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Development of a Low Cost Tool Soldering for Components SMD and BGA

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Abstract

Electronic circuits are making more and more use of components with surface technology. The equipments required for soldering SMD components have a high cost, and most of them are intended for large production. The proposed project is to develop an oven for soldering SMD components. The oven is controlled by an 8-bit microcontroller. PWM was used for the temperature control with a thermocouple sensor. The heating elements are two spotlight lamps with 500W each. Two types of soldering curve have been defined. Working tests were performed by mounting the printed circuit boards and components SMD. The result showed that the presented technique allows the welding of components in a satisfactory manner and enable adaptation to curves and other applications.

Key words: SMD components, Oven, Microcontroller, Solder, Temperature.

Introduction

SMD components (Surface Mounting Devices) are electronic components with casing reduced. The technology increases the reliability of assembly, decreases considerably the size of the circuit and manufacturing cost. The circuit manufacturing that use SMD Technology requires thorough heating control in the soldering, therefore, an oven is needed. It is difficult for research laboratories and /or companies with low production quantity to acquire an oven because of its cost [1, 2].
In this work, we sought to build an affordable oven in terms of construction cost, plus its acceptable heating parameters for SMD assembly. The heating parameters can be easily found in standards [3].

Results and Discussion

The oven was designed with the possibility of using two types of curve 220 and 235 ° C, which are curves with welding characteristics using solder paste of the type (37Pb 63Sn). In chart 1 are presented the heating steps.
By applying the temperature control, SMD soldering curve was obtained. Figures 1(a) and 1(b) shows the curves of the developed oven (red), and the ideal theoretical adopted (blue). Fig.1(c) shows the plate component to be welded, the plate with the solder paste, component (CI) after welded, and a post-welded transistor. The developed oven with the control circuitry box is in Fig.1(d).

Chart 1. Step Solder.

Step	Temperature(°C)	Timer(s)
1	30 - 100	36
2	100 - 150	90
3	150 - 183	84
4	183 - T_p[1] - 183	105

[1]can assume 220 ou 235°C.

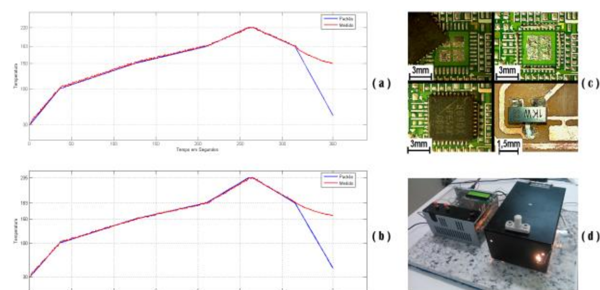

Figure 1. (a) Curves 220°C; (b) 235°C; (c) plate with welded components and (d) oven.

Conclusions

The results showed that the technique used was sufficient for the construction of the oven and improvements of temperature control are not necessary. The heating curves were made based on standards. However, the presented oven permits adjustments on the curve for some application requirements. It is important that the oven structure is of low mass, since the inertia and thermal dissipation problems are known. The heating capacity should be above the desired curve, to be able to control the temperature. The best case for the measurement of temperature is made to attach the thermocouple to an SMD component using thermal grease. The materials used are easily accessible, allowing the construction of the oven without much difficulty.

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