

To. :

DATE : 20 . . .



SPECIFICATION

PRODUCT : STARCAP

MODEL : DCS series

WRITTEN	CHECKED	APPROVED

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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. Product Model Name

- 1) Product : Electric Double Layer Capacitor
- 2) Model name : ~~DCS 5R5 474~~(334, 224, 104, 473) V, H, C

4. Photo (Example)



V-TYPE



H-TYPE

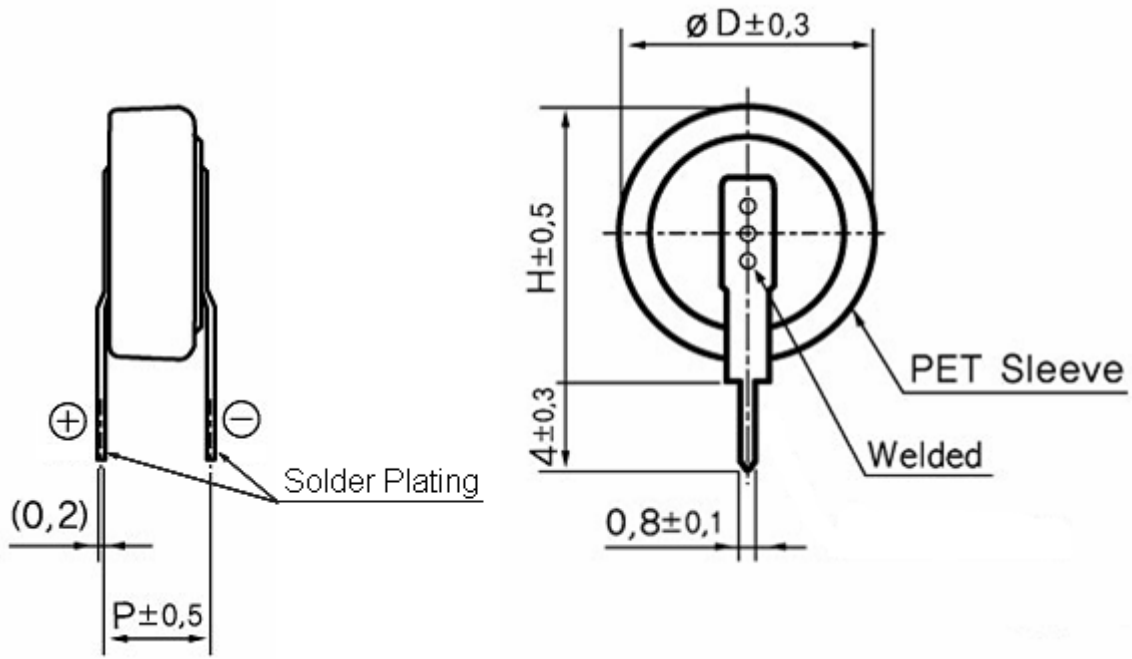


C-TYPE

5. Nominal Specifications

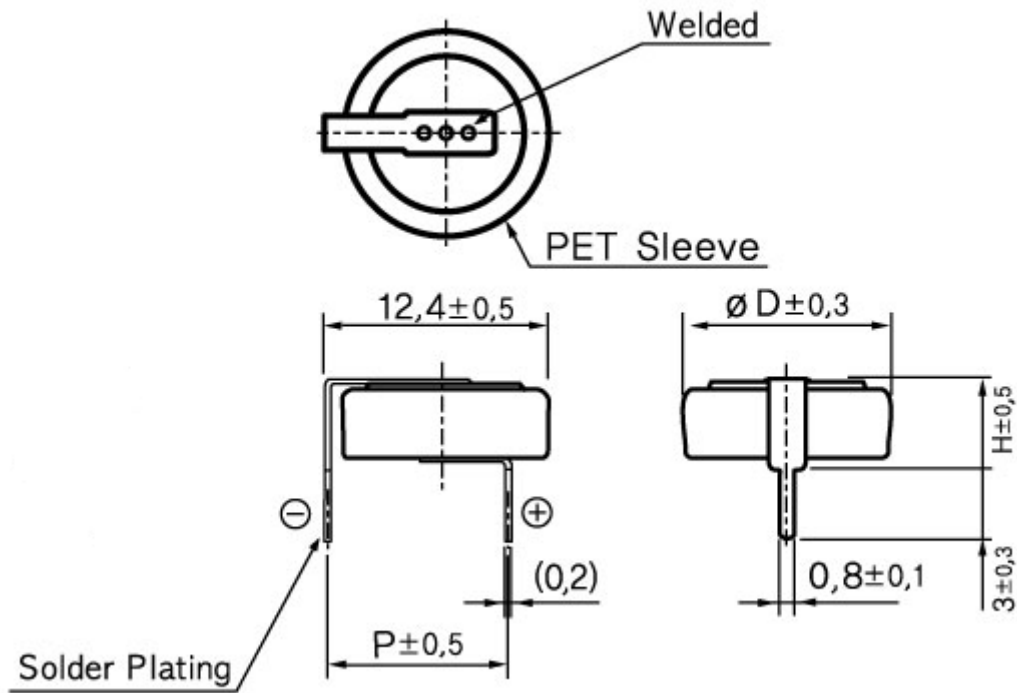
Items	DCS 5R5 473	DCS 5R5 104(224)	DCS 5R5 334(474)
OPERATING TEMPERATURE	-25 ~ +70 °C	-25 ~ +70 °C	-25 ~ +70 °C
RATED VOLTAGE	5.5 VDC	5.5 VDC	5.5 VDC
ELECTROSTATIC CAPACITANCE (F)	0.047 F	0.10(0.22) F	0.33(0.47) F
CAPACITANCE TOLERANCE	-20 ~ 80 %	-20 ~ 80 %	-20 ~ 80 %
EQUIVALENT SERIES RESISTANCE (ESR)	LESS THAN 120Ω	LESS THAN 75Ω	LESS THAN 50Ω
LEAKAGE CURRENT (LC)	LESS THAN 200μA	LESS THAN 330μA	LESS THAN 500μA

6. Product Construction And Dimension (V-type)



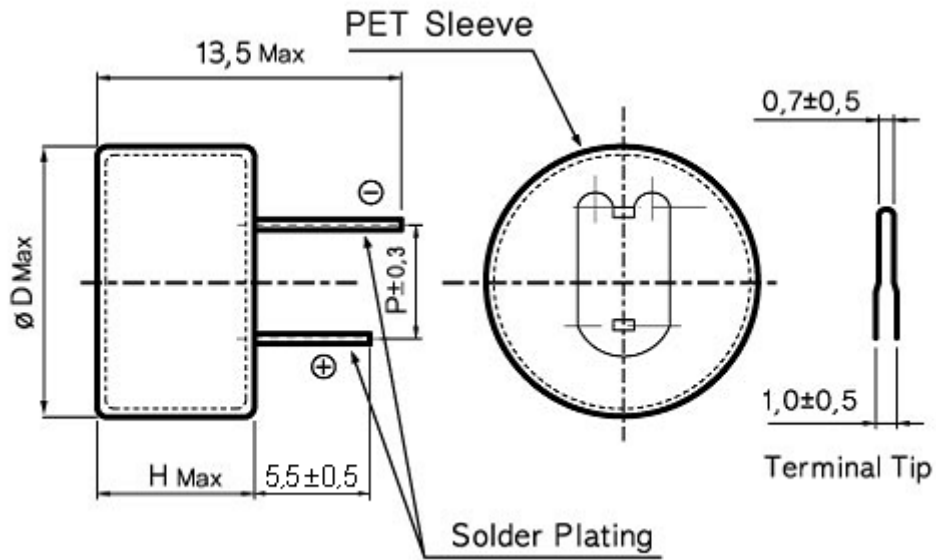
Part No.	Dimensions (mm)		
	$\varnothing D$	H	P
DCS 5R5 473 V	11.5	12.5	5.0
DCS 5R5 104 V	11.5	12.5	5.0
DCS 5R5 224 V	11.5	12.5	5.0
DCS 5R5 334 V	11.5	12.5	5.0
DCS 5R5 474 V	11.5	12.5	5.0

6. Product Construction And Dimension (H-type)



Part No.	Dimensions (mm)		
	ØD	H	P
DCS 5R5 473 H	11.5	5.5	10.0
DCS 5R5 104 H	11.5	5.5	10.0
DCS 5R5 224 H	11.5	5.5	10.0
DCS 5R5 334 H	11.5	5.5	10.0
DCS 5R5 474 H	11.5	5.5	10.0

6. Product Construction And Dimension (C-type)



Part No.	Dimensions (mm)		
	$\varnothing D$	H	P
DCS 5R5 473 C	13.5	6.5	5.0
DCS 5R5 104 C	13.5	6.5	5.0
DCS 5R5 224 C	13.5	6.5	5.0
DCS 5R5 334 C	13.5	6.5	5.0
DCS 5R5 474 C	13.5	6.5	5.0

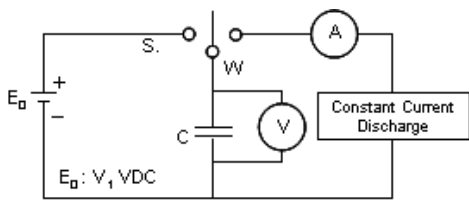
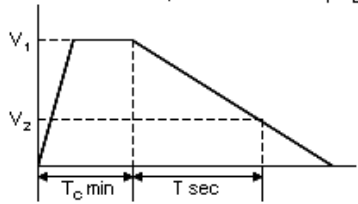
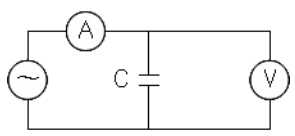
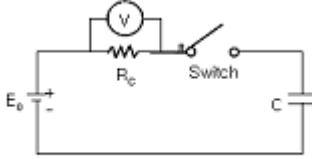
7. Packing Specification

PRODUCT	QUANTITY(PCS)			SIZE(W×L×H mm)		Type
	Vinyl Bag	Inner Box	Outer Box	Inner Box	Outer Box	
DCS 5R5 473 (V,H)	500	2,000	4,000	295×230×140	485×310×310	Bulk
DCS 5R5 104 (V,H)	500	2,000	4,000	295×230×140	485×310×310	Bulk
DCS 5R5 224 (V,H)	500	2,000	4,000	295×230×140	485×310×310	Bulk
DCS 5R5 334 (V,H)	500	2,000	4,000	295×230×140	485×310×310	Bulk
DCS 5R5 474 (V,H)	500	2,000	4,000	295×230×140	485×310×310	Bulk
DCS 5R5 473 C	500	1,500	3,000	295×230×140	485×310×310	Bulk
DCS 5R5 104 C	500	1,500	3,000	295×230×140	485×310×310	Bulk
DCS 5R5 224 C	500	1,500	3,000	295×230×140	485×310×310	Bulk
DCS 5R5 334 C	500	1,500	3,000	295×230×140	485×310×310	Bulk
DCS 5R5 474 C	500	1,500	3,000	295×230×140	485×310×310	Bulk

8. Specifications And Test Method

Items.		Specification		Test Condition (EIAJ RC-2377)															
OPERATING TEMP. RANGE		-25°C ~ +70°C																	
RATED VOLTAGE		5.5 Vdc																	
CAPACITANCE		0.047 ~ 0.47 F		SEE MEASURING METHOD															
CAPACITANCE TOLERANCE		+80% , -20%																	
EQUIV. SERIES. RES. (ESR)		See Nominal Specifications		SEE MEASURING METHOD															
LEAKAGE CURRENT (30MIN)		See Nominal Specifications		SEE MEASURING METHOD															
TEMPERATURE CHARACTERISTICS	CAPACITANCE	STAGE 2	± 30% OF INI. VAL	Measure electrical characteristics after exposing STARCAP Capacitor to each temperature atmosphere for 1 hour															
	ESR		5TIMES ↓ OF INI. VAL																
	CAPACITANCE	STAGE 4	± 30% OF INI. VAL			<table border="1"> <thead> <tr> <th>STAGE</th> <th>TEMPERATURE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20± 2°C</td> </tr> <tr> <td>2</td> <td>-25± 2°C</td> </tr> <tr> <td>3</td> <td>20± 2°C</td> </tr> <tr> <td>4</td> <td>70± 2°C</td> </tr> <tr> <td>5</td> <td>20± 2°C</td> </tr> </tbody> </table>		STAGE	TEMPERATURE	1	20± 2°C	2	-25± 2°C	3	20± 2°C	4	70± 2°C	5	20± 2°C
	STAGE		TEMPERATURE																
	1		20± 2°C																
	2	-25± 2°C																	
	3	20± 2°C																	
4	70± 2°C																		
5	20± 2°C																		
ESR	4TIMES ↓ OF INI. VAL																		
LC	4TIMES ↓ OF INI. VAL																		
CAPACITANCE	STAGE 5	± 10% OF INI. VAL																	
ESR		SPEC. VALUE																	
LC		SPEC. VALUE																	
HUMIDITY RESISTANCE	CAPACITANCE	90% ↑ OF INI. VAL		TEMP. : 40± 2°C HUMIDITY : 90 ~ 95%RH TIME : 240± 8 HOURS NO VOLTAGE APPLIED															
	ESR	3TIMES ↓ OF INI. V																	
	LC	2TIMES ↓ OF INI. V																	
	APPEARANCE	NO MARKED DEFECT																	
SELF DISCHARGE CHARACTERISTICS	VOLTAGE	MORE THAN 4.2V		CHARGING CONDITION	VOLTAGE : 5.5V RESISTANCE : 10Ω CHARGE TIME : 24 HOURS														
				STORAGE CONDITION	STORAGE FOR 24 HOURS TEMP. : LESS THAN 25°C HUMIDITY : LESS THAN 70%RH														
VIBRATION RESISTANCE	CAPACITANCE	SPEC. VALUE		AMPLITUDE : 1.5 ^{mm} FREQUENCY : 10 ~ 55Hz DIRECTION : X, Y, Z 3DIRECTIONS TEST TIME : 6 HOURS															
	ESR	SPEC. VALUE																	
	LC	SPEC. VALUE																	
	APPEARANCE	NO MARKED DEFECT																	
TERMINAL STRENGTH	APPEARANCE	TERMINALS SHALL NOT BE SEPARATED		LOAD 1kg , 10± 1 SEC															
TERMINAL BEND STRENGTH				LOAD 1kg , ANGLE 90° , 1Cycle															
ENDURANCE	CAPACITANCE	± 30% OF INI. VAL		TEMP. : 70± 2°C TEST TIME : 1,000(+24,-0) HOURS APPLIED VOLTAGE : 5.5Vdc															
	ESR	4TIMES ↓ OF INI. V																	
	LC	3TIMES ↓ OF INI. V																	
	APPEARANCE	NO MARKED DEFECT																	

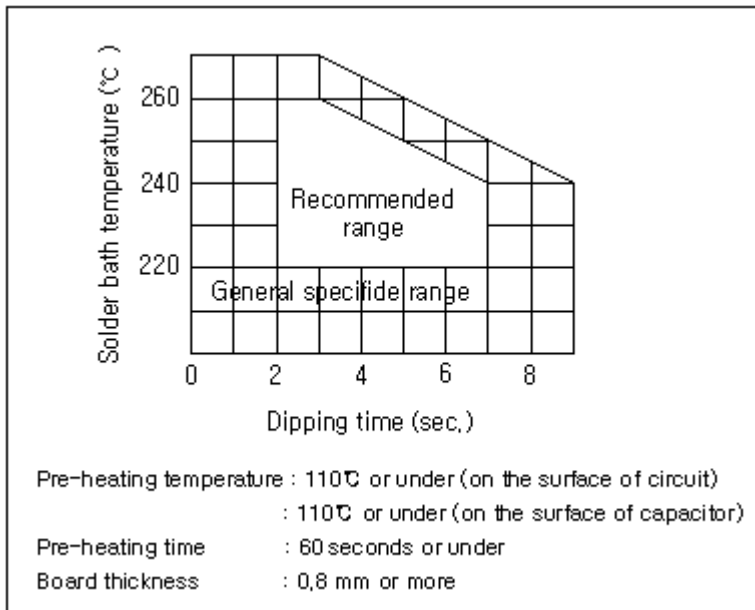
9. Measuring Method Of Characteristics

<p>Capacitance</p>	<ol style="list-style-type: none"> 1) CHARGE THE STARCAP WITH $50 \pm 0.1 \text{mA}$ TO OPERATION VOLTAGE(V_1) FOR 30 Min. 2) DISCHARGE THE STARCAP WITH CONSTANT CURRENT(A) Max $2 \pm 0.1 \text{mA}$ TO THE VOLTAGE OF V_2(NORMALLY 2.0V) WHILE MEASURE THE DISCHARGE TIME(T). (Standard Operating Current for DCS Series STARCAP is 2mA) 3) CALCULATE CAPACITANCE USING THE FOLLOWING FORMULA.  $C = A(\text{Ampere}) \times T \text{ sec} / (V_1 - V_2) \text{V [F]}$ 
<p>Equivalent Series Resistance (ESR @1kHz)</p>	<ul style="list-style-type: none"> ● MEASURE ESR BY THE LCR METER. (Frequency:1kHz, Bias Voltage : $0^{+0.05} \text{V}$) or ● CALCULATE ESR USING THE FOLLOWING FORMULA.  $R[\Omega] = V[V] / I[A] \quad * i[\text{mA}] = I[A] \times 10^{-3}$ <p>R : Internal resistance(ESR) [Ω] V : Measured voltage between terminals [V] i : Current 1mA(A.C.)</p> $\text{ESR}[\Omega] = V / i$
<p>Leakage Current</p>	<ol style="list-style-type: none"> 1) APPLY $5.0 \pm 0.1 \text{V}$ TO THE STARCAP. 2) MEASURE V_R AFTER $30 \pm 0.5 \text{MIN}$. 3) CALCULATE CURRENT USING THE FOLLOWING FORMULA.  <p>$E_0 : \text{Vdc}$ $R_C : 1000\Omega (0.047\text{F})$ $100\Omega (0.1\text{F} \sim 0.47\text{F})$</p> $\text{LC} = (V_R / R_C) \times 10^3 [\text{mA}]$
<p>☞ THE STARCAP SHOULD BE SHORTED BEFORE EACH MEASUREMENT AS FOLLOWS ; CAPACITANCE : 60 MIN. , ESR : 15 MIN. , LC : 15 MIN.</p>	

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



② Recommended condition of manual soldering

- Soldering Tip Temp. : 350°C 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 electrolyzed and its ESR increase. At the worst, it may be broken.

2) Do not use STARCAP for ripple absorption.

3) Polarity

The STARCAP is non-polar fundamentally, however STARCAP gets polarity through aging process before it is packed. Please mount it in accordance with its polarity to maintain the best condition.

4) Operating temperature and life

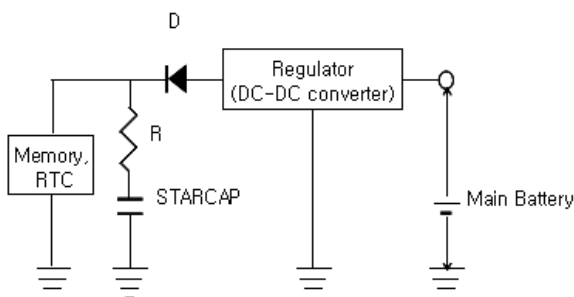
Generally, STARCAP has a lower leakage current, longer back-up time and longer life in the low temperature i.e. the room temperature. But it has a higher leakage current, shorter back-up time and shorter life in the high temperature.

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

You can short-circuit between terminals of STARCAP without resistor. However when you short-circuit frequently, please consult us.

8) Storage

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

- ① TEMP. : 15 ~ 35 °C
- ② HUMIDITY : 45 ~ 75 %RH
- ③ NON-DUST

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 and environment friendly.

By changing the solder plating from leaded solder to lead-free solder, and the outer tube from Polyvinyl Chloride(PVC) to Polyethylene Terephthalate(PET), our new STARCAP has become even more friendly to the environment.

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

* N.D. : Not detected