摘  要

尽管焊接缺陷、焊点可靠性等焊接质量仍然与焊膏印刷、 贴片等前面多道工序有关，但据研究结果和生产统计表明，更多的焊接缺[www.51lunwen.com](http://www.51lunwen.com) 陷来源于再流焊工艺本身。再流焊是预先在PCB(Printed Circuit Board)板的焊接部位(焊盘)放置适量和适当形式的焊料，然后贴放表面组装元器件，经固化(在采用焊膏时)后，再利用外部热源使焊料再次流动达到焊接目的的一种成组或逐点焊接工艺。只要设置合适的再流焊设备的各区温度，几乎能完全满足各类表面组装元器件对焊接的要求，实现可靠的连接。但目前在国内还没有建立再流焊接温度场的模型，仍采用反复试验的方法制定再流焊接工艺，造成了巨大的财力和人力的浪费。因此，对再流焊温度场的仿真研究极其重要。  
本文研究的是BGA器件无铅再流焊过程中的温度场仿真。用ANSYS软件，根据所用无铅钎料的性能，分析了获得良好焊点性能的再流焊温度曲线；利用传热学的理论，将再流焊中红外加热转化为对流加热，结合再流焊设备对PCAs(Printed Circuit Assemblis)加热的实际物理过程，建立了红外热风再流焊方法的传热数学模型；根据再流焊设备的尺寸，结合获得良好性能产品的再流焊焊膏熔化温度曲线的要求，根据BGA的封装，建立仿真所用的PCAs有限元模型；获得再流焊炉各区的加载温度：进一步对PCAs的再流焊接温度场进行了动态模拟，获得了PCAs整体组件的动态温度场和比较满意的再流焊工艺仿真。  
通过对两种加载曲线的仿真结果的比较，获得适合无铅加载的曲线设置以及曲线的优化方法

关键词： 无铅；再流焊；仿真；温度场；表面组装；建模

Abstract

Although the welding defects, welding quality solder joint reliability is still with the solder paste printing, placement, etc. in front of the multi-channel processes, but according to research results and production statistics show that more of welding flaws from the reflow process itself. Reflow soldering is a solder that connect SMD or SMC with PCB by melting the solder utilize external heat sonrce make solder reflow and solidify the solder by cooling it (while adopting the soldering paste)．Reliable connection of various components is attainable when the temperature section of flow oven is setup suitably．The traditional approach of experimentally analysing production defects would be costly and virtually impossible for the temperature field model is not built homeland inside．An alternative to this approach is to derive computational and numerical models to simulate the reflow soldering process．   
  This study is lead-free BGA devices during reflow temperature field simulation. With ANSYS software, according to the performance of lead-free solder analysis analysis for good performance of the reflow solder temperature curve ;whit the heat transfer theory, we will go in the infrared reflow into a convection heating, combined with the reflow equipment of the PCAs (Printed Circuit Assemblis) the actual physical process of heating, the establishment of an infrared hot air reflow method of heat transfer model; according to the size of the reflow equipment, combined with performance products for good solder paste reflow melting temperature curve requirements, according to BGA packages, the establishment of simulation by the finite element model used in PCAs; access various parts of the reflow furnace load temperature: further PCAs re-flow soldering temperature field in the dynamic simulation, the dynamic component of the overall temperature of PCAs field and more satisfied with the reflow process simulation.   
   By comparison of two kinds of load curves’ simulation results. The study can obtain the curve for lead-free settings, and load optimization curve.

Key words: Lead-free; Refolw soldering ;Simulation; temperature field; SMT; Modeling

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