**X-CON should be used in compliance with the following guidelines.**

## 1. Circuit Design

1.1 Prohibited Circuits
Do not use the capacitors in the following circuits, because leakage current may increase.
1) Time constant circuits
2) Coupling circuits
3) Circuits which are greatly affected by leakage current
4) High impedance voltage retention circuits

1.2 Polarity
X-CON is a polarized solid aluminum electrolytic capacitor with positive and negative electrodes. Do not apply reverse voltage on the capacitors, otherwise it may cause leakage current increase or life span decreased.

1.3 Voltage Applied
The applied voltage is equal to the voltage value including the peak value of the transitional instantaneous voltage and that of ripple voltage, not just steady line voltage.
1) Do not apply over-rated voltage or reverse voltage as it may lead to the increase in leakage current and short circuit.
2) When DC voltage is low, a negative ripple voltage peak value must not become a reverse voltage that exceeds 10% of the rated voltage.

1.4 Restriction on Sudden Charge or Discharge
Sudden charge and discharge may result in short circuits or larger leakage current. Therefore, protection circuits are suggested to build in when one of the following conditions are anticipated.
1) The rush current exceeding 10A
2) The rush current exceeding 10 times of rated ripple current of X-CON
A protection resistor (1KΩ) must be inserted to the circuit during the charge and discharge when measuring the leakage current.

1.5 Ripple Current
Use the capacitors within the rated ripple current. When excessive ripple current is applied to the capacitor, it may causes the increase in leakage current and short circuits due to self-heating.

1.6 Leakage Current
There is a risk of leakage current increasing even if the following usage environments are within the suggested range. Owing to the self-correction mechanism, the leakage current returns to a small value in most cases after the application of voltage.
1) After soldering or re-flow
2) High temperature under no loading
3) High temperature / High humidity under no loading
4) Sudden temperature changes

1.7 Capacitor Insulation
1) Insulation of the marked sleeve is not guaranteed. Be aware that the space between the case and the negative electrode terminal is not insulated and has some resistance.
2) Completely separate the case, negative lead terminal, positive lead terminal and PCB patterns with each other.

1.8 Precautions for using capacitors
X-CON capacitors should not be used in the following environments.
1) Direct contact with salt water, oil & chemically active gases
2) Exposure direct under sunlight
3) High temperature owing to heat generating components around the X-CON and on the underside of the PCB
4) High humidity where condensation can form on the surface of the capacitor
5) Acid or alkaline environments
6) High-frequency induction
7) Excessive vibration and shock