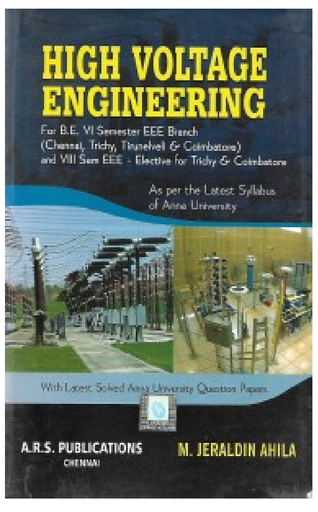
High Voltage Engineering Book By Jeraldin Ahila



The contact resistance at the mating interface between a wire and a metallic pin or between a wire and a pin in a pin grid array (PGA) package is a substantial portion of the total contact resistance and can cause a significant reduction in the electrical current flow through a solder joint. The joint resistance, not including the contact resistance at the mating interface, is referred to as the contact resistance. The contact resistance is a function of several factors, including the contact area, and temperature and pressure of the mating surfaces of the electrical contacts. Solder joint contacts may have a high contact resistance at the mating interface, particularly in high-current applications. Contact resistance increases with decreasing joint size and contact pressure, because the joint area is reduced. Contact resistance is also a function of the material properties of the electrical contacts and the electrical properties of the electrical wiring. The electrical conductivity of the mating interface may be reduced by surface oxidation, solder fluxes, oxide layers, etc. As a result, contact resistance increases. Contact resistance also increases as the mating surface becomes contaminated by oxide, dirt, or other foreign material. Surface contaminants can increase contact resistance by reducing the electrical conductivity of the mating interface. Contamination also alters the mating surface geometry, such as by increasing the surface roughness, which can reduce the contact area. Surface contaminants can reduce the strength of a joint and may cause the solder joint to fail over time. Moreover, if a contaminant is introduced between the mating surfaces, it can cause an electrically conductive bridge to form between the electrical contacts that reduces the electrical conductivity of the interface. Many different approaches have been taken to reduce the contact resistance at the mating interface of solder joints. In the following description, “solder joint” is defined as an electrical joint between two or more conductive members (such as two terminals or an electrical contactor and an electrical wire) that are soldered together, typically by melting a solder material into the joint. For instance, it has been known to provide electrical terminals with a roughened surface to promote improved electrical contact to a mating terminal. Examples of terminals with roughened surfaces include terminals having a surface that is roughened using an electroplating technique, a coarse grained surface having a multitude of indentations, or a crystalline surface having a multitude of indentations. Surface roughening techniques have not generally been used to improve electrical contact of the mating interface in the solder joint. It is believed 82157476af