Utmost IV

Device Characterization and SPICE Modeling

Building on many years' experience, Utmost IV provides a powerful yet easy-to-use tool for the characterization of devices and the generation of accurate, compact models, macro-models, and Verilog-A models for analog and RF applications.

Key Features

- Automated measurement and SPICE model extraction of any device type
- Full control of all measurement conditions with over 100 different measurement instruments supported
- Open architecture instrument drivers can be modified or created by user
- Extract any compact, macro-model or Verilog-A SPICE model
- Combine direct extraction and parameter optimization techniques
- Simulate and optimize any combination of data including extracted data values
- Family of advanced optimizers, including genetic type optimizers
- High-speed multi-threaded SmartSpice interface
- Supports SmartSpice, HSPICE, Eldo and Spectre simulators
- Verilog-A model and extraction sequence co-development platform
- Integration with TCAD tools provides process simulation to SPICE model development flow
- Store your data in either the file system or in a database
- Store, share and re-use data using optional Firebird relational database
- Easy data import from Utmost III legacy data, TCAD simulation files or third party data files

Measuring Devices in the Acquisition Module

- Supports all types of semiconductor devices
- Perform any measurement and control all measurement conditions
- Variables can be used within measurement setups to increase re-usability
- Embed extractions in measurement sequence so that extracted result from one measurement can be fed into the conditions of another measurement
- Supports over 100 measurement instruments
- Open interface allows user to create new or modify existing instrument drivers
- Data can also be generated from simulation, which is useful when converting one model type to another

Name : idvglin Measurement Type : DC	·		
Setup :	Item Type: Sweep		
Node Names = d g s b	Sweep Number	1	
Sweep 1 VG LIN Start = 0V Stop = 5V Step = 100mV Compliance = 100mA Power = 0W	Туре	Voltage	
Constant VB Value = 0V Compliance = 100mA Power = 0W	Nodes	D	
Constant VD Value = 100mV Compliance = 100mA Power = 0W	Method	LIN	
Constant VS Value - 0V Compliance - 100mA Power - 0W	Start	0 5	
Target ID	Stop		
Tagerio	Step	100m	
New Rem	Calculated Field	Number of Points	
	Compliance	100m	
	Power	0	
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Flexible, easy-to-use interface can define any measurement.



Fully automated sequence of measurements.

Supported Measurement Instruments Include

DC Instruments

agilent b1500 agilent_b1505 agilent_e5260 agilent_e5270 agilent_hp_4155a agilent_hp_4155b agilent_hp_4155c agilent_hp_4156a agilent_hp_4156b agilent_hp_4156c hp_4141 hp_4142 hp_4145 keithley_4200 keysight_b1500 keysight_b1505 keysight_e5260 keysight_e5270 tektronic_370 tektronic_371

LCR (Capacitance) Instruments

agilent_b1500 agilent_b1505 agilent_e4980 hp_4274 hp_4275 hp_4276 hp_4277 hp_4279 hp_4280 hp_4284 hp_4285 hp_4294

LCR (Capacitance) Instruments (con't)

keithley_590 keithley_595 keysight_b1500 keysight_b1505 quadtech_7600

AC (s-parameter)

Instruments

agilent ena agilent_pna anritsu_37xxxD hp_8510c hp 8719d hp 8719es hp_8720d hp 8720es hp_8722d hp 8722es hp 8753a hp 8753b hp_8753c hp_8753d hp_8753e hp 8753es keysight ena keysight_pna rohde_schwarz_znb

Scanners

agilent_b2200 agilent_b2201 agilent_hp_e5250

hp_3488 hp_3495 hp_3852 hp_4084 hp_4085 hp_4086 keithley_7001 keithley_7002 keithley_705 keithley_706 keithley_707 keithley_708 keysight_b2200 keysight_b2201 keysight_e5250

Scanners (con't)

hp_3235

Probers

alessi_rel2500 alessi_rel4500 alessi_rel5500 alessi rel6171 cascade_summit_11500 cascade_summit_12000 electroglas_1034 electroglas_2001 electroglas_4080 electroglas_commander karl_suss_pa200 karl_suss_pe100 mpi_sentio rucker_kolls_680 rucker_kolls_681 rucker_kolls_691

Probers (con't)

signatone_wavelink_350 tokyo_seimitsu_3000 tokyo_seimitsu_4000 tokyo_seimitsu_5000 tokyo_seimitsu_6000 tokyo_seimitsu_amp90a wentworth_uk wentworth_us

Thermal Controllers

cascade velox delta_9010 delta_9388 electroglas_tc2000 ers_sp53 ers_sp62 etac_fx4050 micronics_wec10 ransco_900 temptronic_tp03000 temptronic_tp03100 temptronic_tp04100 tenney_junior thermonics_t2420 thermonics_t2500 thermonics_t2600 thermonics_t2820 thermotron triotech_tc1000 triotech_tc2800

Generating SPICE models in the Optimization Module

- SPICE model generation using any combination of direct parameter extraction or parameter optimization
- Supports all technologies
- Supports compact, macro-model or Verilog-A model extraction
- High-speed interface to SmartSpice simulator performs hundreds of simulations per second
- No simulation slowdown when using macro-models
- Selection of any combination of data targets to perform optimization
- Extract and display any device figure of merit, such as threshold voltage
- · Plot, simulate and optimize device figures of merit
- Optimization sequence provides fully automated SPICE model generation mode
- Interactive rubberband sliders instantly show the effect of changing model parameters on the simulated characteristics
- Family of advanced local and global optimizers include:
 - Levenberg-Marquardt
 - Hooke-Jeeves
 - Genetic Optimizer
 - Simulated Annealing
 - Parallel Tempering
 - Differential Evolution
- Hybrid optimization combines the power of the global optimizer with the speed of the local optimizer
- Define model parameters as values or as expressions
- Directly import models from hierarchical SPICE library files, including parameters defined as expressions
- Import and simulate process corner or other complex model formats
- Perform simulations using external model libraries

Corner and Retargeting Module

- Creating corner models or retargeting existing models
- Quick model tuning using electrical test (ET) data tables and trend plots
- Flexible target and measurement setup definitions
- Fast simulation engine

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4	F	TOX	14n		14n	14n	5n	50n			
5	F	XJ	150n		150n	150n	100n	1u			
6	F	NCH	1.7e+	-17	1.7e+17	1.7e+17	5e+16	5e+17			
7	F	NSUB					5e+15	3e+17			
8	F	VTH0	700m		700m	700m	-2	2			
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Rubberband optimization of any number of parameters.



View and optimize any number of targets.

Quick-Start Optimization Project Templates

- Help users create optimization projects for their data
- · Easy project configuration based on templates
- Quickly achieve accurate model cards
- Experienced users can tweak the project more

Developing Verilog-A Models and Extraction Strategies

- · Utmost IV is the perfect Verilog-A model development tool
- Modify Verilog-A model code and instantly see effect on simulated characteristics
- Use data from any source including measurement, TCAD process simulation or other SPICE model simulation to develop new Verilog-A model code and parameters
- Interactive rubberband sliders allow parameter limits to be quickly explored
- Compare model versions

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• Side-by-side development of the Verilog-A model and the extraction strategy for the model

Using TCAD Simulations to Generate SPICE Models

- Full TCAD process simulation to SPICE model generation flow
- Provide 'level 0' SPICE models to designers even before the process is available
- Compare TCAD simulations with measured data from the process
- · Combine TCAD and measured data to develop SPICE models
- · Seamless integration with DeckBuild and VWF tools

Optional Relational Database Organizes Your Work

- As well as normal file storage, Utmost IV offeres a relational database to store your measurement data and projects
- Avoids storage and duplication of thousands of separate data files in difficult to locate file systems
- Provide controlled access to information with full user and group permission settings
- Facilitates sharing and easy retrieval of data
- Database is proven Borland Firebird relational database

Custom Automation Using Script Mode

- Combine the power of Utmost IV with the customization capability of JavaScript programming language
- Perform any measurement, simulation, extraction, or optimization
- · Access any database or file

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• Export a script version of any Acquisition or Optimization project for rapid script development



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