Resistance spot welding (RSW) is the process of joining two or more metal sheets by fusion at discrete spots at the sheet interface. Resistance to current flow through the metal sheets generates heat. Temperature rises at the sheet interface until the plastic point of the metal is reached, the metal begins to fuse, and a nugget is formed. Current is then switched off and the nugget is allowed to cool down slowly to solidify under pressure. In this article, an axisymmetric contact finite element analysis model of RSW was developed using commercial finite element code, namely ANSYS. A two-dimensional axisymmetric model was used to simulate the thermoelectromechanical coupling of the process to determine temperature distribution and different residual stresses in the contact electrode/sheet and sheet/sheet during the RSW process.