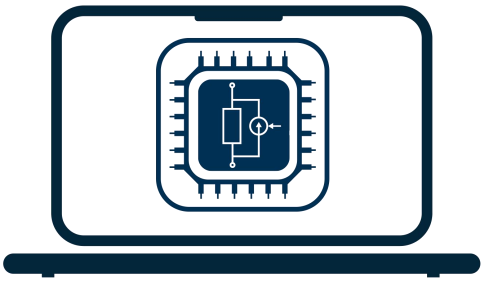


StarSim FPGA Circuit Solver

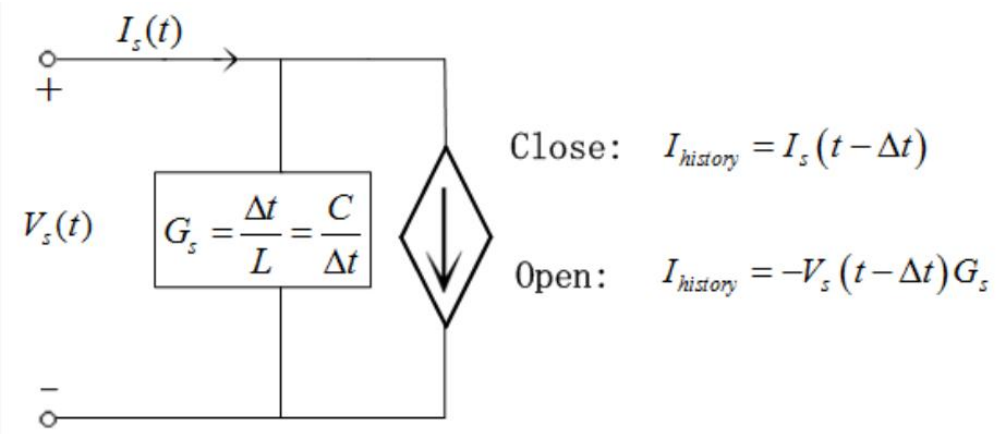
Core software for running power electronics models on FPGA

StarSim FPGA Circuit Solver

StarSim FPGA Circuit Solver is a core license software independently developed by ModelingTech, supporting users to simulate power electronic systems on FPGA in real time. Power electronic systems generally contain power electronic devices (switching frequency is usually at the kHz level), in order to accurately simulate such systems, the simulation timestep needs to be at least 1/50 of the PWM period, which means that the simulation timestep needs to be in the range of hundreds of nanoseconds and several microseconds. With fully utilizing and deeply optimizing the computing power of the FPGA, StarSim FPGA Circuit Solver achieves power electronic systems run in real-time with 1μs timestep.

Switching LC Modelling - Constant Conductance Array, Arbitrary Topology

StarSim FPGA Circuit Solver uses the current mainstream switch modeling approach for FPGA-based simulation, i.e. the switch L/C modeling approach. When the switch is closed it is modelled as a very small inductor, and when the switch is open it is modelled as a very small capacitor.According to the backward Eulerian method, both inductance and capacitance are modelled as a conductance in parallel with an injected current source. Choose an appropriate value of L and C is important to make Gs=dt/L=C/dt, i.e., the corresponding conductance Gs remains the same regardless of whether the switch is closed or open, only the injection current is calculated differently.

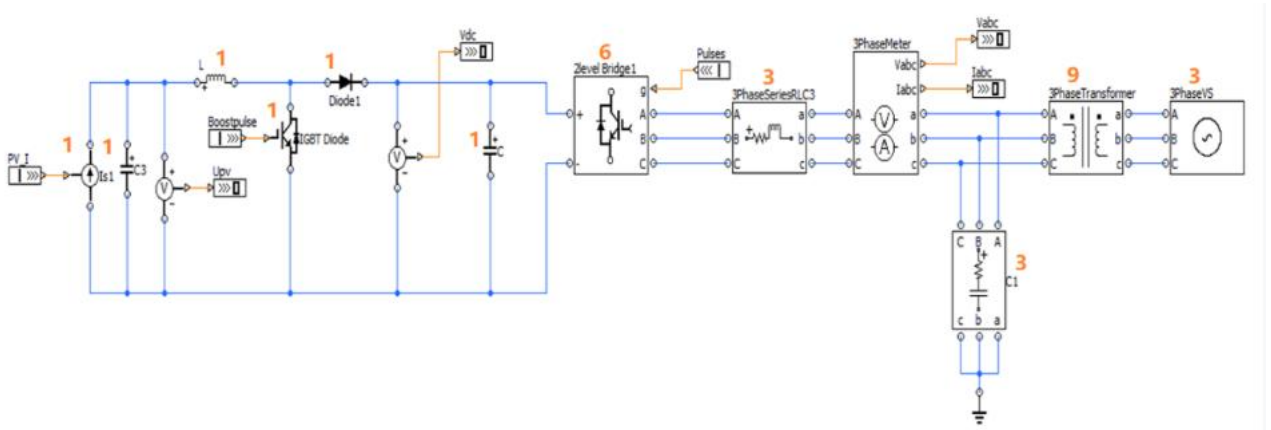


The advantage of switching with constant conductance is that the corresponding admittance

matrix of the circuit is constant regardless of how the switching state of the circuit changes. This feature greatly reduces the difficulty of real-time simulation of power electronic systems on FPGA. At the same time, the switching LC modeling is only at the device level, and there is no restriction on how the power electronic devices themselves are combined. This makes StarSim FPGA Circuit Solver support arbitrary topologies, while some simulation software that derives mathematical models of power electronic systems based on known topologies is more difficult to achieve arbitrary topologies.

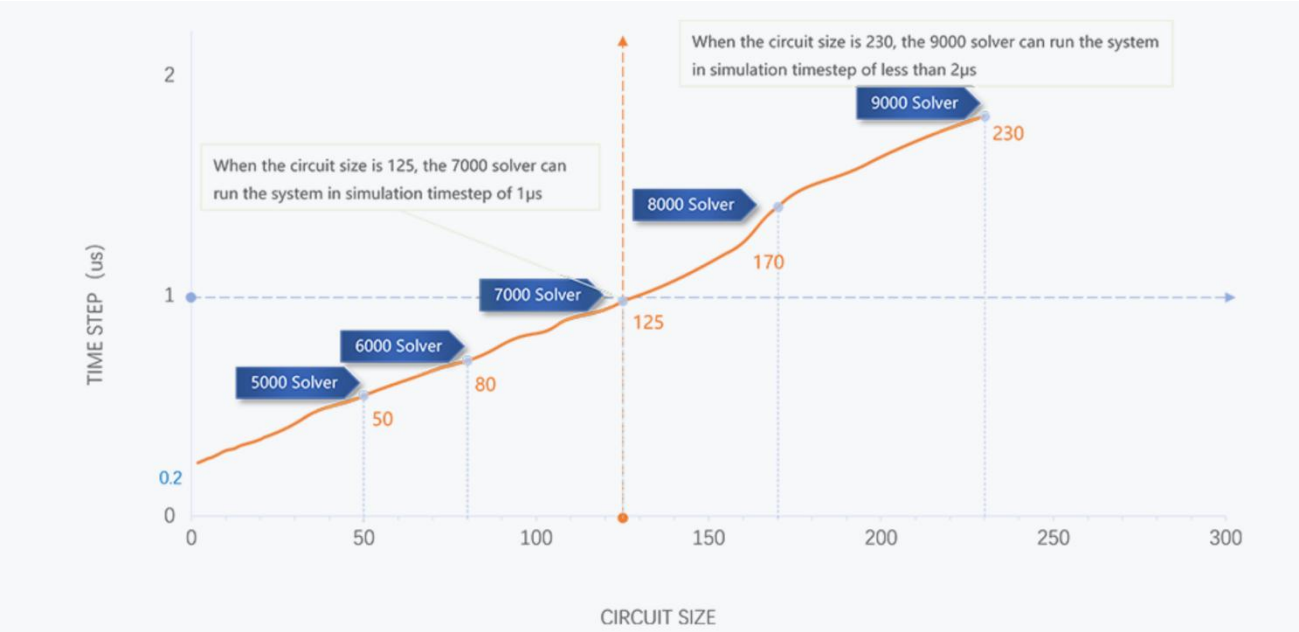
Measure the size of the system in terms of the number of critical components

Unlike some CPU-based simulation software that measures the size of a system according to the number of nodes in the system, StarSim FPGA Circuit Solver measures the size of a system by the number of critical components in the circuit. Critical components include inductors, capacitors, switches, and power supplies. For example, for a typical PV system as shown in the figure below, the transformer contains 9 inductors (9 critical components), including the excitation inductance and primary/secondary leakage inductance, the entire system contains a total of 30 critical components.



Different Solver, same superior computing power

ModelingTech classifies solver into different categories of 5000 - 9000 according to the maximum system supported by Solver, but different Solvers share the same simulation kernel and have the same powerful computing capabilities. The only difference is the supported maximum systems.



No compilation and support for major modelling software

For the convenience of users, StarSim FPGA Circuit Solver is compatible with mainstream power electronics simulation modeling software. Users can directly use their own models without additional model conversion work.

StarSim FPGA Circuit Solver is optimised in software design, no matter the initial loading of the model or the modification of the model, it does not need FPGA programming or compilation work, which can greatly improve the efficiency when changing the model and modifying the parameters in the simulation process.

Application Scenarios

Renewable Energy

Wind Power Converter Testing

PV Inverter Testing

Multiple PCS Testing

Power System& Micro-grid

Microgrid Research

Green Hydrogen Microgrid Simulation

Renewable Energy Farm Simulation

Power Hardware in the Loop Testing

Multi-level System

Modular Multi-level Converter Simulation

High Voltage Converter(HVC) Simulation

Static Var Generation(SVG) Simulation

Electrified Transportation

Electric Motor Drive Controller Testing

Traction Motor Testing