Micro injection molding (μIM) is one of the few technologies capable of meeting the increasing demand of complex shaped micro plastic parts. This process, combined with the overmolding technique, allows a fast and cost-efficient production of multi-material micro components, saving numerous and difficult assembly steps, being the plastic molded directly on a metal substrate. In this scenario, an investigation on the fully automated micro overmolding manufacturing technology of a three-material micro component for acoustic applications has been carried out. Preliminary experiments allowed to identify an initial process window by considering the main defects affecting the part quality (flashes and gate marks). Within this range, the effect of three injection molding parameters, namely mold temperature, melt temperature and injection speed, has been evaluated with respect to the critical geometrical characteristics of the component. An optical CMM with sub-micrometric resolution has been employed for the measurements. Results show that the process parameters have a significant influence on some component features, while others mainly depend on the insert alignment inside the micro mold cavity.