

High Voltage Power Supply for High-Energy X-Ray Source

INDUSTRY**X-Ray****SOLUTION****20 kV/125 W High Voltage DC/DC Power Supply and 30kV DC/DC Isolation Modules****APPLICATION****Vehicle/Cargo X-Ray Scanner****CHALLENGE**

A customer was designing a fully enclosed x-ray source that required a ground-referenced, variable -20 kV/125 W DC/DC power supply which would provide the high voltage source for an electron gun. The power supply needed to be housed within a metal enclosure called a hot deck which also contained several DC/DC components floating on a separate 30 kVDC potential. The system was powered by an external DC source capable of delivering +/-15 VDC, +/-24 VDC and a +5.1 VDC reference input. While ripple of the -20 kV source was important, the primary factor was the supply's ability to provide high power.

The customer planned to encapsulate the final assembly in potting material to minimize micro discharges and arcing, but this added the challenge of keeping the isolation modules cool due to the additional mass of the potting which affected thermal transfer. The customer requested characterization of these modules with a case temperature of 70°C while delivering the required 75 W power level. Additionally, the -20 kV source needed to report arcing events to the customer's data logger.

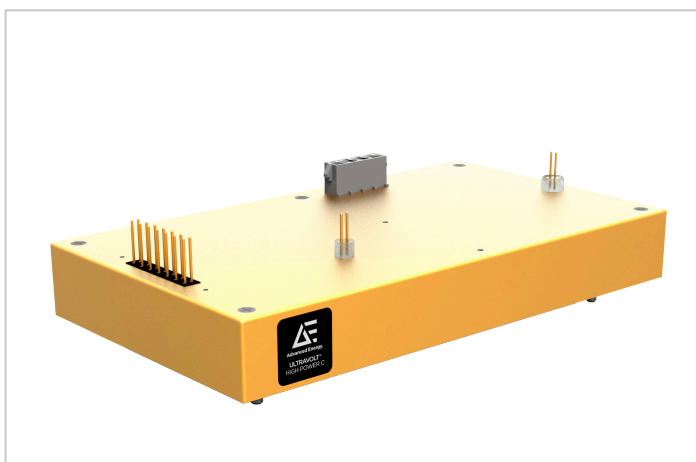


Fig. 1 UltraVolt® High Power C Series

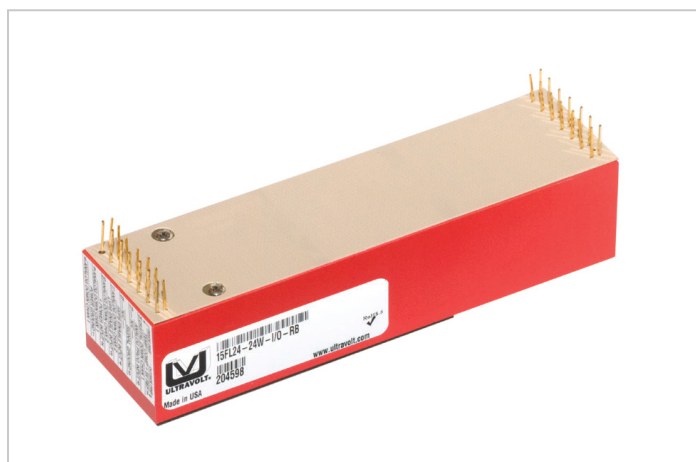


Fig. 2 UltraVolt® EFL Series

SOLUTION

After evaluating the voltage, power and isolation requirements, the Advanced Energy (AE) engineering team recommended P/N 20C24-N125-I10-AD for the electron gun. This power supply includes the AD (Arc Detect) option which provides an arc event counter. For the floating modules, AE recommended the use of three 30EFL24-24W-I/O-RB modules with the 24 VDC outputs connected in parallel. To meet the customer's 70°C requirement for the isolation modules, AE engineering team modified these components by removing the I/O features that were not required. This modification reduced the costs of each module and increased the maximum case temperature of each module from the standard 55°C to 70°C.

The combination of the 20 kV source and the three isolation modules was an excellent choice for this application due to several attributes:

- The 20C module provided the high power required by the electron gun and enabled the customer to count arc events for system reliability records
- The modified 30ELF modules operated successfully at 70°C without additional thermal controls, such as heatsinking, chill-plating etc.
- AE's EFL product is unique within the high voltage power supply industry
- Compact, high voltage-density packaging of all UltraVolt modules kept the relative packaging requirements minimal

Additional benefits that influenced the customer's decision included:

- AE's ability to rapidly modify standard high voltage DC/DC products, which reduced design time and lowered costs compared to a fully custom approach.
- Decades of experience in high voltage floating/hot deck applications
- A strong reputation for quality and reliability
- A proven track record in electron gun and x-ray applications

RESULT

The customer received a solution that fully met all their high voltage DC and floating low voltage DC requirements. They were impressed by AE's technical expertise, long-standing experience in high voltage applications (especially in the high-performance segment for high voltage DC/DC power supplies and the high voltage DC isolation module space), and excellent customer service and product from product conceptualization, via prototype stage to full production of their x-ray system.



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