To. :

DATE : 20 . . .

RoHS	Halogen Free

SPECIFICATION

PRODUCT : STARCAP

MODEL : DCS series

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.E. Kim (R&D)	K.B. Chung (Q.A.)	Initial Release	B.I. Lim (R&D)	May 12, 2014
2	S.E. Kim (R&D)	K.B. Chung (Q.A.)	HF(Halogen Free) Updated	B.I. Lim (R&D)	Jul. 24, 2014

Manufacturer Information

Manufacturer : Korchip Corporation

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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

DCS	5R5	474	V	F	*(Example)*
①	②	③	④	⑤	

① Series Name : DC(Coin type double layer capacitor), S(Small size)
② Rated Voltage : 5.5VDC
③ Capacitance : 0.47 F (474 = 47 × 10^{+4} uF)
④ Terminal Type : V-type
⑤ Pb-Free

3. Photo

V-TYPE

H-TYPE

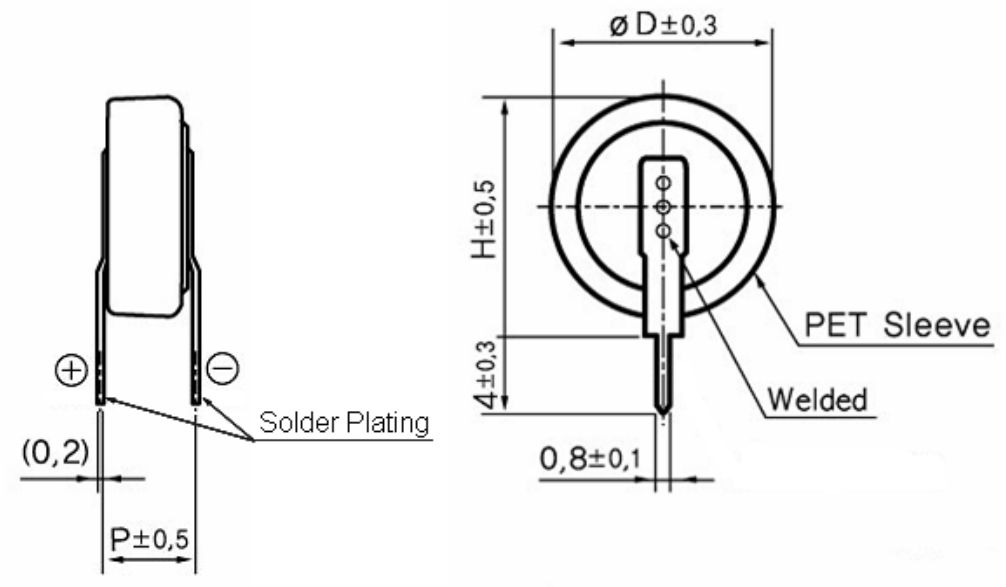
C-TYPE

(Example)

4. General Specifications

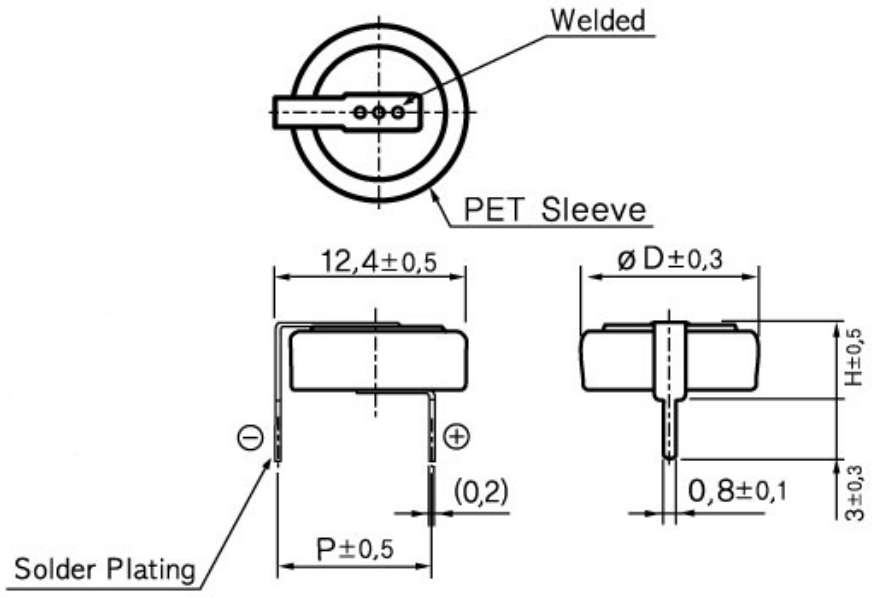
ITEMS	DCS5R5473(104)	DCS5R5224(334)	DCS5R5474
Rated Voltage	5.5 VDC	5.5 VDC	5.5 VDC
Operating Temp.	-25 ~ +70 ℃	-25 ~ +70 ℃	-25 ~ +70 ℃
Capacitance	0.047(0.10) F	0.22(0.33) F	0.47 F
Capacitance Tolerance	-20 ~ 80 %	-20 ~ 80 %	-20 ~ 80 %
Equivalent Series Resistance (ESR)	Less than 120Ω	Less than 75Ω	Less than 50Ω
Leakage Current (LC, 30min.)	Less than 200㎂	Less than 330㎂	Less than 500㎂

5. Product Construction And Dimension (V-type)



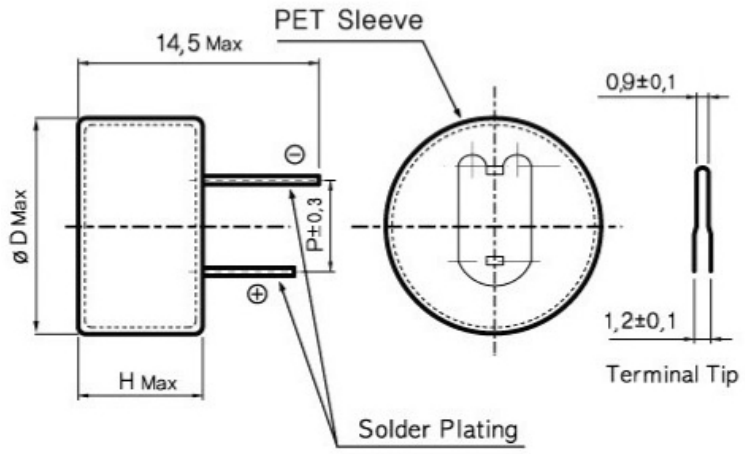
Part No.	Dimensions (mm)		
	ØD	H	P
DCS5R5473VF	11.5	12.5	5.0
DCS5R5104VF	11.5	12.5	5.0
DCS5R5224VF	11.5	12.5	5.0
DCS5R5334VF	11.5	12.5	5.0
DCS5R5474VF	11.5	12.5	5.0

5. Product Construction And Dimension (H-type)



Part No.	Dimensions (mm)		
	ØD	H	P
DCS5R5473HF	11.5	5.5	10.0
DCS5R5104HF	11.5	5.5	10.0
DCS5R5224HF	11.5	5.5	10.0
DCS5R5334HF	11.5	5.5	10.0
DCS5R5474HF	11.5	5.5	10.0

5. Product Construction And Dimension (C-type)



Part No.	Dimensions (mm)		
	ØD	H	P
DCS5R5473CF	13.5	7.0	5.0
DCS5R5104CF	13.5	7.0	5.0
DCS5R5224CF	13.5	7.0	5.0
DCS5R5334CF	13.5	7.0	5.0
DCS5R5474CF	13.5	7.0	5.0

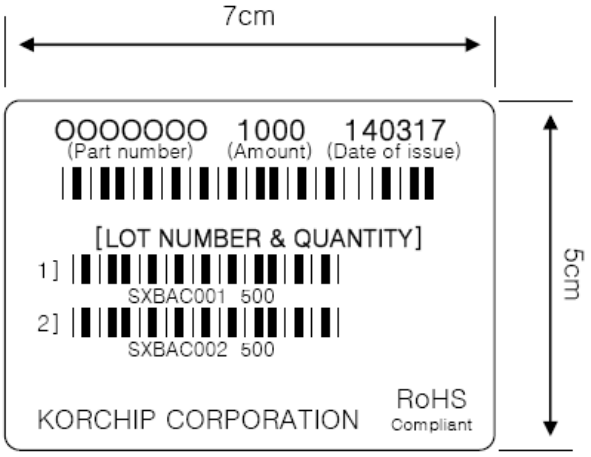
6. Reliability Specifications

<table>
<tr><th colspan="2">Item</th><th colspan="2">Specification</th><th colspan="2">Test Condition (JISC5102)</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>70±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="3">Step 4</td><td>Within ± 30% of Initial Value</td></tr>
<tr><td>ESR</td><td>4Times or less than Initial Value</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>Within ± 10% of Initial Value</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 : 240±8 Hours
<u>No Voltage Applied</u></td></tr>
<tr><td colspan="2">ESR</td><td>3Times or less than Spec. Value</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 4.2Vdc</td><td>Charging Condition</td><td>Voltage : 5.5Vdc
Current : 50㎃
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. : 70±2℃
Test Time : 1,000(+24,-0) Hours
Applied Voltage : 5.5Vdc</td></tr>
<tr><td colspan="2">ESR</td><td>4Times or less than Initial 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 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 : 5.5Vdc
Resistance : 100Ω, Time : 9min.
Discharge Resistance:100Ω, Time:1min.</td></tr>
<tr><td colspan="2">ESR</td><td>4Times or less than Initial 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>
</table>

7. Packing Specifications

Part No.	Quantity (PCS)			Size (W × L × H mm)		Type
	Vinyl Bag	Inner Box	Outer Box	Inner Box	Outer Box	
DCS5R5473(V,H)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5104(V,H)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5224(V,H)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5334(V,H)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5474(V,H)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5473(C)	500	1,500	3,000	240×220×100	460×260×125	Bulk
DCS5R5104(C)	500	1,500	3,000	240×220×100	460×260×125	Bulk
DCS5R5224(C)	500	1,500	3,000	240×220×100	460×260×125	Bulk
DCS5R5334(C)	500	1,500	3,000	240×220×100	460×260×125	Bulk
DCS5R5474(C)	500	1,500	3,000	240×220×100	460×260×125	Bulk

8. Labeling Standards



← **(Example)**

Lot No. System

Ex.) S X B A C 002

① ② ③ ④ ⑤ ⑥

① Product Code : S (STARCAP)

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

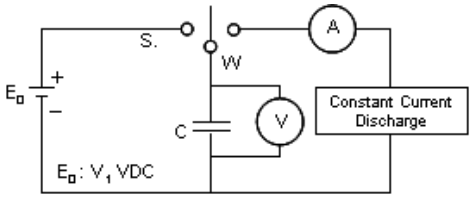
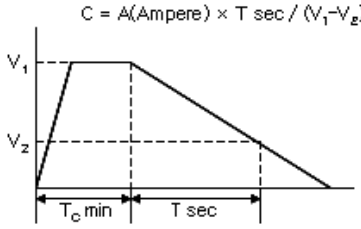
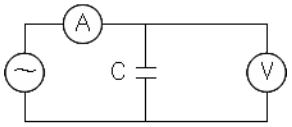
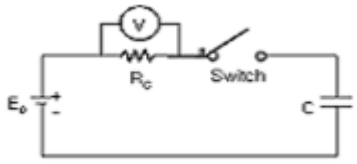
③ Factory Identification Code : B (Factory 2)

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)…

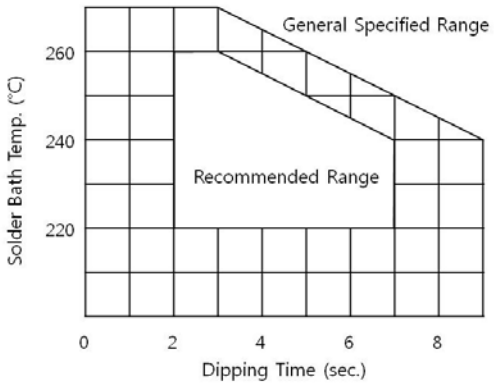
9. Measuring Method Of Characteristics

Capacitance	1) Charge the STARCAP with constant current 50±0.1㎃ to the voltage of V1(=4.4V) for 30 min. 2) Discharge the STARCAP with constant current(A) 2±0.1㎃ to the voltage of V2(=2.2V) while measure the discharge time(T). 3) Calculate capacitance 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 ● Calculate 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 5.0±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 (0.1F ~ 0.47F) 1000Ω (0.047F)
☞ The STARCAP should be shorted before each measurement as follows ; Capacitance : 60 min. , ESR : 15 min. , LC : 15 min.	

10. 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



Pre-heating Temp.	: Max. 100 ℃ (on the surface of STARCAP)
Pre-heating Time	: Max. 60seconds
PCB Thickness	: Min. 0.8mm

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.

11. 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

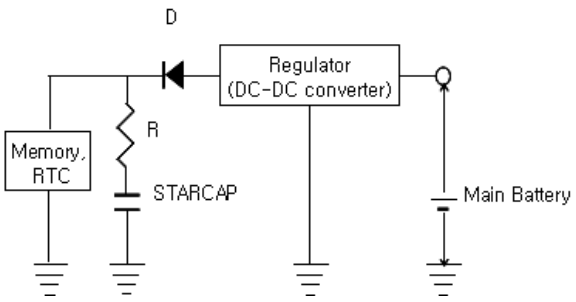
Generally, STARCAP has a lower leakage current, longer back-up time and longer life in the low temperature i.e. the room temperature. But it has a higher leakage current, shorter back-up time and shorter life in the high temperature.

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 on terminal surface or on outer tube of 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.

12. Environmental Management

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

Series	RoHS directive (Pb, Cr+6, Hg, Cd, PBB,PBDE)	ELV directive (Pb, Cr+6, Hg, Cd)	PVC	Halogen Flame Retardant Free (Cl, Br)	etc.
DCS	N.D.	N.D.	N.D.	N.D.	

* N.D. : Not detected