Tantalum Chip Capacitors, Principles and Manufacturing

The basic concept of the tantalum capacitor can be shown using a conceptual diagram such as shown in Figure 1. There are metal electrodes on both sides of a dielectric material so that charge will accumulate proportional to the voltage when a voltage is applied between the electrodes.

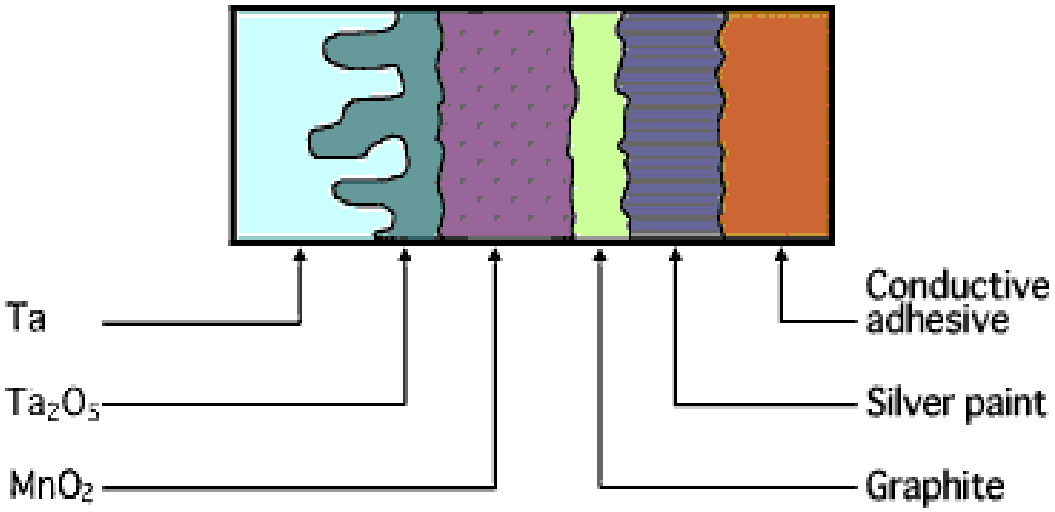


Figure 1: Schematic Diagram of a Tantalum Solid-state Electrolytic Capacitor

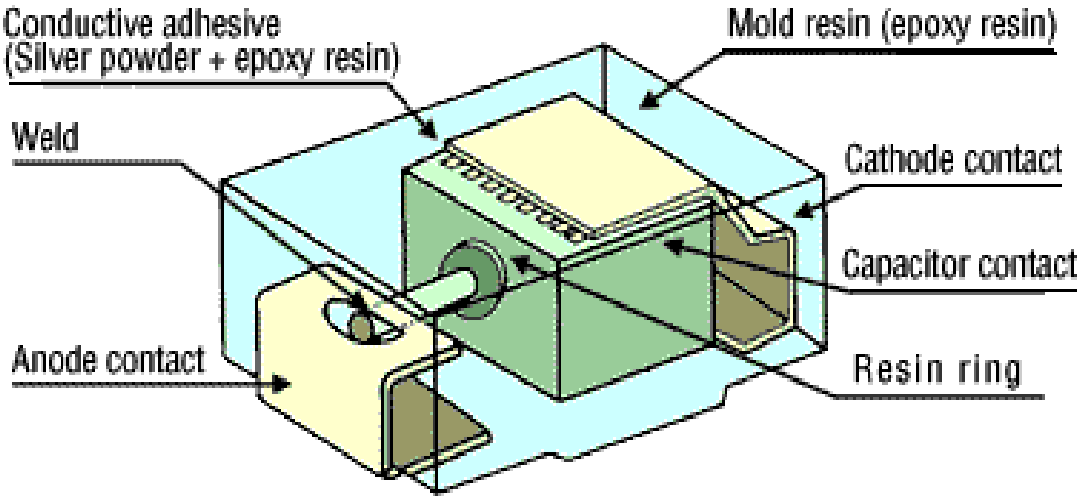
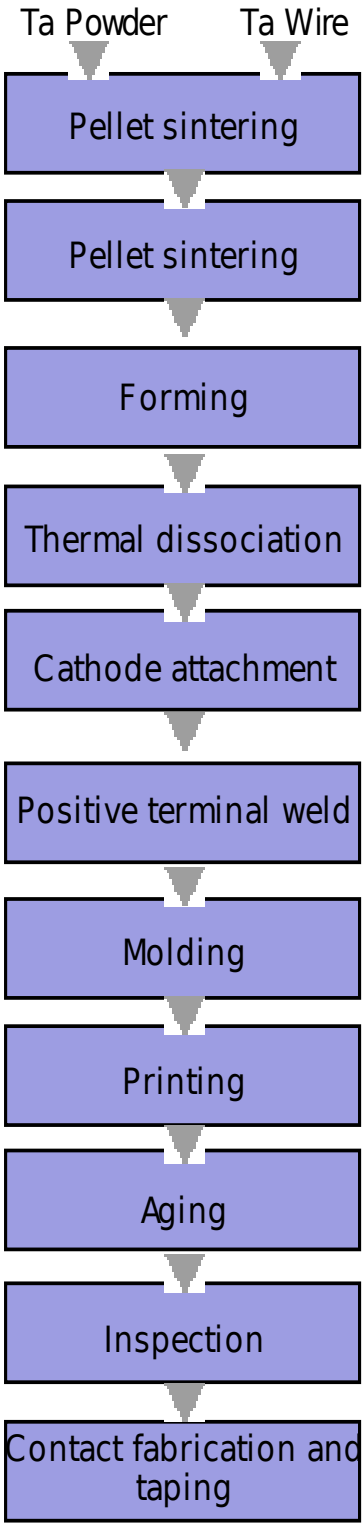


Figure 2: Schematic Diagram of a Chip-type Tantalum Capacitor

The Manufacturing Process



Hardens the Ta powder and wire into a pellet.

Melts and then resolidifies the surface of the Ta metal at a high temperature in a vacuum.

Uses anode oxidation in an oxygen acid solvent to create a thin oxide film on the surface of the Ta metal to serve as the dielectric.

Produces manganese dioxide (a solid electrolyte) through thermal dissociation of manganese nitrate.

First a graphite and then a silver coating is applied to provide a cathode contact.

The tantalum wire is electrically welded to the positive terminal of the lead frame while in the negative contact the silver is connected with paste.

Transfer molding using epoxy resin.

Temperature and voltage is applied.