Discussion on Application Verification Method of Xinyan Electronic Components

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Abstract: This article first analyzes the verification of Xinyan electronic components, including functional verification, performance verification, and process verification. Secondly, the author elaborated on the current status of use of the newly developed electronic component verification methods, such as low applicability of domestic components, poor authority of verification specifications, and low integration of development and application. This paper studies the overall verification process analysis, application verification method analysis, verification effect evaluation analysis, verification information sharing evaluation, etc., in order to improve the accuracy of verification results and the rationality of electronic components distribution.

1. Introduction
With the gradual improvement of new-generation equipment performance, quality, and reliability requirements, equipment research and development units and equipment authorities are paying more and more attention to the quality and level of components that affect equipment performance and reliability. However, the domestic newly developed electronic components lack technical accumulation and application experience. Therefore, China still lacks systematic guidance on how to reasonably and scientifically carry out the application verification of newly-developed electronic components, identify potential risks of newly-developed components, how to improve its own reliability, and how to accelerate the application of newly-developed components. This article proposes a verification process for the application of new research electronic components, and clarifies the verification methods and content requirements of each level. This article provides a reference for accelerating the application of newly developed electronic components and ensuring the quality of equipment development.

2. Verification Content of New Research Electronic Components

2.1 Functional Verification
In the application process of Xinyan electronic components, the components used have a high degree of similarity, so we can use it as a basic condition for verifying the functionality of the parts. In the specific verification process, we can view the principle block diagram of the components according to the product manual. At the same time, we can also compare the pin definitions to complete the application test of the various functions of the components and the application adjustment of the parameters.
In specific applications, as shown in Figure 1, the left picture is the replacement component AT28C64E-25JI, and the right picture shows the original component JM28C64. After comparing the functions, we can find that JM28C64 has no BDY/BUSY pin, and its function will be updated than before. However, the original system did not prepare the processing program corresponding to the BDY/BUSY pin, so this component is not adaptable.

2.2 Performance Verification

When two integrated circuits are used together, we must fully constrain their DC and AC parameters, so as to ensure that the cooperation of the two integrated circuits can reach the best state. We can compare the main performance indicators of the two components based on the component's data manual with the device's power supply voltage, leakage current, input/output voltage, drive capability and other important parameters as the object of comparison. When necessary, we should clarify the test conditions or test environment, and compare the test circuits, test curves, waveforms, etc. with drawings. In addition to using manuals and specifications for comparison, if there is a comparison of actual measured values, we also need to use actual measured values as much as possible. The comparison parameters should cover the main parameters of the device as much as possible. For the inconsistent parameter comparisons, we must analyze and explain which is better. If the parameter performance of the replacement device is poor, we need to conduct an impact analysis to determine whether the replacement device affects the product performance and whether it meets the product design requirements.

As shown in Table 1, we need to select the forward voltage drop as a parameter to compare the two sets of components. We can find that (G) 2DK1560T3 (original components) and USD945 (new components) have a big difference before. The difference is 0.15V. It can be seen that we need to consider the influencing factors in this aspect when applying this component to improve the reliability of the analysis results [1].

2.3 Process Validation

In process verification, there are many indicators that can be verified, such as printed board pad size, component material, thermal expansion coefficient, etc. Take the printed board pad size as an example, in order to clarify the specific influence of the pad length on the soldering strength, we can analyze the pull-off force of the chip pins and set up a corresponding pull-off force experiment. In the experiment, the original pad was used as the control group, assuming that the pull-off force of the pad was 13.5N, and the pad length of the experimental group was slightly longer than that of the control group. At this time, the pin pull-off force was tested, and the measured pad pull-off force was 14.4N, an increase of
0.9N, indicating that the length of the pad will have a certain impact on the strength of the solder joint. However, the obvious degree of this effect is not high, which is also one of the contents that we need to pay attention to in subsequent applications [2].

3. The Current Status of the Use of the Verification Method of the New Research Electronic Components

3.1 Low Applicability of Domestic Components
Combining the results of previous data analysis, we found that some new components that have passed the verification and passed the inspection still have some problems in practical applications. The stability of these new components still cannot meet the application requirements of components. Especially when the components enter mass production, its quality will be difficult to guarantee. In addition, after the components are installed, there will be some operational problems such as short replacement cycle and weak functional attributes. This can easily cause some component companies that require high precision, such as aerospace components, not to choose domestic components. Therefore, the situation of preferring imported components restricts the development speed of domestic components [3].

3.2 Poor Authority of Verification Specifications
China has made very good progress in the production and processing of components, but from an objective perspective, there is still a certain gap in the level of component production between China and foreign countries. At present, there are not many component technologies with independent property rights in China, and we mostly adopt the application path of reverse design. Moreover, although China has made very large application progress in process technology selection, its main body still uses the existing foreign technical experience, and there has not been a relatively mature aerospace component design system in China. Therefore, in the process of production and use, some application faults often occur. In addition, in terms of verification specifications, China has also referred to existing foreign verification specifications, which has led to a relatively low applicability of domestic component production [4].

3.3 Low Integration of Development and Application
In the context of the national support policy and the accelerated development of scientific research technology, the production level of domestic components is also constantly improving. In this way, the operating cost of some mechanical equipment is reduced, and the application value of components is improved. However, from the perspective of actual application, the lack of effective information communication between the manufacturer and the user in the component production process has led to a slow promotion of new components developed by many domestic production units in the market. At the same time, the parameters of the new components cannot meet the actual application requirements. In this way, the manufacturer can only improve the comprehensive performance of the components through rework processing, so that its quality and reliability can meet the requirements of the user, so as to meet the actual application requirements [5].

4. Research on Application Verification Method of Xinyan Electronic Components

4.1 Overall Verification Process Analysis
The verification of new components is one of the most important tasks. In the actual verification process, many assessments are involved. These assessments include the basic characteristics of components, test assessment, comprehensive evaluation of test results, etc. Effectively evaluate the availability of new components, and confirm the maturity of materials and evaluation criteria in the application stage, and use this as a basis to complete the use of components, which can greatly improve the reliability of system applications [6]. It should be noted that in order to ensure the
reliability of the test results, we need to strictly abide by the corresponding test procedures and do a good job of recording each application link. Furthermore, we should also sum up the application experience in time to provide reliable data support for the reasonable application of the system.

4.2 Application Verification Method Analysis

4.2.1 Component Level Verification
In the process of application verification method analysis, component-level verification is a basic application content, and it is also the core link in the verification process. If there is a component design problem found at this stage, we can take improvement measures in time to reduce the cost of subsequent adjustments [7]. In the specific verification process, we need to fully learn from the existing test results at this stage and try some additional test items such as electrical performance parameters, system limit tests, system adaptability to the environment, and evaluation of key system parameters. At the same time, we can also rely on the basic characteristics of the components to analyze the content. What's more, we can also complete component verification by combining ray detection technology, infrared spectrum detection technology, internal inspection technology and other means to improve the reliability of the system operation process.

4.2.2 Board-level/Device-level Verification
In the process of verification work, board-level/device-level verification is also one of the very important verification contents. In the specific verification process, we not only need to develop reliable application design for these application content, but also need to develop application design based on this. When designing, we should put the newly developed components under normal working conditions, and then collect some data of the components such as interface compatibility, data collection conditions, performance test conditions and other data under the mutual matching of peripheral software and hardware. Moreover, in the follow-up test, we will also compare the welding dimensions of the components, and solve the possible potential risks according to the difference, so that it can meet the application requirements. This can not only improve the application value of the system itself, but also improve the reliability of the system operation process [8].

4.2.3 System Level/Equipment Level Verification
In addition to the above-mentioned verification content, in actual application processing, we need to do a good job of system-level/equipment-level verification of new components [9]. In the specific application process, we can rely on other application technologies to establish an application platform that meets the collaborative work of electronic components. Besides, in this process, we should also verify the content of relevant parameters and collect reliable application data information. Meanwhile, in the follow-up test, the corrosion resistance and temperature resistance of the components are compared, and the potential risks that may exist are resolved according to the difference. This not only helps to improve the practicability of the evaluation results, but also helps to improve the reliability and applicability of the components.

4.3 Analysis of Verification Effect Evaluation
The evaluation and analysis of the verification results include the following four aspects. First, indicator evaluation. Evaluate some basic performance of the components and determine whether they meet the application requirements of the equipment itself. Second, the maturity assessment. That is, the practical value of new components in the process of processing technology, material screening, and application [10]. Third, adaptability assessment. Evaluate the environmental adaptability of the components, the applicability of the thermal environment, and the system reliability to judge the practical value of the system itself. Fourth, availability assessment. That is to evaluate the risk level of components. Moreover, we also need to evaluate the results of the system analysis to reduce the risk of system operation.
4.4 Verification Information Sharing Assessment

After completing the above verification work, it has entered the verification information sharing stage. In practical applications, its main function is to help designers understand the application parameters of components. This can also allow the applicable party to have enough trust in the new components, avoiding the situation that was previously not used [11]. Moreover, with the help of information sharing, the repetition rate of design content can also be reduced, so that new components can develop in a reliable direction, thereby improving the reliability of the system operation process. Otherwise, during the operation of the system, we also need to use the database to store and back up information to improve the practicability of the information itself.

5. Conclusion

In summary, in the application phase of new components, firstly, doing a good job of application verification can provide a strong guarantee for the independent research and development of electronic components. Secondly, the use of information sharing can also reduce the repetition rate of design content, so that new components can develop in a reliable direction. This method is conducive to increasing the utilization rate of domestic components and promoting the rapid economic development of the industry.

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