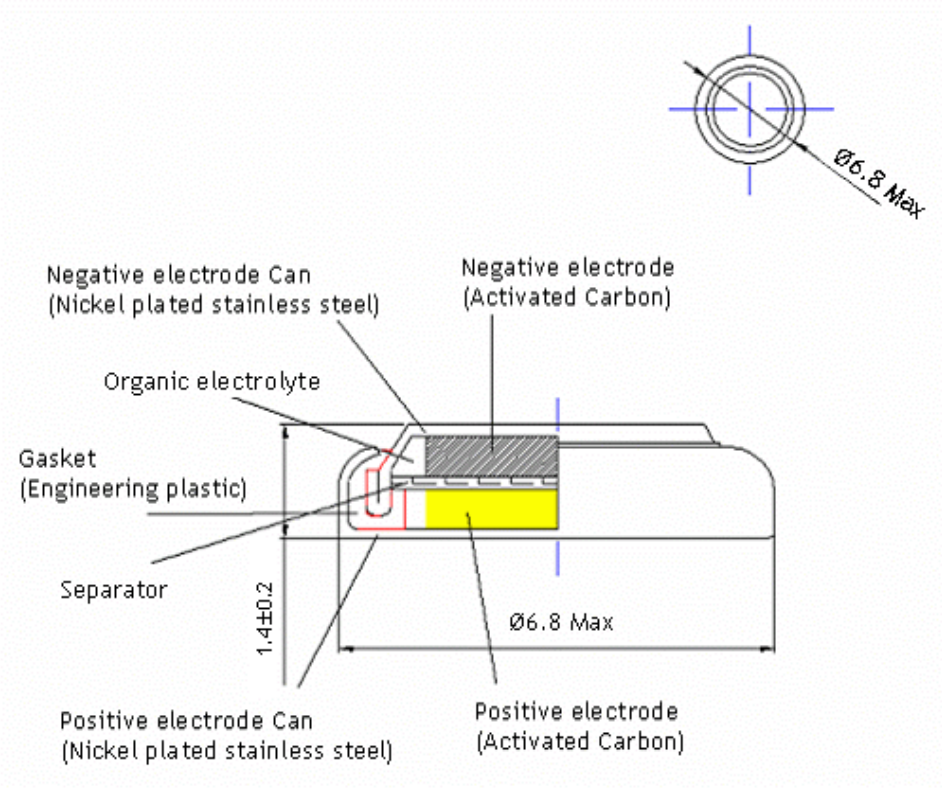
① Series Name : DMS
② Rated Voltage : 3.3VDC
③ Capacitance : 0.22 F (224 = 22 × 10^{+4} uF)

3. Photo

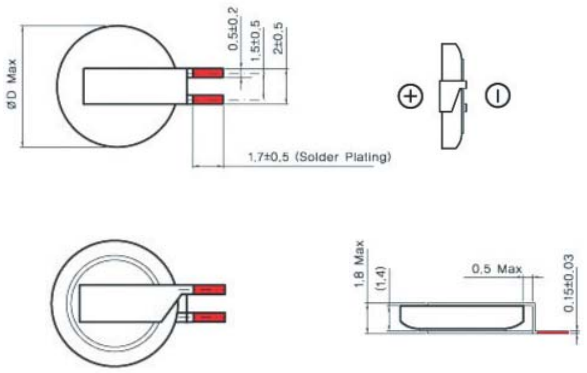
4. General Specifications

ITEMS	DMS3R3204	DMS3R3224	DMS3R3304
Rated Voltage	3.3 VDC	3.3 VDC	3.3 VDC
Operating Temp.	-10 ~ +60 ℃	-10 ~ +60 ℃	-10 ~ +60 ℃
Capacitance (F)	0.20 F	0.22 F	0.30 F
Capacitance Tolerance	-20 ~ 80 %	-20 ~ 80 %	-20 ~ 80 %
Equivalent Series Resistance (ESR)	Less than 200Ω	Less than 200Ω	Less than 200Ω
Leakage Current (LC, 30min.)	Less than 150㎂	Less than 150㎂	Less than 150㎂

5. Cell Structure



6. Product Construction and Dimensions



Part No.	Dimensions (mm)		
	ØD	H	P
DMS3R3204	6.8	1.8	2.0
DMS3R3224	6.8	1.8	2.0
DMS3R3304	6.8	1.8	2.0

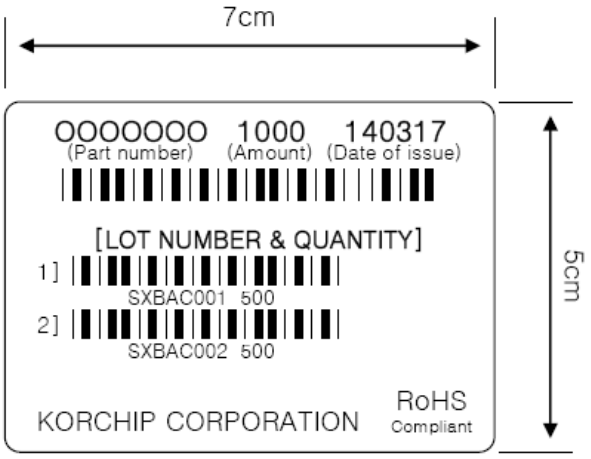
7. Reliability Specifications

<table>
<tr><th colspan="2">Item</th><th colspan="2">Specification</th><th colspan="2">Test Condition</th></tr>
<tr><td rowspan="9">Temperature Characteristics</td><td>Capacitance Change</td><td rowspan="2">Step 2</td><td>Within ± 30% of Initial Value</td><td colspan="2" rowspan="9">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>-25±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>10Times or less than Initial Value</td></tr>
<tr><td>Capacitance Change</td><td rowspan="3">Step 4</td><td>Within ± 30% of Initial Value</td></tr>
<tr><td>ESR</td><td>200ohm or less</td></tr>
<tr><td>LC(30min.)</td><td>4Times or less than Initial Value</td></tr>
<tr><td>Capacitance Change</td><td rowspan="3">Step 5</td><td>Within ± 10% of Initial Value</td></tr>
<tr><td>ESR Change</td><td>200ohm or less</td></tr>
<tr><td>LC Change (30min.)</td><td>Within ± 10% of Initial Value</td></tr>
<tr><td rowspan="4">Humidity Resistance</td><td colspan="2">Capacitance Change</td><td>± 30% of Initial Value</td><td colspan="2" rowspan="4">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>1kohm or less</td></tr>
<tr><td colspan="2">LC(30min.)</td><td>2Times or less than Spec. Value</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 2.0Vdc</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="4">Vibration Resistance</td><td colspan="2">Capacitance</td><td>Spec. Value</td><td colspan="2" rowspan="4">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">LC(30min.)</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 1kg , 10±1 Sec.</td></tr>
<tr><td>Terminal Bend Strength</td><td colspan="2">Load 1kg , Angle 90º , 1Cycle</td></tr>
<tr><td rowspan="4">Endurance</td><td colspan="2">Capacitance Change</td><td>Within ± 30% of Initial Value</td><td colspan="2" rowspan="4">Temp. : 60±2℃
Test Time : 1,000(+24,-0) Hours
Applied Voltage : 3.3Vdc</td></tr>
<tr><td colspan="2">ESR</td><td>4kohm or less</td></tr>
<tr><td colspan="2">LC(30min.)</td><td>Spec. Value</td></tr>
<tr><td colspan="2">Appearance</td><td>No Marked Defect</td></tr>
<tr><td rowspan="4">Cycle Characteristics</td><td colspan="2">Capacitance Change</td><td>Within ± 30% of Initial Value</td><td colspan="2" rowspan="4">Temp. : 25±2℃
Cycle No. : 10,000
Charge Voltage : 3.3Vdc
Resistance : 100Ω, Time : 9min.
Discharge Resistance:100Ω, Time:1min.</td></tr>
<tr><td colspan="2">ESR</td><td>4kohm or less</td></tr>
<tr><td colspan="2">LC(30min.)</td><td>Spec. Value</td></tr>
<tr><td colspan="2">Appearance</td><td>No Marked Defect</td></tr>
</table>

8. Packing Specifications

Part No.	Quantity (PCS)			Size (W × L × H mm)		Weight (Kg)
	Tray	Inner Box	Outer Box	Inner Box	Outer Box	
DMS3R3204(224, 304)	100	1,000	16,000	180×170×75	375×340×350	≃ 9.0

9. Labeling Standards



← **(Example)**

Lot No. System

Ex.) S X A A C 002

① ② ③ ④ ⑤ ⑥

① Product Code : S (STARCAP)

② Production Year Code : X (2013), Y (2014), Z (2015)…

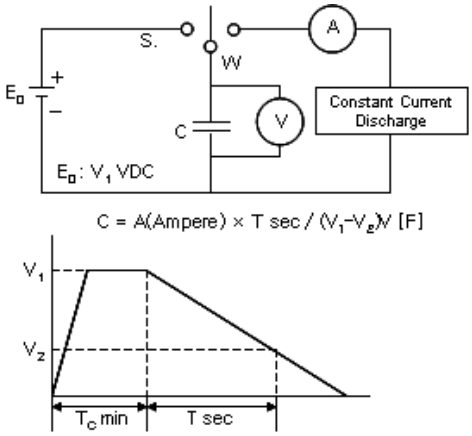
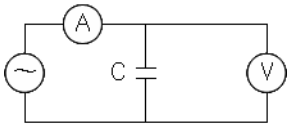
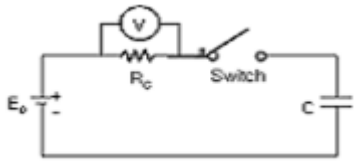
③ Factory Identification Code : A (Factory 1)

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

Capacitance	1) Charge the STARCAP with 1±0.1㎃ to opration voltage of V1(=2.6V) for 1 hour. 2) Discharge the STARCAP with constant current(A) 0.1±0.01㎃ to the voltage of V2(=1.3V) while measure the discharge time(T). 3) Calculate capacitors using the following formula.  C = A(Ampere) × T sec / (V_1-V_2)V [F]
Equivalent Series Resistance (ESR @1kHz)	● 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.)
Leakage Current	1) Apply 3.3 ± 0.1V to the STARCAP.(E_0) 2) Measure V_R after 30±0.5 min. 3) Calculate current using the following formula.  *LC = (V_R/R_C) x 10^3 [mA]* V_R = Measured value R_C = 100Ω
☞ The STARCAP should be shorted before each measurement as follows ; Capacitance : 60 min. , ESR : 15 min. , LC : 15 min.	

11. Mounting

When you solder STARCAP to a printed circuit board, excessive thermal stress could cause the STARCAP's electrical characteristics to deteriorate, compromise the integrity of the seal or cause the electrolyte to leak due to increased internal pressure.

① Recommended condition of flow soldering

If you want to set or mount DMS series STARCAP on a PCB with resin before soldering for ease of soldering process, follow the thermal condition below.

- Hardening Temp. of Resin : 80℃ or below
- Hardening Time of Resin : 10 min. or less

② Recommended condition of manual soldering

- Soldering Tip Temp. : 350℃ or less
- Soldering Time : 3 sec. or less
- Times : Three times or less at intervals of 9 sec. or more

※ Do not touch the metal case of STARCAP with a soldering iron.

③ It is not allowed to go through reflow (IR, Atmosphere heating methods etc.) process.

④ The terminals are plated for good solderability. Rasping terminals may damage the plating layer and degrade the solderability.
Do not apply a large force to the terminals. Otherwise, they may break or come off or the STARCAP characteristics may be deteriorated.

12. Cautions for Use

Please be careful for following points when you use STARCAP.

1) Do not apply more than rated voltage.

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

2) Do not use STARCAP for ripple absorption.

3) Polarity

Please mount it in accordance with its polarity.

4) Operating temperature and life

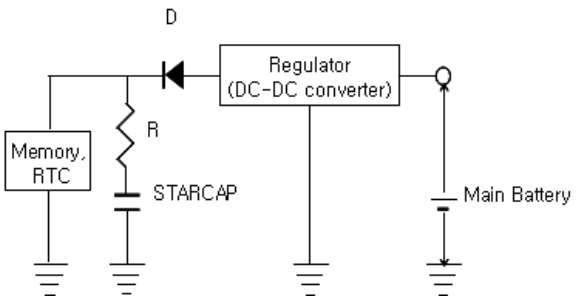
Generally, STARCAP has a lower leakage current, longer back-up time and longer life in the low temperature i.e. the room temperature. But it has a higher leakage current, shorter back-up time and shorter life in the high temperature.

Please design to keep STARCAP away from calorific parts.

5) Cleaning

Some detergent or high temperature drying causes deterioration of STARCAP.
If you wash STARCAP, 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 STARCAP

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

8) Storage

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

① TEMP. : 15 ~ 35 ℃

② HUMIDITY : 45 ~ 75 %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 a STARCAP is stored in the above condition. Storage in improper condition may cause some damage to STARCAP.

9) Do not disassemble STARCAP. It contains electrolyte.

10) Series connection of STARCAP

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

11) The tips of STARCAP terminals are very sharp. Please handle with care.

13. Environmental Management

All STARCAP products are RoHS compliant and environment friendly.

Series	RoHS directive Pb, Cr+6, Hg, Cd, PBB,PBDE	ELV directive Pb, Cr+6, Hg, Cd	PVC	etc.
DMS	N.D.	N.D.	N.D.	

* N.D. : Not detected