SPECIAL FEATURE: Medical Electronics

A Modular Concept for Desktop Power Supply Families

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Today, leading edge power supply companies are using the "modular design approach" at the system design stage to yield large families of power products that can be released to market in a shorter time. The rigorous weave of multi-engineering disciplines — electrical, thermal, mechanical, compliance with field marketing trends w/in3, w/lbs, w/dollar — will obtain extraordinary results. Power design engineers can develop more than 200 standard models on single platform designs. In addition, the platform can also can be considered a springboard for many other standard families such as constant-current, battery chargers, extended temperature range supplies and other semi-custom designs.

Designing on single platform families of standard SELV output voltages 3.3 V to 48 V single as well as multiple combinations requires system engineering planning for worst-case design and stress analysis using power topology selected for power range with an efficiency of >90 percent. A high frequency transformer/inductor design versus a single platform concept requires a single core/single bobbin approach for single and multiple output configurations with series and parallel pin combination jumpers at the PCB level.

A thermal design concept of multi-fold high thermal conductivity alloys permits multi-surface contact to enclosure material selected for good thermal properties and a high vicate (softening) point. Worst case thermal design is for external, desktop, non-vented enclosures. Power increases an average of 10 percent when open-frame/PCB-mount versions are considered. Additional heat sink top surface screening will add to radiation and natural air flow thermal management. Multi-fold heat sink design is optimum for low cost stamp fabrication.

The Modular Design

The mechanical design using a modular concept is where all the circuitry presented in the functional modular description are functionally grouped into independent plug-in modules using a base plate has been in existence for a long time and has been used successfully by many power supply manufacturers. The idea of modularity is to provide flexible architecture, standardization and adaptation, to increase reliability, to shorten time to repair and provide for quick replacement in the field. The availability of power supply modules (post-regulators, PFC, battery back-up, forced parallel sharing) allows the system designer to use a building block approach to satisfy his specific requirements.

Modular power supply configurations are designed using the same modules while improving the plug-in techniques to the maximum extent possible. Modules are plug-in and removable without disturbing adjacent modules, using its connector arrangement that plugs into the wiring harness or mother-board of the mating connector. Modules are fabricated and operated independently and tested prior to final installation by utilizing its plug-in connector arrangement as an additional performance monitor and for fault isolation.

Functional Description

At the core of modular design is a state-of-the-art, high efficiency converter family with a fixed frequency

Desk-Top, 75 W to 100 W Single or Multi-Output Power Supply.

75 W to 100 W Switching Power Supply for Desk-Top and Open-Frame (PCB) Mount.

(100 KHz typ.) switching MOSFET technology. In addition, the power supply produces built-in-test protection hardware to discover fail conditions and report fail detection and isolation. Input fusing, both line and neutral for medical applications, has high interrupting current rating and time delay characteristics to compensate for in-rush current during turn-on and disconnect power supply from the power system in case of failure.

Internal bias regeneration is designed to operate through power interruptions according to voltage sag immunity and voltage fluctuations standards. The internal bias housekeeping isolates the control circuits from the hostile power line, improves human safety and allows control of the power up/power down cycles. The bias is synchronized to the local storage through the regeneration circuit, keeping the control circuitry operating during input power interruption.

Conclusion

Modularity using the known advantages of standardized flexible architecture with quick production capability and high reliability can be extended to external/internal power supply applications. Through creatively combined multi-disciplines, large families of hundreds of standard models can be generated based on single-platform design. The modular concept gives tremendous advantages to medical and ITE OEMs by giving them the broadest product line within a power supply family. This concept requires less redesign time versus the non-modular concept approach should customization be required on one of the family's products. The true advantage is faster time to market, lower NRE cost and reduced power supply unit cost.

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