



SIMport User Guide

Power MOSFET Online Design Tools from NXP

October, 19, 2007



What Is SimPort?

- ▶ SimPort is a new online design tool for Power MOSFETs from NXP. these tools enable our customers to determine the best MOSFETs for their application. Two tools are available:
 1. Active Datasheet – datasheet parameters can be extracted (using a Spice model) with user selectable test conditions. In this way the behaviour of the Power MOSFET can be assessed in conditions similar to those that will be experienced in the end application
 2. Buck Designer – the user inputs their application requirements for a DC-DC Buck Converter (Input & Output Voltage, Output Current etc.) and is presented with the optimum Power MOSFETs for their application. An online Spice simulation can then be performed.

Using the SimPort Tools




SimPort

You are here: [NXP](#) > [SimPort](#)

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What if you could.....

Optimize the selection of your MOSFETs within a specific application environment and rapidly assess MOSFET performance? NXP's SimPort is a live interactive environment to simulate MOSFET performance and provides analysis beyond that available from a data sheet. NXP's leading edge MOSFET technology is electronically modeled to enable the user to optimize selection.

 **Active Datasheet** [LAUNCH TOOL ▶](#)

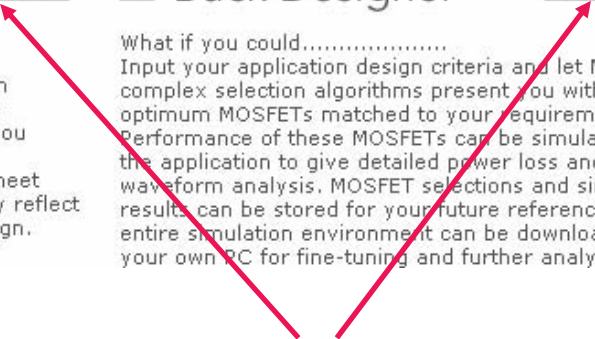
What if you could.....

Select an NXP MOSFET based on your application requirements and then analyse the performance characteristics? With the active datasheet tool, you define the test conditions under which MOSFET characteristics are displayed. In this way, datasheet information is produced that will more accurately reflect the performance of the MOSFET within your design.

 **Buck Designer** [LAUNCH TOOL ▶](#)

What if you could.....

Input your application design criteria and let NXP's complex selection algorithms present you with the optimum MOSFETs matched to your requirements. Performance of these MOSFETs can be simulated within the application to give detailed power loss and waveform analysis. MOSFET selections and simulation results can be stored for your future reference or the entire simulation environment can be downloaded to your own PC for fine-tuning and further analysis.



- ▶ On reaching the NXP SimPort Website, select the tool that you wish to use. If not already done so, you will be asked to log into the site.



Active Datasheet



SimPort
Active Datasheet

You are here: [NXP](#) > [SimPort](#) > Mosfet Selection

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► MOSFET SELECTION

► ACTIVE DATASHEET

PARAMETRIC SEARCH

Package	SOT669 (LFPAK) ▼		
Category	20 - 50 V N-channel MOSFETs ▼		
V _{DS} Max	30 ▼	V	
Configuration	Single N-channel ▼		
R _{DS(on)}	1.8	to	20000 mΩ at 4.5 ▼ V
I _D DC	10	to	100 A
<div>RESET FIELDS FIND PARTS</div>			

PART NUMBER SEARCH

Part Number	<input type="text"/>
<div>FIND PARTS</div>	

- On entering the Active Datasheet, either perform a parametric search for a particular MOSFET using the criteria on the left of the screen, or by directly entering a part number in the right hand side of the screen. On pressing the “FIND PARTS” button all suitable MOSFETs will be displayed.



Active Datasheet



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► MOSFET SELECTION

► ACTIVE DATASHEET

PARAMETRIC SEARCH

Package	SOT669 (LFPAK) ▼	
Category	20 - 50 V N-channel MOSFETs ▼	
V _{DS} Max	30 ▼	V
Configuration	Single N-channel ▼	
R _{DS(on)}	1.8 to 5	mΩ at 10 ▼ V
I _D DC	10 to 100	A
RESET FIELDS FIND PARTS		

PART NUMBER SEARCH

Part Number	<input type="text"/>
FIND PARTS	

► Once the results of the search are displayed, select required MOSFET for further analysis

SHOWING: 1 - 9 OF 9 ITEMS.

PART NUMBER	PACKAGE	CATEGORY	VD MAX	CONFIGURATION	ID DC	RDSON1	@VG=	RDSON2	@VG=	QGD (TYP)
PH3830L	SOT669 (LFPAK)	20 - 50 V N-channel MOSFETs	30	Single N-channel	98	4.9	5	3.8	10	11
PH3330L	SOT669 (LFPAK)	20 - 50 V N-channel MOSFETs	30	Single N-channel	100	4.5	4.5	3.3	10	6.9
PH4830L	SOT669 (LFPAK)	20 - 50 V N-channel MOSFETs	30	Single N-channel	84	4.8	4.5	7	10	5.4
PH3230S	SOT669 (LFPAK)	20 - 50 V N-channel MOSFETs	30	Single N-channel	100	6.5	4.5	3.2	10	13
PH2925U	SOT669 (LFPAK)	20 - 50 V N-channel MOSFETs	25	Single N-channel	100	3	4.5	3	4.5	20.2
PH2525L	SOT669 (LFPAK)	20 - 50 V N-channel MOSFETs	25	Single N-channel	100	3.9	4.5	2.5	10	6.8
PH4025L	SOT669 (LFPAK)	20 - 50 V N-channel MOSFETs	25	Single N-channel	99	6.2	4.5	4	10	5
PH2520U	SOT669 (LFPAK)	20 - 50 V N-channel MOSFETs	20	Single N-channel	100	2.7	4.5	2.7	4.5	18

Active Datasheet

Hyperlink to Product Information Page

PRODUCT INFORMATION

Type Number	Package	V_{DS} (V)	Configuration	I_D DC (A)	$R_{DS(on)}$ (m Ω)	Q_{gd} (typ) (nC)
PH2525L	SOT669 (LFPK)	25	Single N-channel	100	3.9 @ 4.5V 2.5 @ 10V	6.8

OUTPUT CHARACTERISTICS

FIXED VALUES

I_{DS} 25 A

V_{DS} Max 12 V

SWEEP VALUES

V_{GS} 1 4.5 V

V_{GS} 2 10 V

Measurement Conditions

REVERSE OUTPUT CHARACTERISTICS

FIXED VALUES

I_{DS} 25 A

V_{DS} Max 12 V

SWEEP VALUES

V_{GS} 1 4.5 V

V_{GS} 2 10 V

Simulation Circuits can also be viewed

TRANSFER CHARACTERISTICS

Results not available. Please run this test first.

Results shown once simulation performed

GATE CHARGE

Gate charge

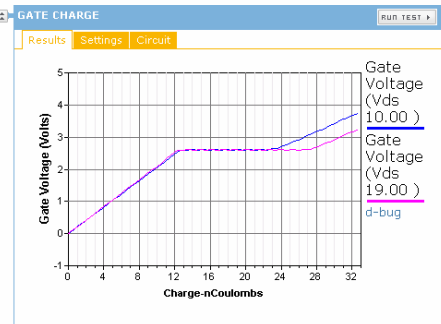
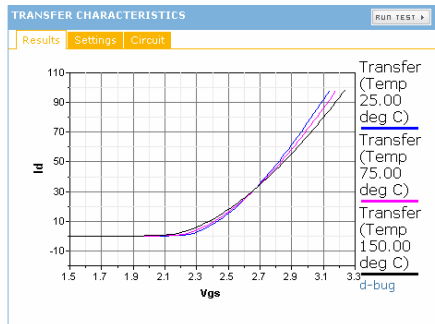
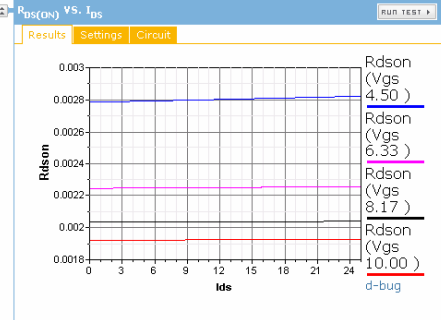
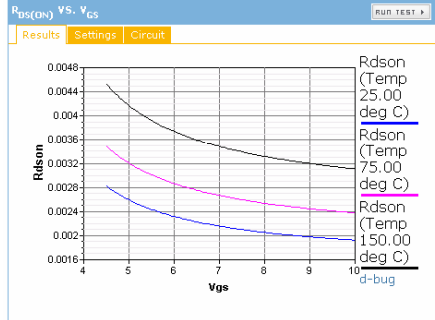
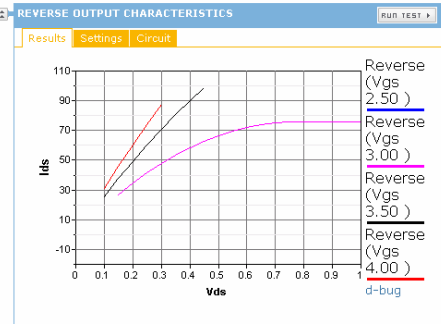
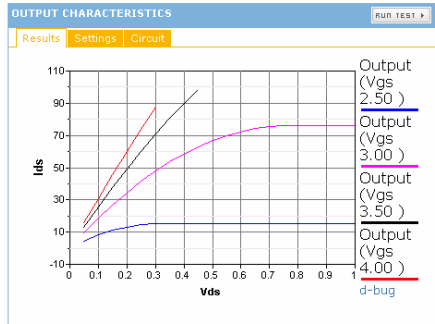
Details of the selected MOSFET are then displayed, with hyperlinks to the product information page where the product datasheet and other information can be found

A number measurements can be simulated where the user can change the test conditions

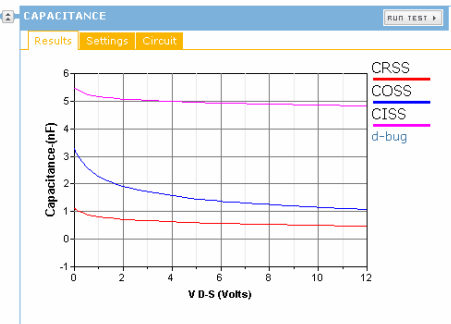
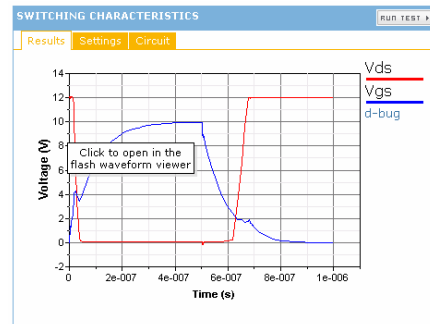
- Output Characteristics
- Reverse Output Characteristics
- $R_{DS(on)}$ vs. V_{GS} and I_{DS}
- Transfer Characteristics
- Gate Charge
- Switching Characteristics
- Capacitance

Active Datasheet

RUN ALL TESTS >



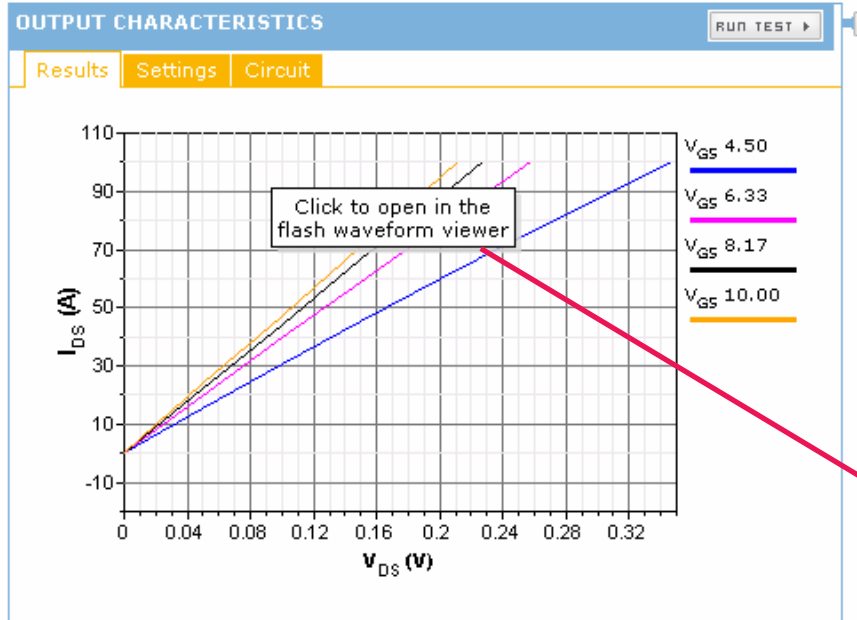
- ▶ Individual tests be performed by pressing the “RUN TEST” button
- ▶ Alternatively all tests can be run simultaneously by pressing the “RUN ALL TESTS” button.
- ▶ Once simulated the results are displayed



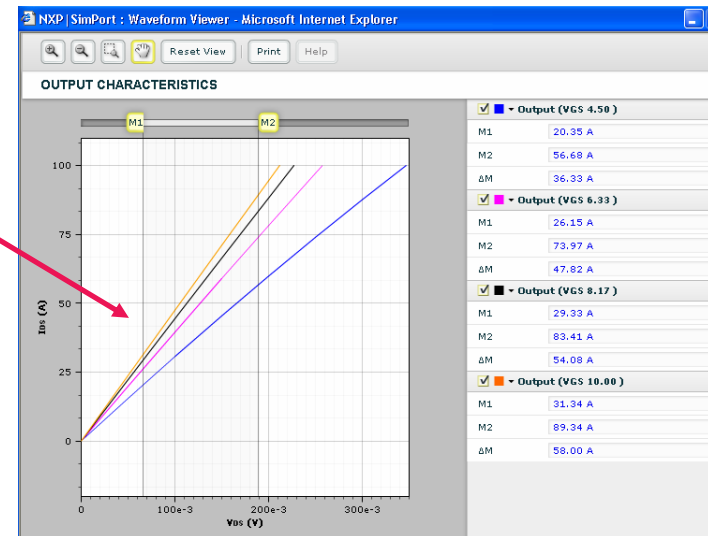
Active Datasheet

PRODUCT INFORMATION			
Type Number	Package	$V_{DS}(V)$	Conf
PH3330L	SOT669 (LFPK)	30	Single

PRINT [Run ALL TESTS](#)



- ▶ The results can be printed out using the “PRINT” button
- ▶ Results can be analysed in more detail by clicking on the result graph to activate a flash viewer that allows individual data points to be accessed.



Buck Designer – MOSFET Selection



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DESIGN PARAMETERS | FET SELECTION | CONVERTER DESIGN | DESIGN SUMMARY | MY DESIGNS

DESIGN REQUIREMENTS

Input Voltage	<input type="text" value="12"/>	V
Output Voltage	<input type="text" value="1.5"/>	V
Output Current Per Phase	<input type="text" value="25"/>	A
Switching Frequency	<input type="text" value="500"/>	KHz
Number of Phases	<input type="text" value="2"/>	<input type="button" value="v"/>
<input type="button" value="RESET FIELDS"/> <input type="button" value="SEARCH FOR DEVICES"/>		

ADVANCED REQUIREMENTS

- ▶ For the initial MOSFET selection, basic design information is entered and the “SEARCH FOR DEVICES” pressed
- ▶ If more information is known about the intended design, then pressing the “SHOW” button will allow more parameters allowing for improved refinement of the MOSFET selection process



Buck Designer – MOSFET Selection

ADVANCED REQUIREMENTS				HIDE ▾	
Output Inductor	<input type="text" value="800"/>	nH	System Parasitic Resistance	<input type="text" value="2"/>	mΩ
Parasitic PCB Inductance	<input type="text" value="3"/>	nH	Max Number of Lower MOSFETs	<input type="text" value="1"/>	x
MOSFET Operating Temperature	<input type="text" value="100"/>	°C	Max Number of Upper Mosfets	<input type="text" value="1"/>	x
UPPER MOSFET DRIVER		LOWER MOSFET DRIVER			
Voltage	<input type="text" value="12"/>	V	Voltage	<input type="text" value="12"/>	V
Turn-On Current	<input type="text" value="2"/>	A	Turn-On Current	<input type="text" value="2"/>	A
Turn-Off Current	<input type="text" value="2"/>	A	Turn-Off Current	<input type="text" value="2"/>	A
Turn-On Resitance	<input type="text" value="2"/>	Ω	Turn-On Resitance	<input type="text" value="2"/>	Ω
Turn-Off Resitance	<input type="text" value="1"/>	Ω	Turn-Off Resitance	<input type="text" value="1"/>	Ω
DRIVER DELAY TIME					
Lower FET Off-Upper FET On	<input type="text" value="30"/>	ns			
Upper FET Off-Lower FET On	<input type="text" value="30"/>	ns			

- ▶ The Advanced Requirements section allows the other design details to be defined. This includes defining the properties of the MOSFET driver .
 - Note that driver delay time may need to be increased if cross conduction is observed in the SPICE simulations









Buck Designer – MOSFET Selection



MOSFET can be view with the active datasheet tool by pressing this symbol

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DESIGN PARAMETERS | **FET SELECTION** | CONVERTED DESIGN | DESIGN SUMMARY | MY DESIGNS

SOLUTION TABLE								COMPARE DESIGNS	
DESIGN	SYNC FET	SYNC LOSS	CONT FET	CONT LOSS	QUANTITY	TOTAL LOSS	COMPARE		
1	 PH2525L	2.37W	 PH4025L	3.56W	1	5.93W	<input type="checkbox"/>	ANALYZE	
2	 PH2525L	2.37W	 PH9025L	3.63W	1	6.00W	<input type="checkbox"/>	ANALYZE	
3	 PH3330L	2.71W	 PH4025L	3.56W	1	6.27W	<input type="checkbox"/>	ANALYZE	
4	 PH3330L	2.71W	 PH9025L	3.63W	1	6.34W	<input type="checkbox"/>	ANALYZE	
5	PIP212	1.79W		2.80W	1	4.59W	<input type="checkbox"/>	ANALYZE	
6	PIP213	3.16W		2.83W	1	5.99W	<input type="checkbox"/>	ANALYZE	

ADVANCED FET SELECTION

- ▶ The optimal Power MOSFETs are automatically chosen.
- ▶ To proceed to the SPICE analysis, click the “ANALYZE” button for the MOSFET pair of your choice
 - Note the Control FET is the high side device, and Sync FET the low side



Buck Designer – MOSFET Selection



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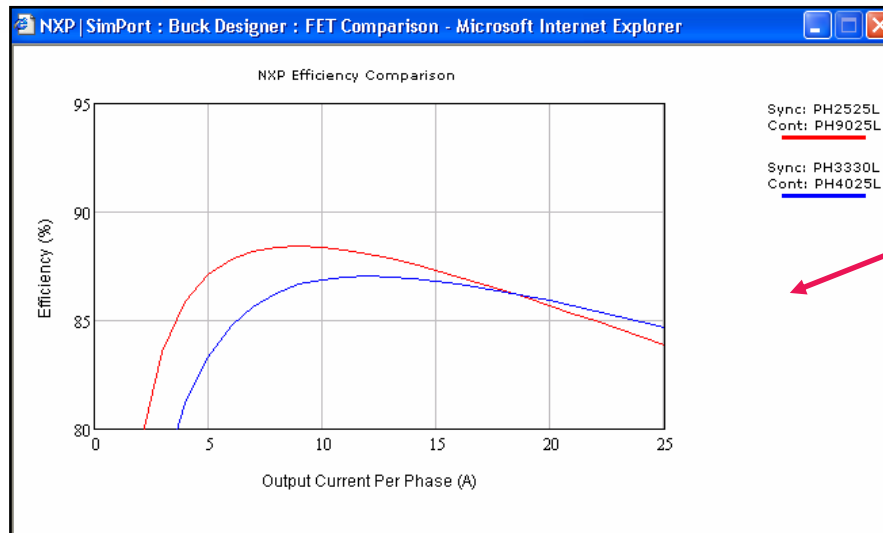
DESIGN PARAMETERS FET SELECTION CONVERTER DESIGN DESIGN SUMMARY MY DESIGNS

SOLUTION TABLE							COMPARE DESIGNS
DESIGN	SYNC FET	SYNC LOSS	CONT FET	CONT LOSS	QUANTITY	TOTAL LOSS	COMPARE
1	PH2525L	2.37W	PH4025L	3.56W	1	5.93W	<input type="checkbox"/> ANALYZE
2	PH2525L	2.37W	PH9025L	3.63W	1	6.00W	<input type="checkbox"/> ANALYZE
3	PH3330L	2.71W	PH4025L	3.56W	1	6.27W	<input type="checkbox"/> ANALYZE
4	PH3330L	2.71W	PH9025L	3.63W	1	6.34W	<input type="checkbox"/> ANALYZE
5	PIP212	1.79W		2.80W	1	4.59W	<input type="checkbox"/> ANALYZE
6	PIP213	3.16W		2.83W	1	5.99W	<input type="checkbox"/> ANALYZE

ADVANCED FET SELECTION

► To compare two potential solutions over the full output current range, simply select two solutions by ticking two boxes in the compare column and press the “COMPARE DESIGNS” button

► The results will then be displayed in a separate window



Buck Designer – Converter Design

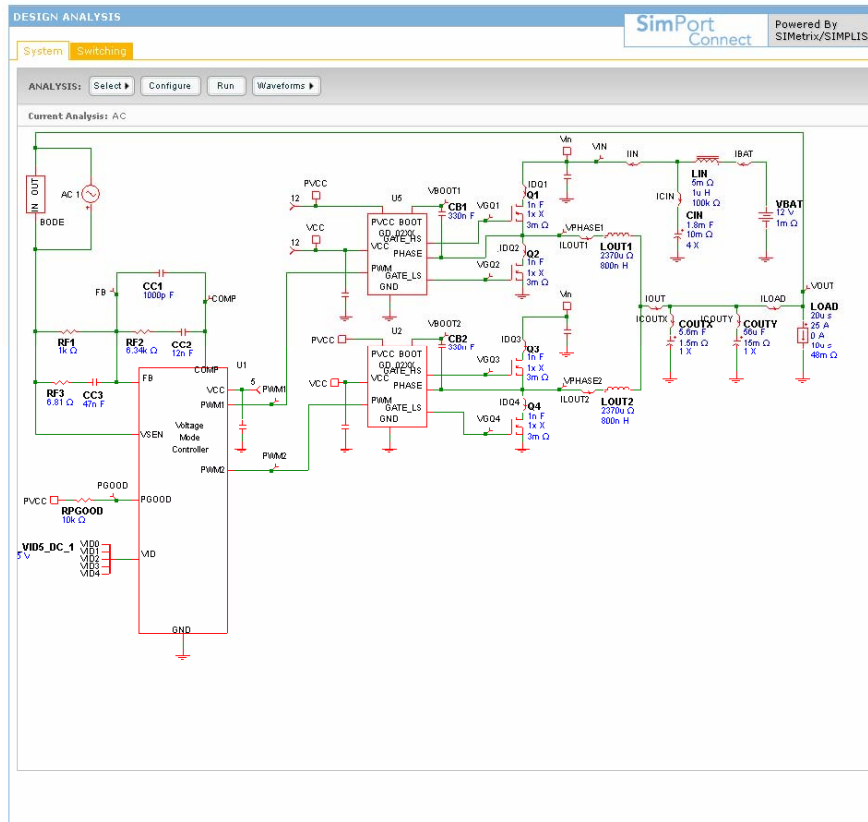


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DESIGN PARAMETERS | FET SELECTION | CONVERTER DESIGN | DESIGN SUMMARY | MY DESIGNS

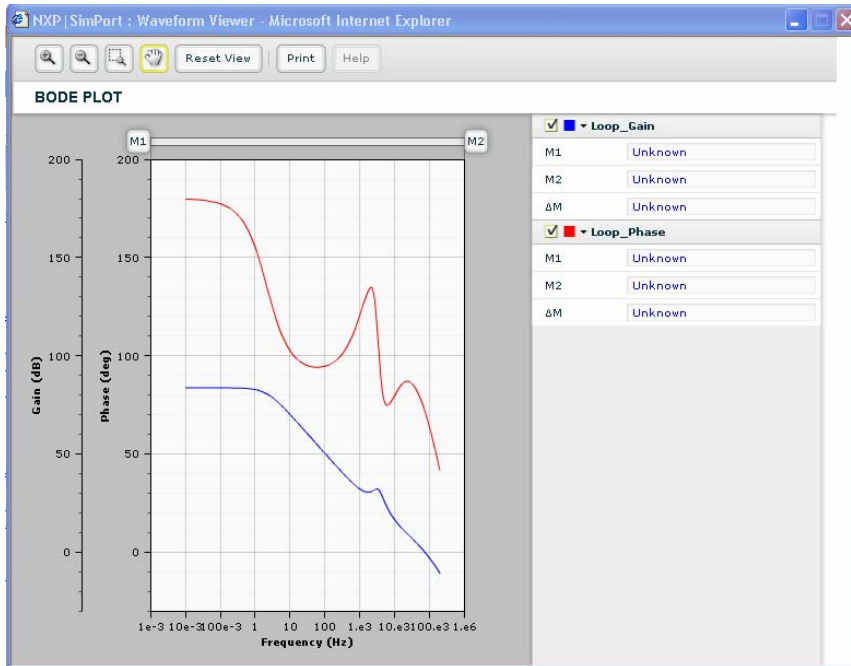


- ▶ The “SYSTEM” tab allows for system level simulations to be performed
- ▶ The “SELECT” button is used to determine whether an AC or transient response is to be performed
- ▶ Individual component values can be changed by clicking on the individual components
 - The output current levels for a load step (transient analysis) can be change in this way

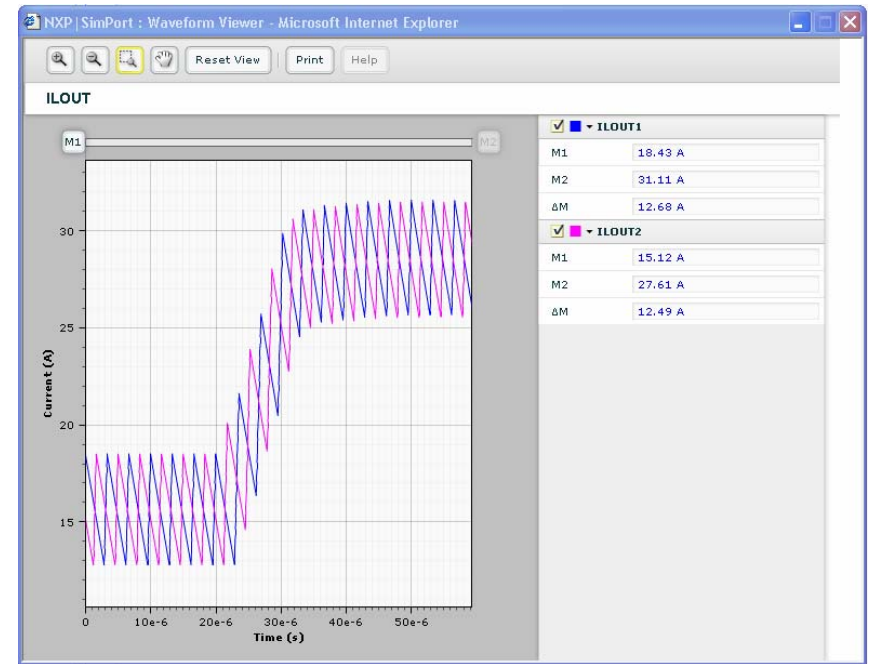


Buck Designer – Converter Design

► Example Outputs from the System Analysis



AC Analysis



Transient

Buck Designer – Converter Design

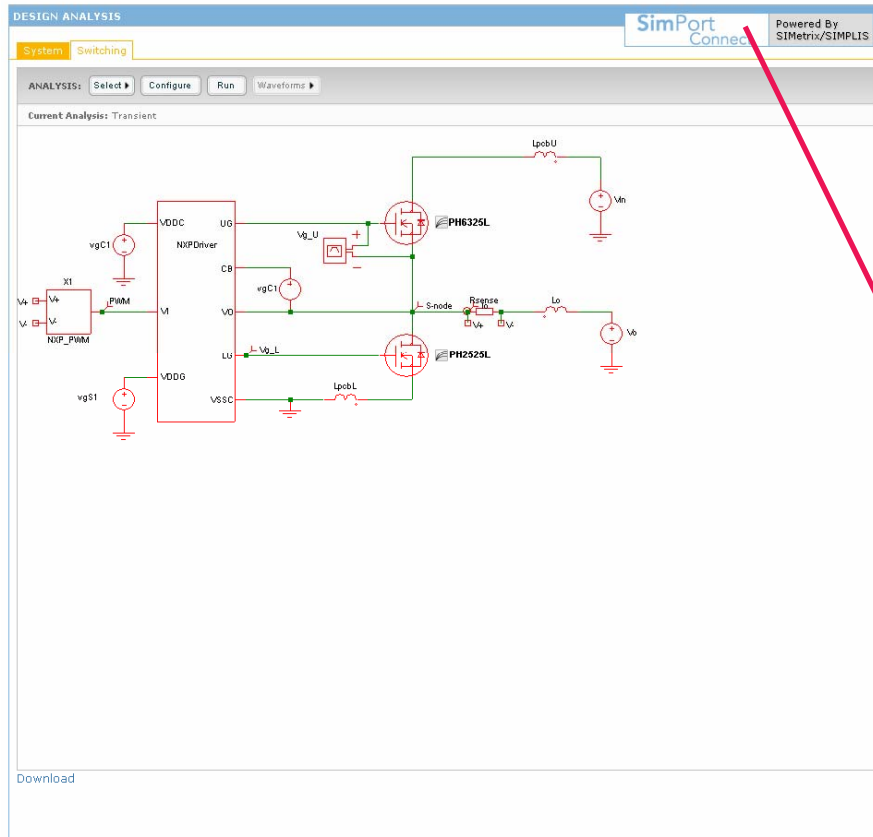


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DESIGN PARAMETERS | FET SELECTION | CONVERTER DESIGN | DESIGN SUMMARY | MY DESIGNS

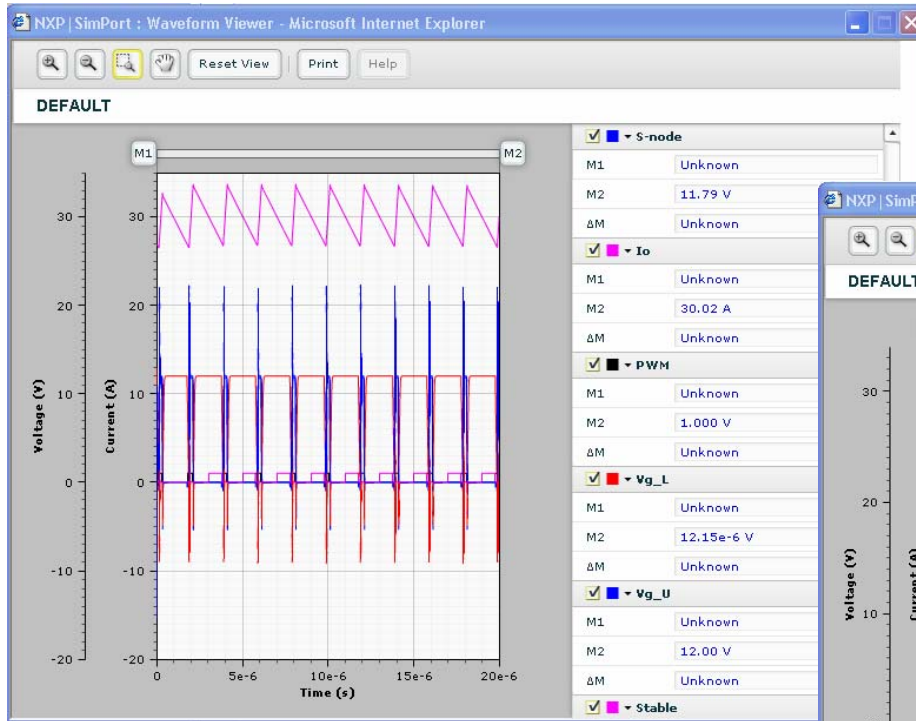


- ▶ The “SWITCHING” tab allows for system level simulations to be performed
- ▶ For offline simulation a version of the simulator can be downloaded.





Buck Designer – Converter Design

Example Outputs from the Switching Analysis



Design Summary



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▾ DESIGN REQUIREMENTS

SYNC FET	CONTROL FET	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT PER PHASE	SWITCHING FREQUENCY
PH2525L	PH9025L	12 V	1.5 V	25 A	500 KHz

▾ ADVANCED REQUIREMENTS

▾ SYSTEM SCHEMATIC

▾ SYSTEM RESULTS


▾ SWITCHING SCHEMATIC

▾ SWITCHING RESULTS

▾ SIMPORT DOWNLOADS

System Schematic Download
Switching Schematic Download

Simport Software Download



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- ▶ A summary of the Buck Designer results can be found under the “DESIGN SUMMARY” tab and System & Switching Schematics downloaded

Design Summary



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[DESIGN PARAMETERS](#) [FET SELECTION](#) [CONVERTER DESIGN](#) [DESIGN SUMMARY](#) [MY DESIGNS](#)

Save Current Design

[My Designs](#) [Edit](#)

	DESIGN	SYNC FET	CONT FET	DESCRIPTION	SAVED
LOAD DESIGN	25A Converter	PH2525L	PH9025L	Just a test	Oct 19, 2007 - 07:45 AM

- ▶ Designs can also be saved in the “MY DESIGNS” section and retrieved for further analysis at a later date.



