To. : DATE : 200 . . .

SPECIFICATION

PRODUCT : STARCAP

MODEL : DCL 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

Index

1. Scope

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

2. Part Number System

DCL	5R5	105	V	F
①	②	③	④	⑤

① Series Name
② Rated Voltage : 5.5VDC
③ Capacitance : 1.0 F (105 = 10 × 10^{+5} uF)
④ Terminal Type : V-type
⑤ Pb-Free

3. Product Model Name

1) Product : Electric Double Layer Capacitor
2) Model name : DCL 5R5 474(105, 155) V, H, C

4. Photo

V-TYPE

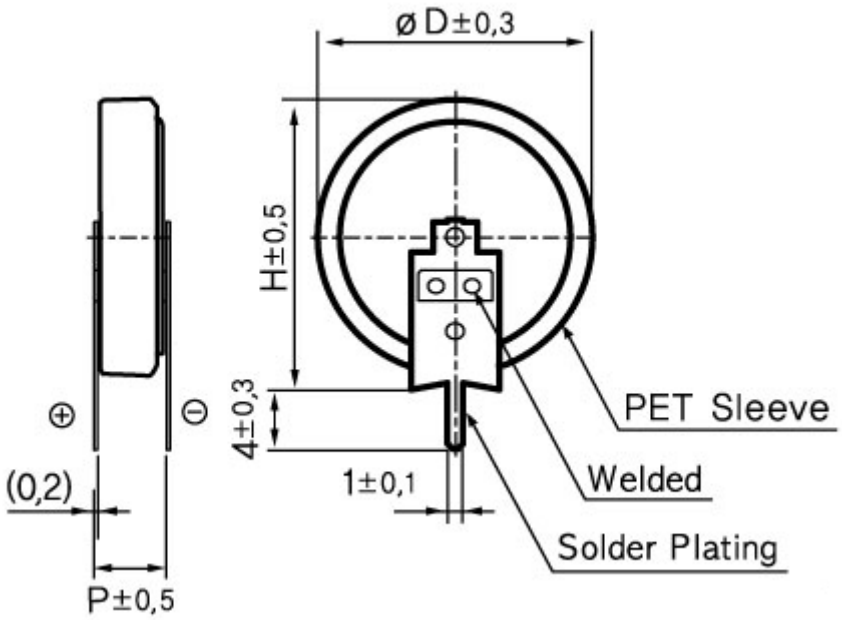
H-TYPE

C-TYPE

5. Nominal Specifications

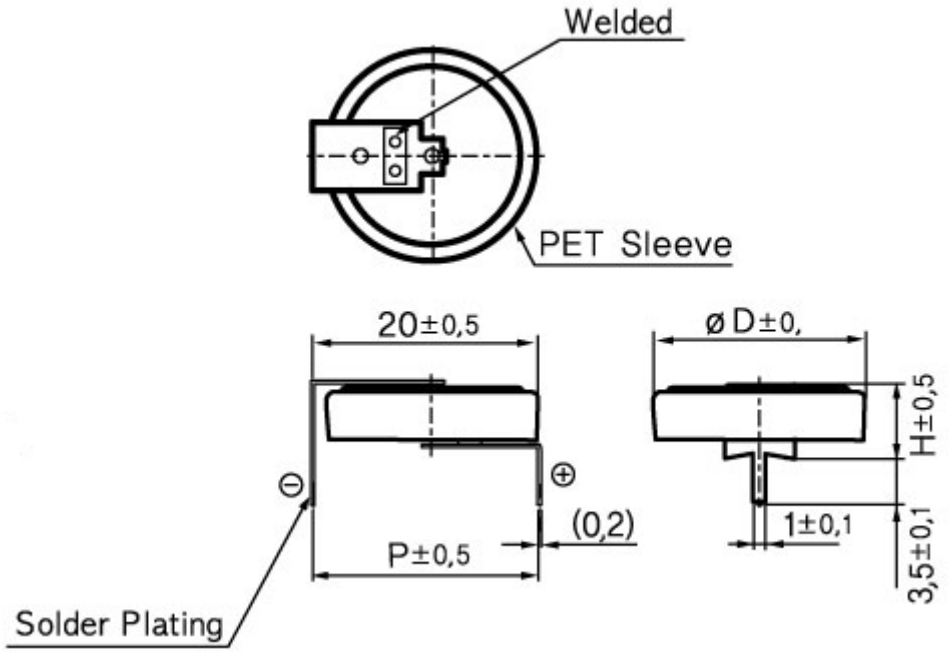
Items	DCL 5R5 474	DCL 5R5 105	DCL 5R5 155
OPERATING TEMPERATURE	-25 ~ +70 ℃	-25 ~ +70 ℃	-25 ~ +70 ℃
RATED VOLTAGE	5.5 VDC	5.5 VDC	5.5 VDC
ELECTROSTATIC CAPACITANCE (F)	0.47 F	1.0 F	1.5 F
CAPACITANCE TOLERANCE	-20 ~ 80 %	-20 ~ 80 %	-20 ~ 80 %
EQUIVALENT SERIES RESISTANCE (ESR)	LESS THAN 30Ω	LESS THAN 30Ω	LESS THAN 30Ω
LEAKAGE CURRENT (LC)	LESS THAN 1.5㎃	LESS THAN 1.5㎃	LESS THAN 1.5㎃

6. Product Construction And Dimension (V-type)



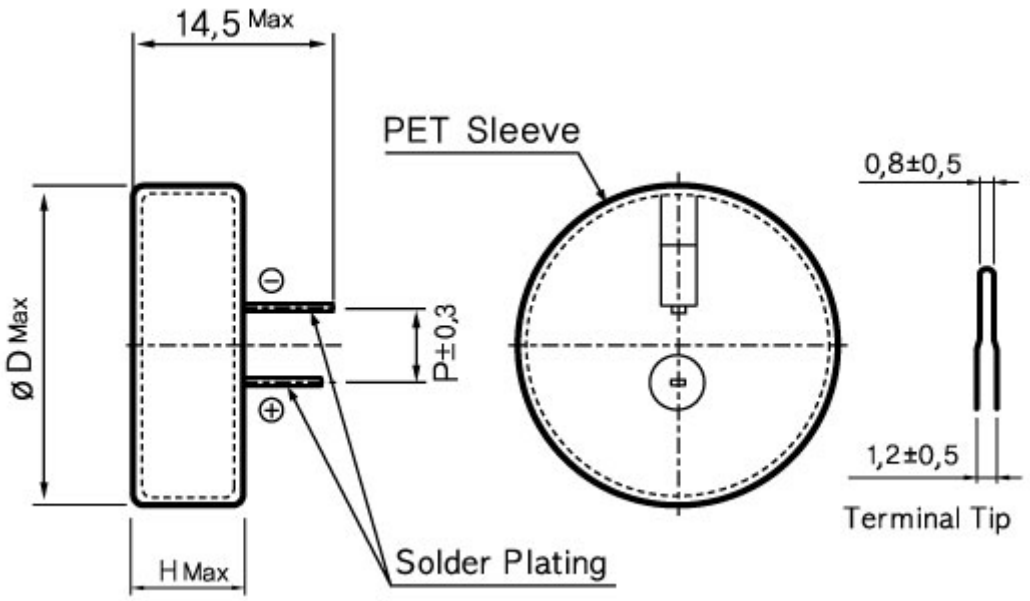
No.	Type	Rated Voltage	Capacitance	Capacitance Tolerance	Measurement (mm)		
					ØD	H	P
1	DCL 5R5 474 V	5.5VDC	0.47 F	-20 ~ 80%	19.0	19.5	5.0
2	DCL 5R5 105 V	5.5VDC	1.0 F	-20 ~ 80%	19.0	19.5	5.0
3	DCL 5R5 155 V	5.5VDC	1.5 F	-20 ~ 80%	19.0	19.5	5.0

6. Product Construction And Dimension (H-type)



No.	Type	Rated Voltage	Capacitance	Capacitance Tolerance	Measurement (mm)		
					ØD	H	P
1	DCL 5R5 474 H	5.5VDC	0.47 F	-20 ~ 80%	19.0	6.5	20.0
2	DCL 5R5 105 H	5.5VDC	1.0 F	-20 ~ 80%	19.0	6.5	20.0
3	DCL 5R5 155 H	5.5VDC	1.5 F	-20 ~ 80%	19.0	6.5	20.0

6. Product Construction And Dimension (C-type)



No.	Type	Rated Voltage	Capacitance	Capacitance Tolerance	Measurement (mm)		
					ØD	H	P
1	DCL 5R5 474 C	5.5VDC	0.47 F	-20 ~ 80%	21.5	7.5	5.0
2	DCL 5R5 105 C	5.5VDC	1.0 F	-20 ~ 80%	21.5	7.5	5.0
3	DCL 5R5 155 C	5.5VDC	1.5 F	-20 ~ 80%	21.5	7.5	5.0

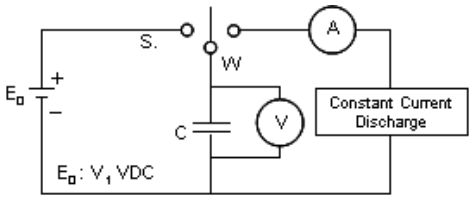
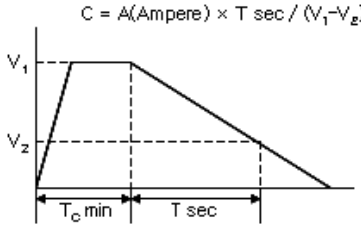
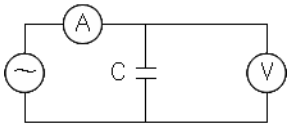
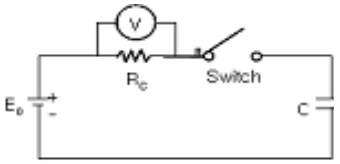
7. Packing Specification

PRODUCT	QUANTITY(PCS)			SIZE(W×L×H mm)		Type
	Tray	Inner Box	Outer Box	Inner Box	Outer Box	
DCL 5R5 474 (V, H-type)	50	400	1,600	295×230×140	485×310×310	Tray
DCL 5R5 474 (C-type)	50	400	1,600	295×230×140	485×310×310	Tray
DCL 5R5 105 (V, H-type)	50	400	1,600	295×230×140	485×310×310	Tray
DCL 5R5 105 (C-type)	50	400	1,600	295×230×140	485×310×310	Tray
DCL 5R5 155 (V, H-type)	50	400	1,600	295×230×140	485×310×310	Tray
DCL 5R5 155 (C-type)	50	400	1,600	295×230×140	485×310×310	Tray

8. Specifications And Test Method

<table>
<tr><th colspan="3">Items.</th><th colspan="2">Specification</th><th colspan="2">Test Condition (JISC5102)</th></tr>
<tr><td colspan="3">OPERATING TEMP. RANGE</td><td colspan="2">-25℃ ~ +70℃</td><td colspan="2"></td></tr>
<tr><td colspan="3">RATED VOLTAGE</td><td colspan="2">5.5 Vdc</td><td colspan="2"></td></tr>
<tr><td colspan="3">CAPACITANCE</td><td colspan="2">0.47 ~ 1.5 F</td><td colspan="2">SEE MEASURING METHOD</td></tr>
<tr><td colspan="3">CAPACITANCE TOLERANCE</td><td colspan="2">+80% , -20%</td><td colspan="2"></td></tr>
<tr><td colspan="3">EQUIV. SERIES. RES. (ESR)</td><td colspan="2">See Nominal Specifications</td><td colspan="2">SEE MEASURING METHOD</td></tr>
<tr><td colspan="3">LEAKAGE CURRENT (30MIN)</td><td colspan="2">See Nominal Specifications</td><td colspan="2">SEE MEASURING METHOD</td></tr>
<tr><td rowspan="9">TEMPERATURE CHARACTERISTICS</td><td>CAPACITANCE</td><td rowspan="2">STAGE 2</td><td>± 30% OF INI. VAL</td><td colspan="2" rowspan="9">Measure electrical characteristics after exposing STARCAP Capacitor to each temperature atmosphere for 1 hour
<table><tr><th>STAGE</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>4TIMES ↓ OF INI. VAL</td></tr>
<tr><td>CAPACITANCE</td><td rowspan="3">STAGE 4</td><td>± 30% OF INI. VAL</td></tr>
<tr><td>ESR</td><td>SPEC. VALUE</td></tr>
<tr><td>LC</td><td>SPEC. VALUE</td></tr>
<tr><td>CAPACITANCE</td><td rowspan="3">STAGE 5</td><td>± 30% OF INI. VAL</td></tr>
<tr><td>ESR</td><td>SPEC. VALUE</td></tr>
<tr><td>LC</td><td>SPEC. VALUE</td></tr>
<tr><td rowspan="4">HUMIDITY RESISTANCE</td><td colspan="2">CAPACITANCE</td><td>90% ↑ OF SPEC. VAL</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>1.2TIMES ↓ OF SPE. V</td></tr>
<tr><td colspan="2">LC</td><td>1.2TIMES ↓ OF SPE. V</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 4.2V</td><td>CHARGING CONDITION</td><td>VOLTAGE : 5.5V
RESISTANCE : 10Ω
CHARGE TIME : 24 HOURS</td></tr>
<tr><td>NEGLIGENCE CONDITION</td><td>24 HOURS NEGLIGENCE
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 3DIRECTIONS
TEST TIME : 6 HOURS</td></tr>
<tr><td colspan="2">ESR</td><td>SPEC. VALUE</td></tr>
<tr><td colspan="2">LC</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 1㎏ , 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</td><td>± 30% OF SPEC. VAL</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 ↓ OF SPE. V</td></tr>
<tr><td colspan="2">LC</td><td>3TIMES ↓ OF SPE. V</td></tr>
<tr><td colspan="2">APPEARANCE</td><td>NO MARKED DEFECT</td></tr>
</table>

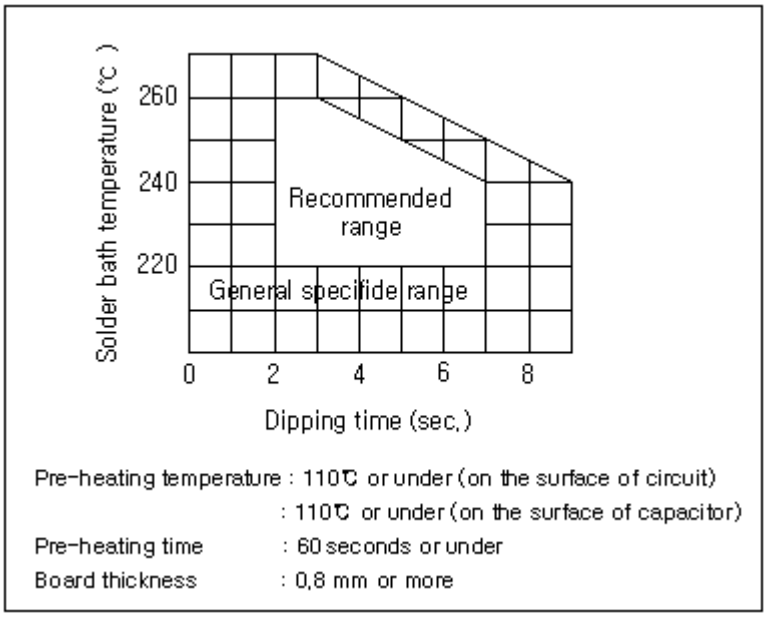
9. Measuring Method Of Characteristics

Capacitance	1) CHARGE THE STARCAP WITH 50±0.1㎃ TO OPERATION VOLTAGE(V1) FOR 1 HOUR. 2) DISCHARGE THE STARCAP WITH CONSTANT CURRENT(A) Max 3±0.1㎃ TO THE VOLTAGE OF V2 WHILE MEASURE THE DISCHARGE TIME(T). (Standard Operating Current for DCL Series STARCAP is 3㎃) 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 5.5± 0.1V TO THE STARCAP. 2) MEASURE V_R AFTER 30±0.5 MIN. 3) CALCULATE CURRENT USING THE FOLLOWING FORMULA.  E_0 : Vdc R_C : 100Ω (DCL 5R5 474) 10Ω (DCL 5R5 105, 155) LC = (V_R / R_C) × 10^3 [mA]
☞ 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 temperature : 110℃ or under (on the surface of circuit)
: 110℃ or under (on the surface of capacitor)
Pre-heating time : 60 seconds or under
Board thickness : 0,8 mm or more

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 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.

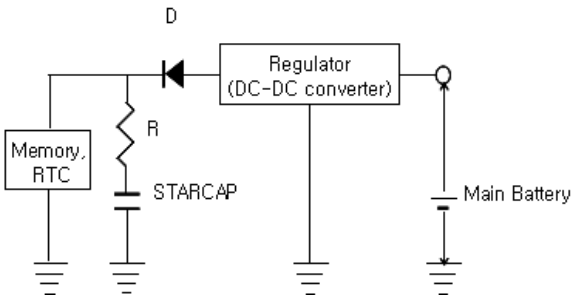
Please design to keep STARCAP away from calorific parts.

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 ℃

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 became 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.
DCL	N.D.	N.D.	N.D.	

* N.D. : Not detected