MPS Design Assistant Tool

Introduction

MPS is committed to providing users with a variety of simulation solutions, including SIMPLIS models, SPICE models, DC/DC converter design models, and Virtual Bench Pro.

The easy-to-use Design Assistant is the most popular tool provided by MPS, and its demand continues to grow each year. Figure 1 shows the annual growth of how often our Design Assistant is requested and utilized.

Figure 1: Design Assistant Proportion Analysis

In particular, the Design Assistant for AC/DC products is popular because of its wide range of products and comprehensive design functions.

To simplify the Design Assistant, MPS officially launched new Design Assistant files for AC/DC products in May 2021. These new files included functional enhancements, interface updates, and QA testing. Figure 2 shows how the AC/DC Design Assistant was downloaded more often on a month-by-month basis as a result of this update.

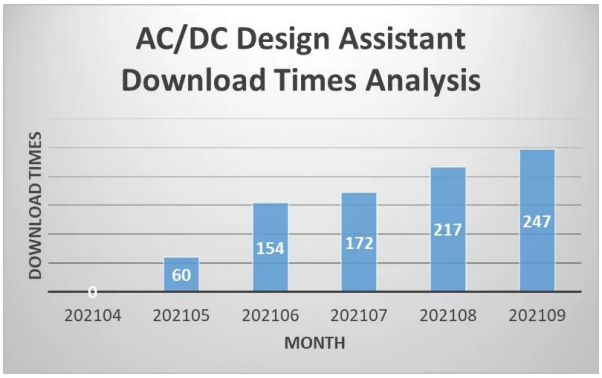

Figure 2: AC/DC Design Assistant Monthly Downloads

This article will explore the advantages of the AC/DC Design Assistant.

Improved Design Assistant Interface

The revamped Design Assistant adopts a similar interface style to the MPS website, creating a harmonious and unified user experience. The text specifications are uniform for parameters such as input, output, and annotation. Figure 3 shows the new Design Assistant interface.

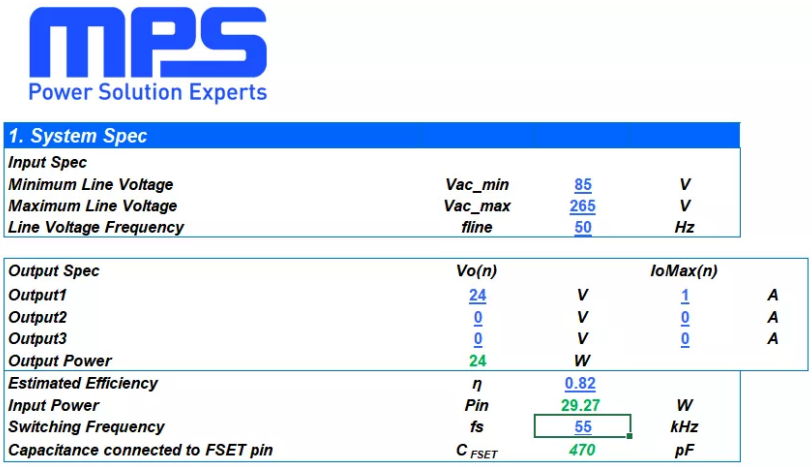

Figure 3: The New Design Assistant Interface

The Instruction page makes it easy for users to get started by providing clear guidance and assistance, in addition to annotating the design steps for each page. For users who want more details about the design process, the Detailed Instruction page covers the design steps of each key parameter.

Figure 4 shows the Design Assistant guide interface.

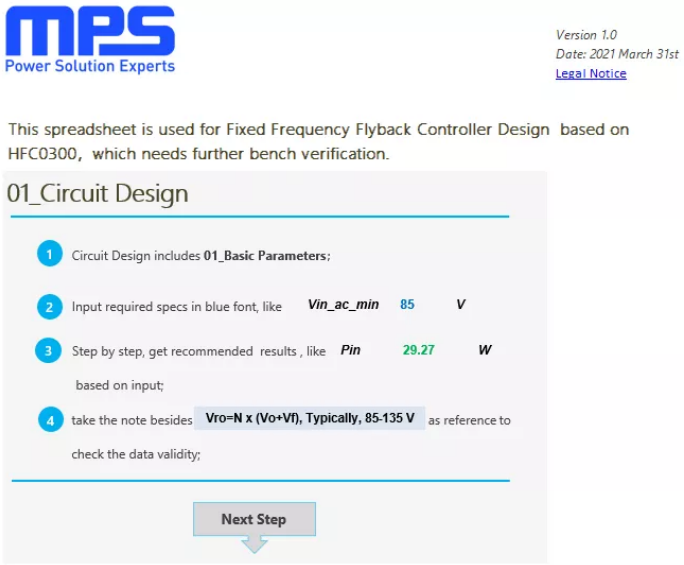

Figure 4: Design Assistant Guide Interface

The current AC/DC Design Assistant covers products such as flyback applications, power factor correction (PFC) applications, LLC applications, and all-in-one applications. Most tools include the external circuit design, as well as transformer design. The design files support one-click printing, which allows users to obtain a preliminary design and quickly validate their design performance in conjunction with other MPS simulation models. As a result, MPS has effectively shortened and simplified the development process.

Design Assistant Set-Up

To set up Design Assistant, follow the steps below.

1. Navigate to the Products page on the MPS website, and filter through the AC/DC product line to select the relevant product.

2. On the product page, click "XLSX" under the "Design Resources" tab to download the tool without having to log in.

   Consider the MPX2001, an all-in-one flyback controller that integrates a primary driving circuit, secondary controller, and synchronous rectification driver. This article uses the MPX2001 to showcase the Design Assistant and verify its functionality using the SIMPLIS model in SR mode.

   Figure 5 shows the Design Assistant download interface on the MPX2001's detail page.

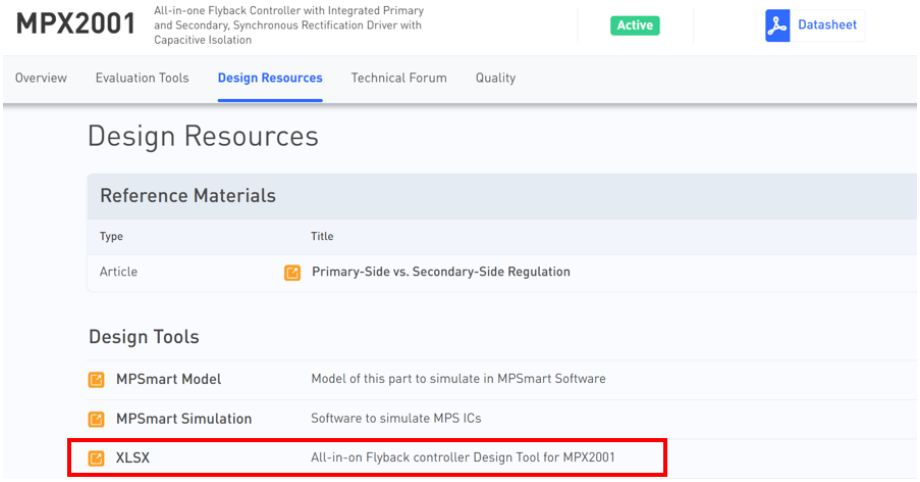

Figure 5: MPX2001 Design Assistant Download Interface

3. Download and save the MPX2001 Design Assistant and the MPX2001 SIMPLIS model, which are both under the "Design Tools" tab.
4. Enter the basic parameters based on the prompts in Design Assistant and modify the recommended values in the SIMPLIS model.

Figure 6 shows an example regarding the AC/DC Design Assistant's input capacitor parameter. The input capacitor value is determined using the input power supply and the input capacitor power coefficient (K_InputCAP).

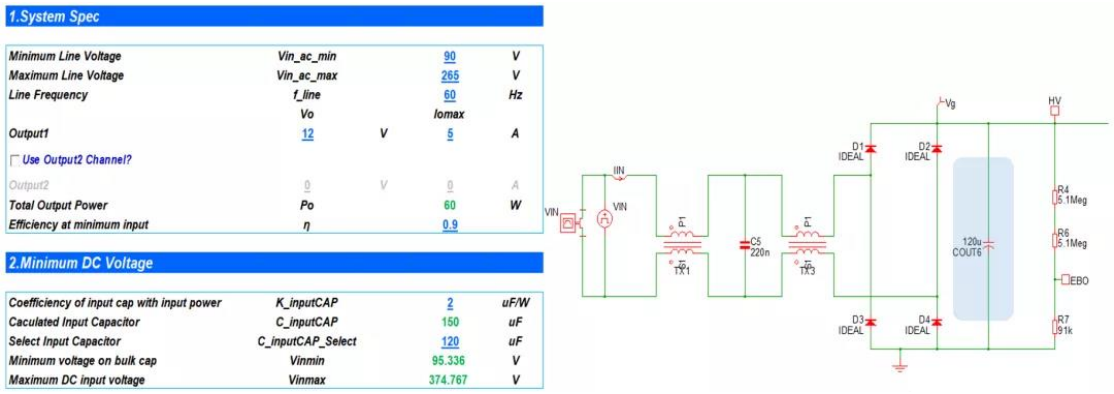

Figure 6: Input Capacitor of the AC/DC Design Assistant

Figure 7 shows an example of the AC/DC Design Assistant regarding transformers. Depending on key parameters — such as the primary-side equivalent output voltage (V_{RO}) and current ripple coefficient (K_P) — the transformer ratio, primary-side MOSFET tube pressure resistance, and primary inductance (L_M) can all be determined.

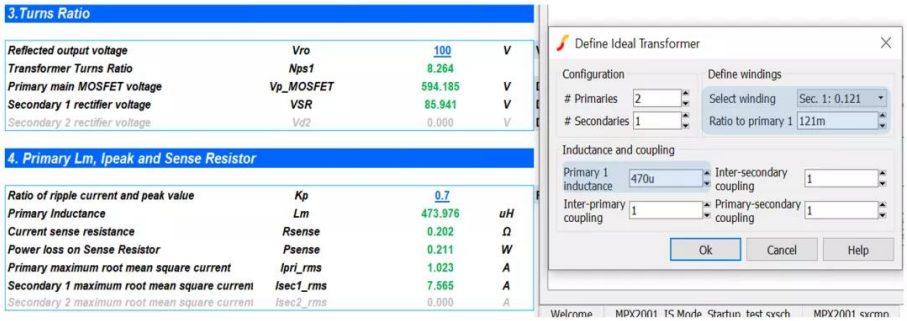

Figure 7: Transformer of the AC/DC Design Assistant

The output capacitor is selected based on the output voltage ripple (see Figure 8). Other designs, such as the RCD snubber circuit, compensation network, and EBO resistors are selected in a similar manner.

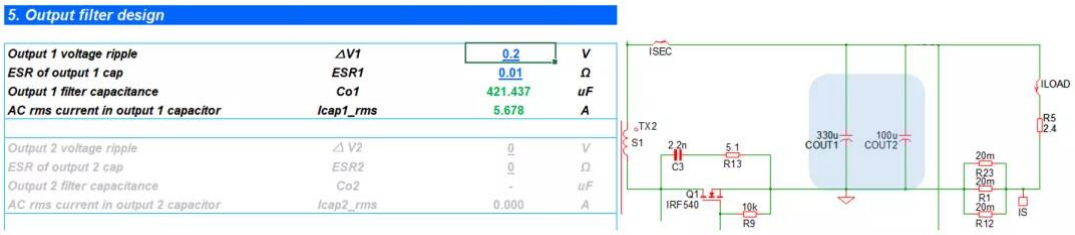

Figure 8: Output Capacitor of the AC/DC Design Assistant

Figure 9 shows the MPX2001 simulation results created by the Design Assistant using the SIMPLIS software. The user can see the waveforms of the primary and secondary voltages, currents, and other key nodes based on the design.

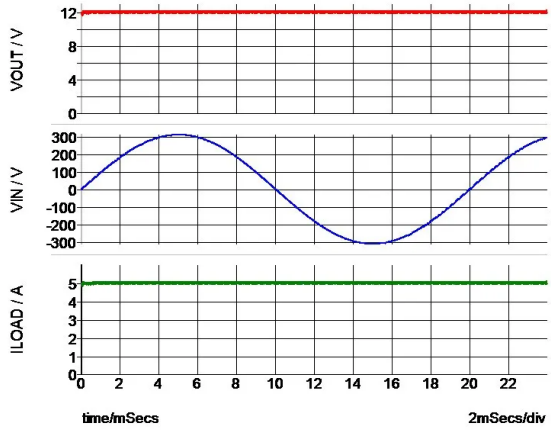

Figure 9: MPX2001 SIMPLIS Model Simulation Results

Once the main circuit is determined, the user enters the B_{MAX} and J_{MAX} values on the Transformer Design page. These values can be selected by either using the recommended core AP, or manually entering the transformer parameters to obtain specifications (e.g. the number of turns and diameter).

Figure 10 shows the Transformer Design page of the AC/DC Design Assistant.

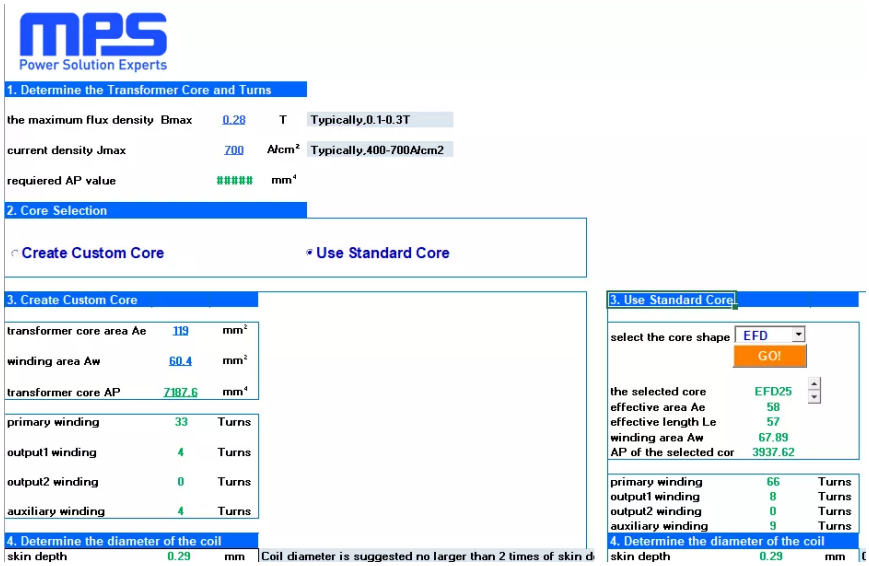

Figure 10: AC/DC Design Assistant Transformer Design Page

Conclusion

MPS' improved Design Assistant provides strategic advantages that shorten the development process. This article explored AC/DC Design Assistant with the MPX2001, and verified its set-up process and functionality. Moreover, the MPS website includes Design Assistant files for other circuits, such as LLC applications and LR design.