

Key New Features in DSIM Version 2021a

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

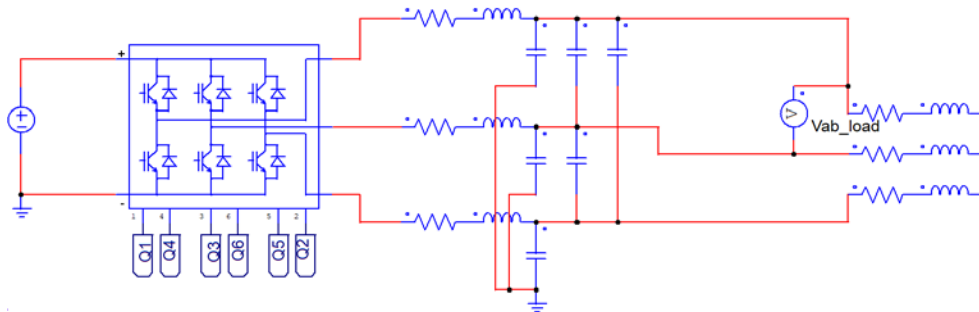
- A new BDESED solver is added for simulating stiff circuits
- Power loss calculation
- Support for single switches
- Support for device database
- Coupled inductors and transformers are supported
- Synchronous machine model is added
- New elements are added to the Element library

BDESED Solver

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

The BDESED 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 BDESED 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.

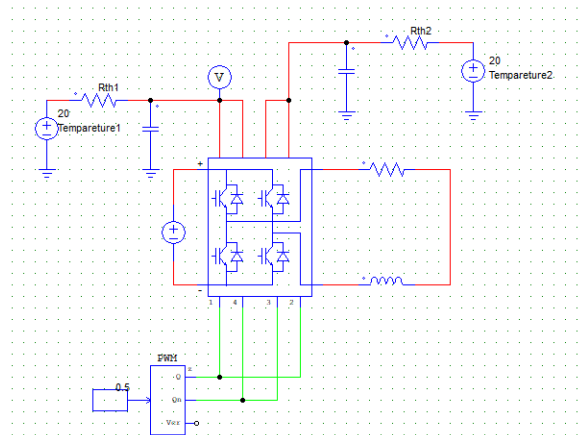
The transient model can be chosen from the device database, as shown below. A device can be entered through the Device Database Editor. Most of the parameters can be found in the manufacturer datasheet.

The image shows three numbered steps in the DSIM software interface:

- 1**: Configuration window for a 1-ph Inverter (S2). The 'Model Level' is set to 'IGBT'. Other parameters include 'Number of Floss Nodes' (4), 'Devices for Node 1-4' (Q1-Q4), and various timing and temperature parameters.
- 2**: A small schematic diagram of a four-switch inverter bridge.
- 3**: 'Search for Device' window. The 'Select Device type' is 'IGBT'. The search results table is as follows:

Manufacturer	Part Number	Package	Vce,max	Ic,max	Tj,max	File Path
Fuji Electric	12MBIS0VN-120-50_T1T2	6-Pack	1200	50	150	D:\PSIM_2021a_Device
Fuji Electric	6MBP300RA060	6-Pack	600	300	150	D:\PSIM_2021a_Device
Infineon	F3L400R12PT4P_B26_T1T4	Dual	1200	400	175	D:\PSIM_2021a_Device
Infineon	F3L400R12PT4P_B26_T2T3	Discre...	650	280	175	D:\PSIM_2021a_Device
Infineon	F3L400R12PT4P_B26_T1T4	Discre...	1200	300	175	D:\PSIM_2021a_Device
Infineon	FF450R12XE4_E	Discre...	1200	450	175	D:\PSIM_2021a_Device
Infineon	FS50R07A2E4	6-Pack	650	70	175	D:\PSIM_2021a_Device
Infineon	FS800R07A2E3	6-Pack	650	800	175	D:\PSIM_2021a_Device
DYS	DGH40N60C2	Discre...	600	40	150	D:\PSIM_2021a_Device
MagnaChip	MBQ40T120FES	Discre...	1200	40	150	D:\PSIM_2021a_Device
On Semi	HGTG20M6A4N	Discre...	600	40	150	D:\PSIM_2021a_Device

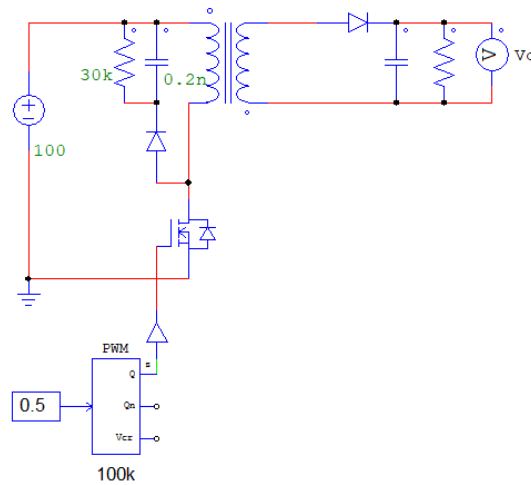
The calculated power loss can interface with the outside thermal equivalent circuit. The voltage at a power loss node represents the module's case temperature, and the current flowing out of the node represents the power loss of the device.



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.

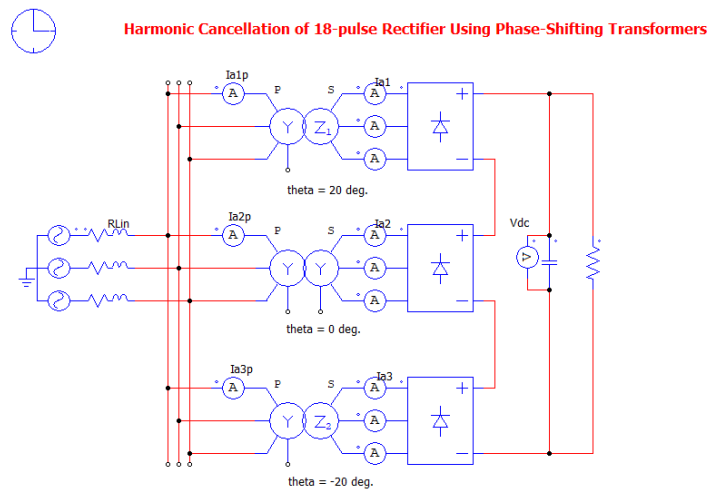


However, DSIM works most efficiently when power converters can be solved as a module (such as a 3-phase inverter). One should use the built-in switch modules whenever possible.

New Library Elements

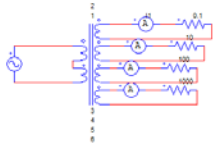
Coupled inductors and transformers

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.

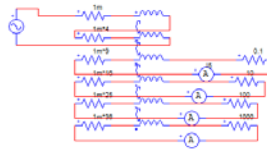




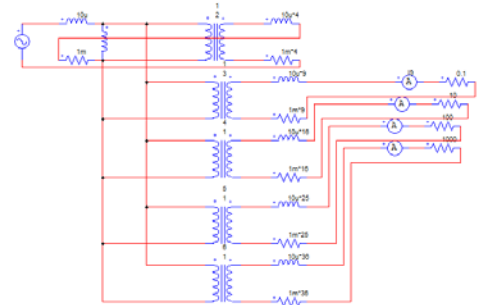
Demo circuits for one phase 6 windings transformer (three ways of implementation)



1. Element : one phase 6 windings transformer



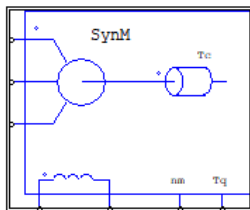
2. Coupling inductors



3. Ideal transformers

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.



Synchronous Machine (with load) : S1

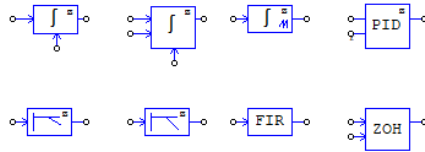
Parameters | Color | Simulation Models

Synch. machine with constant torque load Help

		Display			Display
Name	S1	<input type="checkbox"/>	Speed Sensor Gain	1	<input type="checkbox"/>
Load Type	Constant Torque	<input type="checkbox"/>	Torque Sensor Gain	1	<input type="checkbox"/>
Rs (stator)	Constant Torque	<input type="checkbox"/>			
Ls (stator)	Constant Speed	<input type="checkbox"/>			
Ldm (d-axis)	Constant Power	<input type="checkbox"/>			
Lqm (q-axis)	Externally Controlled	<input checked="" type="checkbox"/>			
Rf (field)	General Load	<input type="checkbox"/>			
Lf (field)		<input type="checkbox"/>			
Rdr (damping cage)		<input type="checkbox"/>			
Ldr (damping cage)		<input type="checkbox"/>			
Rqr (damping cage)		<input type="checkbox"/>			
Lqr (damping cage)		<input type="checkbox"/>			
Ns/Nf (effective)		<input type="checkbox"/>			
No. of Poles P		<input type="checkbox"/>			
Moment of Inertia (motor)		<input type="checkbox"/>			
Initial Rotor Angle		<input type="checkbox"/>			
Initial Rotor Speed		<input type="checkbox"/>			
Torque Flag (motor)		<input type="checkbox"/>			
Constant Torque (load)		<input type="checkbox"/>			
Moment of Inertia (load)		<input type="checkbox"/>			

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 voltage sources are added.

