PROTEK POWER NORTH AMERICA

High-Power Desktop Adaptor Considerations and Solutions

Introduction

One of very first design decisions made when developing the power infrastructure for a new electronic device is whether the AC/DC conversion engine will live inside the product, or external to it. There a number of factors that drive the decision, such as end product size and mobility, thermal constraints, and safety considerations. AC to DC power conversion generates a non-negligible amount of heat, requires the use of heavy magnetic components, and necessitates safe and appropriate treatment of hazardous high voltages. Each of these factors can be a cumbersome milestone to overcome when designing an electronic product with an internal power supply. For that reason, more and more products are being designed with external, enclosed power adaptors. This puts the onus of thermal management and hazardous voltage management on the power supply manufacturer alone, and also facilitates the size and weight optimization of the actual end product. The trend of external power conversion began with lower power products, but the demand for higher and higher power external solutions continues to grow.

A Look at the Industry Today

A brief perusal of your favorite electronic component distributors website will reveal quickly that there is a relatively narrow window of output power ratings available in the desktop adaptor form factor. In fact, very few manufacturers are currently marketing and producing desktop type adaptors in power levels greater than 300W. Above this power level, one is more likely to consider an internal AC/DC conversion engine as open frame power supplies are widely available in power ratings up to several kilowatts.

Applications requiring such high levels of power are more likely to be larger, static, industrial devices, and not those which one would be likely to plug into a standard wall outlet. This is not always the case, however, which is why Protek Power developed the PMP400 series of desktop power adaptors.

PMP400 Series

Protek Power released the PMP400 series of desktop power adaptors in 2015 in an effort to meet the increasing demand for higher power external converters. The PMP400 is capable of providing 400W of continuous power and comes in a relatively compact 4.72” x 9.84” package, with a power density of nearly 4.5W/in^3. One would be hard pressed to find a comparable device from another manufacturer.

Need More Power?

Even after the release of the PMP400, we continue to see an increasing demand for even higher power solutions. The engineers at Protek Power developed a means to meet this growing demand using some of our existing resources. We have had great success in tooling plastic cases and cabling systems for use with our higher power open frame products. Using this technique, Protek Power recently developed a custom **800W desktop power supply** in a 13”x6.5”x3” desktop adaptor package! Ask us how we might be able to accommodate *your* higher power desktop needs.

Limitations and Considerations

There are of course some limiting factors in the development of higher power desktop adaptors. The first and foremost being the current ratings of standard AC power inlets. A standard C14 AC inlet is rated to handle 10A, which after taking typical switch mode conversion inefficiencies into account, immediately limits the output power to approximately 1.08kW. Even if a higher rated, non standard inlet were to be implemented, one must still consider that typical North American outlets can only provide 15A of current. Additionally, there are a number of thermal considerations. Enclosing an open frame power supply disrupts its ability to exchange heat with free moving air. The inability for heat to easily escape the enclosure via convection necessitates either the use of a built in fan, or significant derating to the performance of the open frame unit. One must also consider the fact that performance degradation in high ambient temperatures is more significant for an enclosed supply. A 1.08kW rated desktop power adaptor can still only provide 810W in a 50°C environment, and only 540W at 60°C. Lastly, consider the physical size requirements of a higher power desktop adaptor. While cutting edge open frame devices are achieving densities of nearly 30W/in^3, adaptor densities are more typically on the order of 5W/in^3, attributing to physically larger solutions in general.

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