Technical Article

Peaks and Valleys

Some power supplies specify a peak load capability to support loads that are higher than the nominal continuous power for short periods. In these applications the average power required is typically significantly lower than the peak demand.

Applications that require high peak currents include print heads, pumps, motors, and disk drives. These products are found in factory automation, medical pumping systems, fluid and material handling, robotics, power tools, machining, packaging, test, dispensing systems & printers.

Using a power supply that is capable of supporting high peak loads will result in a physically smaller power supply reducing system size, weight and cost. In a system that requires 800W for a short duration, using a 400W power supply with an 800W peak rating will result in significant savings in volume and cost over a supply rated at 800W continuous power.

There are four typical characterizations of peak load capability.

1. The power supply is rated for up to 30 seconds with a duty cycle of 10 to 15% at a peak load that is just below the Over Current Protection (OCP) limit. The OCP is usually set around 20 to 50% above the continuous current rating. This is essentially a standard design that has been tested to give short duration headroom over and above the nominal continuous rating. There are applications that require an additional 20-30% of power for short durations. Many electromechanical applications demand higher peak current for a shorter duration.

2. A very high peak of up to 200% of nominal for a very short duration where the OCP does not react to the overload condition. Typically this allows peak current handling for 200 - 500 us. This peak capability covers a limited range of applications.

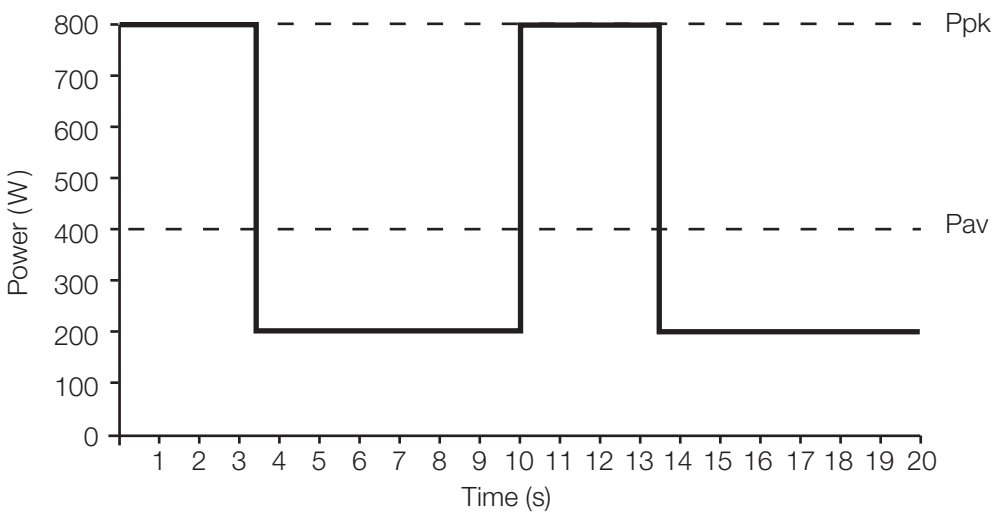
3. A higher power rating at high-line, normally meaning 180 VAC and above. For example, a 1200W power supply may be able to provide 1500W of continuous power when operated at an AC input voltage greater than 180 VAC. This is a genuine size and cost benefit if the AC input is in the higher range and is often specified for higher power products which are connected from phase to phase when the nominal single phase supply is low.

4. A power supply with the architecture, OCP, energy storage, efficiency and thermal design to support high peak electromechanical loads. Such units will typically deliver up to twice their nominal power for up to 10 seconds with duty cycles up to 35%. XP's fleXPower modular power system is one example which allows several standard outputs alongside one that provides a high peak current.

When selecting a power supply for a high peak power application the key parameters are the peak power can be provided, the maximum duration of the peak, the duty cycle and power consumed by the load during the non-peak duration to ensure that the average or continuous rating of the power supply is not exceeded.

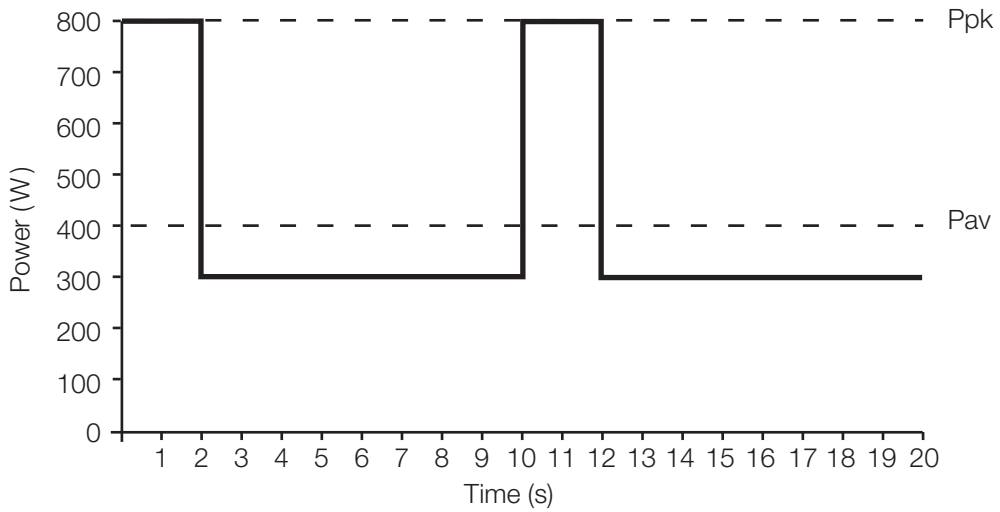
For example, the specification of a 400W power supply that can provide 800W peak for up to 10 seconds at a 35% duty cycle defines the operating envelope within which the requirement must fall where the average power does not exceed the continuous rating of 400W.

If the maximum rated peak power (Ppk) is required for the full 35% duty cycle then the available power during the non-peak duration (Po) will be approximately 180 watts in order that the average power rating (Pav) is not exceeded.



$$Pav = \frac{(Ppk \times T_1) + (Po \times T_2)}{T_1 + T_2}$$

Using the same formula, if the duty cycle is reduced 20%, then the non-peak power can be increased to 300W. without exceeding the average continuous power rating of 400W.



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