



Streamlining  
design and  
optimization time

# NXP LLC Resonant Converter Design Tool

The NXP LLC resonant converter design tool helps engineers bridge design and decision-making gaps from system specifications to a complete set of paper designs with the help of a simple, sequential design flow.

## OVERVIEW

Completing and optimizing a near production-ready resonant converter design can be tricky, tedious, and even challenging. The main focus of the design tool is to address common issues/concerns proactively, such as worst corner case stress of each device, device tolerance/distribution effect to performance, and design optimization. As a result, we can cut design iteration, trial-and-error effort on bench, and development time. The design tool is written in Excel and is downloadable.

## FEATURES AND BENEFITS

- ▶ Detailed step-by-step sequential flow helps engineers to easily follow and complete designs
- ▶ Proactively assess worst and corner case stress and thermal of devices
- ▶ Proactively assess device tolerance/distribution effect to system performance

- ▶ Fine knobs and guidelines to help engineers fine-tune design towards optimization
- ▶ Complete a paper design with schematic, BOM, and magnetic build sheets for the whole system
- ▶ Combining FHA-based LLC design with a downloadable SIMPLIS simulation model helps to save iteration cycles

## APPLICATIONS

- ▶ Desktop and all-in-one (AIO) PCs
- ▶ Gaming consoles
- ▶ TV power supplies (Ultra HD, 4K)
- ▶ Notebook adapters

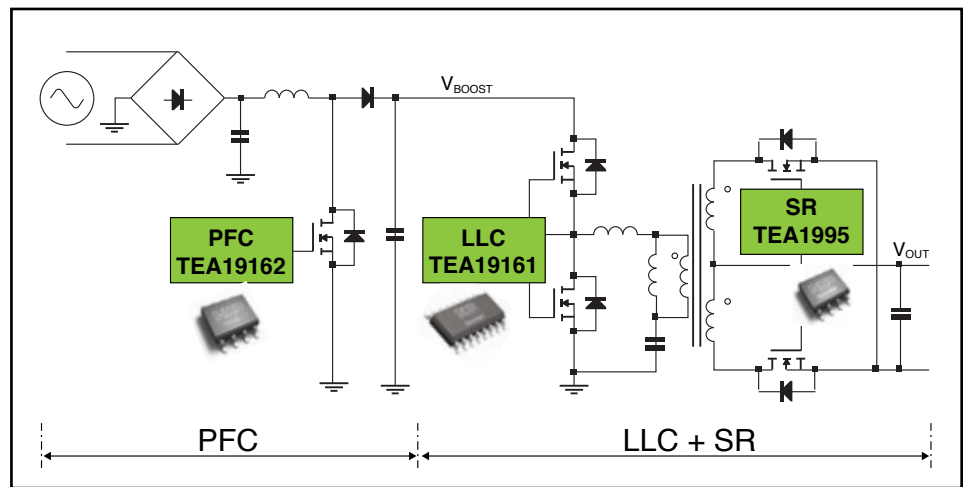


## SUPPORTING PRODUCTS

The TEA19161T and TEA19162T/HT are combined controller ICs for a LLC resonant converter including a PFC. They provide high efficiency across all power levels. Combining with the TEA1995T/TEA2095T(TE) dual LLC resonant SR controller further enhances system efficiency at relatively low cost.

- ▶ **TEA19161T:** Digital controller for high-efficiency resonant power supply
- ▶ **TEA19162T/HT:** PFC controller
- ▶ **TEA1995T:** Dual synchronous rectifier controller (Product is an NXP GreenChip® solution)
- ▶ **TEA2095T/TE:** Dual synchronous rectifier controller (Product is an NXP GreenChip® solution)

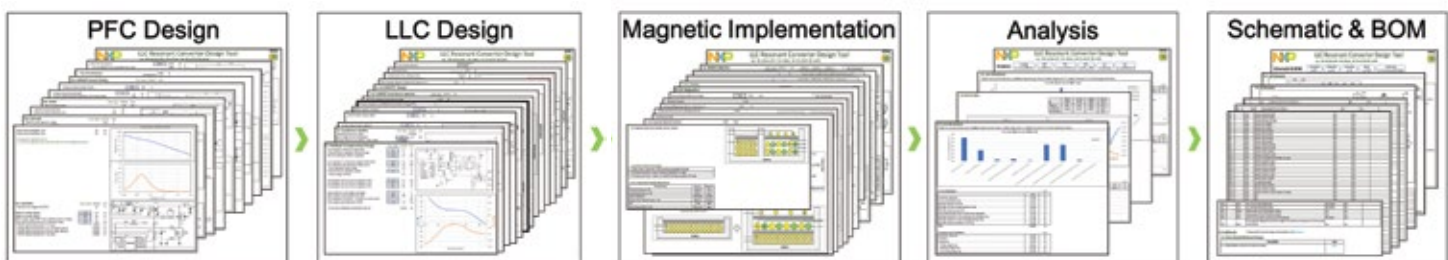
## SYSTEM CONFIGURATION: PFC + LLC RESONANT CONVERTER + SR



## DESIGN BLOCKS

The Excel-based design tool is self-explanatory. Five design blocks are available: PFC design, LLC design, magnetic implementation, analysis, and schematic & BOM. The sequential flow runs from left to right as shown on spreadsheets at the bottom of the Excel file.

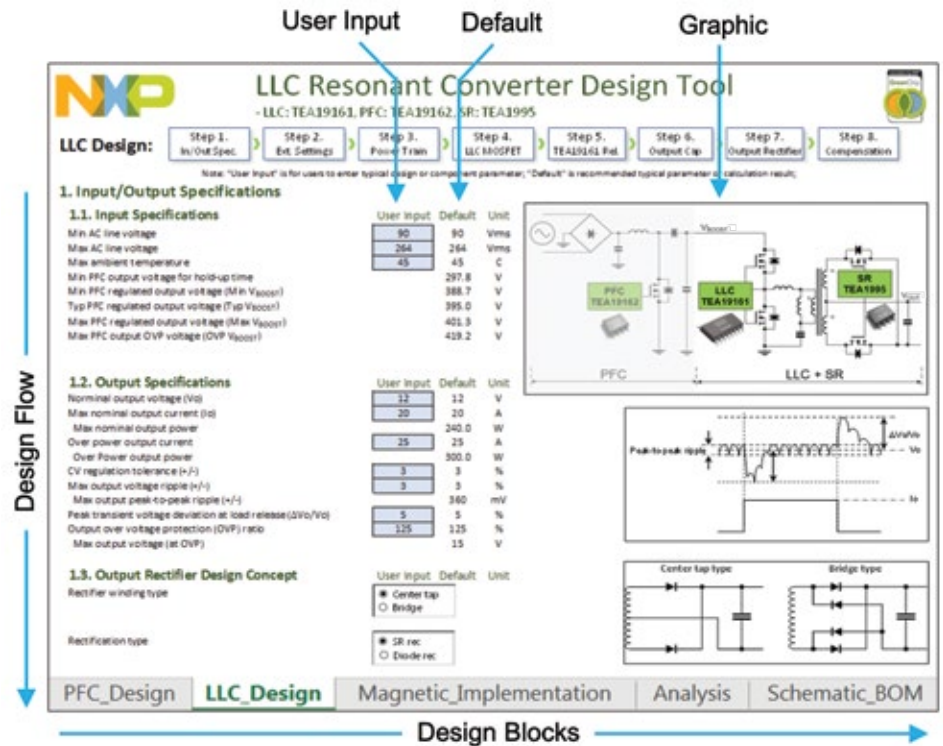
- ▶ **PFC Design:** Cover all powertrain and IC-related component design
- ▶ **LLC Design:** Cover all powertrain and IC-related component design
- ▶ **Magnetic Implementation:** Design all magnetic components and recommend Magnetic Build Sheets used for magnetic vendors to construct magnetic samples
- ▶ **Analysis:** Facilitate design case comparison and design optimization
- ▶ **Schematic & BOM:** Complete system schematic and BOM for PCB layout and part ordering



## DESIGN FLOW

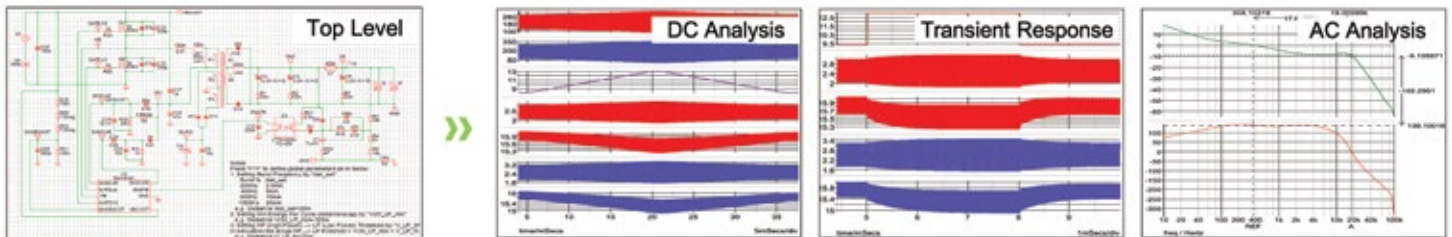
For each design block the flow runs from top to bottom sequentially.

- ▶ **User Input:** For users to enter design or component parameters
- ▶ **Default:** Recommended parameters or calculation results
- ▶ **Graphic area:** To better illustrate contents
- ▶ **Real-time design guides:** Hover over "User Input" or a description and a note pops up with an explanation or a design recommendation
- ▶ **Precaution:** If an entered "User Input" is way off reasonable design range, a "Caution" or "Warning" message pops up with an explanation or guidelines



## SIMULATION VERIFICATION

The FHA approach of the LLC design helps to create an approximate initial design with a clear physical meaning, but bench tuning/optimization may be necessary. Computer-based simulation compensates FHA design weakness and provides accurate design values, so it plays an important role in LLC design. NXP provides downloadable LLC SIMPLIS simulation models, which help to secure a more solid design.



## NXP GREENCHIP SOLUTIONS

The NXP GreenChip power solutions portfolio enables smarter, more compact, and energy-efficient power solutions. Complete GreenChip system solutions help optimize applications such as highly efficient power supplies and system protection.

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