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Research on Device Process Characteristics and Improving PCB Manufacturing Process Level

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Abstract

The research and development of printed circuit boards is inseparable from the rapid development of devices. Because the developed printed circuit boards must meet the electrical technical requirements of the devices, so that the functional parameters of the devices can play a fuller role, to ensure the high stability and high reliability of the operation time of electronic equipment. In particular, the progress of surface mount (SMT) and micro assembly (CSP or CMT) devices has put forward higher technical requirements for the manufacturing process of printed circuit boards. For this reason, the manufacturing process of printed circuit boards must adapt to the needs of the rapid development of microelectronics technology. Therefore, studying the process characteristics of devices is an important way to develop printed circuit boards with novel structures. Therefore, starting from the characteristics of device processes, this article mainly studies and explores how to improve the manufacturing process level of printed circuit boards.

Keywords

Device process; manufacturing level; PCB; improvement

Introduction

At present, all kinds of electronic products have tended to be miniaturized and intelligent, so it is objectively necessary to introduce new product manufacturing processes. When technicians make intelligent electronic products, they can use the new PCB manufacturing process to achieve control The effect of reducing product manufacturing costs, simplifying the product manufacturing process, and speeding up product manufacturing speed [1]. Therefore, the current practice of electronic product manufacturing should clarify the specific application points of PCB product manufacturing process, and combine the characteristics of the electronic product itself to carry out product Reasonable choice of production technology.

1. Device Process Characteristics

The main feature of the structure of the developed device is the density of the devices used. The high integration of integrated circuit devices is the main manifestation of the device structure: because the integration of the device increases, it will inevitably lead to the input/output (I/O) of the transmission signal. The number of input /output (I/O) of the plug-in technology (DIP or THT) devices usually used is within 100. The number of input/output (I/O) of the surface package device QFP is between 100-50); RGA surface packaging technology, the number of input/output (I/O) of its devices has increased to 150Q-2000. With the development of micro- electric technology, new devices have been developed and developed, so that the number of input/output (I/O) of the device will increase to between

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300.) --4000. Due to the high integration of the device, the structure of the device tends to be more complex and multifunctional. The fine pitch is reduced, and higher technical requirements are put forward for surface mounting. This has a great driving force on the manufacturing process of printed circuit boards, and the existing process level must be rapidly improved. Research and develop more PCBs with novel structures to meet the needs of miniaturization and multi-functionality of electronic equipment. From the structural analysis of the device, its main characteristics are that the distance between legs is relatively small, the wires are short and fine, the wire spacing is narrow, and the aperture is small and dense. According to the process characteristics of the device, the PCB manufacturing process must be solved. First of all, according to the changes in wiring density, wire width, spacing size and aperture, a PCB with high density, high precision and high reliability should be manufactured on a limited surface area [2].

2. Improve the PCB Manufacturing Process

2.1 Improve the PCB manufacturing process from a technical perspective

2.1.1 PCB process types

Printed circuit boards mainly include double-sided boards (as shown in Figure 1), single-sided boards (as shown in Figure 2) and multi-layer boards (as shown in Figure 3). The above three types of printed circuit boards are all common PCB manufacturing processes. In the early process of designing printed circuit boards, the common single-sided board process processing method mainly involves the distribution and arrangement of wires and components on two board surfaces. However, after the evolution of PCB process technology, the single-sided board process has shown obvious process limitations. The root cause is that the use of single-sided board process processing methods can easily cause path crossing, and it is impossible to achieve a good wiring effect [3].

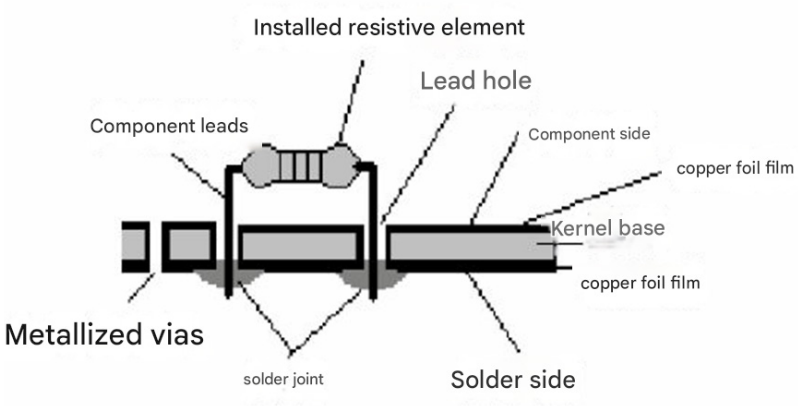

Figure 1. Cross-section of a double-sided printed circuit board.

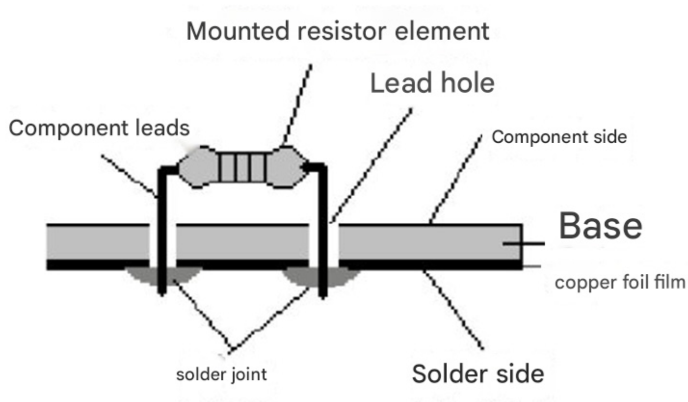

Figure 2. Cross-section of a single-sided printed circuit board.

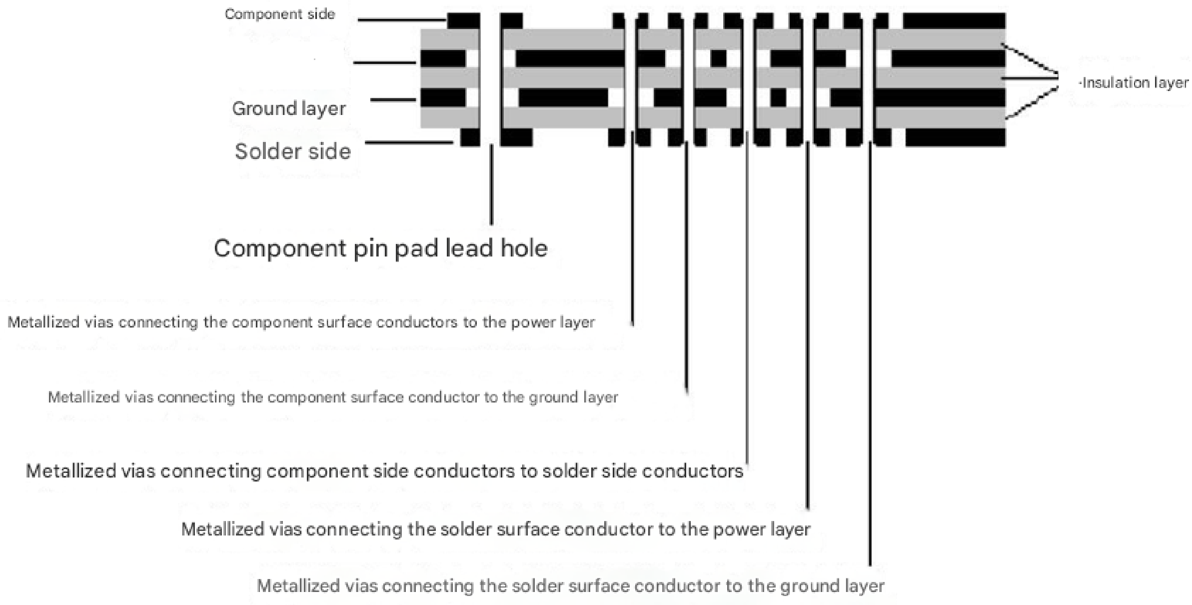

Figure 3. Cross-section of a multilayer printed circuit.

2.1.2 High-precision and high-density technology

According to the rapid development of microelectronics technology, the widespread application of ultra-large-scale integrated circuits, the progress of surface packaging technology and micro-assembly technology, the rapid development and development of high-precision and high-density process technology can better meet the needs of the rapidly developing electronic information industry. The so-called high-precision and high-density technology is to use a large number of advanced process technologies in the manufacturing process of printed circuit boards, including fine wire and narrow spacing technology, micro-hole technology, narrow ring (or no ring) technology or blind hole technology. The research and development of these process technologies make the manufacturing process equipment more advanced, and the performance of raw materials needs to meet the technical requirements of the design. In particular, when the width and spacing of the wires are finer and narrower, the raw materials, process equipment, process technology, process environment conditions, etc. for the development and production of printed circuit boards need to be rapidly changed or accelerated technical transformation before they can be manufactured. Therefore, the emergence and development of high-precision and high-density technology is far from being inseparable from the development of devices and the progress of device assembly technology. In the device, QFP, BGA, etc., not only the package size is small but also the pitch is getting narrower and narrower. This requires the research and development of suitable surface packaging or chip-level assembly printed circuit boards, which are difficult to meet the needs of electronic equipment for lightness, thinness, intelligence, smallness and multi-functions.

2.2 Improve PCB manufacturing level from manufacturing process measures

2.2.1 Review of high-precision and high-density printed circuit board drawings and disks

This is a very important project approval work. First of all, the design and process data provided by the designer must be comprehensively checked and verified to ensure that the drawings and disk data provided by the designer are consistent. Then, the drawings must be reviewed and the design rule software must be used to check the wire width, wire spacing, hole diameter and hole spacing, ring width, etc. of the graphics. If they do not meet the process requirements or the process level is not up to the target, reasonable corrections must be made and the design must be approved before production (signed or stamped). At the same time, the front and back sides of the graphics and the number of layers must be numbered in sequence according to the film pairing required by the inner core board. Mark the welding surface and component surface drilling diagram, screen printing diagram, etc. for review. Only when they are confirmed to be correct can the production process plan be formulated.

2.2.2 Make sample plates based on the batch size to provide confirmation basis

According to the process plan, first of all, the design and process information provided by the process are digested and the trial production is carried out in the engineering department to fully check the feasibility of the design process. Only after the design or user's approval can it be put into production. This part of the work is very important process work. It is an important process measure to avoid large-scale scrapping, an effective method to check the feasibility of the process, and an important business means to ensure user satisfaction.

2.2.3 Use modern high-tech means to produce high-quality products

Modern large-scale production basically implements high-tech means to achieve high-quality products. The use of high-tech means can achieve all the process means required for high-precision and high-density printed board manufacturing. This mainly requires that the process equipment used must be able to be connected to the computer, that is, it must have good software functions to network all key equipment and testing instruments. It will inevitably accelerate the speed of production and ensure every step of the process. Measures are recognized and implemented to consistently achieve higher levels of quality standards. This means that the information or data provided by the computer is converted into the required high-precision, high-density and contrast- enhancing negative film through a light plotter, and then converted into the required via holes or component holes and positioning holes on the surface of the substrate through a CNC drilling machine. Or reference hole, through the optical test system (AOI), the high-density film can be displayed on the large screen for extreme testing. Through the on-off test machine or flying probe test system, it can be detected through the data conversion probe or flying probe The solder pad Ningdian et al. The important thing is that the operator must truly realize its importance and have a thorough understanding of its working principles, and make full use of modern high-tech process equipment to produce high-quality products.

2.2.4 The expansion and contraction state of the film must be strictly controlled during the graphic transfer process

Graphic transfer is to use the principle of photochemistry to produce high-precision and high-density circuit images on the surface of the inner and outer copper foils through the light contrast of the film. Therefore, the number of graphic transfers is very large. Due to the temperature rise of the exposure clip, it directly affects the size change of the film, that is, the expansion and contraction of the size. If the expansion and contraction data is too large, it will directly cause the change of the alignment of the inner layer of the multilayer board. For this reason, the method of replacing multiple films alternately is adopted, but the consistency of the film accuracy must be ensured. At the same time, the change law of the film size can be grasped in time, and the process method of detection at any time can be adopted to obtain more accurate data of the size change.

2.2.5 Improve the quality of pattern electroplating, it is necessary to obtain uniform current distribution on the plated surface

In addition to accurately calculating the surface area to be plated, the surface area of the auxiliary cathode, and the allowable current of the mixer, the distance ratio and geometric shape of the cathode and anode are the key to this ideal current distribution state. From a theoretical analysis, the farther the distance between the cathode and anode during electroplating, the better the dispersion ability. However, this is impossible because the volume of the tank cannot meet the requirements. Only by changing the shape of the anode, such as using a hanging anode facing the cathode in a semicircular shape or a hanging basket anode in a spherical shape, its electric lines are in a crossed state to ensure the uniformity of metal distribution. In the ratio of the cathode and anode, first ensure that the anode has enough area, otherwise the insufficient anode surface will be polarized, the anode dissolution effect will be poor, the uniform distribution of the current will be disturbed or destroyed, and the uniformity of the layer will be changed.

3. Conclusion

After analysis, it can be seen that the production process of electronic products cannot lack the support of new PCB technology. Compared with the traditional printed circuit board process, the new PCB process has better product production timeliness, and can achieve the goal of ensuring the quality of electronic products and improving the safety performance of electronic products. Specifically in the relevant technical practice of manufacturing electronic products, technicians should focus on the comprehensive promotion and application of new PCB technology, and use new product manufacturing process means to achieve maximum electronic product manufacturing and production benefits.

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