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## Chips of choice

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Tantalum chips are in demand and a shortage is expected to continue for up to a year. But there are alternatives, says, Jim Wright from NIC Components.

The recent increase in market demand for tantalum chip electrolytic capacitors has meant that excessive lead times have become increasingly evident.

The last shortage of surface mount chip tantalum electrolytic capacitors was in 1996, when demand outstripped capacity for about a six month period. Eventually increased component production caught up with demand but not before a number of systems' manufacturers adopted and, when Tantalums were once again available, then continued with

various alternative technologies.

Projection for an end to the present shortage is not for another 8 to 12 months, when manufacturers of Tantalum capacitors are anticipating production capacity increases to meet demand again. Unlike the end of the 1996 shortage, this time there is not expected to be a surplus of Tantalums. This is because of the increased activity in markets that this type of capacitor is being used in, which include PCs, computer peripherals and, most importantly, handheld devices, such as mobile phones, PDAs and laptops. It is because of this, that alternatives to Tantalum chip technology are becoming increasingly attractive to manufacturers of telecom and computer products, where short lead times are the expected norm. Indeed, those manufacturers who have adopted alternative component technologies, such as SMT aluminum electrolytic and SMT ceramic chip capacitors, have also found a number of other performance and cost related advantages.

One of the undesirable features of tantalum capacitors is their characteristic short circuit failure (i.e. heat, smoke and burnt PCB boards) because of over-voltage, reverse biasing and unforeseen transient events. The thin dielectric that gives the tantalum its volumetric efficiency is its Achilles' heel and is the reason for such failures but this shortfall in performance can be corrected when an alternative, such as SMT aluminum electrolytic capacitors, are used. The higher safety margins that SMT aluminum electrolytic capacitors offer because of improved tolerance to over-voltage and reserve biasing conditions. Very simply, the aluminum capacitors are more reliable and therefore less prone to catastrophic failure when unforeseen transient events occur.

Another alternative is the SMT ceramic chip capacitor. As well as providing smaller packages, at small capacitances, when compared with similar tantalum devices, these electrostatic solutions are also non-polarized. This means that they can be used indiscriminately and are immune to reserve biasing and other transient conditions.

Another alternative is the SMT solid electrolyte aluminum electrolytic capacitor. Although this solution is more expensive than its liquid electrolyte based aluminum counterpart, it operates better at high frequencies and exhibits similar life expectancy when compared to tantalum capacitors. The low impedance characteristics of the solid aluminum style devices make them particularly suitable for high current power supply applications.

One of the greatest advantages of both the SMT aluminum electrolytic and SMT ceramic chip capacitors is their relative cost, when compared to Tantalum solutions. The former is less expensive because of the considerably lower cost of raw materials (i.e. aluminum and electrolytes) and also lower manufacturing related costs as compared to tantalum capacitor manufacturing.

Ceramic chip capacitors cost advantage is applicable to low capacitance value ( $C < 0.47\mu\text{F}$ ), where the cost of Ceramic styles can be two to five times less than their tantalum counterparts.

The shortage of SM tantalum electrolytic capacitors has forced many manufacturers of computers, handheld equipment and power supplies to explore other sources. This may, in the long run, be a greater boon than they suspect, as, whatever the advantages of tantalum solutions, if they can design-in a cheaper device with better performance, why not stick with it.