SIMport User Guide

Power MOSFET Online Design Tools from NXP

October, 19, 2007

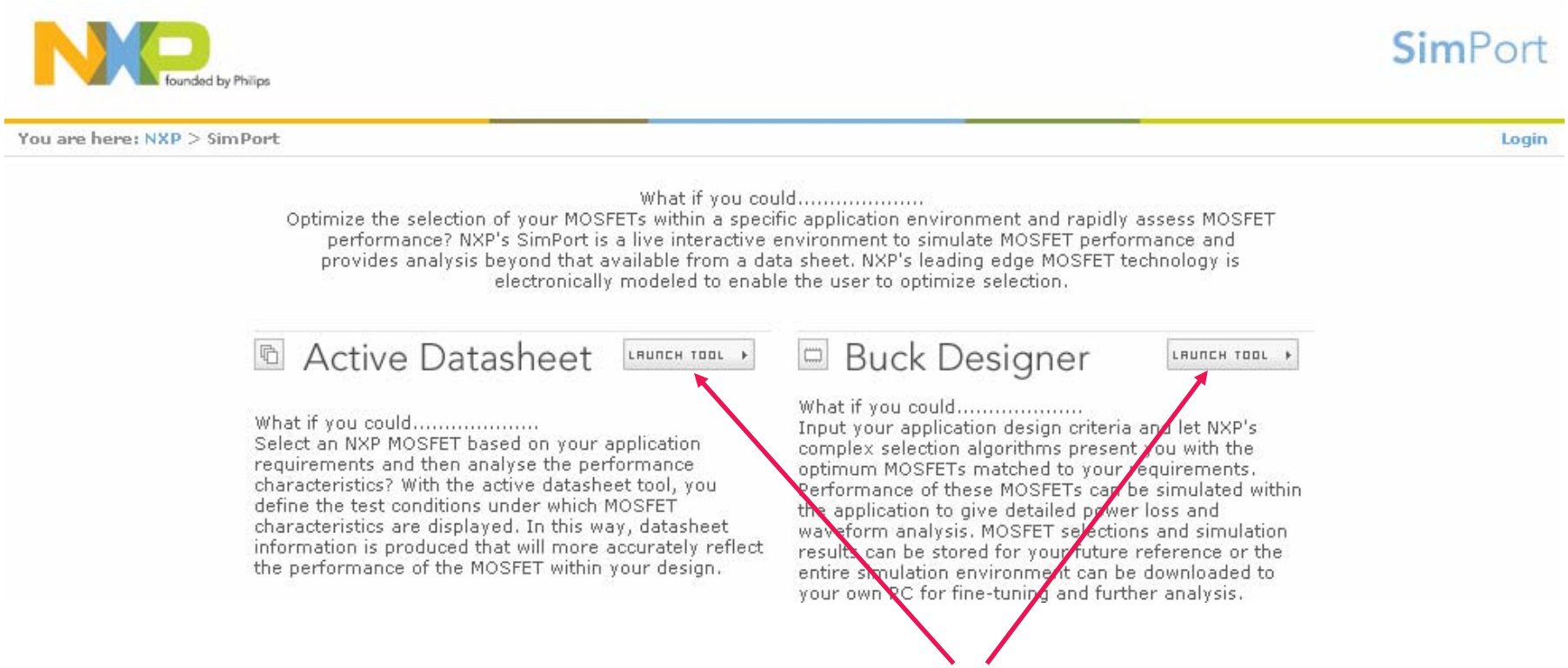
What Is SimPort?

- 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

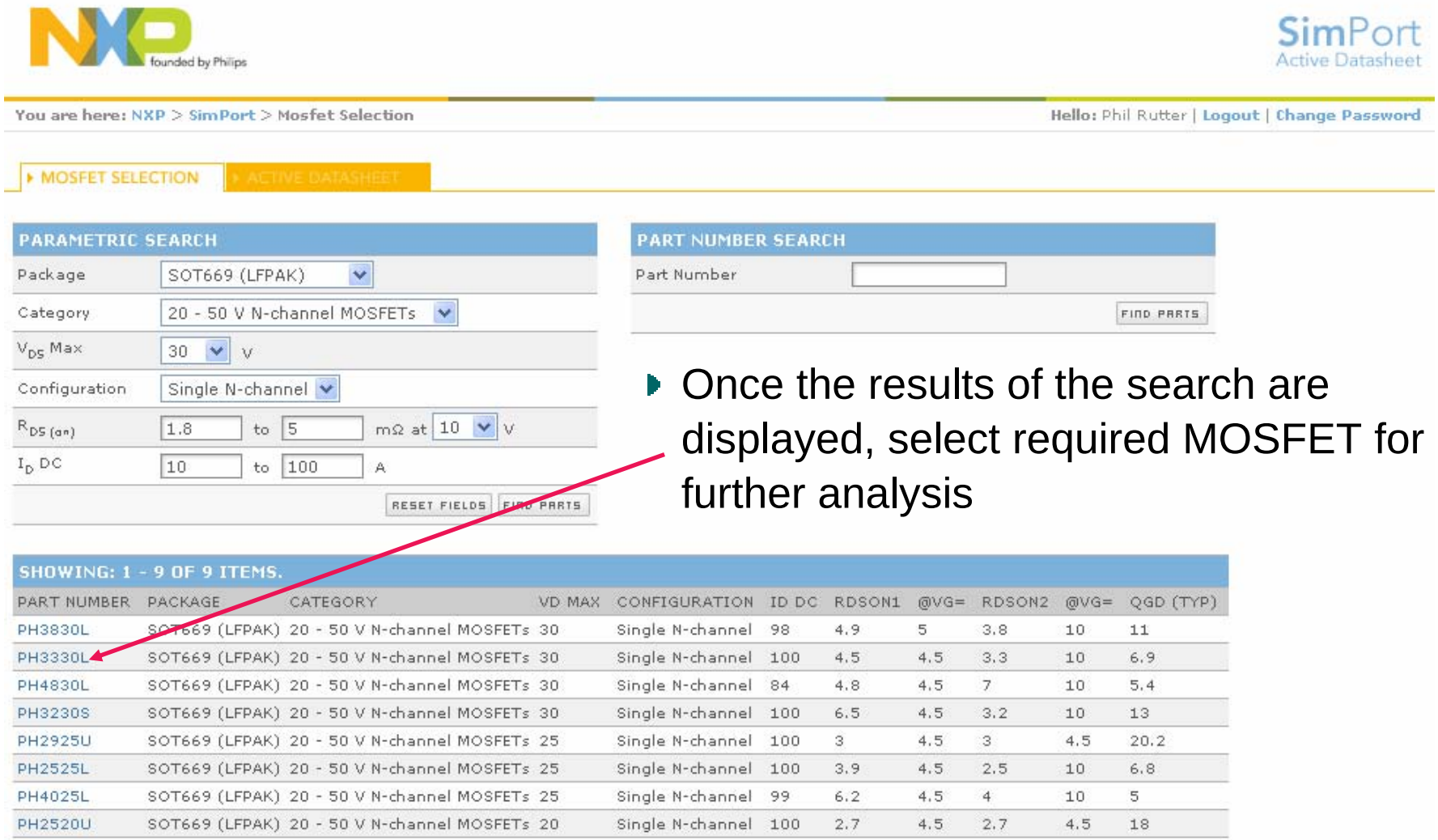


- On reaching the NXP SimPort Website, select the tool that you wish to use. If not already done so, you will be asked to log into the site.

Active Datasheet

- 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.

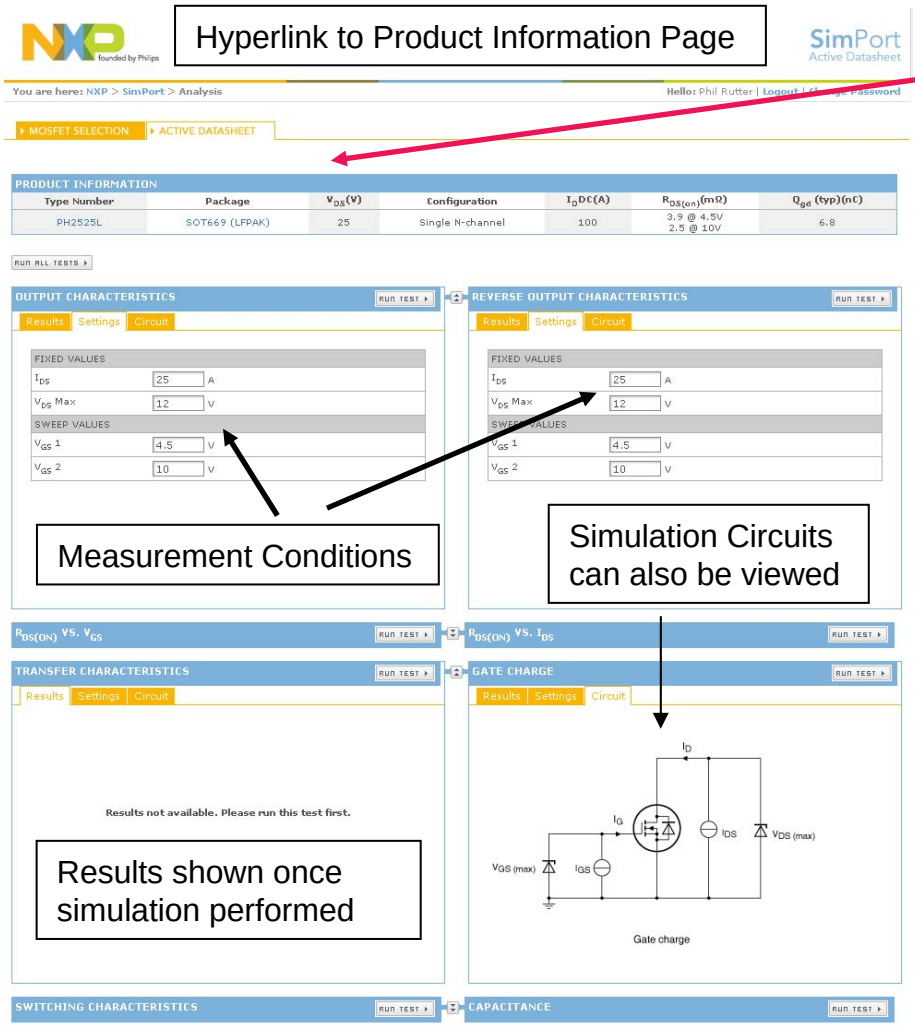
Active Datasheet



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

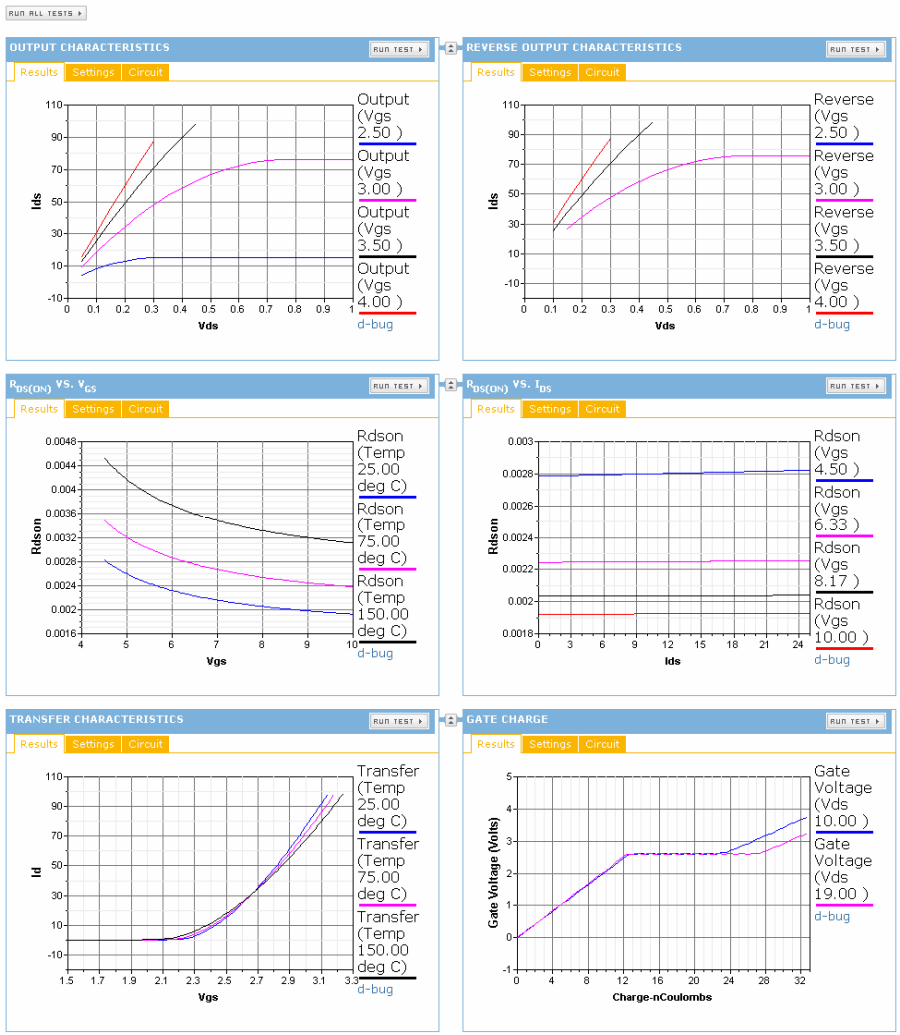
- Once the results of the search are displayed, select required MOSFET for further analysis

Active Datasheet



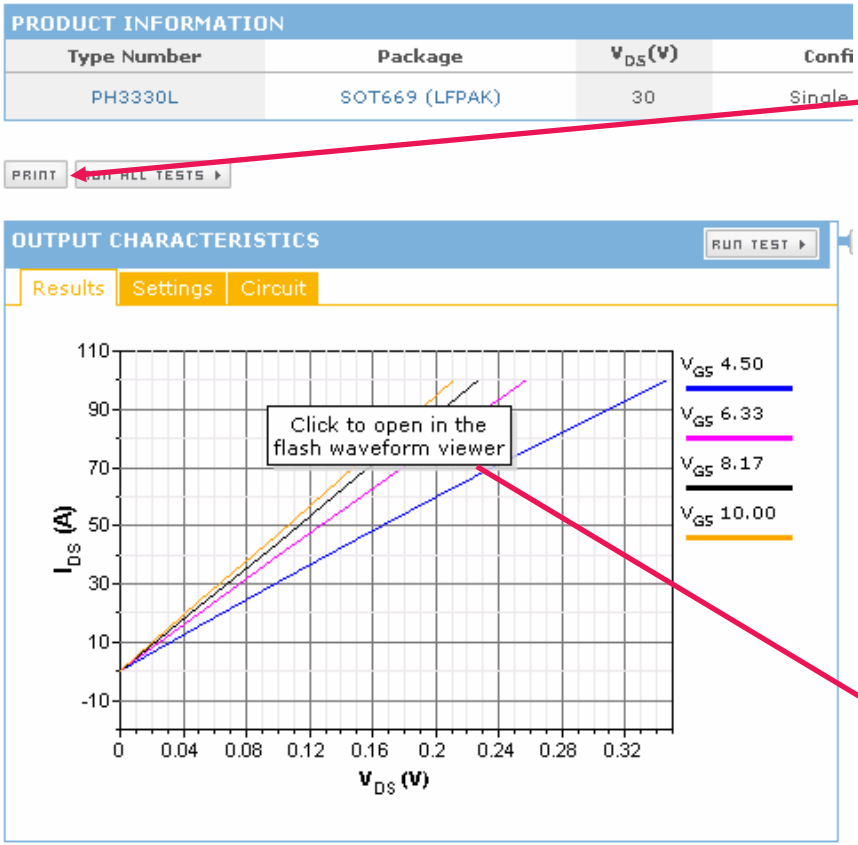
- Details of the selected MOSFET are then displayed, with hyperlinks to the product information page where the product datasheet and other information can be found
- A number measurements can be simulated where the user can change the test conditions
  - Output Characteristics
  - Reverse Output Characteristics
  - $R_{DS(on)}$ vs. V_{GS} and I_{DS}
  - Transfer Characteristics
  - Gate Charge
  - Switching Characteristics
  - Capacitance

Active Datasheet

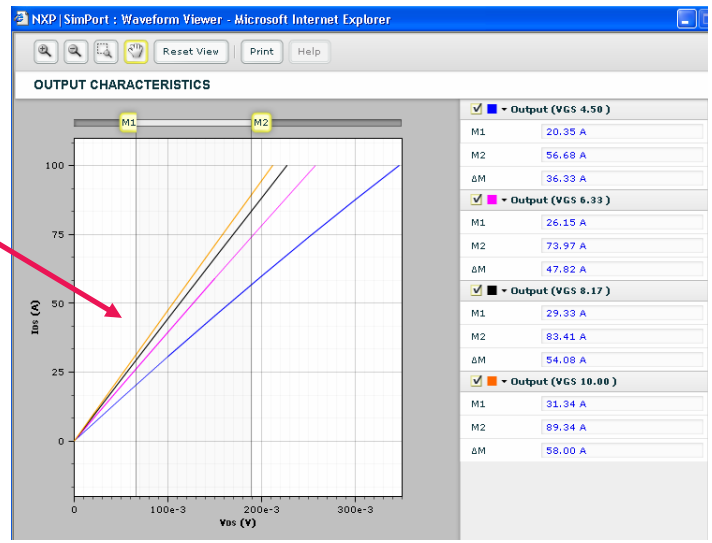


- Individual tests be performed by pressing the “RUN TEST” button
- Alternatively all tests can be run simultaneously by pressing the “RUN ALL TESTS” button.
- Once simulated the results are displayed

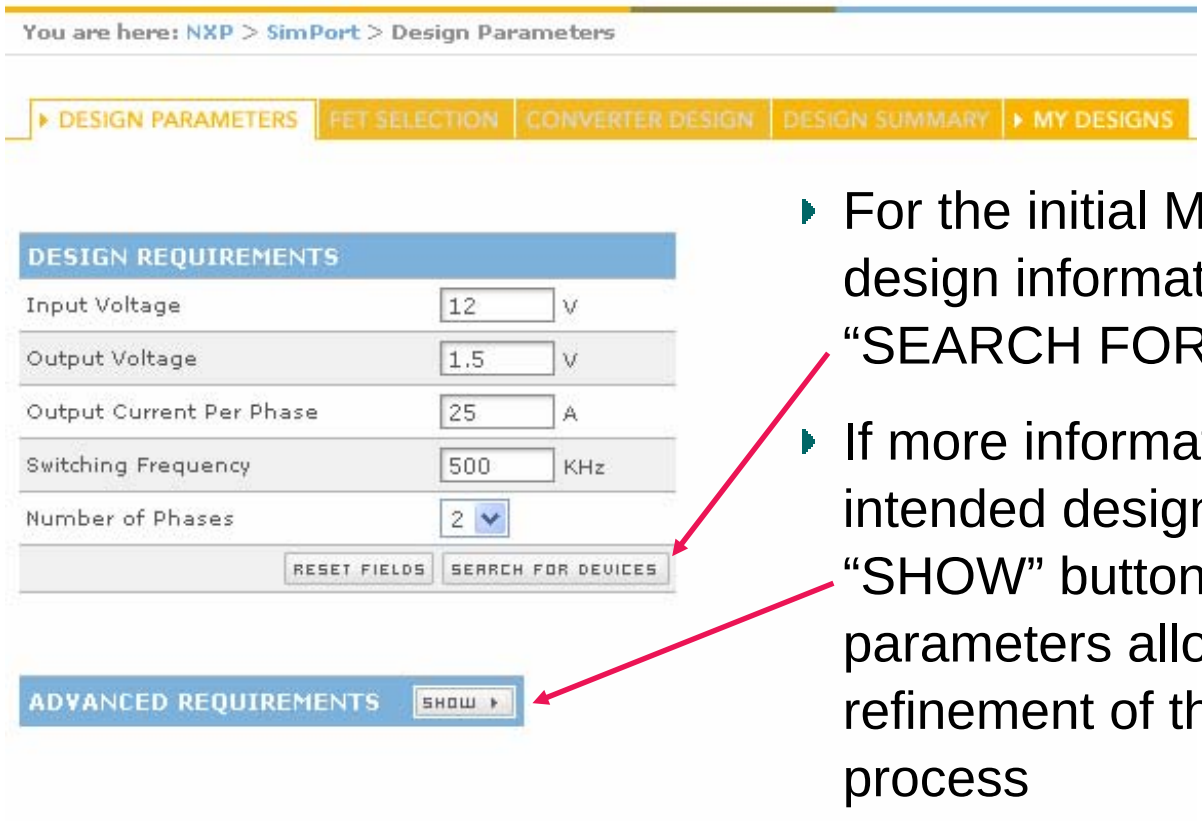
Active Datasheet



- 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



- 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	800	nH	System Parasitic Resistance	2	mΩ	
Parasitic PCB Inductance	3	nH	Max Number of Lower MOSFETs	1	x	
MOSFET Operating Temperature	100	°C	Max Number of Upper Mosfets	1	x	

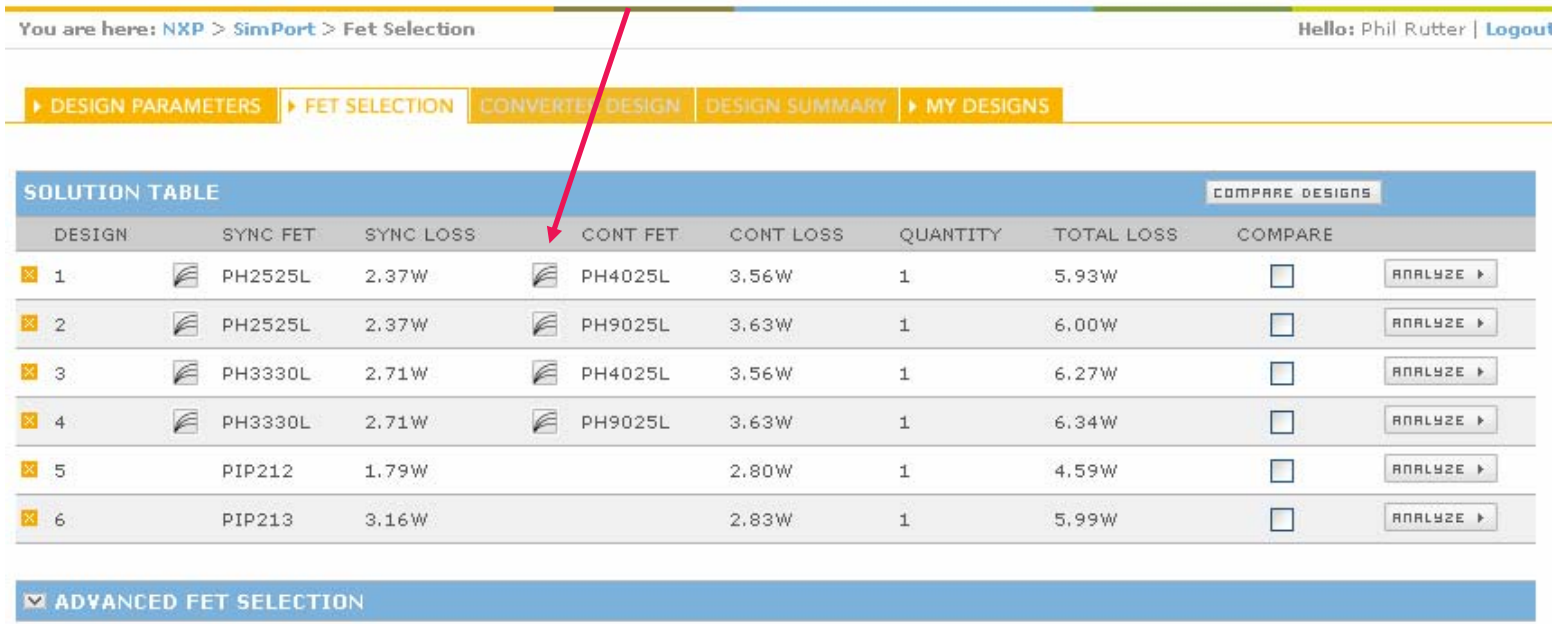
UPPER MOSFET DRIVER			LOWER MOSFET DRIVER		
Voltage	12	V	Voltage	12	V
Turn-On Current	2	A	Turn-On Current	2	A
Turn-Off Current	2	A	Turn-Off Current	2	A
Turn-On Resitance	2	Ω	Turn-On Resitance	2	Ω
Turn-Off Resitance	1	Ω	Turn-Off Resitance	1	Ω

DRIVER DELAY TIME		
Lower FET Off-Upper FET On	30	ns
Upper FET Off-Lower FET On	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

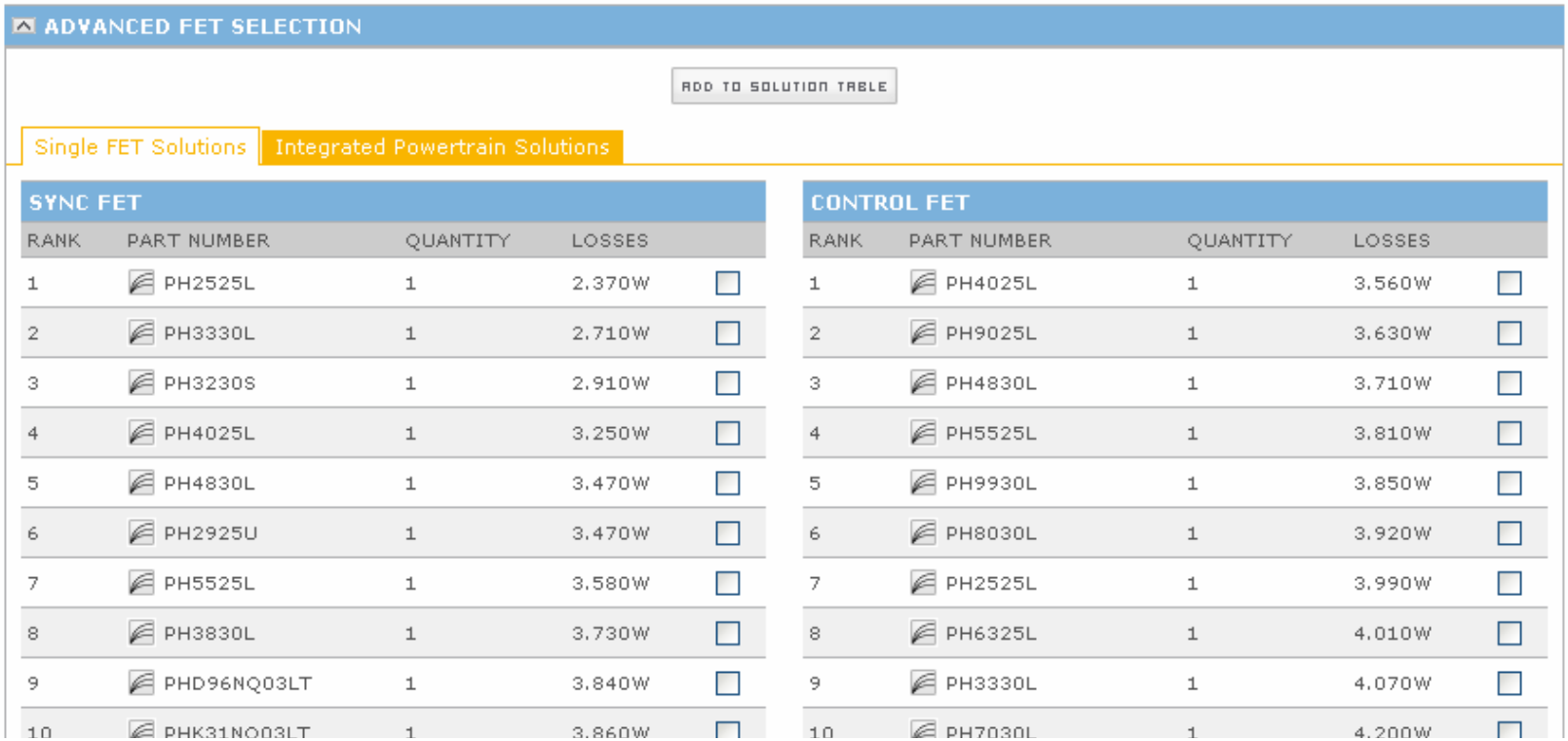
Buck Designer – MOSFET Selection

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



- 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



ADVANCED FET SELECTION

ADD TO SOLUTION TABLE

Single FET Solutions | Integrated Powertrain Solutions

SYNC FET

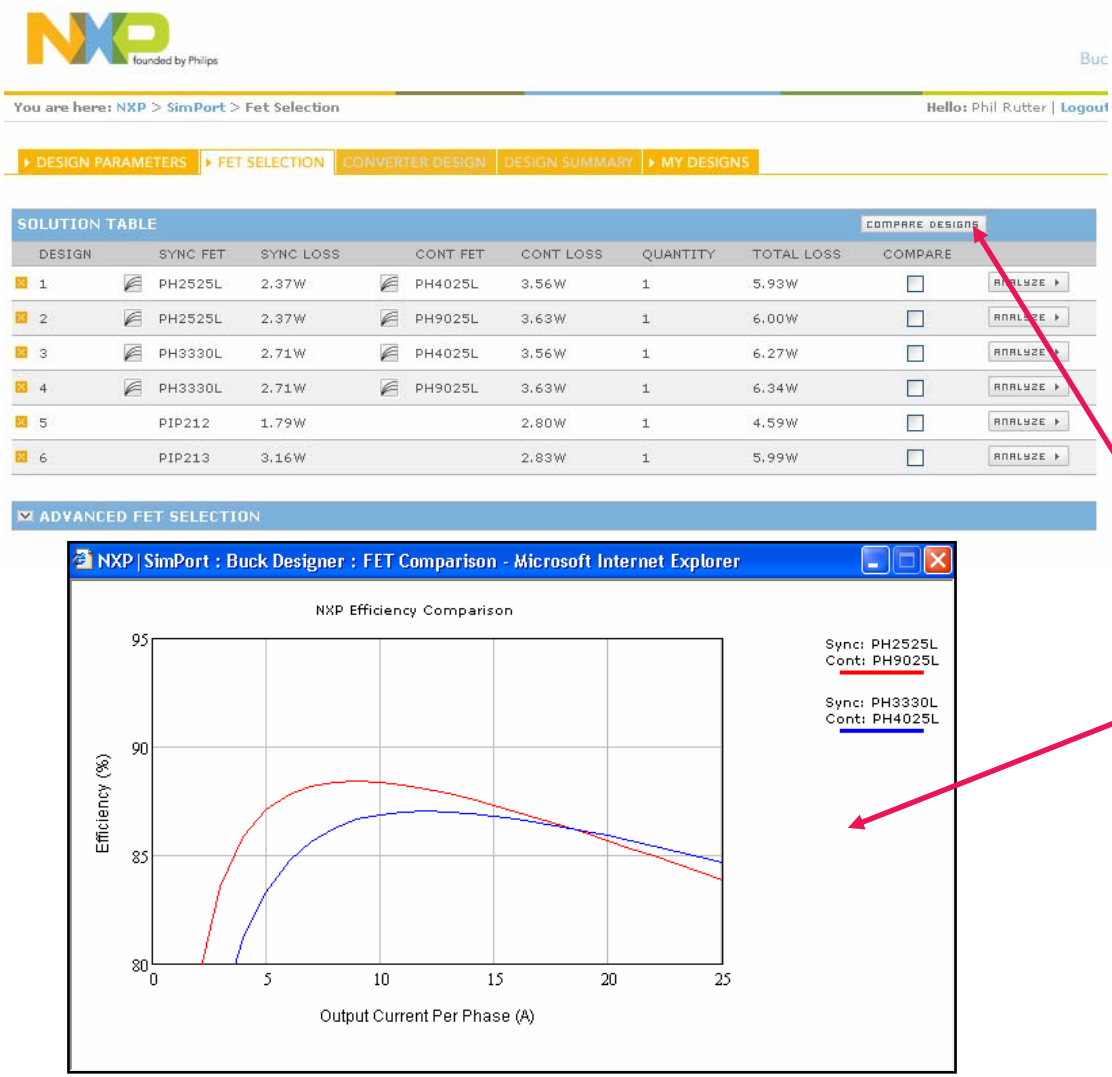
RANK	PART NUMBER	QUANTITY	LOSSES
1	PH2525L	1	2.370W
2	PH3330L	1	2.710W
3	PH3230S	1	2.910W
4	PH4025L	1	3.250W
5	PH4830L	1	3.470W
6	PH2925U	1	3.470W
7	PH5525L	1	3.580W
8	PH3830L	1	3.730W
9	PHD96NQ03LT	1	3.840W
10	PHK31NQ03LT	1	3.860W

CONTROL FET

RANK	PART NUMBER	QUANTITY	LOSSES
1	PH4025L	1	3.560W
2	PH9025L	1	3.630W
3	PH4830L	1	3.710W
4	PH5525L	1	3.810W
5	PH9930L	1	3.850W
6	PH8030L	1	3.920W
7	PH2525L	1	3.990W
8	PH6325L	1	4.010W
9	PH3330L	1	4.070W
10	PH7030L	1	4.200W

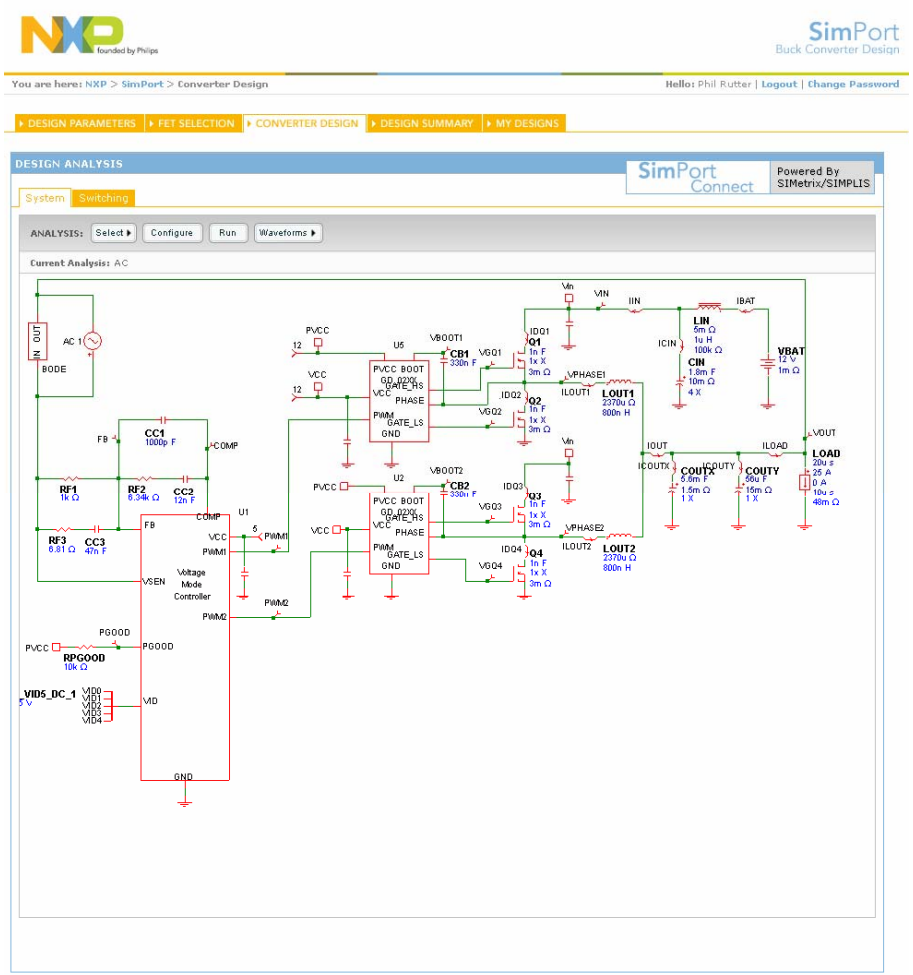
- The full results can be viewed by opening the “ADVANCE FET SOLUTION” section
- To add a pair of MOSFETs to the solution table just select and Sync and Control FET and press the “ADD TO SOLUTION” button

Buck Designer – MOSFET Selection



- To compare two potential solutions over the full output current range, simple 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

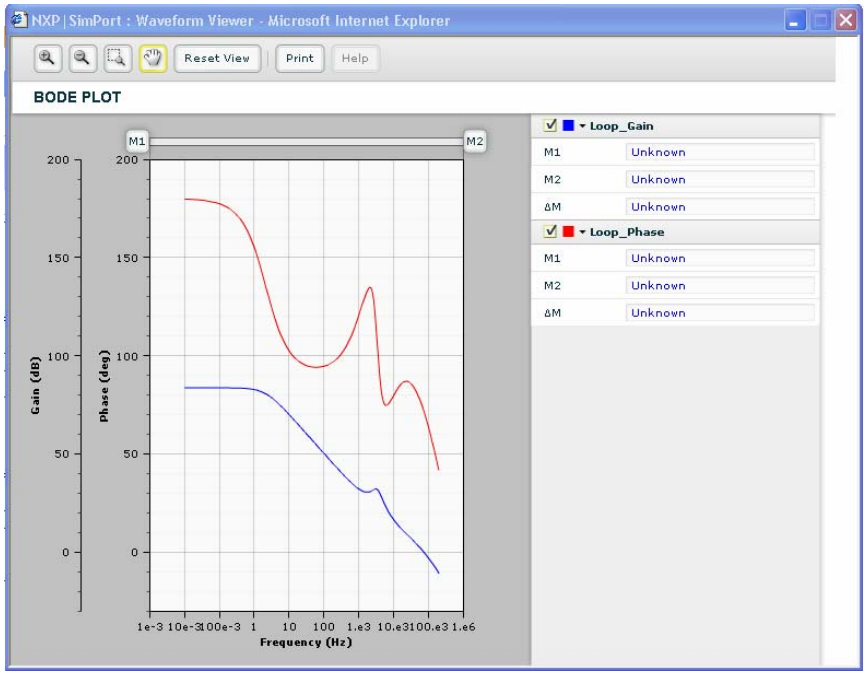
Buck Designer – Converter Design



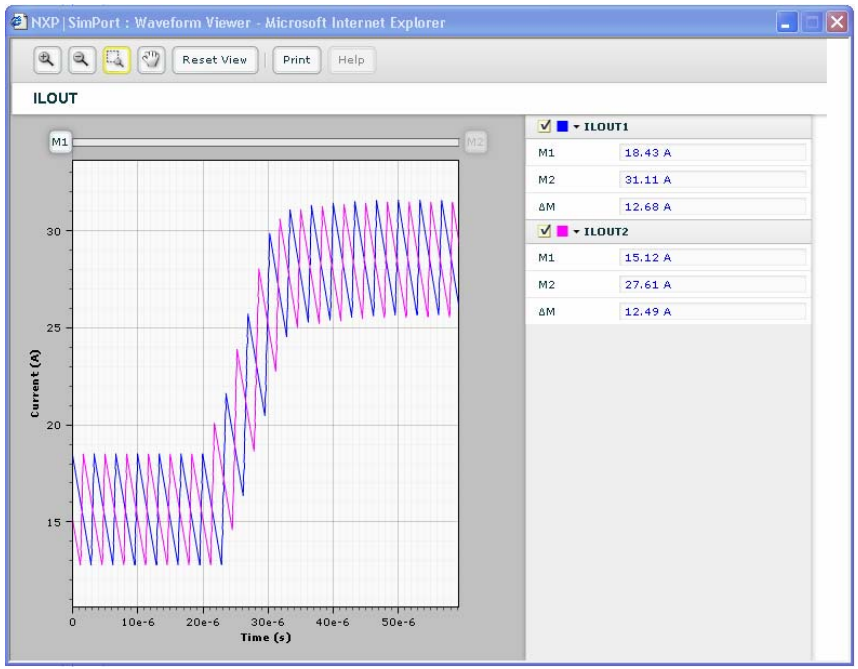
- The “SYSTEM” tab allows for system level simulations to be performed
- The “SELECT” button is used to determine whether an AC or transient response is to be performed
- Individual component values can be changed by clicking on the individual components
  - The output current levels for a load step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

Buck Designer – Converter Design

- Example Outputs from the System Analysis

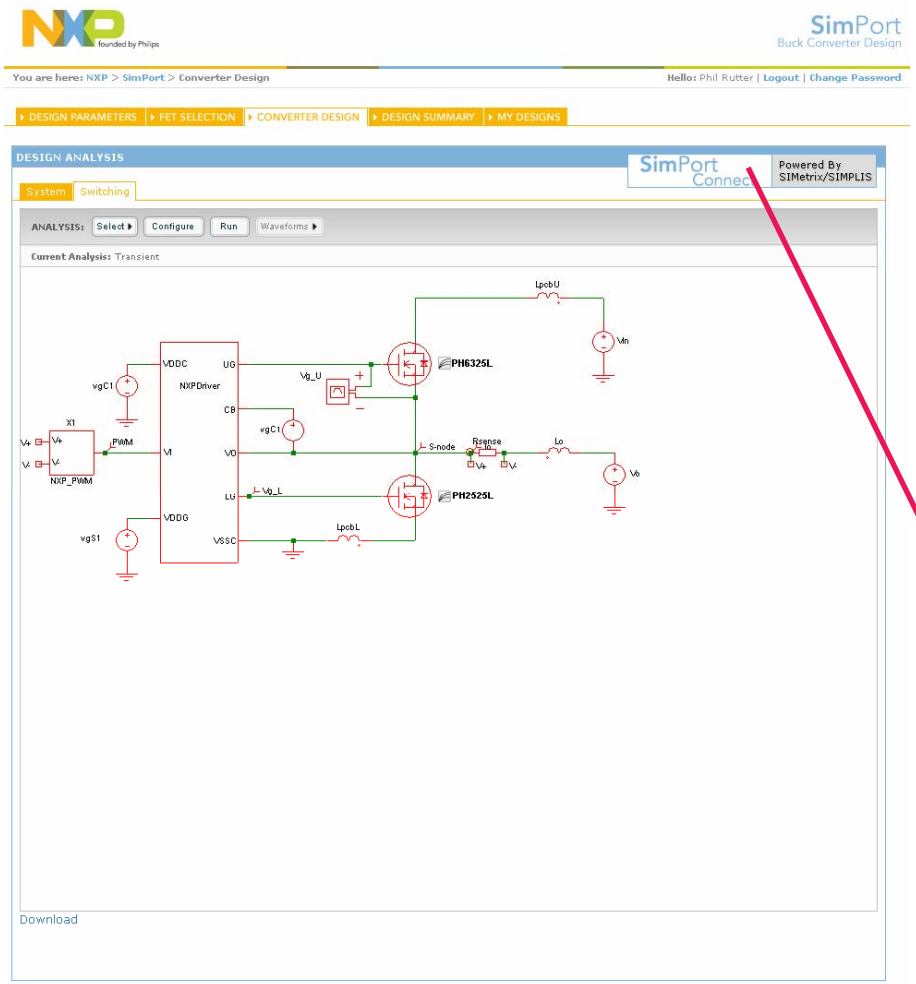


AC Analysis

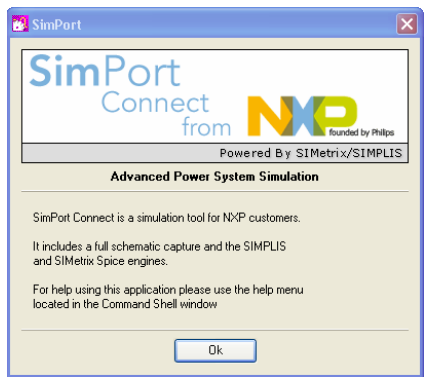


Transient

Buck Designer – Converter Design

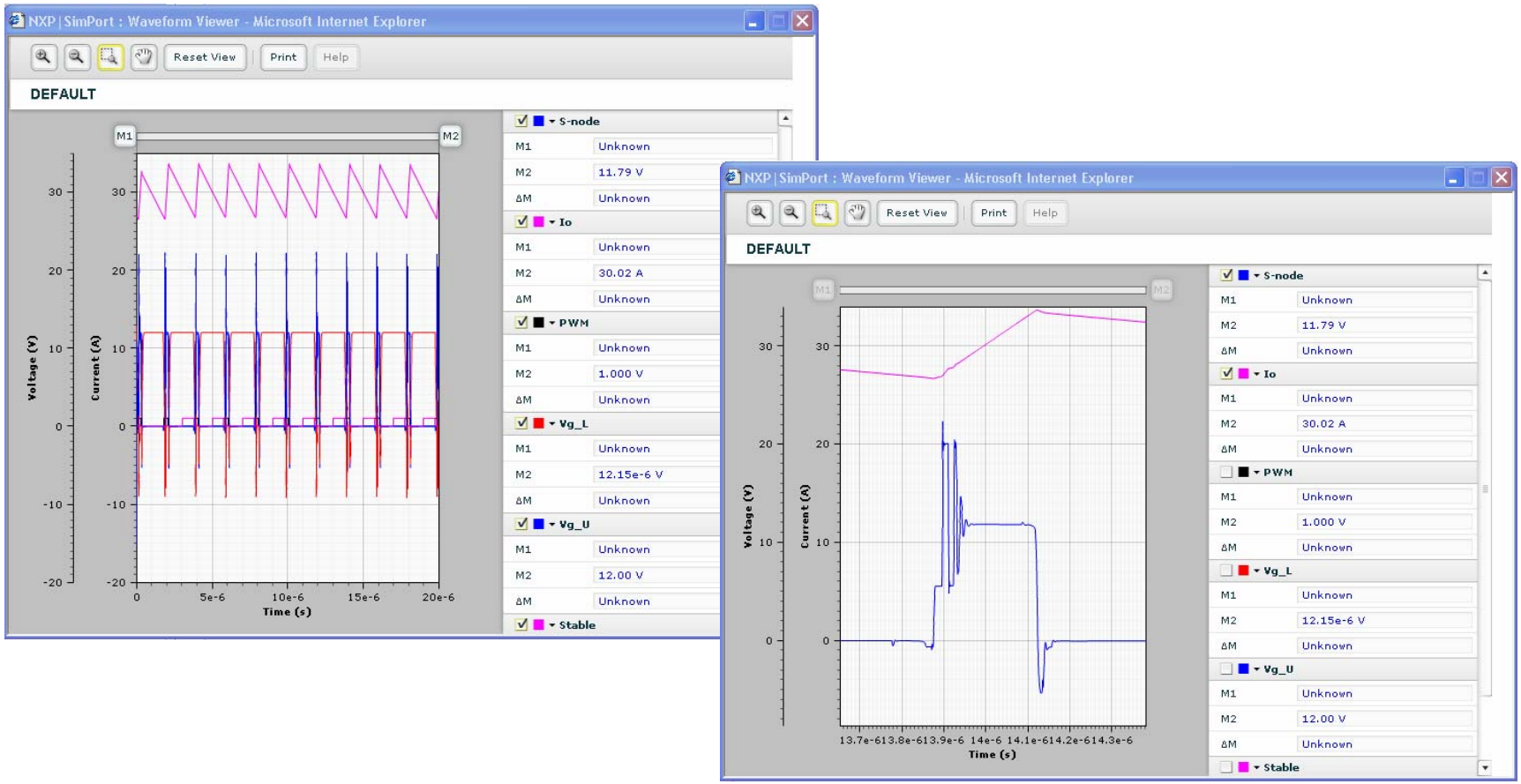


- The “SWITCHING” tab allows for system level simulations to be performed
- For offline simulation a version of the simulator can be downloaded.

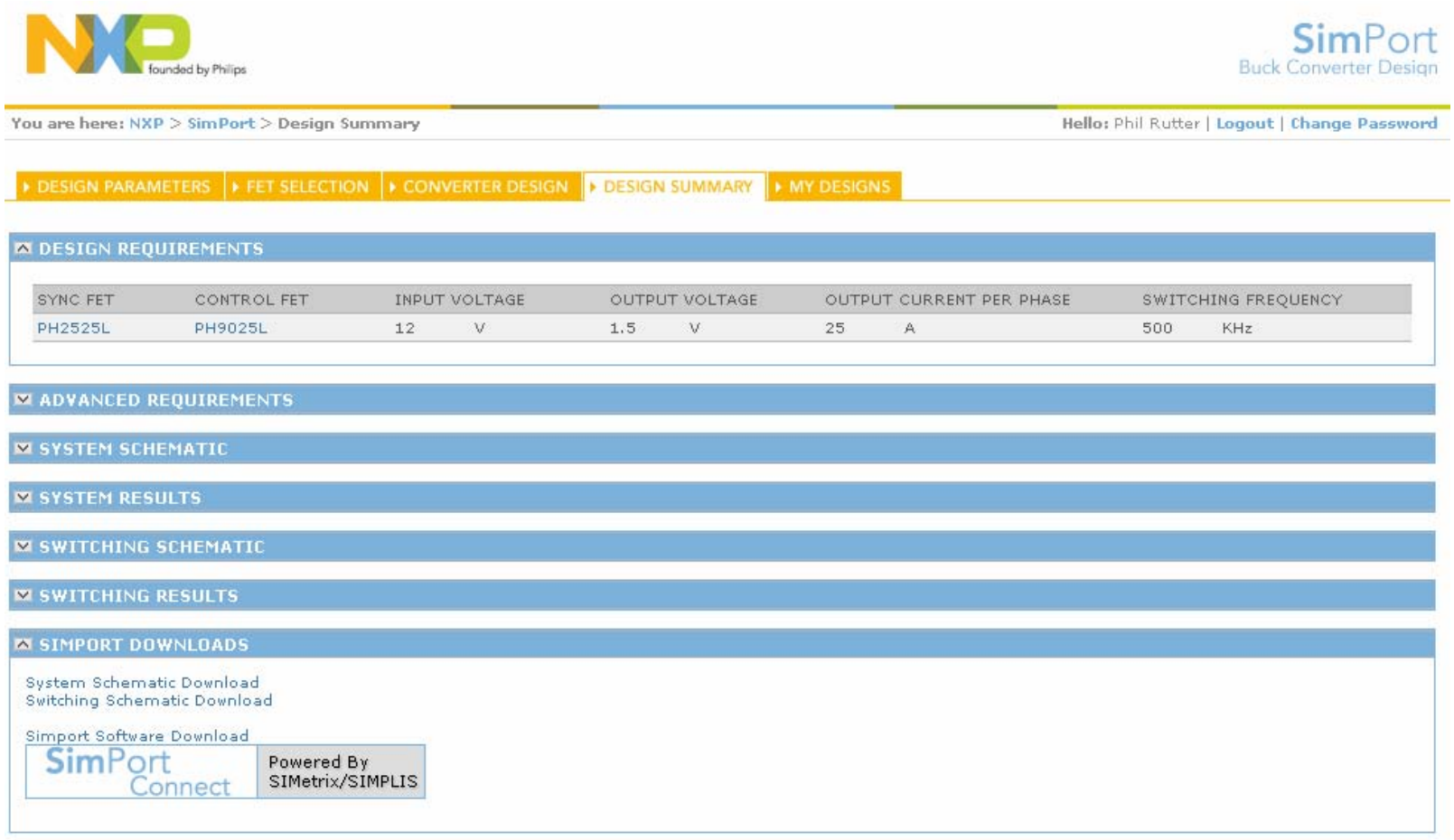


Buck Designer – Converter Design

- Example Outputs from the Switching Analysis



Design Summary



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

Design Summary

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