AVX OxiCap™ Outperforms Aluminum Electrolytic Capacitors in Consumer Applications

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- **OxiCap™ SMD Niobium Oxide Capacitors**
- **4.7 to 1000µF Capacitance Range**
- **High CV and low ESR offering**
- **Excellent Stability Performance**
- **Reliability up to 500k hours**
- **RoHS and Lead-Free Compliant**

The process of movement from high-end electronic devices to the consumer market has speed up recently under an effect of globalization of worldwide design & manufacturing capabilities. We can see this process especially in applications such as cellular phones, digital cameras, notebooks and LCD displays. The faster move to the consumer market has significantly increased the importance of flexibility in design and manufacturing. One of the key capabilities that have to be achieved is to select the right high-technology electronic components with the best performance versus low cost. Recent developments in tantalum technology have resulted in a new type of solid electrolyte capacitor the OxiCap™ based upon niobium oxide material that meets the requirements for a high-technology component in consumer applications.

The OxiCap™ NOJ series is offered in wide range of capacitance from 4.7µF to 1000µF in a voltage range from 1.8V to 10V. A lower ESR NOS series is available with ESR levels down to 35mΩ (such as latest NOS 330µF D case 4V). Small and Low profile case sizes with heights reduced to 2mm, 1.5mm and 1.2mm are also released for a head room limited applications.

OxiCap™ versus Aluminum:

Aluminum capacitors are a popular capacitor technology in many consumer electronics today, especially due to its low price. However the latest requirements for downsizing, lead-free reflow capability and RoHS regulations combined with product reliability may change the position of aluminum capacitors on the market. OxiCap™ capacitors are in the best position to offer an alternative solution with high benefit to cost values for upcoming electronic designs. The benefits can be seen mainly in the following areas:

- SMD small package with higher volumetric efficiency
- Good stability of electrical parameters
- No dry out effect (no wear out)
- Small dependence of electrical parameters on temperature
- Higher volumetric efficiency (Higher capacitance in the same case size)
- Higher reliability/safety
- Lead-free and RoHS compliant
- Multiple Pb free reflow capable
- Higher Pick and Place speeds

The voltage range of OxiCap™ is 10V maximum that may fulfill most demand from today's electronic as the recommended derating is just 20%. The voltage range may be considered as the only limitation of OxiCap™ against Aluminum capacitors together with face to face price comparison. However, the total cost performance of OxiCap™ can be much better than Aluminum capacitor if a complete cost model is calculated including high speed SMD technology, lead-free compliance, high manufacturing yield, reduced customer complaints with related rework cost etc. Additional functionality can be achieved also by downsizing where for example typical space needed for an Aluminum capacitor 470µF 6.3V is 578mm^3 and board space is 50mm^2 (8mm diameter with 11.5mm length). OxiCap™ 470µF 6.3V is available in SMD E case size within just 129mm^3 volume and board space 31mm^2 (7.3x4.3x4.1mm). Lead-free compliance given by OxiCap™ will also open doors to sell product in new markets or maintain the current market share position. Additionally less capacitance is typically needed in the OxiCap to provide the same electrical performance as the Aluminum in filtering due to its naturally lower and more stable esr.

Reliability

The reliability level of Aluminum capacitors is typically between 1000 to 5000 hrs. This may be a considerable limitation for many applications such as LCD displays and PC computers. In addition repeated issues with reliability on certain brands of Aluminum capacitors have raised a lot of concerns in desktop computer industry today. Leaking electrolyte has resulted in ESR and DCL instability that has stopped operation of many desktop computers in the hands of end users.

OxiCap™ has no wear-out mechanism and due to its self-healing and self-arresting mechanisms it provides the highest level of safety and reliability within the capacitor technologies. The MTBF (Mean Time Between Failures) is in range of 200 000 to 500 000 hrs e.g. up to 100 times better in comparison to Aluminum capacitors. OxiCap™ operates at temperature range from -55°C to 105°C (NOJ) / 125°C (NOS) with no degradation of capacitance with time as very often seen in case of Aluminum capacitors where the electrolyte dries out especially at continuously operating temperature at 40°C to 85°C as typically in a PC environment. Often designers have to add redundant levels of capacitance.

RoHS and Lead-free Compliance

AVX OxiCap™ capacitors are manufactured and tested to comply with the latest lead-free and RoHs requirements. Capacitors are capable of withstanding 3x reflow profile up to 260°C and comply with JEDEC 020C requirements. Aluminum capacitors are not recommended to be exposed to 3x 260°C reflows and thus can not meet the JEDEC 020C specification requirements. The 'lead-free' Aluminum capacitors on the market have improved its thermal load resistance to typically withstand one time 250 to 260C reflow profile. This is not sufficient for mass production of many advanced electronic boards with one side, 2nd side reflow and rework e.g. three reflow profiles capability requirements. The European Union has banned the use of lead in electronic assemblies since 1st July 2006. After this date no electronic boards with lead solders are allowed to be sold in European market (with a few exceptions). The use of alternative lead-free solder alloys require the increase in peak reflow temperature to 255-260°C and significantly the time at elevated temperatures are greatly extended.
In addition, some of the low ESR types of Aluminum capacitors are using a conductive counter electrodes based on for example TCNQ salt that is a complex compound of chemicals and thermally unstable as well as potentially toxicity.

Summary

AVX OxiCap™ Niobium Oxide Capacitors offer the safest, most stable and reliable alternative to Aluminum capacitors with a high cost versus performance value. OxiCap™ capacitors is a new technology outside of a the tantalum supply chain with a unique non short circuit failure mode providing new, upper level of safety & reliability. The parts can be used up to 80% of rated voltage and compatible to lead-free reflow requirements. The excellent steady state reliability makes the parts a favorite choice not only for consumer applications but also for high end, automotive, professional and the military.

For samples and additional technical data – please contact your local AVX sales representative or check www.avx.com/tabanner.pdf., or send your request to techsale-tantalum@avx.cz