

## Operating Precautions 1

**OS-CON** is an aluminum electrolytic capacitor with unique structure.

Please note the following points in order to take full advantage of **OS-CON**' performance, with most stable quality.

### Crucial Precautions

#### 1. Polarity

**OS-CON** is a solid aluminum electrolytic capacitor with positive and negative electrodes. Do not reverse the polarity when using. If it is used with the polarities reversed, increased leakage current or a decreased life span may result.

#### 2. Prohibited circuits

Since problems can be expected due to the leakage current fluctuations that occur during soldering and other processes, the **OS-CON** cannot be used on the following circuits.

- 1) High impedance voltage retention circuits
- 2) Coupling circuits
- 3) Time constant circuits

\*In addition to the leakage current fluctuation above, the operational conditions such as characteristics at high and low temperature, damp heat and endurance stipulated in the specifications will affect the capacitance. The fluctuation of the capacitance may cause problem if it is used as a time constant capacitor, which is extremely sensitive to the fluctuation of the capacitance. Do not use it as a time constant capacitor.

- 4) Circuits to get bad influence by big leakage current

Additionally, please contact SANYO for usage of two or more **OS-CONs** in series for voltageproof.

#### 3. Overvoltage prohibited during design

Overvoltage exceeding the rated voltage may not be applied even for an instant as it may cause a short circuit.

#### 4. Sudden charge and discharge restricted

Sudden charge and discharge restricted (for maintenance of high-proof reliability).

A protection circuit is recommended for when a sudden charge or discharge causes excessive rush current because this is a main cause of short circuits and large leakage current.

Use protection circuits under the following both cases; 1) The rush current exceeds 10A. 2) The rush current exceeds 10x the maximum allowable ripple current of **OS-CON**. (Refer to pages 49 to 51)

Be sure to insert a protection resistor of about 1kΩ for charge and discharge when measuring the leakage current.

#### 5. Considerations when soldering

The soldering conditions are to be within the range prescribed in the specifications. If the specifications are not followed, there is the possibility of the appearance becoming defective and of increase of abnormal leakage current and capacity reduction when soldering is conducted under conditions that are harsher than those stipulated.

#### 6. Sufficient PCB installation space (PCB means Printed Circuit Board after this.)

Sealing resin of **OS-CON** may have a bulge. The design must give consideration to the standard of height and lead position displacement given in the specifications.

#### 7. Considerations when using in industrial equipment

To ensure reliability when the **OS-CON** is used in industrial equipment, design must allow for its capacitance, impedance, and other characteristics.

#### 8. Using in equipment regarding human life

In case of using in equipment regarding human life (e.g. Space equipment, aeronautic equipment and atomic equipment etc.), be sure to talk over the matter with SANYO.

Don't use without recognition document of SANYO.

## Operating Precautions 2

### Cautions

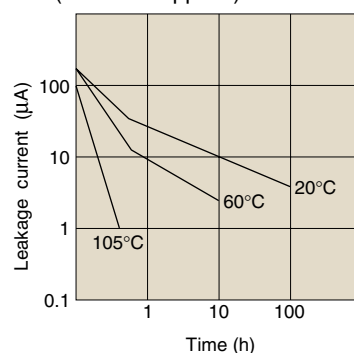
#### 1. Circuit designing cautions

- (1) Check the rated performance
 

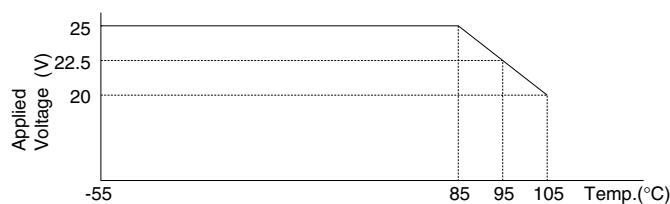
After checking the operation and installation environments, design the circuit so that it falls within the rated performance range stipulated in the specifications.
- (2) Operating temperature and ripple current
  - (a) Set the operating temperature so that it falls within the stipulated range in the specifications.
  - (b) Do not supply current that exceeds the rated ripple current. When excessive ripple current is supplied, internal heat increases and reduces the OS-CONs life span.
- (3) Leakage current
 

Even when the soldering conditions fall within the range of the specifications, leakage current increases a little on occasion. It also increases a little during high temperature no-load, damp heat no-load, and rapid change of temperature with no voltage applied. In cases such as these, leakage current will decrease by applying voltage at the OS-CONs upper category temperature or less. The speed at which the leakage current is restored is increased by applying a high voltage under voltage rating when the OS-CONs temperature is close to the upper category temperature. (Refer to the following diagram.)

OS-CON leakage current restoration characteristics  
10 $\mu$ F/16WV (16V DC applied)



- (4) Applied voltage for designing
  - (a) For 2 to 20 WV products and 30WV products, 100% of the rated voltage can be applied without causing any problems. Use less than 80% of the following temperature reduction voltage for 25 WV products. In case of using at rated voltage, please don't apply over voltage. (Refer to the following diagram.)



- (b) Make sure the sum of the DC voltage value and the ripple voltage peak values does not exceed the rated voltage.
- (c) When the DC voltage is low, set it so that the negative ripple voltage peak value does not become a reverse voltage that exceeds 10% of the rated voltage.
- (d) Use the OS-CON within 20% of the rated voltage for application of reverse voltage during the transient phenomena caused when the power is turned off or the source is switched.

- (5) Reduction of failure stress  
The main failure mode of **OS-CON** is open mode primarily caused by electrostatic capacity drop at high temperature (i.e. wear out failure), besides random short circuit mode failures primarily caused by over voltage occurs as minor one. The time it takes to reach the failure mode can be extended by using the **OS-CON** with reduced ambient temperature, ripple current and applied voltage.  
The failure rate is less than 0.5%/1,000h when used at 60% of the confidence level with the prescribed voltage applied at 105°C.
- (6) Capacitor insulation  
(a) Insulation in the marking sleeve is not guaranteed. Be aware that the space between the case and the negative electrode terminal is not insulated and has inconstant resistance.  
(b) Be sure to completely separate the case, negative electrode terminal, positive electrode terminal from adjacent components and PCB foil.
- (7) Operating environmental restrictions  
Do not use the **OS-CON** in the following environments.  
(a) Places where water, salt water or oil can directly fall on it, and places where condensation may form.  
(b) Places filled with noxious gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).  
(c) Places susceptible to ozone, ultraviolet rays and radiation.
- (8) Lead pitch  
The pitch and diameter of PCB holes to which **OS-CON** is mounted should be designed to conform to the dimensional tolerance stipulated in the specifications.
- (9) PCB design  
(a) Avoid locating heat-generating components around the **OS-CON** and on the underside of the PCB (underneath the **OS-CON**).  
(b) Follow the recommendations given in the specifications for land patterns for SMD type (SVP and SVQP Series) PCB when designing circuits.
- (10) Parallel connection  
A large amount of ripple current may be applied to the **OS-CON** when it is used in parallel with another capacitor. Carefully select the type of capacitor. (Refer to page 52 for details.)
- (11) Other  
Design circuits after checking the following items.  
(a) Electrical characteristics are affected by temperature and frequency fluctuations. Design circuits after checking the amount of fluctuation.  
(b) When mounting an **OS-CON** on a double-sided PCB, design it so that extra PCB holes and the through holes for connecting the front and back of the PCB are not located underneath the **OS-CON**.

## 2. Mounting precautions

- (1) Things to note before mounting  
(a) Do not reuse **OS-CONs** that have been assembled in a set and energized. Excluding **OS-CONs** that have been removed for measuring electrical characteristics during a periodic inspection, they cannot be reused.  
(b) Leakage current may have increased in **OS-CONs** that have been stored for a long period of time. In this case, use after treatment of rated voltage with an approximately 1kΩ resistor at about 60 to 75°C for 1h.
- (2) Mounting-1  
(a) Mount after checking the capacitance and the rated voltage.  
(b) Mount after checking the polarity.  
(c) Do not drop the **OS-CON** on the floor. Do not use **OS-CONs** that have been dropped.  
(d) Do not deform and then mount an **OS-CON**.

## (3) Mounting - 2

- (a) Mount after checking that the OS-CONs lead pitch and the PCB holes pitch match.
- (b) When an automatic inserter is used to clinch the OS-CONs lead terminals, make sure it is not set too strong.
- (c) Be careful to the shock force that can be produced by absorbers, product checkers, and centerers on automatic inserters and installers.
- (d) Do not apply excessive external force to the lead terminals, the OS-CON itself, and electrode terminals of chip type.

## (4) Soldering with a soldering iron

- (a) Set the soldering conditions (temperature, time) so that they fall within the stipulated range in the specifications.
- (b) When the lead terminal must be processed because the lead pitch and the PCB holes spacing do not match, process it before soldering so that no stress is applied to the OS-CON itself.
- (c) Do not subject the OS-CON itself to excessive stress when soldering.
- (d) When a soldering iron is used to repair an OS-CON that has already been soldered once and needs to be removed, remove it after the solder has been completely melted so that no stress is applied to the OS-CONs lead terminal.
- (e) Do not let the tip of the soldering iron touch the OS-CON itself.
- (f) The leakage current value after soldering may increase a little (from a few  $\mu\text{A}$  to several hundred  $\mu\text{A}$ ) depending on the soldering conditions (preheating and solder temperature and time, PCB material and thickness, etc.). The leakage current can be reduced through self-repair by applying voltage.

## (5) Flow soldering

- (a) Do not solder the OS-CON by submerging it in melted solder. Use the PCB to protect the OS-CON and only solder the opposite side that the OS-CON is mounted on.
- (b) Set the soldering conditions (soldering temperature, terminal submersion time) so that they fall within the stipulated range in the specifications.  
The leakage current value after soldering may increase a little (from a few  $\mu\text{A}$  to several hundred  $\mu\text{A}$ ) depending on the soldering conditions (preheating and solder temperature and time, PCB material and thickness, etc.). The leakage current can be reduced through self-repair by applying voltage.
- (c) Take care that flux does not adhere to anywhere except the lead terminal.
- (d) When soldering, take care that other components do not fall over and touch the OS-CON.
- (e) Flow soldering under extremely abnormal conditions may reduce the electrostatic capacity of products after soldering.

## (6) Reflow soldering

- (a) Do not use reflow soldering for radial lead type OS-CONs.
- (b) Set the soldering conditions (preheating, soldering temperature and time) so that they fall within the stipulated range in the specifications..  
The leakage current value after soldering may increase a little (from a few  $\mu\text{A}$  to several hundred  $\mu\text{A}$ ) depending on the soldering conditions (type of reflow furnace, reflow conditions, PCB material and thickness, number of components, etc.). The leakage current can be reduced through self-repair by applying voltage.
- (c) Please contact SANYO for setting VPS soldering conditions.
- (d) Reflow soldering may reduce the capacitance of products after soldering even if stipulated soldering conditions in specifications are met.

## (7) Handling after soldering

- (a) Do not tilt, bend or twist the OS-CON after it has been soldered on the PCB.
- (b) Do not use the OS-CON like a handle to move the PCB after it has been soldered to it.
- (c) Do not bump the OS-CON with objects after it has been soldered to the PCB. When stacking PCBs, make sure that the OS-CON does not touch other PCBs or components.
- (d) Do not subject the OS-CON to excessive stress after it has been soldered to the PCB.

(8) Washing the PCB

Check the following items before washing the PCB with these detergents : high quality alcohol-based cleaning fluid such as Pine- $\alpha$ ST-100S, Clean thru 750H, 750L, 710M, 750K, or Techno Care FRW14 through 17; or detergents including substitute freon such as AK-225AES and IPA.

- (a) Use immersion or ultrasonic waves to clean for a total of less than five minutes. (Less than two minutes for the SVP, SEP and SVQP series.)
- (b) The temperature of the cleaning fluid should be less than 60°C.
- (c) Watch the contamination of the detergent (conductivity, PH, specific gravity, water content, etc.).
- (d) After cleaning, do not store the **OS-CON** in a location subject to gases from the cleaning fluid or in an airtight container. Dry the PCB and **OS-CON** with hot air (less than the maximum operating temperature). Note that when it is heated (heat run, dry, etc.) soon after cleaning, the sleeve may swell and shrink again.
- (e) Please contact SANYO for details about detergents and cleaning methods, and about detergents other than those listed above.

(9) Fixatives and coatings

- (a) Select appropriate materials for the **OS-CONs** marking material and sealant. In particular, make sure the fixative, coating and thinner do not contain acetone.
- (b) Before applying the fixative or coating, completely remove any flux residue and foreign matter from the area where the PCB and **OS-CON** are to be joined together.
- (c) Allow any detergent to dry before applying the fixative or coating.
- (d) Please contact SANYO for fixative and coating heat curing conditions.

### 3. Precautions with completed board

- (1) Do not directly touch the **OS-CONs** lead terminals and electrode terminals.
- (2) Do not use electric conductors to cause short circuits between the **OS-CONs** lead terminals or electrode terminals. Do not subject the **OS-CON** to conductive solutions such as acids and alkaline water solutions.
- (3) Check the installation environment of the board the **OS-CON** is installed in.
- (4) Age the board at conditions that fall below the capacitors ratings.
- (5) It is recommended to use a set at a room temperature and under ordinary humidity.

### 4. In the event that something unfortunate should occur

(1) Phenomenon of after short circuit mode

- (a) Resin sealing type. (SC, SA, SL, SH, SS, SP Series)

In the event that a short circuit causes the current to become relatively small ( less than approximately 3 A for  $\phi$ 10 and less than approximately 1 A for  $\phi$ 6.3), the **OS-CON** itself will generate a little heat, but the appearance will not be affected even when electricity is supplied continuously.

However, if the short circuits current value exceeds the above mentioned values, the temperature inside the **OS-CON** will increase. When the temperature exceeds approximately 220°C, the impregnated organic semiconductor melts and liquefies, the internal pressure is raised, and the liquefied organic semiconductor and odorous gas is released from the space between the sealant and the aluminum case and lead terminals. In this case, keep your face and hands away from the area.

- (b) Rubber type. (SVP, SVQP, SEP Series)

In the event that a short circuit cause the current to become relatively small ( less than approximately 1A for  $\phi$ 10, 0.5A for  $\phi$ 8 and less than approximately 0.2A for  $\phi$ 6.3), the **OS-CON** itself will generate a little heat, but the appearance will not be affected even when electricity is supplied continuously.

However, if the short circuits current value exceeds the above mentioned values, the temperature inside the **OS-CON** will increase, the internal pressure is raised, rubber packing is turned over, odorous gas is released.

- (2) If a short circuit occurs and odorous gas is released, either turn off the sets main power or unplug the power cord from the outlet.
- (3) If a short circuit should occur, it may take a few seconds to a few minutes until the organic semiconductor liquefies and an odorous gas produces, depending on the conditions. Set it up so that a power protection circuit works during this time.
- (4) If the gas comes in contact with the eyes, rinse immediately. If the gas is inhaled, gargle immediately.
- (5) Do not lick the **OS-CONs** electrolyte. If the electrolyte comes in contact with skin, wash it off with soap immediately.
- (6) The electrolyte, separator, resin and tube used in the **OS-CON** are all combustible. When the current is extraordinarily large after a short circuit, assuming the worst possibility, the shorted-out section in the lead terminal or inside the capacitor has sparked, and it may have caught fire to the resin and/or sleeve. Give consideration to the capacitors mounting method, mounting position, pattern design and such.

#### 5. Storage conditions

- (1) Do not store the **OS-CON** at high temperatures and high humidity. Store it in a location that is not subject to direct sunlight and that has temperatures less than 35°C and a relative humidity less than 75% generally.
- (2) Store the **OS-CON** in an airtight plastic bag to keep the leads in good condition. There are aluminum laminate bags for SMD Type, SVP and SVQP Series.
- (3) To keep the leads in good condition, store radial lead type **OS-CONs** for no more than one year, and SMD-types for no more than six months.
- (4) Open the bag before just mounting. Also use up all **OS-CONs** once opened. In case of left over, put **OS-CONs** back in the bag (SMD Type ; special aluminum laminate bag), and seal the opening with tape. Put storage-box itself in a plastic bag, and seal the opening with tape (for taping products).
- (5) Do not store the **OS-CON** in damp conditions such as with water, salt spray, or oil spray, and high humidity.
- (6) Do not store the **OS-CON** in places filled with noxious gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
- (7) Do not store the **OS-CON** in places susceptible to ozone, ultraviolet rays and radiation.

#### 6. Disposal

**OS-CON** comprises solid organic compounds, various metals and resin. Treat it as industrial waste when disposing of them. It is possible for SANYO to dispose of only massive **OS-CONs**.

Please accept that we don't take full responsibility for problems about industrial possessive rights of a third party, that it is not directly concerned with structure processes of our product.  
Please design providing against a safety measure (the prevention of error operation etc.) toward social damage (personal, fire accident, and so on).