CASE STUDY

Optimizing Electrosurgical Generator Performance with Advanced Energy's CS1000 Power Supply

INDUSTRY	SOLUTION	APPLICATION
Electrosurgery	CS1000 Series	Ablation

CHALLENGE

A global medical equipment manufacturer was developing a new electrosurgical generator for ablation. Ensuring patient protection and regulatory compliance (isolation, earth leakage current, and EMI) were key considerations in their new design. Additionally, they wanted to minimize the size and weight of the mobile equipment

The equipment had several AC input devices (AC-DC power supply, pumps and cooling elements) that contributed to the overall system leakage current. In their previous generation system, they had faced significant EMI challenges due to the need to keep earth leakage current below the regulatory limit, which had cost them many months in development time, eventually delaying their product launch. They were keen to mitigate this issue as much as possible on this new system design. In addition, they noticed dust ingress on systems deployed in the field due to fans drawing dust from the outside environment.

The chosen topology was a distributed power architecture with a single AC-DC power supply for the system delivering 700 W.

SOLUTION

Upon reviewing the requirements, Advanced Energy's Field Application Engineer (FAE) proposed the CS1000 power supply. The CS1000 is a 1U medically certified, fanless power supply capable of delivering up to 1000 W continuous output power. Given the other devices contributing to the system earth leakage, AE proposed using the 150 uA leakage current option to help the system meet the 300 uA system limit.

Initial electrical testing proved to be very successful. The high efficiency of the power supply (>90%) reduced the temperature build up in the system, simplifying the overall system cooling. The BF ready outputs of the CS1000, with its increased creepage and clearance, reduced the size of other isolation barriers in the system, helping the system designers save board space in meeting the system isolation requirements. During EMI testing, the overall system performance indicated that large input filtering was still needed.

AE offered the use of our Customer Experience Center(CEC) for additional testing, support, and possible performance improvements. With its full EMI characterization capabilities, AE's service team identified the source of the emissions. As space was limited on customer PCBs, AE examined if the power supply could be modified to help reduce the conducted line emissions further. Real-time inductor and Y cap modifications indicated AE could help the system meet the required performance level and eliminate the need for additional input filtering and a large isolation transformer, significantly reducing system size and weight.

RESULT

AE supplied five samples of the modified CS1000 for further testing at the customer location. After electrical approval, AE's engineering team proceeded to complete safety agency approval on the modified CS1000 to the latest IEC60601-1 safety standard.

- The CEC and characterisation derisked the solution and accelerated EMI compliance of the system, significantly reducing system development time.
- Eliminating the isolation transformer and additional EMI filters reduced system weight by 4 kg and size by 20%, making the equipment more portable and mobile.
- BF ready outputs simplified system isolation compliance, reducing their regulatory approval schedule and reducing their time to market.
- Fanless solution reduced dust ingress and will increase long term reliability of the system.

CONCLUSION

In conclusion, the implementation of the CS1000 power supply significantly enhanced the performance and reliability of the electrosurgical generator. By addressing key challenges such as EMI compliance, system leakage current, and dust ingress, the solution not only met regulatory requirements but also improved the overall design. The collaboration with the experts at AE's Customer Experience Center(CEC) played a crucial role in optimizing the system, leading to a more portable and efficient product. This successful integration ultimately reduced development time, minimized system size and weight, and accelerated the time to market.

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