Key New Features in DSIM Version 2021a

DSIM v2021a includes many new functions and improvements. Key new features are:

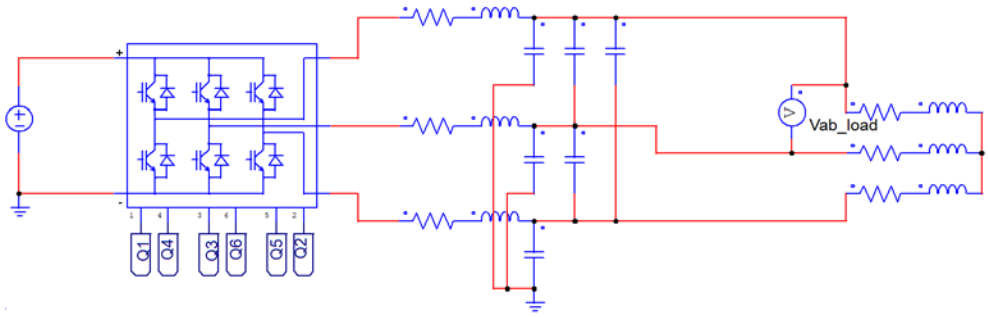
- A new BDSED solver is added for simulating stiff circuits
- Power loss calculation
- Support for single switches
- Support for device database
- Coupled inductors and transformers are supported
- Synchronous machine model is added
- New elements are added to the Element library

BDSED Solver

The BDSED solver is a new simulation solver in DSIM for stiff power converter circuits, for example, these with parasitic elements. BDSED is a general solver that can solve both stiff and non-stiff circuits. For non-stiff circuits, BDSED is less efficient than the original DSED solver. When a circuit is stiff, DSIM will warn you to change to the BDSED solver, which is much faster than the DSED solver.

The BDSED solver enables the simulation of stiff circuits, which will help support the analysis of high-frequency oscillations and EMI.

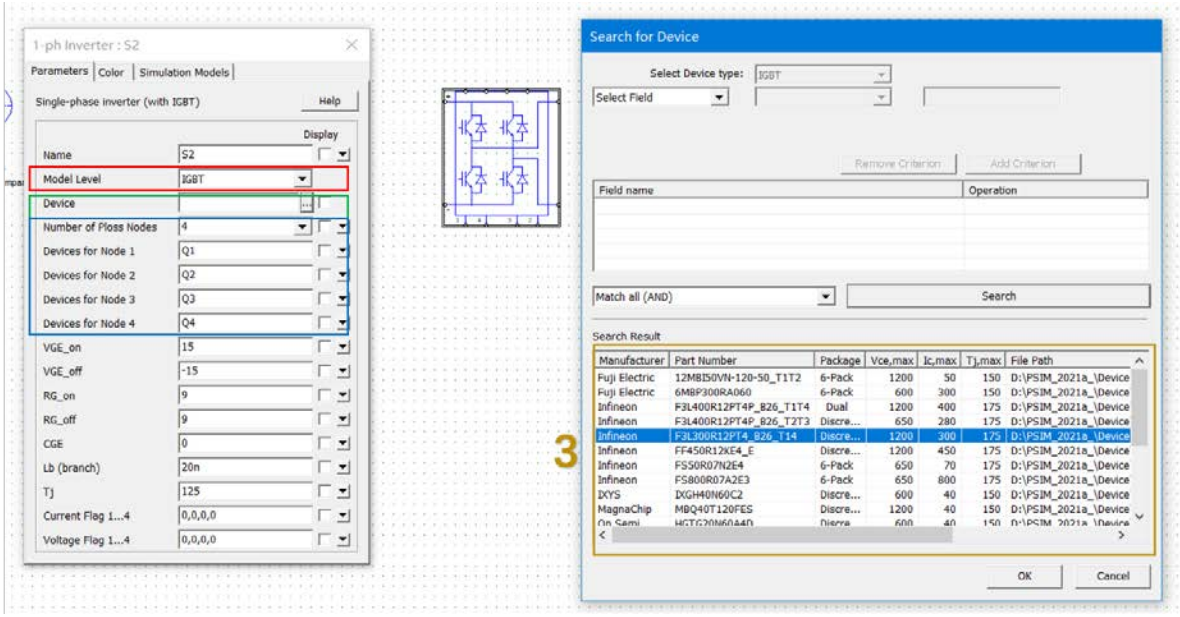
For example, the following inverter system consists of several parasitic capacitances (in the range of pF) and inductances (in the range of nH). The BDSED solver is hundreds of times faster than DSED in this case.



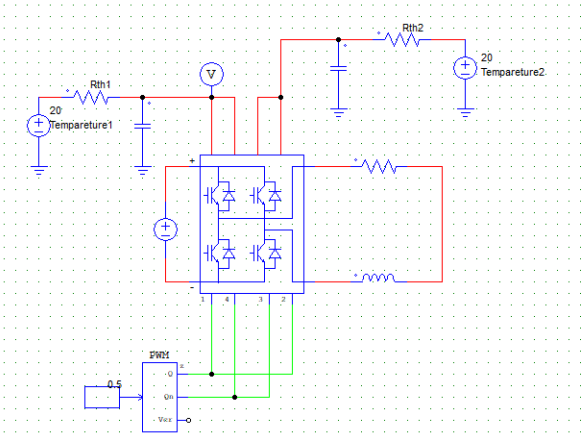
Power Loss Calculation and Device Database

DSIM supports detailed physical models for IGBT and SiC MOSFET. These physical models can be used to not only simulate switching transient, but also calculate device losses.

The transient model can be chosen from the device database, as shown below. A device can be entered through the Device Database Editor. Most of the parameters can be found in the manufacturer datasheet.



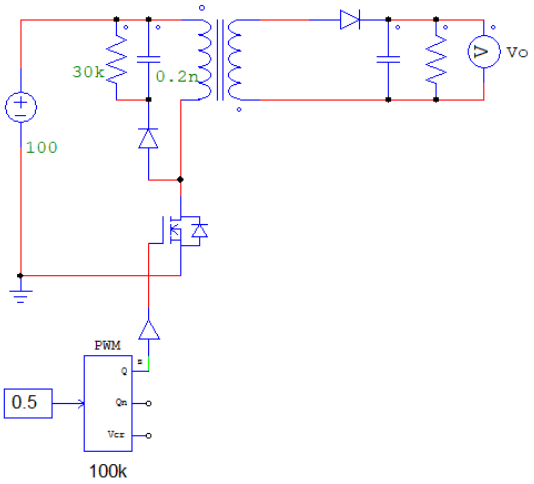
The calculated power loss can interface with the outside thermal equivalent circuit. The voltage at a power loss node represents the module's case temperature, and the current flowing out of the node represents the power loss of the device.



DSIM provides the functionality to simulate the switching transient of a physical device model. Using this model, DSIM can also calculate the power losses and junction temperature of the device. This provides a convenient way to study the device behaviour in detail, and to compare devices from different manufacturers easily.

Support for Single Switches

In this version, individual switches are supported. For example, the flyback converter shown below can be simulated by DSIM.

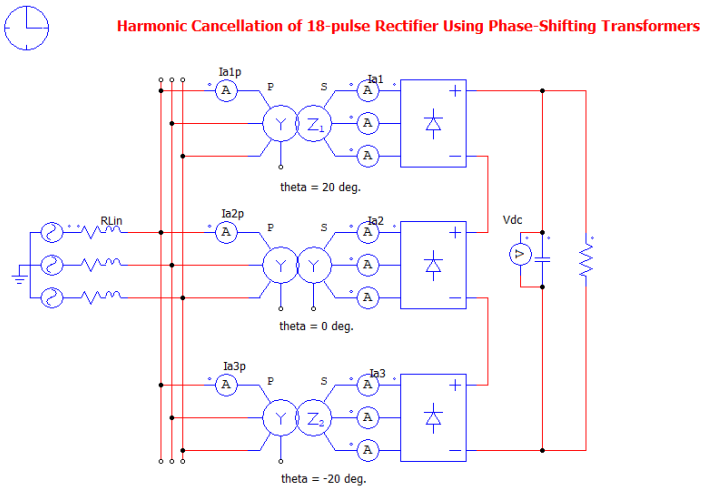


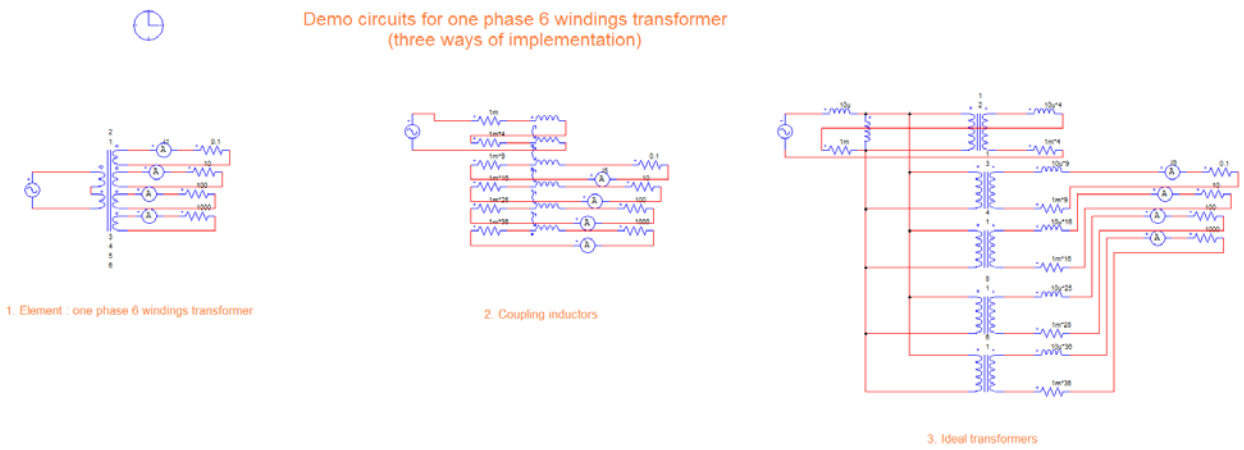
However, DSIM works most efficiently when power converters can be solved as a module (such as a 3-phase inverter). One should use the built-in switch modules whenever possible.

New Library Elements

Coupled inductors and transformers

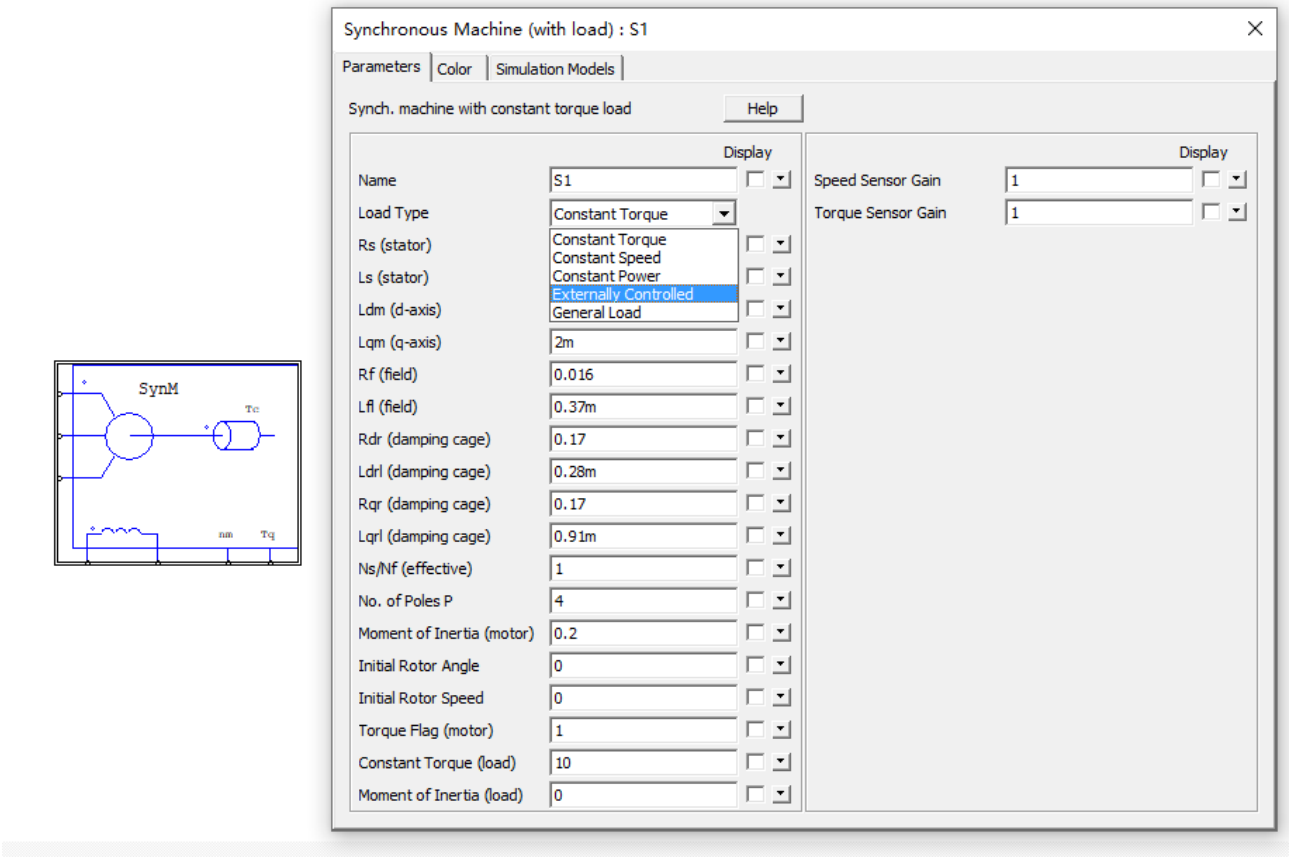
Coupled inductors and transformers are commonly used in the power converters. They are supported in this version. The examples show the functions of these elements.





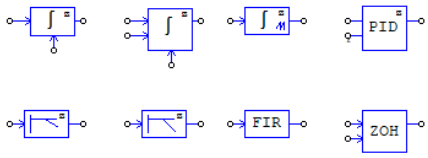
Synchronous machine and external load

The synchronous machine with load is added. Besides, the externally controlled load is supported for all the motor modules in DSIM.



Digital control blocks

The following integrators, filters, and function blocks are added to the library.



Power sources

Current sources are now supported in DSIM and several volage sources are added.