

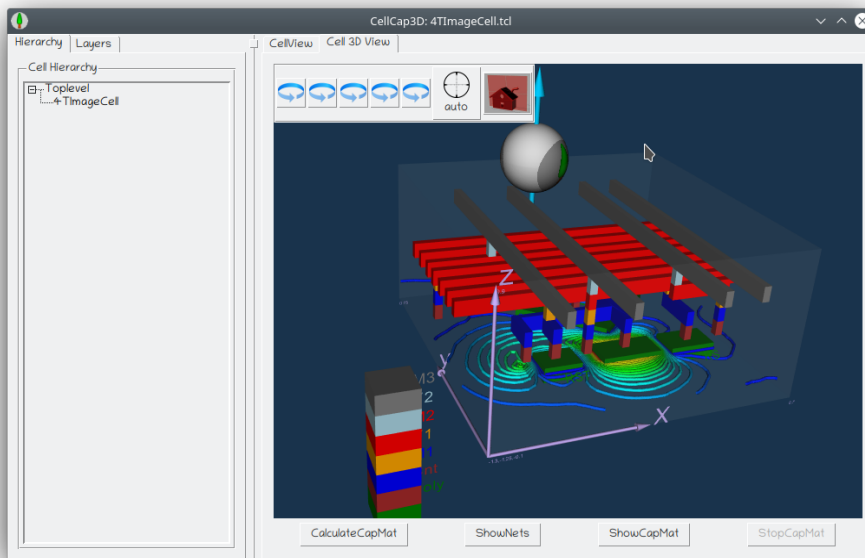
SEQUOIA Design Systems, Inc.

www.sequoiadesignsystems.com

CellCap3D Datasheet

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Product Overview

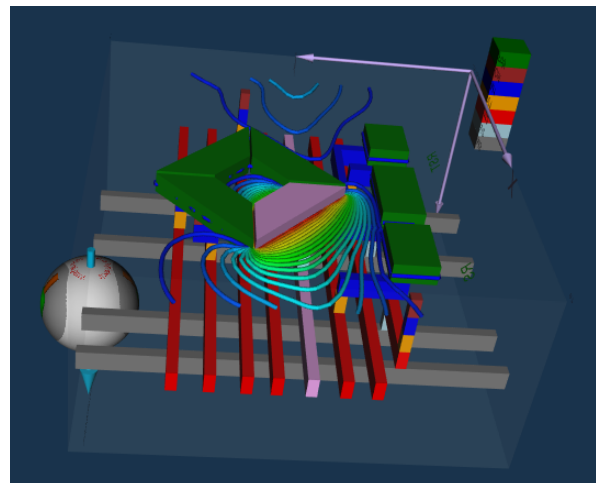


CellCap3D is SEQUOIA's tool for fully integrated accurate gds-to-spice calculation of capacitance matrices for image sensor cells, memory cells and similar. CellCap3D includes mesh generation, numerical solvers and graphical interfaces for viewing the 3D cell model, connected nets, capmatrix values and internal potential distributions. Overall input to the tool is provided through Tcl - a

powerful extension language with full programming capabilities.

CellCap3D Workflow

Capacitance matrices are calculated from two orthogonal input data sets: a gds database with the cell layout and vertical layer information such as layer thicknesses dielectric permittivity of insulators. A 3D cell model is constructed from these inputs and an efficient and high quality simulation mesh is generated automatically. Calculation of the cap

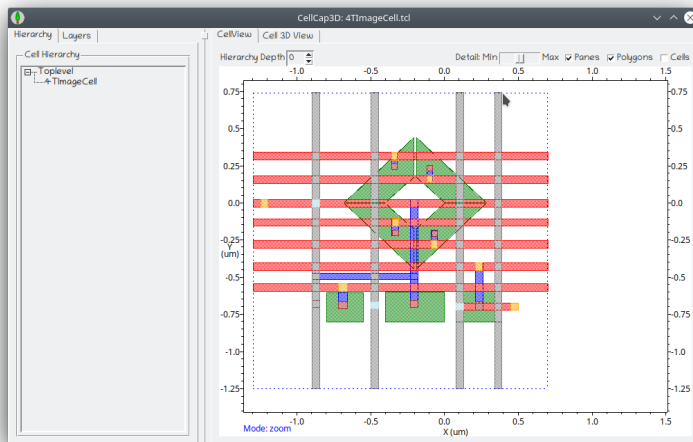


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matrix for a complex modern image sensor cell is typically completed in a few minutes. A state-of-the-art numerical solver is built-in and enables viewing of internal potential distributions for detailed analysis.

Electrical Connectivity

Electrically connected conductive portions of the structure are traced automatically and biased together during capacitance calculation.



Capmatrix values are calculated automatically and viewed through CellCap3D GUI. Clicking a capmat cell highlights related nets in the 3D model.

Name	piece0	piece1	piece2	piece3	piece4	piece5	piece6	...
AVDD	Cnt_1	MI_10	MI_9	M2_10	VI_10	VI_3	Cnt_4	...
BL	Cnt_6	MI_4	M2_1	M3_2	VI_1	V2_1		...
FD	CntP_6	Cnt_2	Cnt_3	MI_12	M1_3	Poly_6		...
GND	MI_5	MI_11	M2_2	M2_6	M3_3	M3_4	M3_5	...
RS	CntP_7	MI_3	M2_8	Poly_7	VI_5			...
RST	CntP_1	MI_5	M2_9	Poly_5	VI_4			...
TXI	CntP_4	MI_1	M2_3	Poly_2	VI_8			...
TX2	CntP_2	MI_6	M2_4	Poly_1	VI_9			...
TX3	CntP_5	MI_2	M2_5	Poly_4	VI_6			...
TX+	CntP_3	MI_7	M2_7	Poly_3	VI_7			...

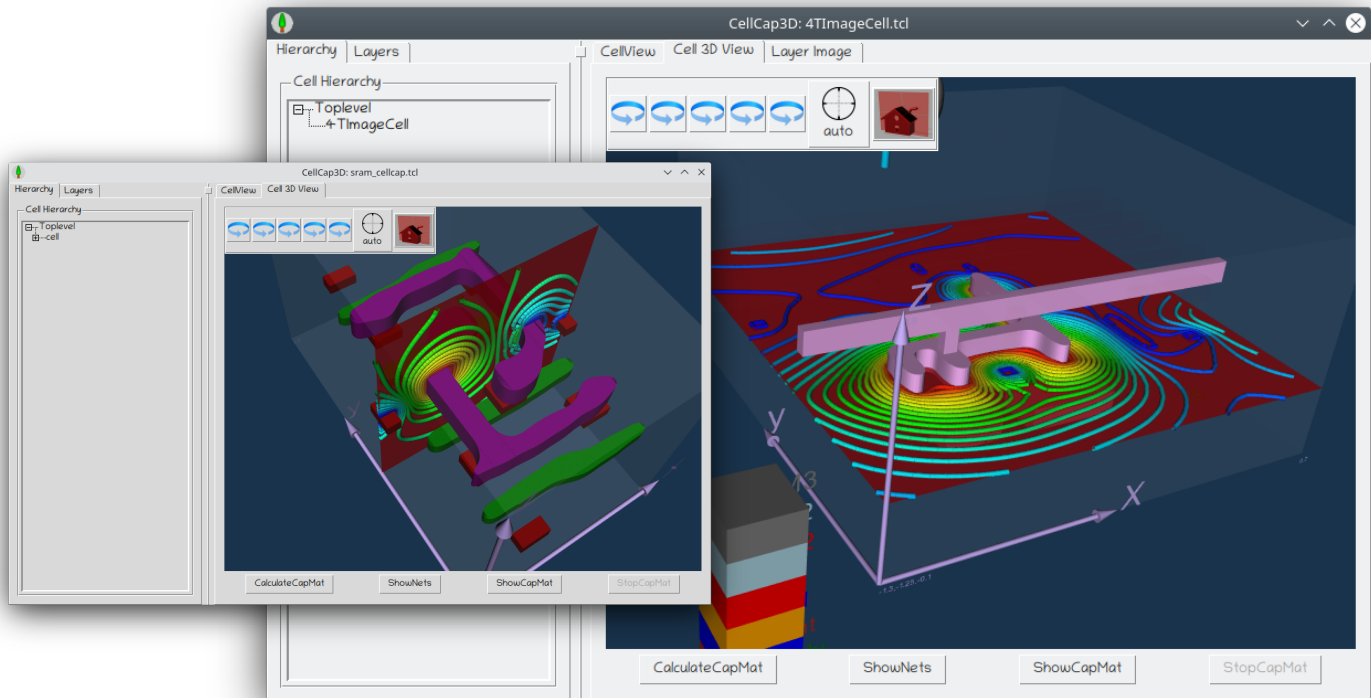
Boundary Conditions

Periodic boundary conditions (PBC) are available in addition to reflective BC and can significantly improve accuracy and reduce calculation time for typical image or memory cell analysis.

Capacitance Matrix

	AVDD	BL	FD	GND	RS	RST	TXI	...
AVDD	21.0987	-2.1188	-3.5127	-3.3164	-2.6940	-3.7929	-2.3420	...
BL	-2.2696	15.1049	-0.0160	-9.3861	-1.6703	-0.9053	-0.3299	...
FD	-3.5722	-0.0148	18.3648	-0.0534	-2.0406	-2.5539	-2.6339	...
GND	-3.4005	-9.3585	-0.0567	23.4276	-1.3798	-1.1996	-1.4723	...
RS	-2.7489	-1.5067	-2.0042	-1.4655	14.6246	-5.0483	-0.2164	...
RST	-3.7421	-0.8413	-2.4700	-1.1905	-4.9555	13.8517	-0.0467	...
TXI	-2.4144	-0.3551	-2.5326	-1.4109	-0.1599	-0.0458	14.2230	...
TX2	-1.1709	-0.2947	-2.5091	-2.5195	-0.0602	-0.0707	-6.0088	...
TX3	-0.8116	-0.2646	-2.6174	-2.6618	-0.3386	-0.0518	-1.1017	...
TX+	-0.9888	-0.3646	-2.6888	-1.4765	-1.3494	-0.1945	-0.0837	...

Considering Lithographic Distortions and Corner Rounding



CellCap3D can handle complex layouts (gds) including layers subject to lithographic distortion. Such layer polygons may be extracted from SEM images, produced by lithography simulators including SEQUOIA Cell Designer (as in the sram cell shown above), or approximated by directly introducing corner rounding in CellCap3D as shown in the example below of an image sensor cell.

Availability

CellCap3D is available under Linux (Redhat and Ubuntu). Please contact SEQUOIA Design Systems, Inc. for further details at info@sequoiadesignsystems.com