Decide what your power supply requirements will be.

Design Example:

For this step we will design an AC to DC off-line power supply with the following requirements:

**Input Specifications:**
- 85 Vac to 265 Vac
- 50 Hz line frequency
- 80% efficiency

**Output Specifications:**
- Multiple loads are required
- LCD Display: 15V/1A
- Battery charger: 5V/2A (this will be the control-regulated main output)
- Microcontroller: 3.3V/0.5A
Decide which topology to use for your design.

Our design example requires three loads. So we’ll use the Secondary-Side Regulated (SSR) Flyback topology. To access to the tool, click on Flyback / Controller with Integrated MOSFET at the web page http://www.fairchildsemi.com/support/design-tools/system-design-and-simulation.
Enter your design requirements into Step 1.

For **Number of Outputs**, check **3 Outputs**. For Main Output, enter “5V” and “2A”. For “2nd Output” enter “15” V and “1” A; and for “3rd output” enter “3.3V/0.5A”

Click on **“Next Step”** to guide you through the step-by-step tabs 2-9. This allows you to create an optimized custom circuit design.

You can also click on **Auto Complete** to create a complete Flyback power supply schematic, bill of materials (BOM), and perform circuit simulation; e.g. Steady State, Transient, and AC Analysis.

The **“Auto Complete”** button may be used in any of the steps 1-9 at any time to complete the design using the displayed **“Design Values”**.

**Tool Tip:** The 80% Efficiency requirement is entered in Step 1d. Click on the small dash button to expand.
Enter your fine-tuned design parameters.

For this design example, we’ll fine-tune some parameters; e.g. For **MOSFET Overshoot factor**, enter the value “1.3” and for **Peak-current-limit derating factor**, enter the value “93”. Click on the Info button for definitions of these parameters. In response, the PSW tool has recommended the Fairchild integrated MOSFET and Controller, FSL126MR.

You can tune the design for desired circuit performance based on your specific application requirements, guided by calculation results at every step, i.e.:

- Voltage and current stresses on power components
- Transformer magnetizing inductances
- Power losses on switches, transformer core and winding

After you complete this step, click “Next”.

**Tool Tip:** Active tabs will be dark blue. Grey tabs indicate that they have not been visited.
Enter your transformer specifications.

The tool recommended the EE30 core. However, we are going to select a core with a larger $AeAw$ product to reduce the transformer losses. For the Max core-window fill factor, enter 0.18. Select the RM10. Click on “Auto Complete”.

The tool may display CAUTION messages within the design steps, suggesting ways to improve the design. These caution messages will only be visible when stepping through the design.
**Tool Tip:** Customize selected Core and Bobbin in **Step 3: Core & Turns.**

Select “Yes” next to “Customize selected core” and/or “Customize selected bobbin” to make visible and editable all the related parameters.
Tool Tip: Output Filters Reference Guide

The selection of the output filter capacitor can be very critical to the whole Flyback converter design. A capacitor selection guide is provided to guide the proper capacitor selection for the optimum Flyback converter design. In Step 6, click on the right side of “Capacitor Selection Guide” to open the detailed guidelines.

**Power Supply WebDesigner**

**SSR Flyback, Step 6. Output Filters**

**Reference Guide**

**Overview**

This capacitor reference guide is intended to provide in-depth guidance to the Power Supply WebDesigner (PSW) tool’s “Secondary-Side Regulated Flyback Converter” Step 6: Output Filters. A plot and a typical capacitor catalog table are illustrated to facilitate part selection.

**Considerations for Selecting Cap-ESR**

**1. Cost and Size**

Capacitor cost and size trade-offs need to be considered during capacitor selection. In general,
- The lower the capacitor ESR, the higher the cost.
- The higher the capacitance, the larger the size.
**Tool Tip: Efficiency Analysis**

Power loss analyses are displayed in the Step 9: Efficiency tab. If you click “Next” through the tool, the last step of your design will be your efficiency curves and loss breakdowns by component.
Analyze your design.

After completing Steps 1-9 or clicking on “Auto Complete”, the tool will display a complete circuit schematic. Click on the “Simulation Schematic” tab to simulate your design.

You can click on the “Design” tab to jump back into the design and make adjustments. This is the recommended way to make changes to your design. Advanced users may want to make component adjustments by clicking on the component symbol on this schematic.

**Tool Tip:** The tool does not calculate the input Filter component values. Displayed values are typical for a 50watt converter.
Set up AC Input for analysis/simulation.

For this design example, our AC input is 175 V rms. You can also change the line voltage by over-writing the value or moving the red slider. The tool will translate this value to a DC input voltage for simulation.

For the entered AC line voltage, you may choose to simulate at either the Peak or the Minimum voltage on the bulk capacitor, Cdc.

You can click on “Transient Analysis”, “AC Analysis” or “Steady-state Analysis” to run an analysis/simulation.

Tool Tip: The load settings in the pop-up window are explained in the Info button.

Tool Tip: Double click on load symbol to setup load condition for analysis in Component Window.
View your Analysis results

Analysis results can be viewed by clicking on “Result”, which displays a dynamic waveform calculate, Webscope. Waveforms can be manipulated here; e.g. like an oscilloscope.

You can also click on the Waveform tab to see a static summary of all analysis results.

To keep simulation times less than one minute, the simulation circuit is simplified. As a result, simulation waveforms will lack the typical high frequency ringing.
Create your Bill of Materials.

**Bill of Materials (BOM)**

**Tool Tip:** Click on the BOM tab to generate a complete Bill of Materials.

**Tool Tip:** Click on the Vendor tabs to search its inventory.

**Tool Tip:** Adjust the search filters of the Part Search Tool to search the desired components.

**Tool Tip:** To choose an alternative part, click on the Find icon to open Part Search Tool.

**Tool Tip:** Click the Select icon to change and add the part number to BOM.
Save your design and create reports.

Click on the “Report” tab to generate a PDF summary of your design.

You can save your design on our server to return at a later time to resume working with it. Your design is confidential, accessible only with your login.

For technical and tool support or general feedback, please press “Give Feedback” to send an email.

Tool Tip: Click to download or print the Report in PDF format.