

Before continuing to this article, make sure to read [Live Digital Solutions for Efficient Power Supply Designs \(Part I\)](#).

MPS's [HR121x family](#) of products are rich in digital and analog functions. These PFC + LLC combo controllers are highly integrated, and offer reduced power consumption that makes them well suited for standby power applications. They can work in either discontinuous conduction mode (DCM) or continuous conduction mode (CCM) to support the application's components under light-load or heavy-load conditions. This part family has digital programmability, which provides a level of flexibility that can easily address the requirements of numerous applications — a feature that some engineers are concerned could complicate designs.

This article addresses that concern by highlighting MPS programs created to simplify the design process. MPS provides powerful and easy-to-use graphic user interface (GUI) tools to help engineers optimize their design. For this example, the HR121x provides multiple PFC and LLC control modes, and these modes vary depending on which part in the series is selected. These options may seem intimidating, but the GUI makes it easy to program these products. Simply fill in the corresponding circuit parameters, input the switching frequency according to the design goal, and switch the threshold. Figure 1 shows how to use the GUI system using the [HR1210](#).

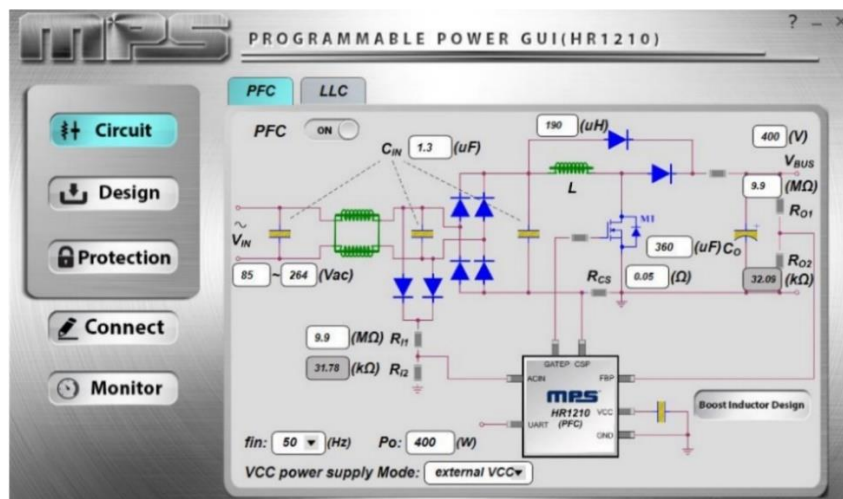


Figure 1: MPS Programmable Power GUI with the HR1210

It only takes a few minutes to set the device's basic control modes. The HR121x series supports other advanced functions as well, which we'll explore in greater detail below.

The adjustable 8-level PFC output voltage can be automatically adjusted according to the input voltage and load conditions, so that it can find different optimal operating points across the full operating range (see Figure 2). This function saves the engineer from having to determine the optimal output voltage, which then in turn saves time and cost by eliminating the need for additional tests.



Figure 2: HR1210 Adjustable PFC Output Voltage

The GUI allows the designer to compensate the reactive current of the input capacitor in sections, and solve the power factor (PF) problem under light-load conditions with the push of a button (see Figure 3).

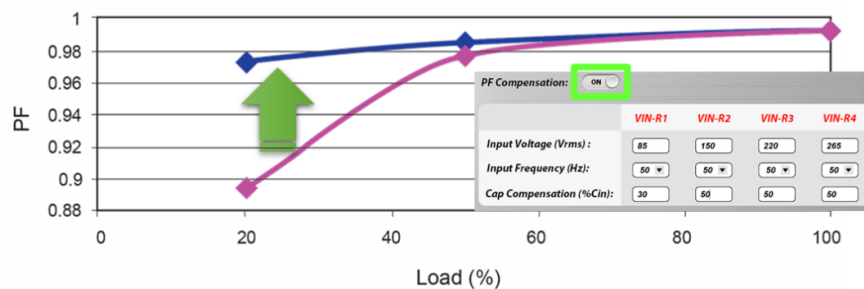


Figure 3: HR1210 PF Compensation Feature

The designer can also program the burst frequency to determine and achieve the best balance between light-load efficiency and audible noise (see Figure 4). This feature significantly reduces testing time, and gives the engineer greater bandwidth to fine-tune other parameters.

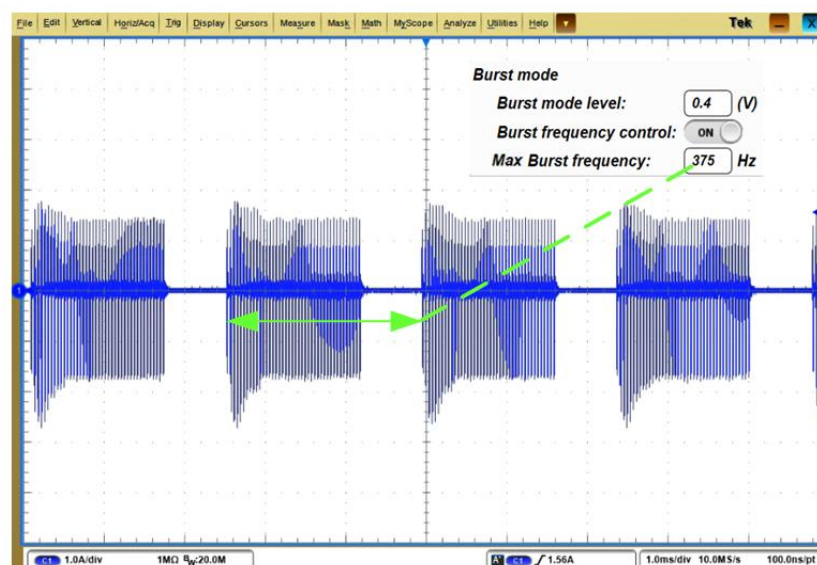


Figure 4: HR1210 Burst Mode Feature

There are also numerous subtle benefits to using MPS's HR121x family of products. By communicating through the UART port, the physical hardware of the power supply in these products can be connected to the automated test system. Using the HR121x's programmable memory in this way means that the designer can scan for key parameters and measure the efficiency curve of the system. Then the designer can analyze and compare the data sweeps to determine the optimal parameter settings for the system. Figure 5 shows an efficiency curve that has been plotted for the HR1210.

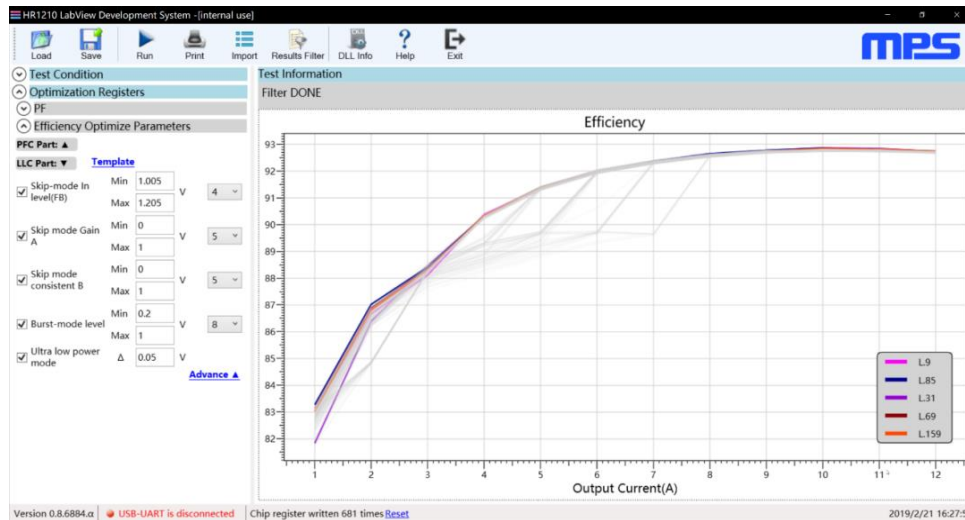


Figure 5: HR1210 Efficiency Curve

With this automated testing approach, users can empirically optimize their design without much additional effort. In an era when automation continues to replace human labor, selecting the right MPS digital solution can shorten your design time, enable you to better optimize the end device's performance, and reduce time-to-market. The HR121x family of controllers meets these needs, and also offers each product in multiple packages to meet any given application's spatial constraints. We explored the HR1210 in this article, but there are currently four other products in the HR121x family, and more being developed. For more details on the entire HR121x family, check out this [video](#) from MPS's APEC 2020 demo.