Switching Power Supply Block Diagram: A switching power supply is used to convert a given input voltage to a regulated output voltage and current. Depending on the input voltage level, output power and regulatory requirements a switching power supply will consist of some or all of the following blocks. In some cases, such as inverters for alternate energy generation, the flow is reversed as one is taking a DC input and converting it to a AC output.
Switching power supplies create a regulated output from a less regulated input. As such it is necessary in most stages to transfer information about the current and voltage levels in the circuit to the power management IC.

The magnetics in the Feedback and Control Loop Stage typically consist of gate drive transformers and/or current sense magnetics.

Current Sense Magnetics:
- Surface Mount, Up to 35A
- Through Hole, Up to 38A

Gate Drive Transformers:
- Surface Mount, DC/DC
- Through Hole, AC/DC

Click teal links for more info.
Switching Power Supply Block Diagram

EMI Filter Block: A switching power supply is used to convert a given input voltage level, current level, and frequency from the power source into the appropriate output voltage level, current level, and frequency. This requires the use of electronic components such as transistors, diodes, and filters. Some of the components used in the EMI filter include:

- SMT Common Mode Chokes
- THT Common Mode Chokes
- SMT Differential Mode Chokes
- THT Differential Mode Chokes

EMI Filter: Switching power supplies operate by 'chopping' an input voltage into a sequence of high-frequency square waves which are then converted and filtered to the appropriate output voltage and current. The high frequency square waves contain a significant amount of fundamental and harmonic switching noise which must be filtered to minimize injecting noise back into the power source or radiating noise into surrounding equipment. The magnetics in an EMI filter consist of differential chokes (i.e.: single winding inductors) and common mode chokes (dual winding inductors).

Please click teal links above for more info.
Power Factor Correction (PFC) Block

Active PFC: The power factor is the ratio of the real power flowing to a load and the apparent power. Ideally the real power is equal to the apparent power and the ratio is one. However, for non-linear loads which produce significant harmonic content the apparent power is often much higher and this difference results in actual wasted power on the AC distribution system.

As a result, it is desirable to increase the power factor (i.e.: decrease the harmonic content) by employing an active PFC circuit after the rectifier stage.

In most power supplies a PFC boost circuit is used which boosts the input rectified AC input voltage to a constant higher DC voltage (typically 400v) and only draws input current that is in phase with the line voltage.

The magnetics in a PFC circuit consist of the PFC Inductor which is typically a custom single winding inductor (sometimes with an auxiliary winding to power the PFC IC) for a given application with a relatively large inductance value and capable of withstanding large AC signals. Please contact Pulse Power for Information on PFC products.
Switching Power Supply Block Diagram

AC/DC Isolated Power Stage

The bridge rectifier or the active PFC circuit essentially produces a high-voltage (90v to 400v typically) dc output. As a result what is defined as a AC/DC power supply is really a high-voltage DC/DC power supply. This power stage converts the input voltage to either a lower voltage intermediate bus voltage (typically 12v, 24v or 48v) or directly to the voltage(s) required by the load.

In addition, this stage provides the necessary safety isolation to ensure that users are not harmed by the high level input voltages. The topology (or method) used for this conversion will be selected based on the power level, efficiency requirements, cost and size constraints. Typical topologies include Forward, Push-pull, Half-bridge, Full-bridge and Flyback. The magnetics in the AC/DC Isolated Power Stage typically consist of the main power transformer which must be designed in accordance with the appropriate safety agency regulations and an output power inductor as well as the feedback and control magnetics outlined.

Please click here for more information.
Switching Power Supply Block Diagram

DC/DC Isolated Power Stage

Typically this stage is converting either the intermediate bus voltage supplied by the AC/DC stage or a voltage produced by a dc battery source to the desired output voltage(s). In addition this stage provides the necessary safety isolation. The most common input voltage is 48v (36-72v) or 24v (18-36v). The topology (or method) used for this conversion will be selected based on the power level, efficiency requirements, cost and size constraints. Typical topologies include Forward, Push-pull, Half-bridge, Full-bridge and Flyback.

The magnetics in the DC/DC Isolated Power Stage typically consist of the main power transformer and an output power inductor as well as the feedback and control magnetics outlined.

- THT DC/DC Transformers
- SMT DC/DC Transformers
DC/DC Non-Isolated Power Stage

In many power supply applications the non-isolated DC/DC stage is the only stage as it is used to convert an existing DC battery voltage to some other required voltage(s). In other power supply applications this is the last stage in the conversion process from the AC input to the required output voltages. The topology (or method) used for this conversion will be selected mainly based on the relative levels of the input voltage and output voltage. Buck topology (input higher then output), Boost topology (input lower then output), Buck-Boost and SEPICs are used when the input can be either higher or lower then the output.

The magnetics in the DC/DC Non-Isolated Power Stage consist of one or more power inductors. Please see below links.

- **Surface Mount**: Unshielded Drum Core, Shielded Drum Core, Wire Wound, Toroid, Flat Coil, Power Bead, Planar
- **Through Hole**: Power Cube, Toroid, Power Bead
Low Power Housekeeping Stage

Throughout the switching power supply stages it is often necessary to provide a low power signal to supply power to the various bias voltages used by the power management ICs during start-up and shut-down modes.

During these modes the main power supply stages are not yet active or have been deactivated due to a fault condition. In general the housekeeping supply topology (or method) is determined by simplicity and cost and usually a flyback topology is employed.

The magnetics in the Lower Power Housekeeping Stage typically consist of a low power flyback transformer.

*View PDF for more information.*