

## Material Data and Handling

This should be read in conjunction with the Product Datasheet. Failure to observe the ratings and the information on this sheet may result in a safety hazard.

### 1. Material Content

Solid Tantalum and OxiCap<sup>®</sup> capacitors do not contain liquid hazardous materials.

The operating section contains:

Tantalum/Niobium	Graphite/carbon
Tantalum/Niobium oxide	Conducting paint/resins
Manganese dioxide	Fluoropolymers (not TAC)

The encapsulation contains:

TAC - epoxy molding compound, solder/tin coated terminal pads

TAJ, TMJ, TPS, TPM, TRJ, TRM, TLJ, TLN, TCJ, TCM, TCN, J-CAP<sup>™</sup>, TCO, TCQ, NLJ, NOJ, NOS and NOM - epoxy molding compound, tin/solder coated terminal pads

TAP - solder, solder coated terminal wires, epoxy dipped resin

The capacitors do not contain PBB or PBB0/PBBE. The solder alloys may contain lead.

### 2. Physical Form

These capacitors are physically small and are either rectangular with solderable terminal pads, or cylindrical or bead shaped with solderable terminal wires.

### 3. Intrinsic Properties

#### Operating

Both Tantalum and OxiCap<sup>®</sup> capacitors are polarized devices and operate satisfactorily in the correct d.c. mode. They will withstand a limited application of reverse voltage as stated in the datasheets. However, a reverse application of the rated voltage will result in early short circuit failure and may result in fire or explosion. Consequential failure of other associated components in the circuit e.g. diodes, transformers, etc. may also occur. When operated in the correct polarity, a long period of satisfactory operation will be obtained but failure may occur for any of the following reasons:

- normal failure rate
- surge voltage exceeded
- reverse voltage exceeded
- temperature too high
- ripple rating exceeded

If this failure mode is a short circuit, the previous conditions apply. If the adjacent circuit impedance is low, voltage or current surges may exceed the power handling capability of the capacitor. For this reason capacitors in circuits of below 1Ω/V should be derated by minimum 50% for tantalum and 20% for OxiCap<sup>®</sup>. Precautions should be taken to prevent reverse voltage spikes. Where capacitors may be subjected to fast switched, low impedance source voltages, the manufacturers advice should be sought to determine the most suitable capacitors for such applications.

#### Non-operating

Both Tantalum and OxiCap<sup>®</sup> capacitors contain no liquids or noxious gases to leak out. However, cracking or damage to the encapsulation may lead to premature failure due to ingress of material such as cleaning fluids or to stresses transmitted to the tantalum anode.

### 4. Fire Characteristics

#### Primary

Any component subject to abnormal power dissipation may

- self ignite
- become red hot
- break open or explode emitting flaming or red hot material, solid, molten or gaseous.

Fumes from burning components will vary in composition depending on the temperature, and should be considered to be hazardous, although fumes from a single component in a well ventilated area are unlikely to cause problems.

#### Secondary

Induced ignition may occur from an adjacent burning or red hot component. Epoxy resins used in the manufacture of capacitors give off noxious fumes when burning as stated above. Wherever possible, capacitors comply with the following:

BS EN 60065

UL 492.60A/280

LOI (ASTM D2863-70) as stated in the datasheets.

### 5. Storage

AVX Tantalum dielectric chip capacitors are unaffected by the following storage condition for 2 years:

Temperature: -10°C – +50°C

Humidity: 75% RH maximum

Atmospheric pressure: 860 mbar ~ 1060mbar

Tantalum and OxiCap<sup>®</sup> capacitors exhibit a very low random failure rate after long periods of storage and apart from this there are no known modes of failure under normal storage conditions. All capacitors will withstand any environmental conditions within their ratings for the periods given in the detail specifications. Storage for longer periods under high humidity conditions may affect the leakage current of resin protected capacitors. Solderability of solder coated surfaces may be affected by storage of excess of 2 years. If F-series capacitors should be stored more than 1 year please contact AVX for advice.

### 6. Moisture Sensitivity Level

MSL is defined in J-STD-020. It is applicable to non-hermetic surface mount devices, and is focussed on parts in plastic packages.

The basic concept is that a plastic package may contain moisture, which can become a high pressure vapour during solder reflow. If this occurs, the vapor pressure may cause internal cracking or damage to the device. It can also result in external steam jets from the package, and these may displace other nearby components on the circuit board during the solder process. A common industry reference for this is "popcorning".

AVX solid electrolyte chips (standard tantalum, conductive polymer, OxiCap<sup>®</sup>), which are considered MSL 3, MSL 4 or MSL 5 (ref. product datasheet) are molded in plastic packages, and are distributed in packaging including a moisture barrier.

AVX solid tantalum TACmicrochip<sup>®</sup> (TAC, TPC) are considered MSL 1 and supplied in packaging with a moisture barrier. TLC series is considered MSL 3 and is distributed in packaging including a moisture barrier.

# Product Safety Information Datasheet

## Material Data and Handling

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The series, which are considered MSL 3, MSL 4 or MSL 5 are delivered in vacuum sealed bag with calculated shelf life:

- a) 12 months at < 40°C and < 90% relative humidity (RH)
- b) 24 months at < 30°C and < 70% relative humidity (RH)

### 7. Disposal

Incineration of epoxy coated capacitors will cause emission of noxious fumes and metal cased capacitors may explode due to build up of internal gas pressure. Disposal by any other means normally involves no special hazards. Large quantities may have salvage value.

### 8. Unsafe Use

Most failures are of a passive nature and do not represent a safety hazard. A hazard may, however, arise if this failure causes a dangerous malfunction of the equipment in which the capacitor is employed. Circuits should be designed to fail safe under the normal modes of failure. The usual failure mode is an increase in leakage current or short circuit. Other possible modes are decrease of capacitance, increase in dissipation factor (and impedance) or an open-circuit. Operations outside the ratings quoted in the datasheets represents unsafe use.

### 9. Handling

Careless handling of the cut terminal leads could result in scratches and/or skin punctures. Hands should be washed after handling solder coated terminals before eating or smoking, to avoid ingestion of lead. Capacitors must be kept out of the reach of small children.

Care must be taken to discharge capacitors before handling as capacitors may retain a residual charge even after equipment in which they are being used has been switched off. Sparks from the discharge could ignite a flammable vapor.

## Environmental Information

AVX has always sought to minimize the environmental impact of its manufacturing operations and of its capacitors supplied to customers throughout the world. We have a policy of preventing and minimizing waste streams during manufacture, and recycling materials wherever possible. We actively avoid or minimize environmentally hazardous materials in our production processes.

### 1. Material Content

For customers wishing to assess the environmental impact of AVX's capacitors contained in waste electrical and electronic equipment, the following information is provided: Surface mount tantalum capacitors contain:

- Tantalum/Niobium and Tantalum/Niobium oxide
- Manganese dioxide
- Carbon/graphite
- Silver
- Tin/Tin-lead alloy plating
- Nickel-iron alloy or Copper alloy depending on design (consult factory for details)
- Polymers including fluorinated polymers
- Epoxide resin encapsulant

The encapsulant is made fire retardant to UL 94 V-0 by the inclusion of inert mineral filler and fire retardants.

### 2. Packaging Material

The component packing tape is recyclable Polycarbonate and the sealing tape is a laminate of halogen-free polymers. The reels are recyclable polystyrene, and marked with the recycling symbol. The reels are overpacked in recyclable fiber board boxes. None of the packing contains heavy metals.

### 3. Lead (Pb)

Parts supplied today are electroplated over the terminal contact area with 100% fused matte Tin (Sn). Parts with SnPb termination finish are available upon request only. Contact AVX for availability of parts with SnPb termination finish.

### 4. Fire Retardants

A combustible encapsulant free of antimony trioxide and organic bromide compound are supplied today. AVX believes that the health and safety

benefits of using these materials to provide fire retardancy during the life of the product, far outweigh the possible risks to the environment and human health.

### 5. Nickel Alloy

It is intended that all case sizes will be made with a high copper alloy termination. Some case sizes are supplied now with this termination, and other sizes may be available. Please contact AVX if you prefer this.

### 6. Recycling

Surface mount Tantalum and OxiCap® capacitors have a very long service life with no known wear-out mechanism, and a low failure rate. However, parts contained in equipment which is of no further use will have some residual value mainly because of the Tantalum metal or niobium oxide contained. This can be recovered and recycled by specialist companies. The silver and nickel or copper alloy will also have some value. Please contact AVX if you require assistance with the disposal of parts. Packaging can be recycled as described above.

### 7. Disposal

Surface mount Tantalum and OxiCap® capacitors do not contain any liquids and no part of the devices is normally soluble in water at neutral pH values. Incineration will cause the emission of noxious fumes and is not recommended except by specialists. Landfill may be considered for disposal, bearing in mind the small lead content.

Under certain extreme physical conditions it is possible to generate ignition of Tantalum, Niobium and Niobium oxide capacitors. These physical conditions relate to high-speed impact and although not considered to be a normal operating occurrence may occur as a method of material(s) recovery. Therefore appropriate safeguards procedures and methodologies need to be adopted to eliminate any risks of material ignition.

For further information, please contact your local AVX sales office or representative.

### 8. Typical Component Weight by Case Sizes

The approximate weight of capacitor by case size is in the table below. If the weight of specific part number is required, please contact manufacturer.

Case Size	TAJ, TMJ TPS, TRJ TLJ, THJ	TPM TRM	TLN	TCJ TCO TCQ	TCM	TCN J-CAP™	NOJ NOS NLJ	NOM	TAC TLC TPC	F38	F72	F75	F91, F93 F97	F92	F95	F98	F98-AJ6	TCH	THH
Typical Weight (mg)																			
A	29			28			25		57.3				28	19	37				
B	68			72			57		83.6				65	36	68				
C	166			137			154					240	160						
D	290	298		278			265	14				400	300						
E	512	527		472	474		392	402	0.5										
F	148						109												
G	28			25			23												
H	52			51		51			15.2										
I									12										543
J									5.9										
K	17		22	15		20			2.8										
L			41			38			9										
M			10			10			11.3	5.7	330					6	8		
N	9		10	9		10							350						
O						11													
P	15			15			12							9	18				
Q															20				
R	10			10					23.4		180	670			7				
S	19		27	18		25	17			12.4					25	13	14		
T	35		47	39		43	32		65.8						41				
U	738	673		642	679				8.5	1.2		160				1.6			
V	641	649		655	625		510		16.4										
W	99			100			82												
X	152			151		190	126												
Y	223	237		215			178												
Z						190			3.9										
3						251													
4			426			355													
5				429															
6			1056																
8						355													
9																		2185	2210

## Environmental Information

### 9. RoHS Compliance

#### 9.1 Tantalum & Niobium Oxide Capacitors (excluding F-series)

AVX can declare that we do not add any materials from the list below to series TAJ, TMJ, TPS, TPM, TRJ, TRM, THJ, TLJ, TLN, TCJ, TCM, TCN, J-CAP™, TCO, TCQ, TAC, TLC, TPC, NLJ, NOJ, NOS and NOM during production, so they are not contained in any significant level.

#### 9.2 F-Series Eco-Products "GeoCap"

AVX promotes environmentally conscious practices.

AVX offers "GeoCap", which has completely lead free terminals and contains no polyvinyl chloride in the sleeve.

Substances		Taping Code	RoHS Compliance
Heavy Metals	Cadmium and cadmium compounds	All	YES
	Lead and lead compounds	A,B,Y,P	YES
		R,S,T,U	YES, since production date 1/1/04
		K,H	NO
	Mercury and mercury compounds	All	YES
Hexavalent chromium compounds	All	YES	
Chlorinated organic compounds	Polychlorinated biphenyls (PCB)	All	YES
	Polychlorinated naphthalenes (PCN)	All	YES
	Chlorinated paraffins (CP)	All	YES
	Mirex (Perchlordecone)	All	YES
Brominated organic compounds	Polybrominated biphenyls (PBB)	All	YES
	Polybrominated diphenylethers (PBDE)	All	YES

### F-SERIES TANTALUM CAPACITORS

Type • Classification		Series	Lead-Free Compliance	Anti Polyvinyl Chloride Compliance
Surface Mount type	Resin-Molded type	F38, F91, F92, F93, F97, F98	Complied	Complied
	Conformal Coated type	AUDIO F95, F95, F72, F75		

### F-SERIES TANTALUM CAPACITORS CORRESPONDING TO ROHS DIRECTIVE

	Resin-Molded Chip F91/F92/F93/F97 Series	Conformal Coated Chip Audio F95/F95/F72/F75 Series	Facedown Terminal Resin-Molded Chip F98 Series	Conductive Polymer Facedown Terminal Resin-Molded Chip F38 Series
Compliance with RoHS Directive	Compliant	Compliant	Compliant	Compliant
Construction of Electrode Terminal	42 Alloy/ Ni/ Sn plating	Ni/ Sn-Cu solder	U Case Cu/ Ni/ Au/ Sn-3.5Ag plating M, S Case Cu/ Ni/ Au plating	Cu/ Ni/ Au plating
	Sn thickness 5µm Plating type matte No heat treatment after plating	Sn-Cu thickness 30µm (Solder dipping) No heat treatment after Solder dipping	U Case Sn-Ag thickness 5µm M, S Case Au thickness 0.05µm Plating type matte No heat treatment after plating	Au thickness 0.05µm Plating type matte No heat treatment after plating
Lead (Pb)	Does not contain	Does not contain	Does not contain	Does not contain
Chromium (VI)				
Mercury				
Cadmium				
PBB				
PBDE				
MSL (IPC/ JEDEC J-STD-020)	* LEVEL 1 to LEVEL 3 If you need detailed information about MSL LEVEL, please contact us.	LEVEL 3	LEVEL 3	LEVEL 3