Issue date: Sep. 25, 2002

Specification No.: 2FTGP41Z1

Messrs. NDB

Functional Polymer Capacitors
Specifications

Customer Part No.:

Customer Specification No. :

Nippon Chemi-Con Part No. : PS Series

Nippon Chemi-Con Corporation

PS Manufacturing Section Engineering Group
Manager

Shinichi Kaneko

Receipt Stamp

1. Composition of part number
Example: 4PS820MJ12

4	PS	820	M	J12
Rated voltage in volts	Series name	Capacitance code	Cap.tol (M=±20%)	Case Code

Notes (1) Capacitance code
These shall comply with Table 1

Table 1 Capacitance code

Rated capacitance (μF)	Code
390	390
560	560
820	820

(2) Rated voltage code
Shown as Table 2

2. Rating
2.1 Category temperature range
-55 to +105°C

2.2 Rated voltage and Surge voltage
These shall comply with Table 2.

Table 2 Rated voltage and Surge voltage

Rated voltage (v)	2.5	4	6.3	10	16
Surge voltage (v)	2.9	4.6	7.2	11.5	18.4

2.3 Standard items
These shall comply with Table 3.

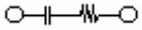
Table 3 Standard items list

Part Number Description	Rated voltage (VDC)	Rated Capacitance (μF)	tanδ	Leakage Current (μA)	E S R 100-300kHz at 20°C (mΩ)	Rated ripple current 100kHz at105°C (mA r.m.s.)	Dimensions (mm)	
							ϕD	L
2R5PS680MH11	2.5	680	0.12	340	10	5230	8	11.5
2R5PS1500MJ12	2.5	1500	0.12	750	8	5500	10	12.5
4PS560MH11	4	560	0.12	448	10	5230	8	11.5
4PS820MJ12	4	820	0.12	656	8	5500	10	12.5
6PS390MH11	6.3	390	0.12	491	12	4770	8	11.5
6PS680MJ12	6.3	680	0.12	857	10	5500	10	12.5
10PS270MH11	10	270	0.12	540	14	4420	8	11.5
10PS470MJ12	10	470	0.12	940	12	5300	10	12.5
16PS180MH11	16	180	0.12	576	16	4360	8	11.5
16PS330MJ12	16	330	0.12	1056	14	5050	10	12.5

3.Performance
Unless otherwise specified, the capacitors shall be measured at +15 to +35°C, 45 to 75%RH and 86 to 106kPa. However, if any doubt arises on the judgment, the measurement conditions shall be

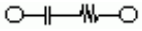
+20±2°C, 60 to 70%RH and 86 to 106kPa.The test conditions shall comply with JIS C5101-1 1998

3.1 Capacitance(Cap.)

[Conditions] Measuring frequency : 120Hz±20%
Measuring voltage : 0.5Vrms max. +1.5 to 2.0Vdc
Measuring circuit : Series equivalent circuit 

[Criteria] Capacitance shall be within the specified tolerance.

3.2 Tangent of loss angle (tanδ)

[Conditions] Measuring frequency : 120Hz±20%
Measuring voltage : 0.5Vrms max. +1.5 to 2.0Vdc
Measuring circuit : Series equivalent circuit 

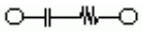
[Criteria] 0.12 max.

3.3 Leakage current (L.C.)

[Conditions] DC leakage current shall be measured with rated voltage, which is applied through a resistor of 1,000±10Ω connected in series with the capacitors, at the end of a specified period of 2 minutes after the capacitors reached the rated voltage across the terminals.

[Criteria] I = 0.2CV max
Where, I : Max. leakage current (μA), C : Nominal capacitance (μF), V : Rated voltage(V).

3.4 ESR

[Conditions] Measuring frequency : 100kHz±20%
Measuring voltage : 0.5Vrms max. +1.5 to 2.0Vdc
Measuring circuit : Series equivalent circuit 

[Criteria] ESR shall not exceed the specified value.

3.5 Temperature characteristics

[Conditions]

Step1: Measure impedance at +20±2°C, 100kHz±20%
Step2: Measure impedance at -25±2°C, 100kHz±20%
Step3: Measure impedance at -55±2°C, 100kHz±20%

[Criteria] Impedance ratio of the -25°C and -55°C values to the +20%°C values shall be not xceed the following values.

Z-25°C / Z+20°C = 1.15
Z-55°C / Z+20°C = 1.25

3.6 Vibration

[Conditions]	Vibration frequency range	: 10 to 55Hz
	Peak to peak amplitude	: 1.5mm
	Sweep rate	: 10 to 55 to 10Hz in about 1 minute
	Direction and period of motion	: 2 hours in each of 3 mutually perpendicular directions (total of 6 hours)
[Criteria]	Capacitance (during test)	: The reading shall be stable.
	Appearance	: No significant damage
	Capacitance change	: Shall be within ±5% of the initial measured value.

3.7 Solderabillity

[Conditions]	Type of solder	: H60A, H60S or H63A
	Flux	: Ethanol solution (25 wt.% rosin)
	Solder temperature	: +235±5°C
	Solder immersion time	: 2±0.5 seconds
	Depth of immersion	: lead wires at 1.5 to 2.0mm from the rubber seal with a thermal screen
	Speed of immersion	: 25±2.5mm/sec.
[Criteria]	Solder shall cover at least 3/4 of the lead surface immersed.	

3.8 Soldering heat

[Conditions]	Type of solder	: H60A, H60S or H63A
	Flux	: Ethanol solution (25 wt.% rosin)
	Solder temperature	: +265±5°C for 10±1 seconds or +350±10°C for 3.5±0.5 seconds
	Depth of immersion	: lead wires at 1.5 to 2.0mm from the rubber seal with a thermal screen
	Speed of immersion	: 25±2.5mm/sec.
[Criteria]	Appearance	: No significant damage.
	Leakage current	: Shall not exceed the initial specified value.
	Capacitance change	: Shall be within ±10% of the initial measured value.
	Tanδ	: Shall not exceed the initial specified value.

3.9 Humidity resistance with bias

[Conditions]	The following specifications shall be satisfied when the capacitor are restored to +20°C after the rated voltage applied for 500 hours +48/0 at +60°C, 90 to 95%RH.	
[Criteria]	Appearance	: No significant damage.
	Leakage current	: Shall not exceed the initial specified value.
	Capacitance change	: Shall be within ±20% of the initial measured value.
	Tanδ	: Shall not exceed 150% of the initial specified value.
	ESR	: Shall not exceed 150% of the initial specified value.

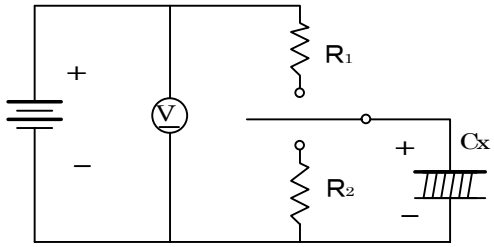
3.10 Endurance

[Conditions]	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage applied for 2,000 hours +72/0 at +105±2°C.	
[Criteria]	Appearance	: No significant damage.
	Leakage current	: Shall not exceed the initial specified value.
	Capacitance change	: Shall be within ±20% of the initial measured value.
	Tan δ	: Shall not exceed 150% of the initial specified value.
	ESR	: Shall not exceed 150% of the initial specified value.

3.11 Surge voltage

[Test Conditions] The following specifications shall be satisfied when the capacitors are restored to +20°C after the surge voltage is applied at a cycle of 360 seconds which consists charge for 30±5 seconds and discharge for 330 seconds, for 1000 cycles at 105±2°C.

[Test Circuit]



Ⓥ:DC voltmeter

R1:Protective resistor 1kΩ

R2:Discharging resistor 1kΩ

Cx:Capacitor under test

[Criteria]

Appearance	: No significant damage
Leakage current	: Shall not exceed the initial specified value.
Capacitance change	: Shall be within ±20% of the initial measured value.
Tanδ	: Shall not exceed 150% of the initial specified value.
ESR	: Shall not exceed 150% of the initial specified value.

3 .12 Assured Failure Rate

1% / 1000 hours max.

4 Others

4.1 Export Trade Control Ordinance Others

(Aluminum electrolytic capacitors is complied when exporting from Japan)

1. Section 1 through 15 of Appendix Table 1 in Export Trade Control Ordinance

Item 41-4 in Section 2 of Appendix Table 1 (Section 49 in Chapter 1 of MITI's Ordinance) and Item 7 in Section 7 of Appendix Table 1 (Section 6 in Chapter 6 of MITI's Ordinance) state export regulations on pulse use capacitors (750V or higher) and high voltage use capacitors (5,000V or higher).
However, aluminum electrolytic capacitors are less than 750V in their voltage range, so that the regulations do not apply to the aluminum electrolytic capacitors.

2. Section 16 of Appendix Table 1 in Export Trade Control Ordinance

Item 41 in Section 16 of Appendix Table 1 (Section 42 in Chapter 14 of MITI's Ordinance) applies to pulse use capacitors or pulse generators. Since any capacitor, including Nippon Chemi-con's aluminum electrolytic capacitors, functions as pulse use, the Export Trade Control Ordinance applies export regulations to the aluminum electrolytic capacitors.

If an exporter has the information that his exporting goods are used to any development of extensive destructive weapons, the exporter must ask for exporting permission of the Ministry of International Trade and Industry (MITI).
Regardless of the above, when the MITI notified the exporter that his exporting goods are possibly used to any development of extensive destructive weapons and so forth, the exporter must ask for exporting permission of the MITI. If receiving the notice form the MITI, Nippon Chemi-Con will inform your company of it.

4.2 Cleaning of assembly boards

Acceptable cleaning conditions

For higher alcohol system cleaning agents, capacitors are capable of withstanding immersion or ultrasonic cleaning within 10 minutes at a maximum temperature of 60°C. The wash, rinse and drying process should be so arranged that other components and pc boards cannot rub off the marking of the capacitor. Especially note that shower cleaning can affect the marking.

Higher alcohol system cleaning agents, recommended:

Pine Alpha ST-100S

Clean Through 750H, 750K, 750L, and 710M

Technocare FRW-14 to 17

* Other cleaning agents:

A terpene or petroleum system solvent swells and damages the rubber seal materials of a capacitor, so that the life of the capacitor can be shortened. An alkaline saponification detergent, which has high pH, erodes an aluminum metal or washes away the marking. Consequently, do not use all these cleaning agents.

For CFCs substitute, Asahi Glass AK225AES solvent is recommended to use only for Solvent-Proof type capacitors, which are especially designed. The Solvent-Proof type capacitors are capable of withstanding any one of immersion, ultrasonic or vapor cleaning within 5 minutes as acceptable cleaning conditions for the AK225AES solvent.

From the environmental point of view, however, do not use the CFCs substitute solvent as much as possible.

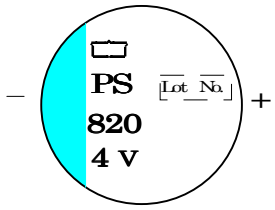
IPA (Isopropyl alcohol) is usually one of the acceptable cleaning agents. Flux concentration in the IPA cleaning agent should be controlled at a maximum limit of 2wt.%, because the halogenide ions in flux can dissolve in the cleaning agent.

5 Marking

The following items shall be marked on each capacitor.

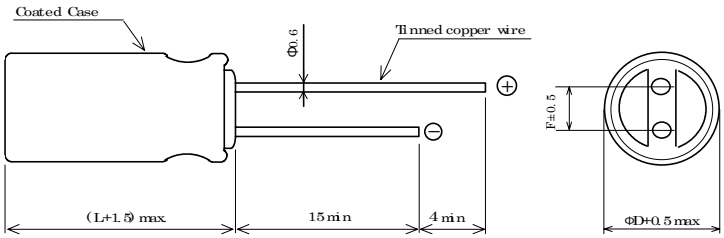
1. Rated voltage
2. Nominal capacitance
3. Polarity
4. Series code [PS]
5. Lot No.
6. Manufacturer's identification mark

Example



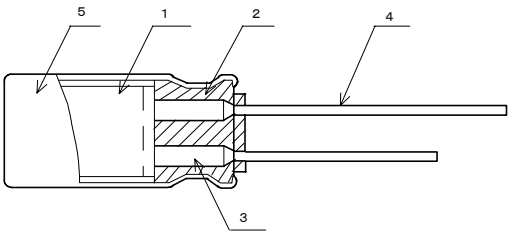
6. Dimension and construction

6.1 Dimension (mm)



ϕD	10	8
L	12.5	11.5
F	5.0	3.5

6 .2 Construction



	Compositions		Materials
1	Element	Anode foil	Aluminum
		Cathode foil	Aluminum
		Separator	Synthetic fiber
		Fixing tape	Adhesive tape(Polyimido or PPS)
2	Seal		Rubber(IIR)
3	Aluminum tab		Aluminum
4	Lead wire		Tinned copper
5	Case		Plastic coated aluminum

*No ozone depleting substance has been used.

7 Marking on Carton Box

The following items shall be marked on the box.

1) Series name
2) Part description
3) Production drawing Number
4)Quantity
5) Customer part No.(Where customers designated.)
6) Lot No.(Assembly lot No. of capacitor.)

8 Precautions to Users

8.1 Failure mode

8.1.1 PS series contains a conductive polymer as material of cathode electrode. Therefore, like other solid electrolyte capacitors, the life ends mostly due to random failure mode, mainly short circuit.

8.1.2 If continuously a current flow through the capacitor due to short circuit that is caused by over voltage application etc, the capacitor is overheated higher than 300°C, then aluminum case of the capacitor would be removed by increasing internal pressure due to the vaporization of materials.

8.2 Applying voltage

8.2.1 Do not apply an over voltage exceeding the full rated operating voltage of the capacitors. The over voltage may cause increasing the leakage current and giving short circuit.

8.3 Category temperature range

8.3.1 Do not operate the capacitors at out of the specified Category temperature range. The operation at out of the range may cause deterioration of the capacitors' characteristics and giving failure.

8.4 Reverse voltage

8.4.1 PS series are polarized capacitor. Do not use the capacitors in wrong polarity.

8.5 Permissible ripple voltage and current

8.5.1 The sum of the DC bias voltage and ripple voltage must not exceed the specified rated voltage of the capacitors.

8.5.2 Do not exceed the rated permissible ripple current of the capacitors.

8.6 Soldering condition

8.6.1Follow the instruction below for soldering.

1) Do not input flux on any part of capacitors other than their terminals.
2) Soldering conditions (temperature, time and the number of repeats) should be within the limits prescribed in the product specifications.
3) Do not dip the bodies of capacitors into the solder bath.
4) Do not let other components lean against the capacitors during soldering.

8.7 Cleaning conditions

8.7.1 As long as the cleaning agents prescribed in the catalogue or the specification sheet are used, the cleaning does not give the capacitors any damage. For CFCs substitutions and other cleaning agents, consult us before actual use.

8.8 Other precautions

8.8.1 Designing device circuits

1) Select the capacitors suited to their installation and operating environment, and use them within the performance limits prescribed in their catalogue or product specifications.
2) Do not use capacitors in circuits where charge and discharge are frequently and sharply repeated.
3) Do not expose capacitors to the following environment.
   a.Water, salt water, dew or oil spatters.
   b.Toxic gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonium, etc.) fills into.
   c.Ozone, ultraviolet rays or radiation is applied to.
   d.Vibration or mechanical shock, which exceeds the limits prescribed in the catalogue or product specifications, is applied to.

4) Avoid locating any heat-producing object around a capacitor or on the reverse side of the printed circuit board
under the capacitor.
5) Other precautions in designing device circuits.
a.The electrical characteristics of a capacitor vary with respect to temperature and frequency. Design the device
circuits by taking these changes into account.
b.If using more than one capacitor to connect in parallel, balance the currents flowing into the individual
capacitors.

8.8.2 Installing capacitors in devices
1) Do not re-use the capacitors already used in devices. The used capacitors are not reusable, except that they are taken from a device for periodic inspection measuring their electrical characteristics and then returned to the device.
2) Although discharged at a final manufacturing process, the capacitors are somewhat re-charged spontaneously by a recovery voltage phenomenon within a month. If these capacitors bring an electric shock or damage any sensitive circuit at assembly processes, discharge the electricity of the capacitors through the resistor before use.
3) Make sure of the rated capacitance and voltage of the capacitor when installation.
4) Make sure of the polarity at installation.
5) Do not use the capacitors once dropped on the floor etc.
6) Do not deform capacitors in installing to devices.
7) Note capacitors may be damaged by mechanical shocks caused by the vacuum head, component checker or centering operation of an automatic mounting machine.
8) Do not dip the body of a capacitor into the solder bath.
9) Do not apply mechanical stress to the capacitor after soldering to the printed circuit board.
a.Do not incline, twist or push the body of the capacitor down after soldering it to the printed circuit board.
b.Do not take the assembly board by the capacitor in lifting or carrying the assembly board.
c.Do not bump or strike any object against the capacitor after soldering to the printed circuit board. Also, if the assembly boards are piled up, they should be so placed that any of the boards and other components cannot touch the capacitor.
10) Do not use adhesives and coating materials containing halogenated solvents.
11) Precautions for using adhesives and coating materials
a.Do not apply adhesive or coating materials with flux or dirt left on the rubber seal of the capacitor or between the printed circuit board surface and the capacitor seal.
b.For permissible heat conditions for curing adhesives or coating materials, follow the instructions in the catalogue or product specifications of capacitors.

8.8.3 During operation of devices
1) Do not touch capacitor terminals directly with bare hands.
2) Do not short-circuit the terminals of a capacitor by applying any conductive object. Also, do not spill an electric-conductive liquid such as acid or alkaline solution over the capacitor.
3) Do not place the devices into the following environment.
a.Water or oil spatters down onto the capacitors.
b.Direct sunlight pours down onto the capacitors.
c.Ozone, ultraviolet rays or radiation is applied to the capacitors.
d.Toxic gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonium, etc.) fills into.
e.Vibration or mechanical shock exceeding the limits prescribed in the catalogue or product specifications is applied to the capacitors.

8.8.4 Maintenance inspection

1) Make periodic inspections for the capacitors that have been used in the devices for industrial applications.
2) The following items should be checked by the periodic inspections.
   a. Significant damage to appearances
   b. Electrical characteristics (leakage current, capacitance, tanδ and other characteristics prescribed in the catalogs or product specifications)

8.8.5 Warning

1) If capacitor should burn by a short circuit, immediately turn off or unplug the main power supply of the device.
2) If you should expose your eyes to smoke from the capacitor or inhale it, immediately flush the open eyes and gargle with water.

8.8.6 Fumigation

1) Fumigation process may be required when exporting the end electrical product. The process, actually halogenated ions, may cause the aluminum electrolytic capacitor to corrode. The fumigation solvent must not directly adhere to the electrical product and the solvent must be dried completely. Please consult us if solvent adheres to the aluminum electrolytic capacitors or drying condition is not satisfaction.

8.8.7 Storage

1) Do not store capacitors at a high temperature and high humidity. Store the capacitors indoors at a temperature of 5 to 35°C and a humidity less than 75%RH.
2) Store the capacitors in places free from water, oil or salt water.
3) Store the capacitors in places free from toxic gasses (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonium, etc.)
4) Store the capacitors in places out of ozone, ultraviolet rays or radiation.

8.8.9 Disposal

1) Ask a specialist for the disposal of industrial wastes.