American Standard Circuits
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AMERICAN STANDARD CIRCUITS FLEX SOLUTIONS

Discover ASC's commitment to close collaboration with their customers, showcasing how obstacles seamlessly transform into opportunities and long term solutions.

USE CASE SUMMARY

Within the aerospace industry, reliability and durability are paramount, especially in avionics applications where the performance of electronic components directly impacts flight safety. This whitepaper examines how ASC redesigned a rigid-flex 4 layer PCB, equipped with stiffeners, addresssing critical failure issues, resulting in improved reliability and long-term performance.

CHALLENGE

Our customers' existing supplier was experiencing an alarming 70% failure rate within their avionics applications. The primary issue stemmed from copper cracking in the flex area of the PCB, caused by repetitive bending during the assembly process and subsequent use in the application. This compromised the integrity of the electrical connections, leading to system failures and potential safety concerns.

SOLUTION

To address the reliability issues, our team proposed a comprehensive solution that focused on redesigning the PCB stack-up and incorporating advanced materials to enhance durability and flexibility. The key components of the solution included:

- **Redesigned Stack-Up**
  We reengineered the PCB stack-up to optimize the distribution of materials to provide greater support in the flex area. This strategic adjustment mitigated the risk of copper cracking by minimizing stress concentrations during bending.

- **Adhesiveless Kapton Material**
  Adopting adhesiveless Kapton material enhances avionics PCBs, offering improved flexibility, reduced thickness, and enhanced thermal stability. This material substitution significantly boosted reliability and performance.

- **Thickness Optimization**
  Reducing the flex circuit thickness from 19.6 mils to 13.4 mils, a 32% decrease, achieved a vital balance between flexibility and rigidity. The prior excess thickness led to excess stress concentrations, resulting in the root cause of copper cracking during bending.

- **Integration of Stiffeners**
  Adding stiffeners to the rigid-flex PCB assembly offers extra support in bend-prone areas, enhancing structural integrity for avionics applications. This strategic reinforcement caters to unique requirements, ensuring robust performance.

American Standard Circuits
475 Industrial Drive
West Chicago, IL 60185

sales@asc-i.com
asc-i.com

RESULTS

The implementation of the solution yielded significant improvements in reliability and performance, as evidenced by the following outcomes:

- **Qualification on a Long-Term Program**

  The redesigned rigid-flex PCB successfully met the stringent requirements of the customer's avionics application, leading to qualification on a 12-year program. This long-term commitment supports the confidence in the reliability and durability of the solution.

- **Mitigation of Copper Cracking**

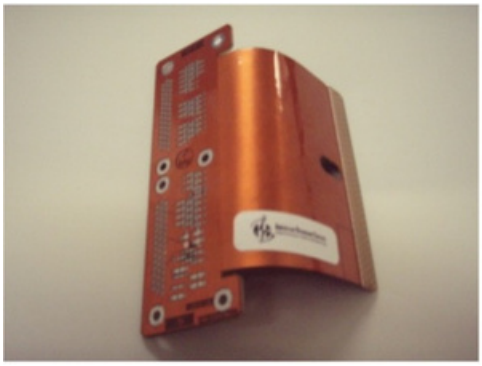
  The optimized stack-up, use of adhesiveless Kapton material, and thickness reduction effectively mitigated the issue of copper cracking in the flex area. This improvement significantly enhanced the reliability and longevity of the PCB in demanding aerospace environments.

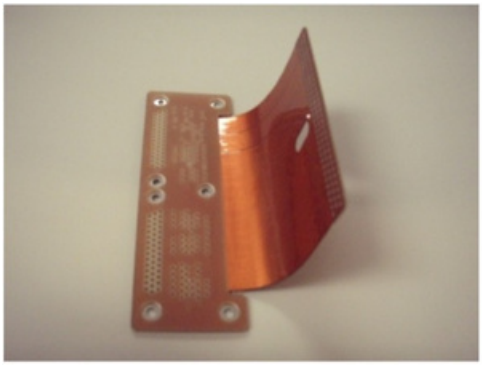
- **Enhanced Flexibility and Durability**

  By striking the right balance between flexibility and rigidity, the redesigned PCB demonstrated superior performance under dynamic conditions, ensuring sustained functionality throughout the operational lifecycle.

CONCLUSION

Through a close partnership with our customers and a strategic redesign, the adoption of advanced materials and manufacturing techniques, we successfully addressed critical reliability issues encountered in avionics applications. The enhanced flexibility, durability, and structural integrity of the rigid-flex PCB have positioned it as a reliable solution for long-term deployment in aerospace systems. This whitepaper exemplifies our commitment to innovation and quality in meeting the unique challenges of the aerospace industry.





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