

To. :

DATE : 20 . .

RoHS 1,2 and 3	Halogen Free
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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.H. Song (R&D)	K.B. Chung (Q.A.)	Initial Release	B.I. Lim (R&D)	Dec. 15, 2020

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 334 V F (Example)
 ① ② ③ ④ ⑤

- ① Series Name : DC(Double layer capacitor - Coin type), S(Small size)
- ② Rated Voltage : 5.5VDC
- ③ Capacitance : 0.33 F (334 = $33 \times 10^{+4}$ uF)
- ④ Terminal Type : V-type
- ⑤ Pb-Free

3. Photo



V-Type



H-Type



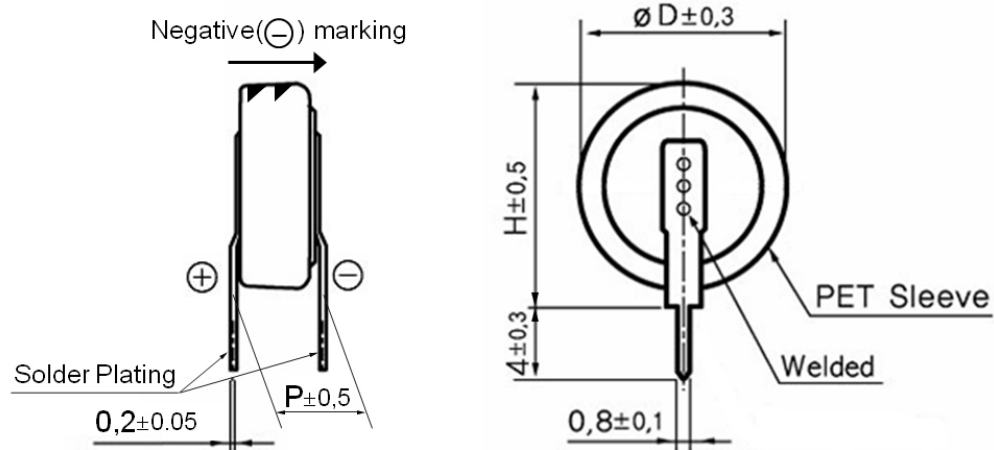
C-Type

(Example)

4. General Specifications

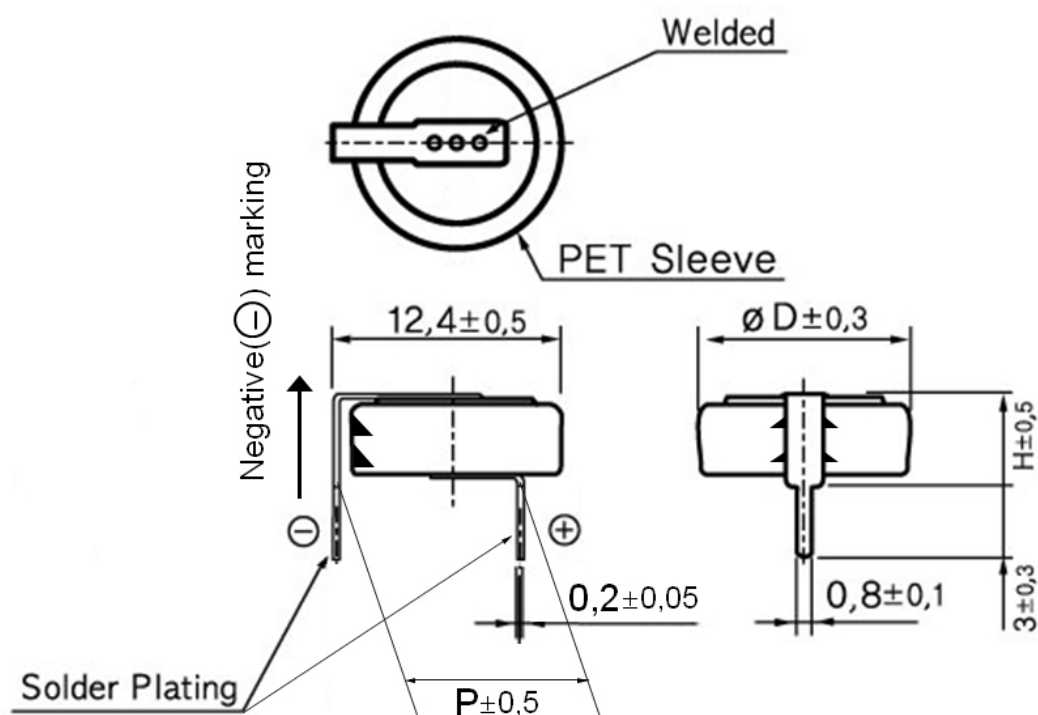
ITEMS	DCS5R5473(104)	DCS5R5224(334)	DCS5R5474
Rated Voltage	5.5 VDC	5.5 VDC	5.5 VDC
Operating Temp.	-25 ~ +70 °C	-25 ~ +70 °C	-25 ~ +70 °C
Capacitance	0.047(0.10) F	0.22(0.33) F	0.47 F
Capacitance Tolerance	-20 ~ 80 %	-20 ~ 80 %	-20 ~ 80 %
Equivalent Series Resistance (ESR)	Less than 120Ω	Less than 75Ω	Less than 50Ω

5. Product Construction And Dimension (V-type)



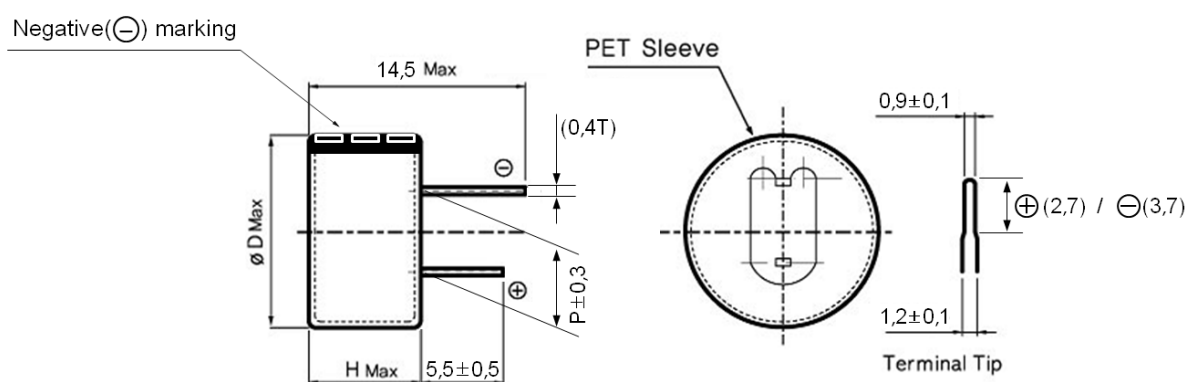
Part No.	Dimensions (mm)		
	ØD	H	P
DCS5R5473VF	11.5	12.5	5.0
DCS5R5104VF	11.5	12.5	5.0
DCS5R5224VF	11.5	12.5	5.0
DCS5R5334VF	11.5	12.5	5.0
DCS5R5474VF	11.5	12.5	5.0

5. Product Construction And Dimension (H-type)



Part No.	Dimensions (mm)		
	$\varnothing D$	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

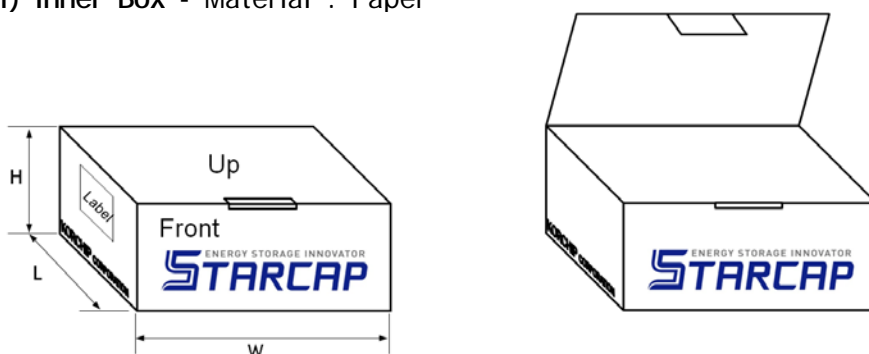
6. Reliability Specifications

Item		Specification		Test Condition													
Temperature Characteristics	Capacitance Change	Step 2	Within ± 30% of Initial Value	Measure electrical characteristics after exposing STARCAP Capacitor to each temperature atmosphere for one(1) hour <table><tr><td>Step</td><td>Temperature</td></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>		Step	Temperature	1	20±2℃	2	-25±2℃	3	20±2℃	4	70±2℃	5	20±2℃
	Step		Temperature														
	1	20±2℃															
	2	-25±2℃															
	3	20±2℃															
	4	70±2℃															
5	20±2℃																
ESR	5Times or less than Initial Value																
Capacitance Change	Step 4	Within ± 30% of Initial Value															
ESR		4Times or less than Initial Value															
Capacitance Change	Step 5	Within ± 10% of Initial Value															
ESR Change		Within ± 10% of Initial Value															
Humidity Resistance	Capacitance Change		± 30% of Initial Value	Temp. : 40±2℃ Humidity : 90 ~ 95%RH Time : 240±8 Hours No Voltage Applied													
	ESR		3Times or less than Spec. Value														
	Appearance		No Marked Defect														
Self Discharge Characteristics	Voltage		More than 4.2Vdc	Charging Condition	Voltage : 5.5Vdc Current : 50mA Charge Time : 24 Hours												
				Self Discharge Condition	Duration : 24 Hours Temp. : Less than 25℃ Humidity : Less than 70%RH												
Vibration Resistance	Capacitance		Spec. Value	Amplitude : 1.5mm Frequency : 10 ~ 55Hz Direction : X, Y, Z 3 Directions Test Time : 6 Hours													
	ESR		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 Change		Within ± 30% of Initial Value	Temp. : 70±2℃ Test Time : 1,000(+24,-0) Hours Applied Voltage : 5.5Vdc													
	ESR		4Times or less than Spec. Value														
	Appearance		No Marked Defect														
Shelf Life	Capacitance Change		Within ± 30% of Initial Value	Temp. : 70±2℃ Test Time : 1,000(+24,-0) Hours No Voltage Applied													
	ESR		4Times or less than Spec. Value														
	Appearance		No Marked Defect														

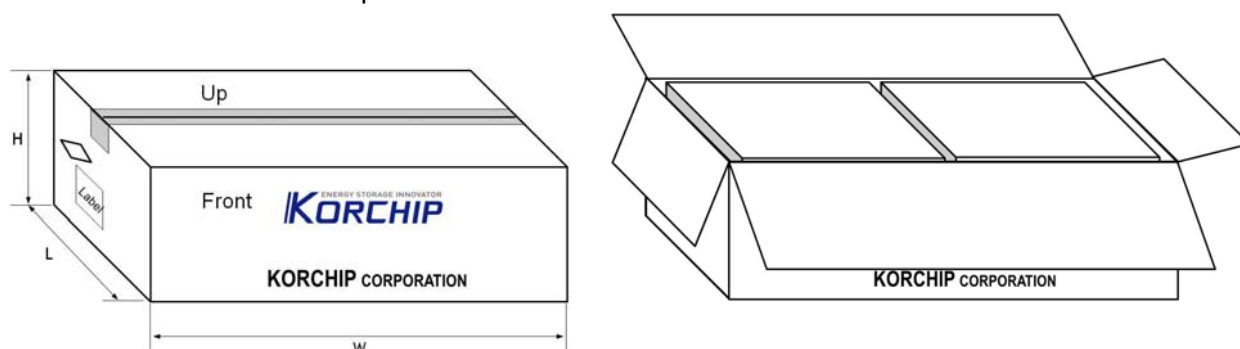
7. Packing Specifications

Part No.	Quantity (PCS)			Size (W × L × H mm)		Type
	Vinyl Bag	Inner Box	Outer Box	Inner Box	Outer Box	
DCS5R5473(VF, HF)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5104(VF, HF)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5224(VF, HF)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5334(VF, HF)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5474(VF, HF)	500	2,000	4,000	240×220×100	460×260×125	Bulk
DCS5R5473CF	200	1,000	2,000	240×220×100	460×260×125	Bulk
DCS5R5104CF	200	1,000	2,000	240×220×100	460×260×125	Bulk
DCS5R5224CF	200	1,000	2,000	240×220×100	460×260×125	Bulk
DCS5R5334CF	200	1,000	2,000	240×220×100	460×260×125	Bulk
DCS5R5474CF	200	1,000	2,000	240×220×100	460×260×125	Bulk

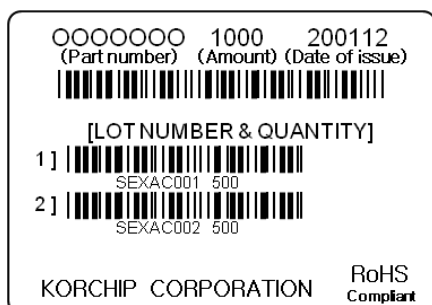
1) Inner Box - Material : Paper



2) Outer Box - Material : Paper



8. Labeling Standards



← (Example)

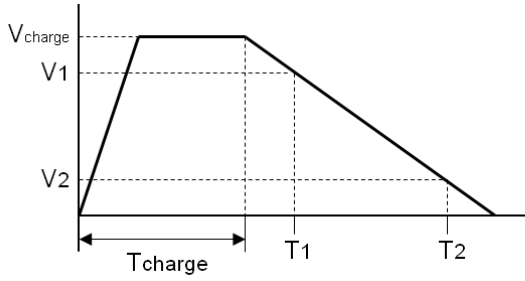
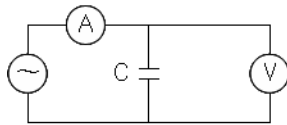

Lot No. System

Ex.) S E 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), D (2019), E (2020)...
- 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)...

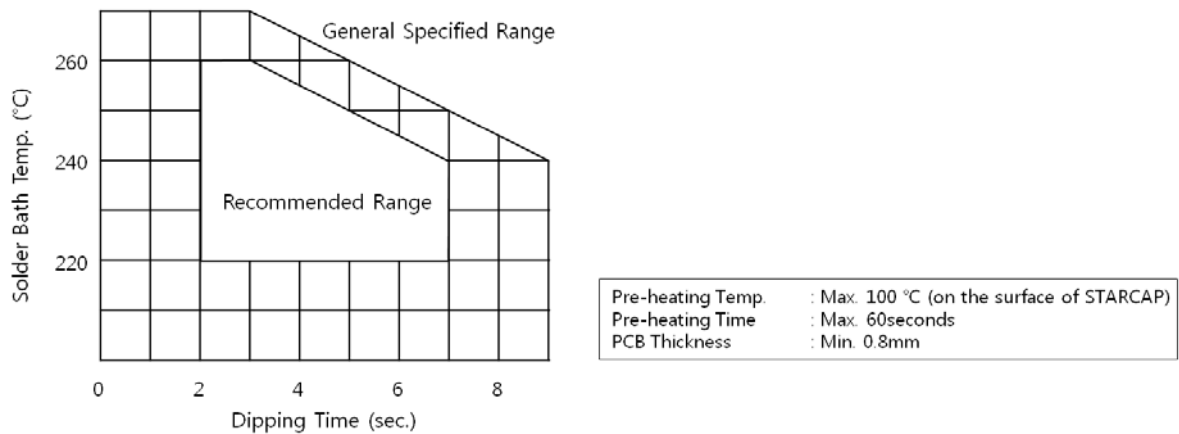
9. Measuring Method Of Characteristics

Capacitance	<p>1) Charge the STARCAP with constant current $I_{\text{charge}} (=0.05\text{A})$ to $V_{\text{charge}} (=5.0\text{V})$ then keep charging for $T_{\text{charge}} (=1800\text{sec.})$</p> <p>2) Discharge the STARCAP with constant current $I_{\text{disch}} (=0.002\text{A})$ while measure the discharge time T_1, T_2 between $V_1 (=4.4\text{V})$ and $V_2 (=2.2\text{V})$.</p> <p>3) Calculate capacitance using the following formula.</p>  $C = \frac{I_{\text{disch}} \times (T_1 - T_2)}{V_1 - V_2}$
Equivalent Series Resistance (ESR @1kHz)	<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.  $R[\Omega] = V[V] / I[A] \quad * \quad i[\text{mA}] = I[A] \times 10^{-3}$ <p>R : Internal resistance(ESR) [Ω] V : Measured voltage between terminals [V] i : Current 1mA(A.C.)</p> $\text{ESR}[\Omega] = V / i$
<p> 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

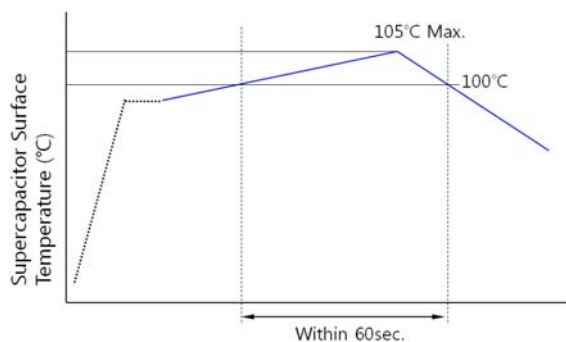
- Soldering Tip Temp. : 350°C or less
- Soldering Time : 3 sec. or less
- Times : Three times or less at intervals of 9 sec. or more
- ※ Do not touch the metal case of STARCAP with a soldering iron.

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.

⑤ Follow the recommended heating profile in applying the adhesive curing process



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 environment and lifetime

STARCAP shows faster deterioration in high temperature operation. The lifetime of STARCAP follows the general lifetime acceleration rule of double or half per every 10°C 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 STARCAP and it may cause fast deterioration or electrolyte leakage of STARCAP.

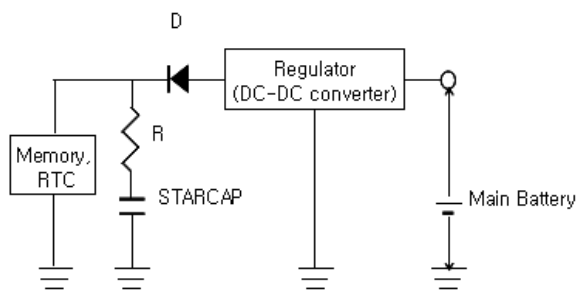
If STARCAP capacitor is used in an electronic or electrical device over a long period of time especially in high temperature or high humidity environment, please check it periodically and replace it when necessary.

5) Cleaning

Some detergent or high temperature drying causes deterioration of 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 °C
- ② HUMIDITY : Less than 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 sleeve of STARCAP.

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

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) 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.

12. 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.
DCS	N.D.	N.D.	N.D.	N.D.	N.D.	

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