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Power Device Simulator User's Manual

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1. Introduction

1.1 Overview

Power Device Simulator (tentative name) is a simulator (charge-free) utilizing DC-DC regulator and switching MOSFET manufactured by Panasonic easily on the Web.
Power Device Simulator consists of three simulation tools, **IC Designer** for DC-DC regulator, and **Active Datasheet**, **Buck Analyzer** for MOSFET.
With support for specification verification, operating analysis, creating BOM list, and online purchase, **Power Device Simulator** alleviates customers' burden for product selection.

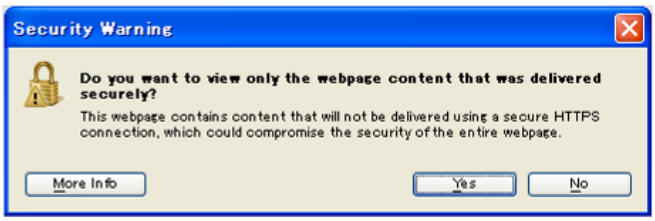
1.2 Hardware Requirements and Support

- **Power Device Simulator** supports for Japanese and English
- Following hardware requirements are recommended. Please confirm them beforehand, otherwise the abnormal operation or the unexpected error may occur depending on customers' environment.
  OS: Windows 7, Windows Vista, Windows XP, Mac OS X
  Browser: Internet Explorer 9, Google Chrome 23, Firefox 16.0.2 and their previous versions
- If you have questions regarding **Power Device Simulator** besides errors in operation etc., please call our sales representatives or visit following Website.

Semiconductor Business Unit, Industrial Devices Company, Panasonic Corporation
URL: http://www.semicon.panasonic.co.jp/en/

1.3 Usage Note

- If Security Warning is displayed when using Internet Explorer (IE), click **No (N)** button.



- Though simulation results of **Power Device Simulator** are verified consistency with observation results using our evaluation board, they may be different from actual results due to the difference of boards, mounting conditions, evaluation environments, etc.
- If this simulator is left for 30 minutes without operation, "Timeout Error" occurs and re-login is needed.
- Specifications on this site are subject to change without prior notice.
- We may not meet your request for sample purchases from this site due to changes in inventory status of products at each distributor.

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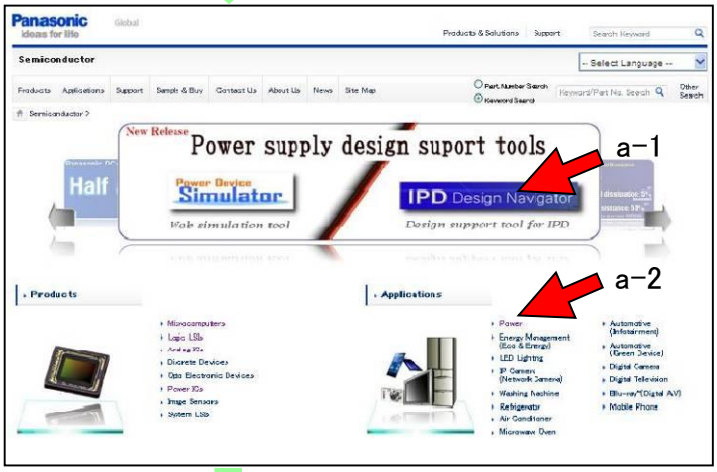
2. How to Access

Visit **Panasonic Power Solution** site by using either one of following methods.

a. From **Panasonic Semiconductors** site

Panasonic Semiconductor Search

http://www.semicon.panasonic.co.jp/en/

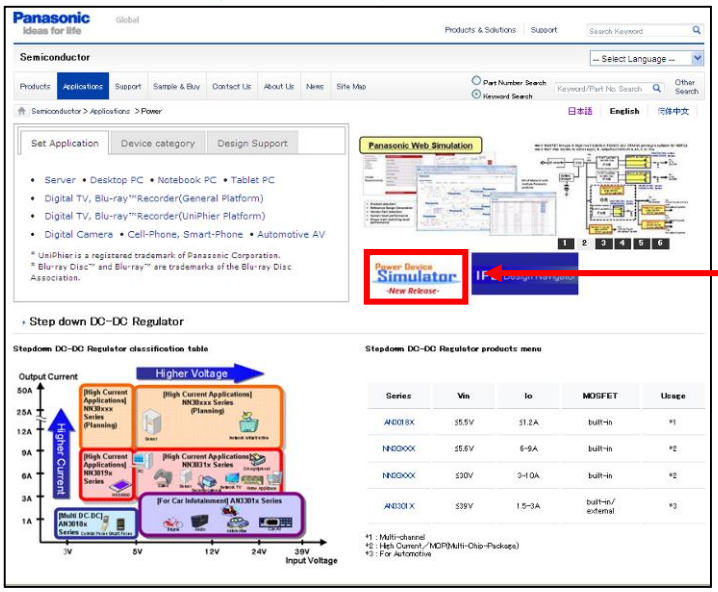


a-1. Click **Power supply design support tools** in rolling banners.

a-2. Click **Power** in **Applications** menu.

http://www.semicon.panasonic.co.jp/en/applications/power/

b. With direct input for URL.



Click this banner linked to **Power Device Simulator** site.

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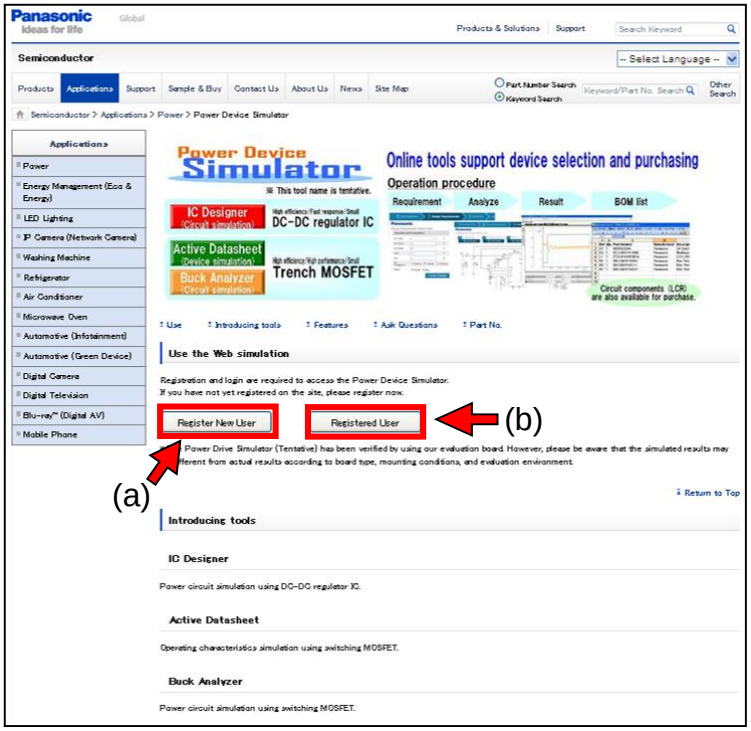
3. Login Step

3.1 Select "Register New User"/"Registered User"

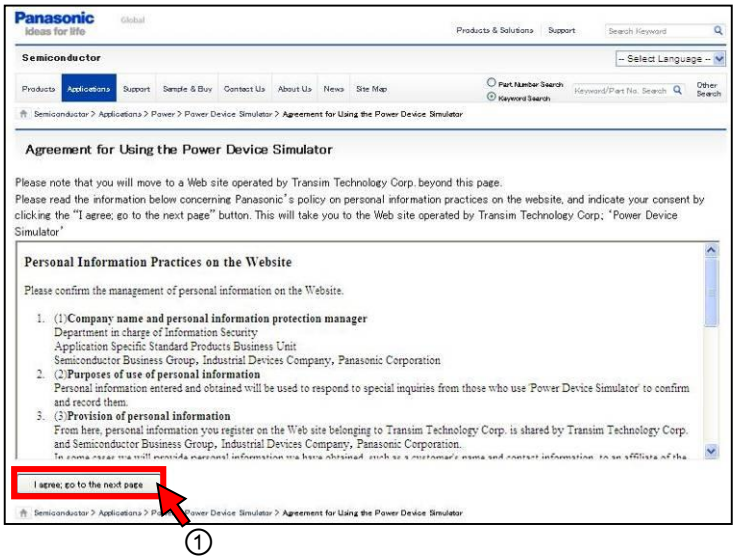


Follow the following steps.

(a) For new users, click **Register New User** button for **Account Registration**.

(b) For registered users, click **Registered User** button.

3.2 Agreement for Personal Information Practice



① Read **Personal Information Practice on the Website** completely. If you agree with it, click **I agree; go to the next page** button. This tool becomes available.

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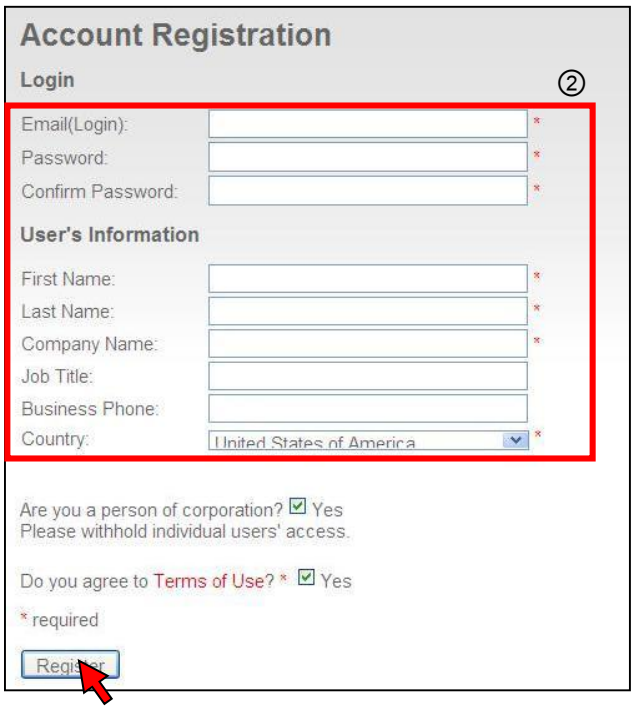
3.3 Account Registration



② Enter your email address, password, name, company name, country, etc. Click **Register** button with **Terms of Use** checked.

3.4 Login

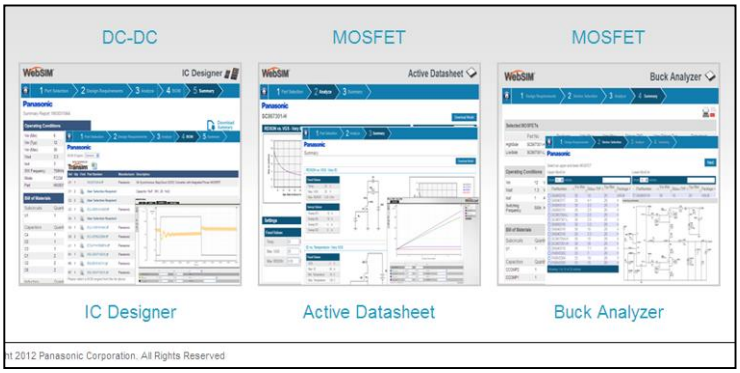
For registered users, **Login** window is displayed.

③ Enter your email address and password. Click **Login** button.

* If you click **Login** button with **Remember me** checked, you don't need to enter them from next time.

* If you forget your password, click **Forgot password** button. Your password is sent to your email address.

3.5 Tool Menu



Tool menu is displayed after login. Select the simulation tool you use.

IC Designer
Power supply circuit simulation using DC-DC regulator

Active Datasheet
Device simulation using MOSFET

Buck Analyzer
Power supply circuit simulation using MOSFET

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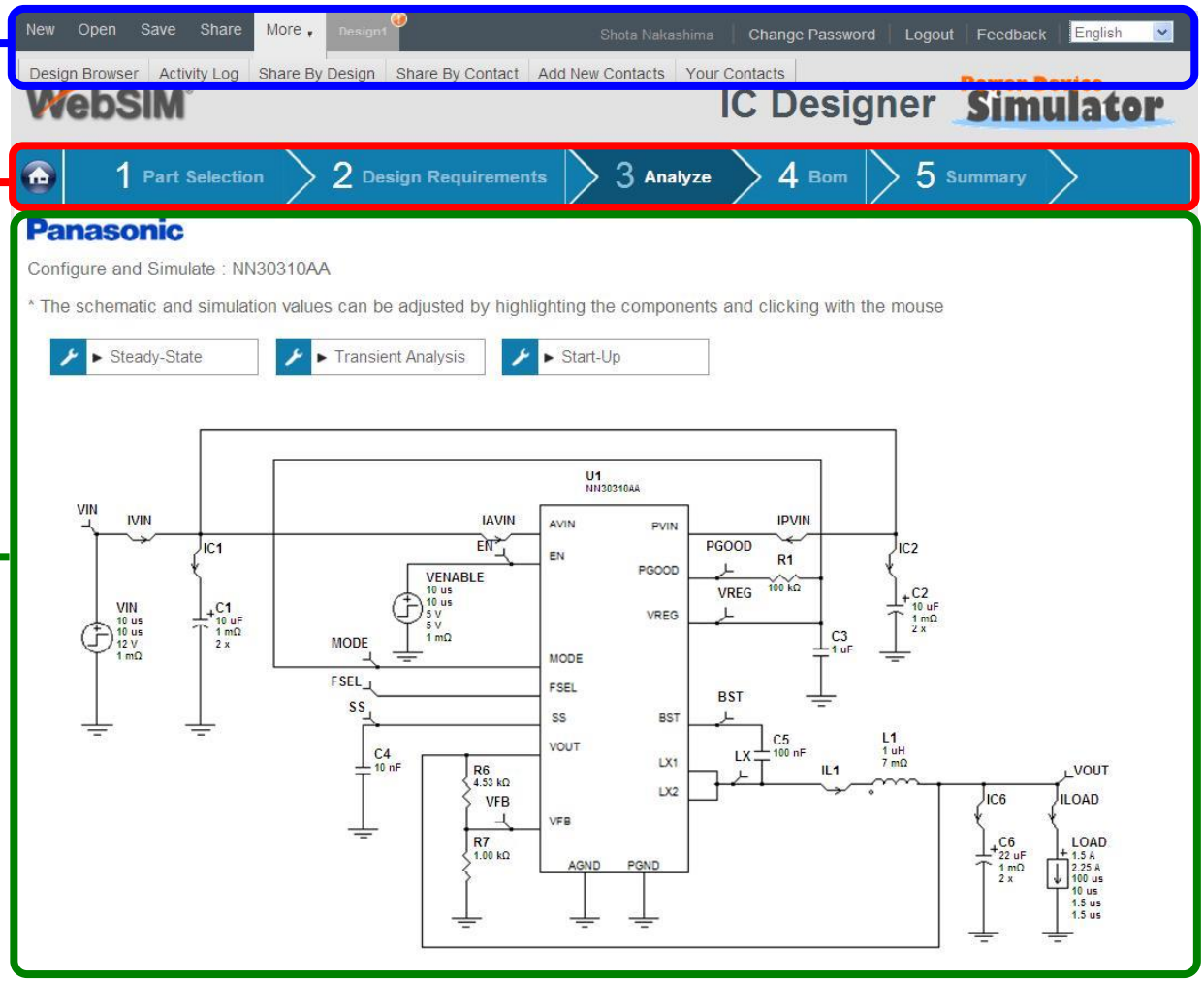
4. Description for Basic Functions



Data Management Function
* Select supported language (Japanese/English) with pull-down menu in the right corner.
New: Create new data, **Open**: Open saved data, **Save**: Save data,
Share: Send data to designated destination, **More**: History, Delete data, etc.

Tool Flow (Example: IC Designer)
1. Part Selection → 2. Design Requirements → 3. Analyze → 4. Bom → 5. Summary

Input/Result Display
Specification input, analysis, constant value change, simulation result display, etc.

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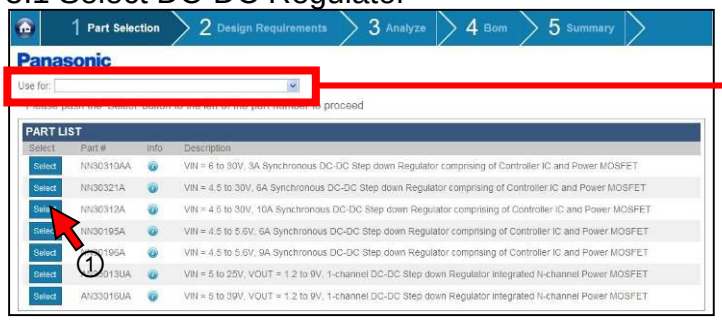
5. How to use IC Designer

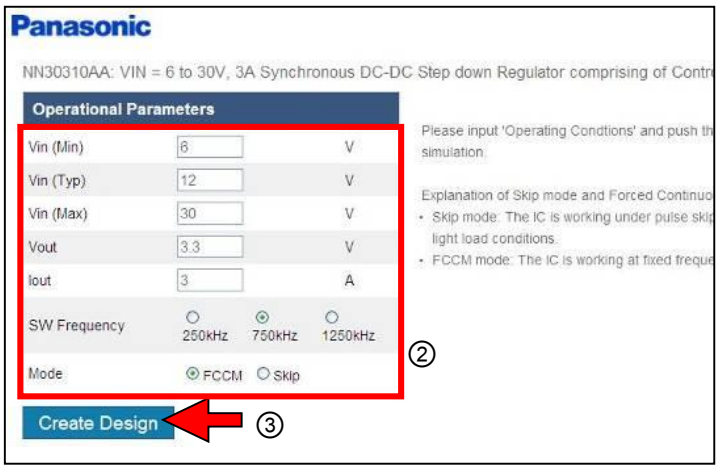
5.1 Select DC-DC Regulator



Select the application you intend to use for.

① Select the DC-DC regulator.
Click **Select** button on the left of **Part** #.
* To download datasheets, click **Info** button.

5.2 Enter Operational Parameters



② Enter Operational Parameters (Vin, Vout, Iout(*), SW Frequency, Mode).

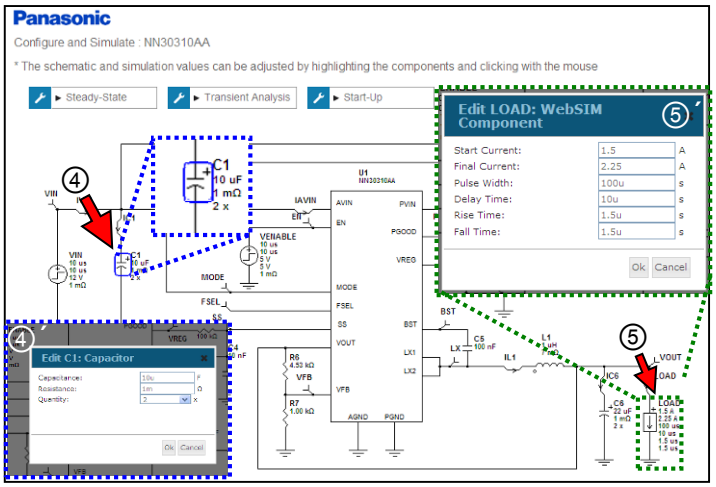
* Input the maximum value to Iout.
In the operating analysis simulation, the load current is assumed as 50% to 75% (RMS) of Iout.
(For more information, see Section 5.3.1, “Constant Value Change.”)

③ Click **Create Design** button to display a recommended circuit.

Description for Operation Mode
- Skip mode: Efficiency improvement mode with light load
- FCCM mode: Forced continuous mode with frequency fixed.

5.3 Constant Value Change/Operating Analysis

5.3.1 Constant Value Change



Following analyses are available.
- **Steady-State/Transient Analysis/Start-Up**

* Frequency analysis is also available for AN33XXX series.

④ Constant values of components can be changed with pop-up window (④´) displayed by clicking each component figure.

⑤ The Start Current and Final Current of [LOAD] refer to the load current (ILOAD) in each operating analysis.

【Initial setting values of ILOAD】
Start Current: Iout x 50%
Final Current: Iout x 75%

To change parameters, click [LOAD] on the circuit diagram. (⑤´)

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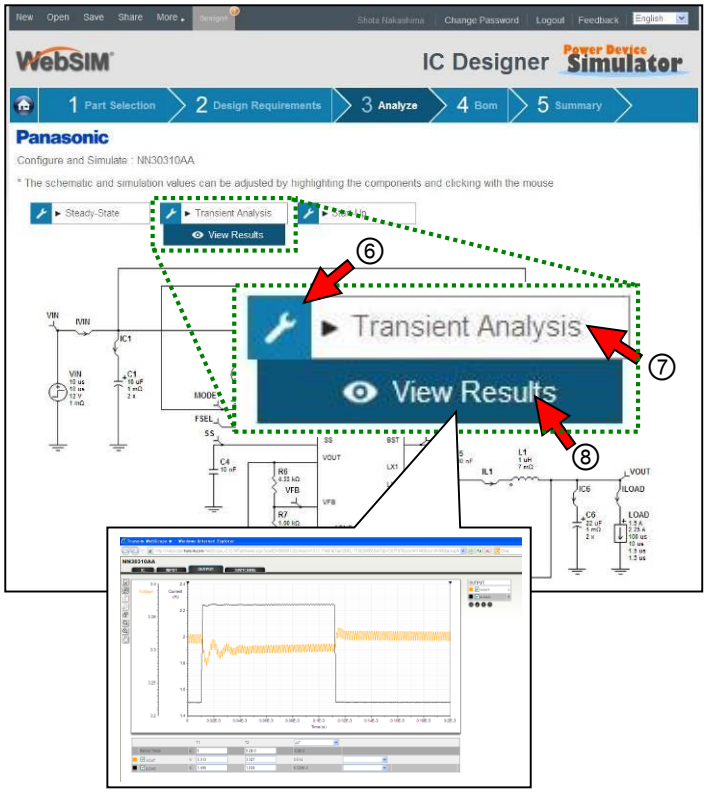
5.3.2 Steady-State/Transient Analysis/Start-Up

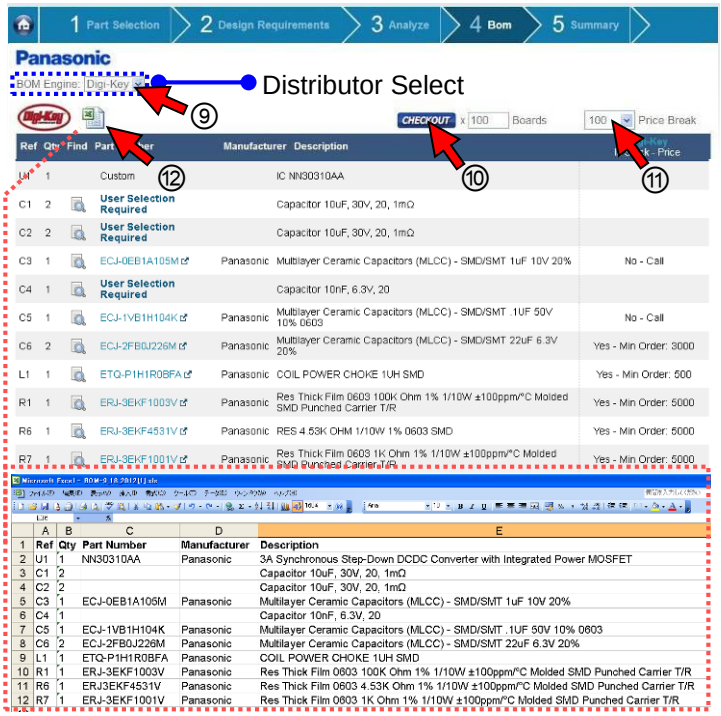


⑥ Change Simulation Stop Time.
- **Transient Analysis**: 200 µs (default)
- **Start-Up**: 4 ms (default)

⑦ Start **Transient Analysis**.

⑧ View simulation results with dedicated viewer.

5.4 Bom List/Online Purchase



	A	B	C	D	E
1	Ref	Qty	Part Number	Manufacturer	Description
2	U1	1	NN30310AA	Panasonic	3A Synchronous Step-Down DCDC Converter with Integrated Power MOSFET
3	C1	2			Capacitor 10uF, 30V, 20, 1mΩ
4	C2	2			Capacitor 10uF, 30V, 20, 1mΩ
5	C3	1	ECJ-0EB1A105M	Panasonic	Multilayer Ceramic Capacitors (MLCC) - SMD/SMT 1uF 10V 20%
6	C4	1			Capacitor 10nF, 6.3V, 20
7	C5	1	ECJ-1VB1H104K	Panasonic	Multilayer Ceramic Capacitors (MLCC) - SMD/SMT .1UF 50V 10% 0603
8	C6	2	ECJ-2FB0J226M	Panasonic	Multilayer Ceramic Capacitors (MLCC) - SMD/SMT 22uF 6.3V 20%
9	L1	1	ETQ-P1H1R0BFA	Panasonic	COIL POWER CHOKE 1UH SMD
10	R1	1	ERJ-3EKF1003V	Panasonic	Res Thick Film 0603 100K Ohm 1% 1/10W ±100ppm/°C Molded SMD Punched Carrier T/R
11	R6	1	ERJ3EKF4531V	Panasonic	Res Thick Film 0603 4.53K Ohm 1% 1/10W ±100ppm/°C Molded SMD Punched Carrier T/R
12	R7	1	ERJ-3EKF1001V	Panasonic	Res Thick Film 0603 1K Ohm 1% 1/10W ±100ppm/°C Molded SMD Punched Carrier T/R

⑨ Select the distributor with pull-down menu.

* Please note that online purchase for semiconductor products (DC-DC regulator, MOSFET) is not available now.

⑩ Click **CHECKOUT** button to display inventory status of products.

⑪ When setting quantity for lump-sum purchase, the unit prices are displayed (**Price Break**).

⑫ Download BOM list (Excel format).

* Online purchase for DC-DC regulator will be available after the beginning of February, 2013. (Online purchase for passive components is available now.)

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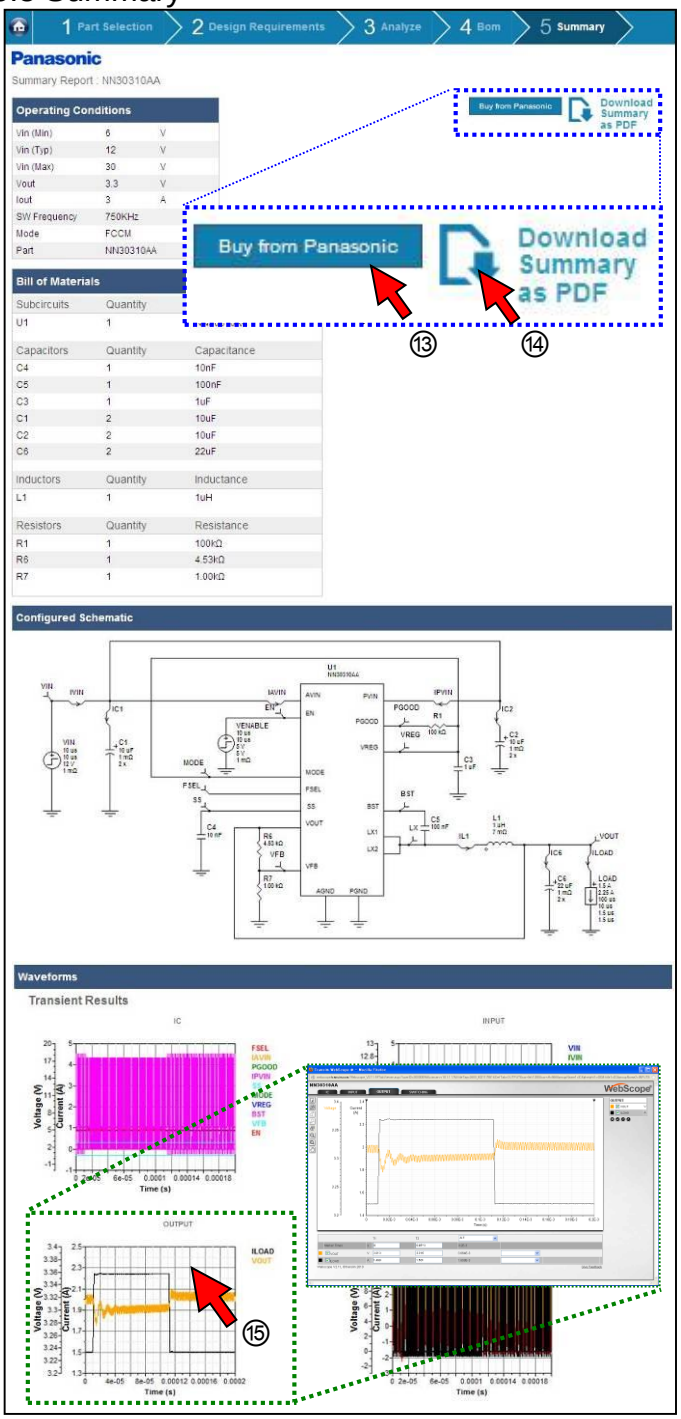
5.5 Summary



⑬ Go to **Sample & Buy** site.
* Dedicated online purchase site for semiconductors

*** Sample & Buy** site will be closed after sales system by distributors is prepared.

⑭ Download the **Summary** (**Operating Conditions, Bill of Materials, Configured Schematic, Waveforms**) as PDF.
* To open PDF, **Acrobat Reader** should be installed.

⑮ When clicking the graph area, dedicated viewer opens. You can view details of the graph with zoom function, etc.

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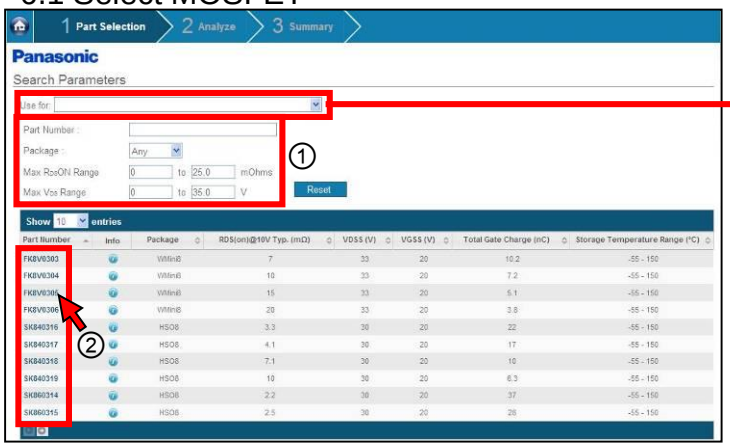
6. How to Use Active Datasheet

6.1 Select MOSFET



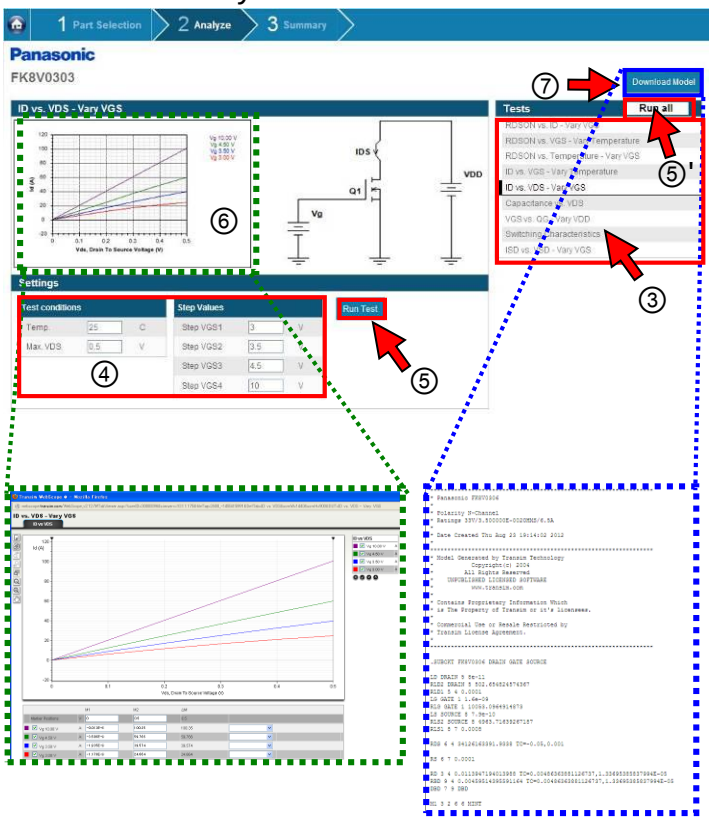
Verify the characteristics of single MOSFET.
You can evaluate with the test circuit described in the datasheet at customers' operating condition.

Select the application you intend to use for.

① Enter Search Parameters for MOSFETs.
Appropriate products are listed.

② Select the desired product.
Click **Part Number** of the desired product.

6.2 Various Analysis



③ Click the test item.

④ Enter **Test conditions** and **Step Values**.

⑤ Click **Run Test** button to start simulation.
(Click **Run all** button (⑤') to start all simulations.)

⑥ When clicking the graph area, dedicated viewer opens. You can view details of the graph with zoom function, etc.

⑦ Click **Download Model** to download SPICE data (lib format).

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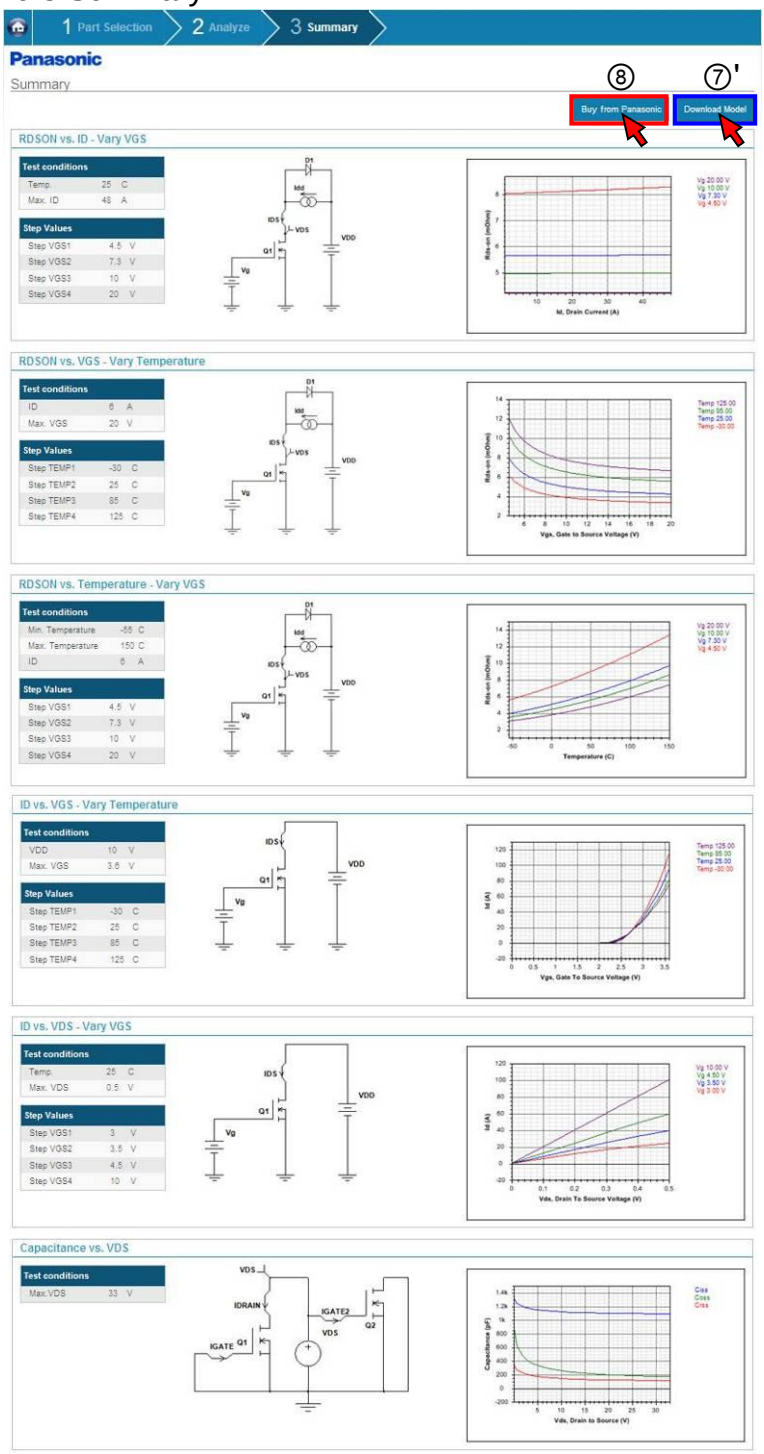
6.3 Summary



Summary is displayed as operating results of this tool.

⑧ Go to **Sample & Buy** site.
* Dedicated online purchase site for semiconductors

*** Sample & Buy** site will be closed after sales system by distributors is prepared.

⑦' Click **Download Model** to download SPICE data (lib format).

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7. How to Use Buck Analyzer

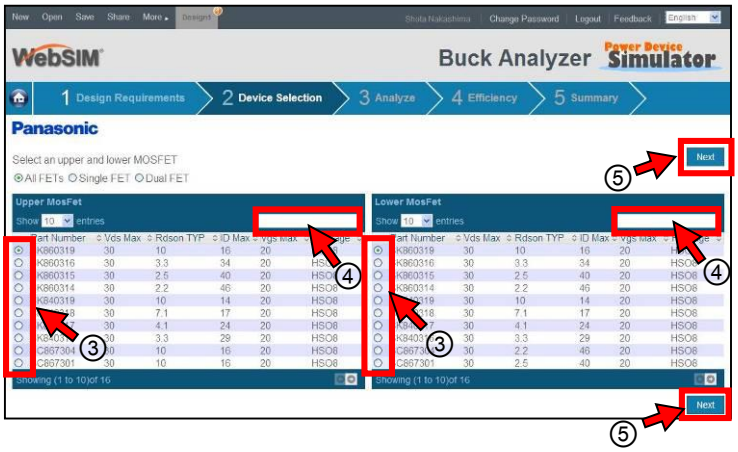
7.1 Enter Operational Parameters

Select the application you intend to use for.

① Enter **Operational Parameters** (Vin, Vout, Iout).

② Click **Select MOSFETs** button to go to **Select MOSFET** window.

7.2 Select MOSFET

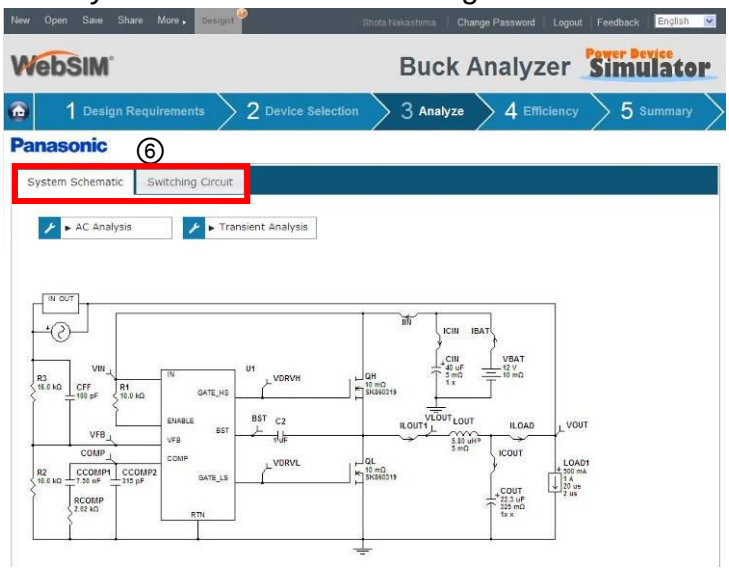


③ Select **Part Number** of **Upper/Lower MOSFETs** from parts list. Search refinement for single or dual products is also available.

④ Prefix search of part number is enabled.

⑤ Click **Next** to go to **Analyze** window.

7.3 System Schematic/Switching Circuit



Following analyses are available.

- **AC Analysis** (**System Schematic** only)
- **Transient Analysis**

* Whole-circuit loop gain characteristics can be simulated in **System Schematic** mode. Switching characteristics including parasitic impedance of the board can be simulated in **Switching Circuit** mode.

⑥ Click this tab menu to select the analysis for **System Schematic/Switching Circuit**.

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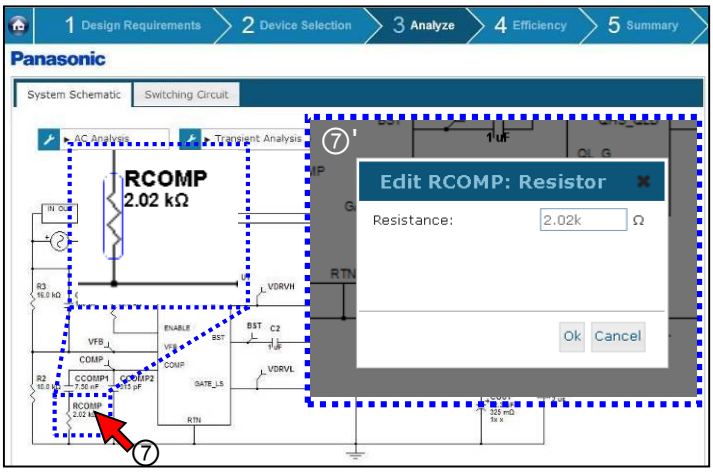
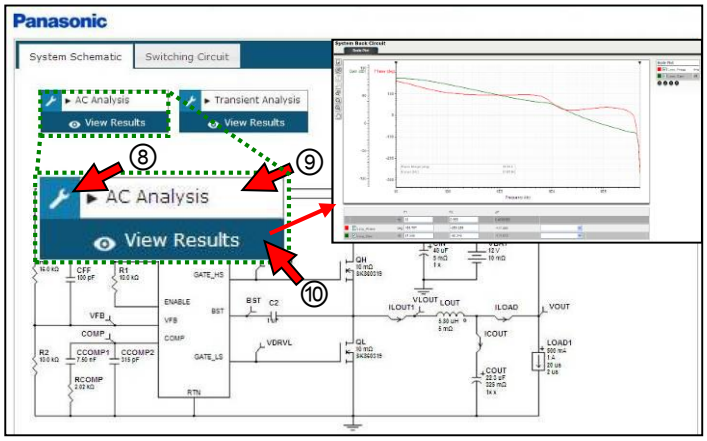
7.3.1 System Schematic

7.3.1.1 Constant Value Change



⑦ Constant values of components can be changed with pop-up window (⑦') displayed by clicking each component figure.

7.3.1.2 AC Analysis/Transient Analysis



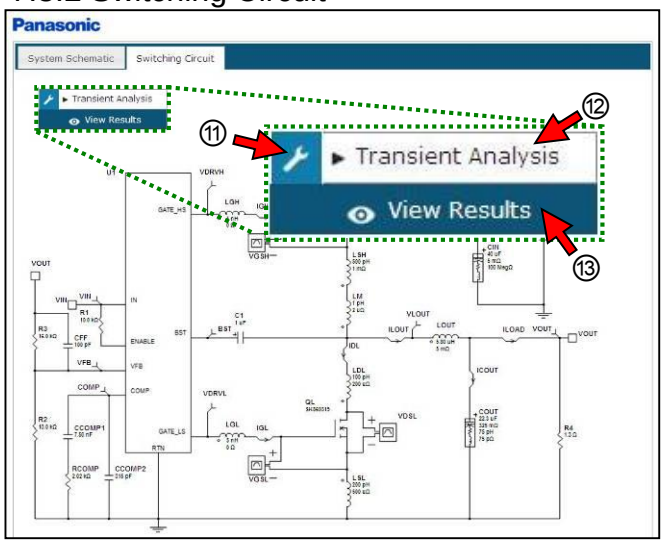
In **System Schematic** mode, whole-circuit loop gain and transient characteristics can be simulated.

⑧ Change following default values.
AC Analysis: Start Frequency 10 Hz
Stop Frequency 500 kHz
Transient Analysis:
Simulation Stop Time 100 µs

⑨Start **AC Analysis**.

⑩View the simulation result with dedicated viewer.

7.3.2 Switching Circuit



In **Switching Circuit** mode, load response characteristics by power supply circuit switching operation including parasitic impedance of the board can be simulated.

To change constant values of components, refer to "7.3.1.1".

⑪ Change following default value.
Transient Analysis:
Simulation Stop Time 250 µs

⑫ Start **AC Analysis**.

⑬ View the simulation results with dedicated viewer.

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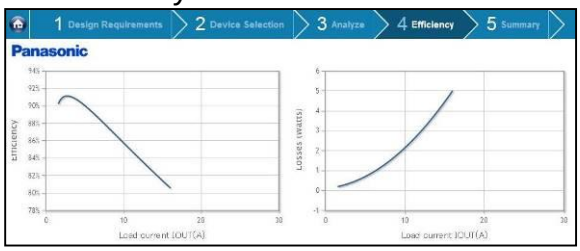
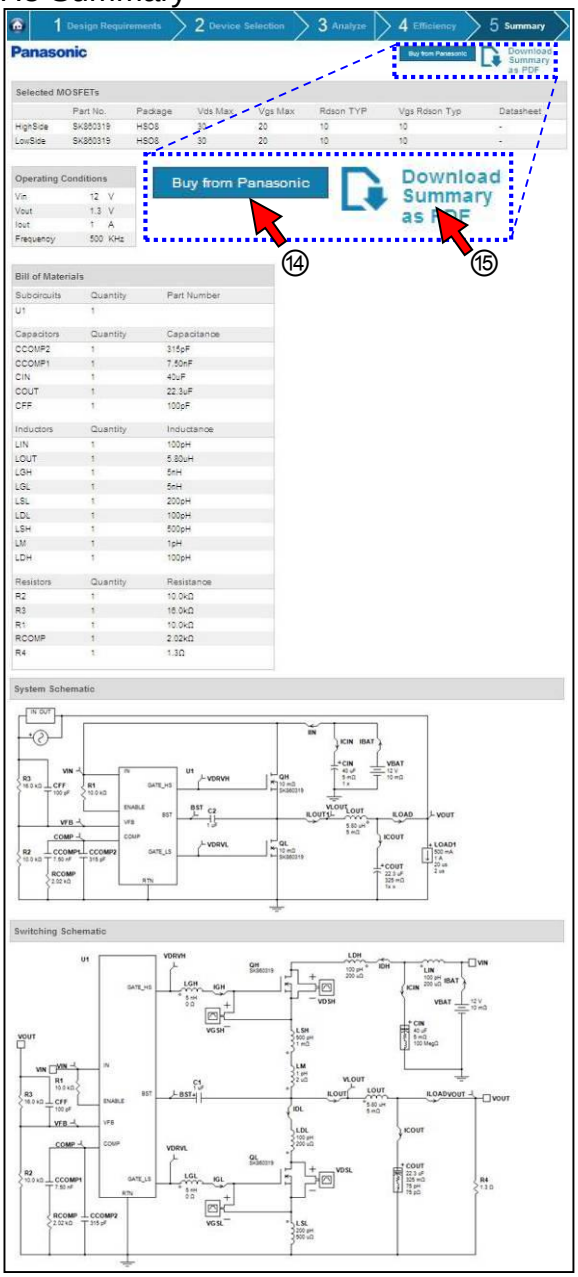
7.4 Efficiency/Loss Curves



Efficiency and Loss Curves of the designed circuit is displayed.

* Please note that parasitic impedance or losses due to the jitter of switching waveform, which really exist, are not taken into consideration in this efficiency calculation.

7.5 Summary



⑭ Go to **Sample & Buy** site.
* Dedicated online purchase site for semiconductors

* **Sample & Buy** site will be closed after sales system by distributors is prepared.

⑮ Download the **Summary** (**Operating Conditions, Bill of Materials, Configured Schematic, Waveforms**) as PDF.
* To open PDF, **Acrobat Reader** should be installed.

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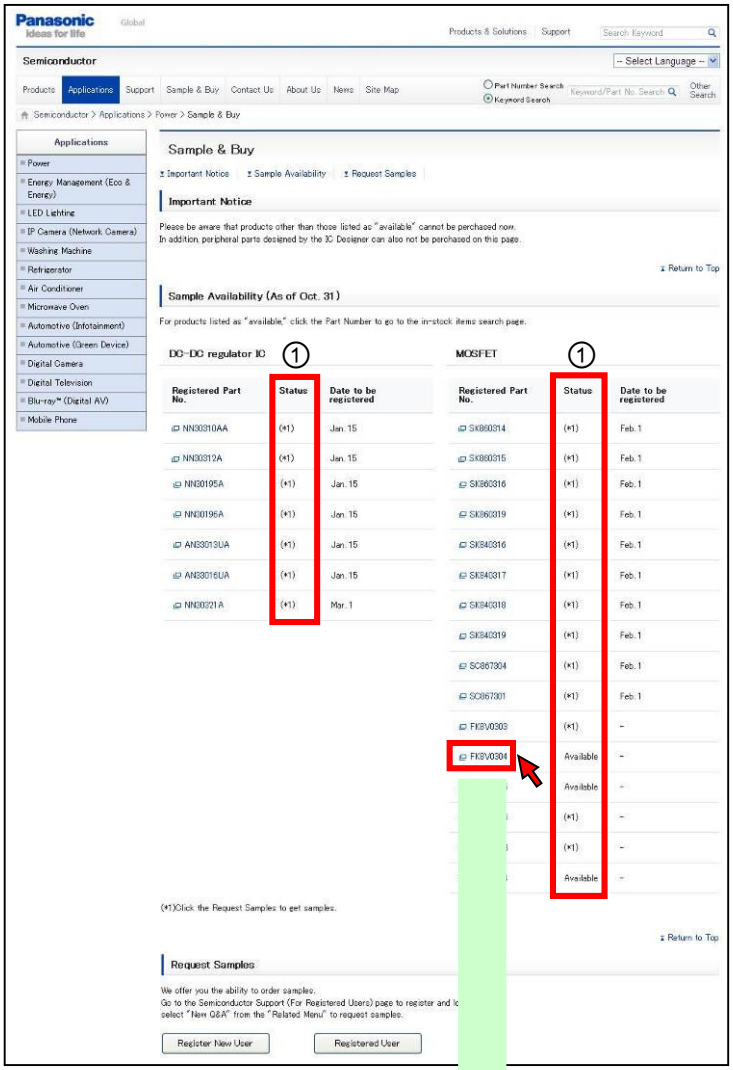
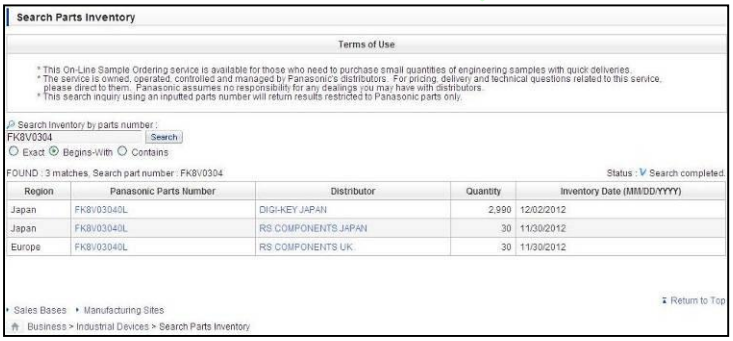
8. Inquiry for Sample

(Until the Beginning of February, 2013)

8.1 Registered Products





This is dedicated online purchase site for semiconductors.

*** Sample & Buy** site will be closed after sales system by distributors is prepared.

① Check the **Status** of products.

If the **Status** of the product is "Available", sample purchase from the distributor authorized by Panasonic is available.
Click **Registered Part No.** to go to **Search Parts Inventory** site.

If the **Status** of the product is not "Available", see the following page, "8.2 Unregistered Product".

Sample purchases from listed distributors are available.
Click the **Panasonic Parts Number** corresponding to the desired distributor to go to online purchase site.
(Quantity of samples for dealing varies according to distributors.)

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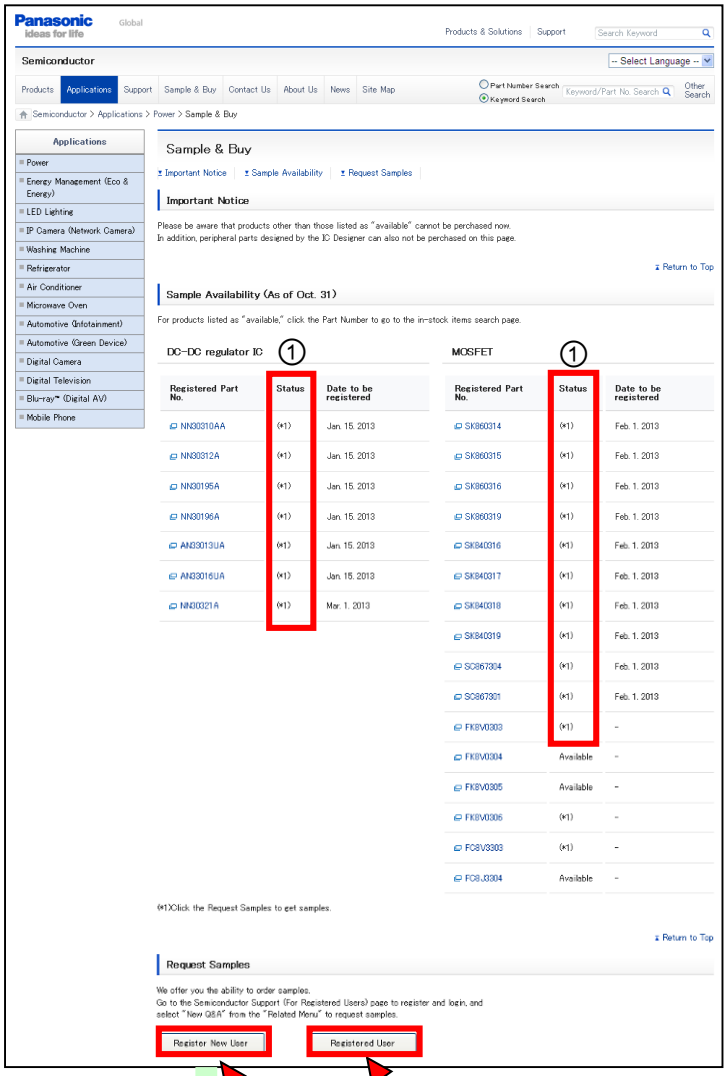
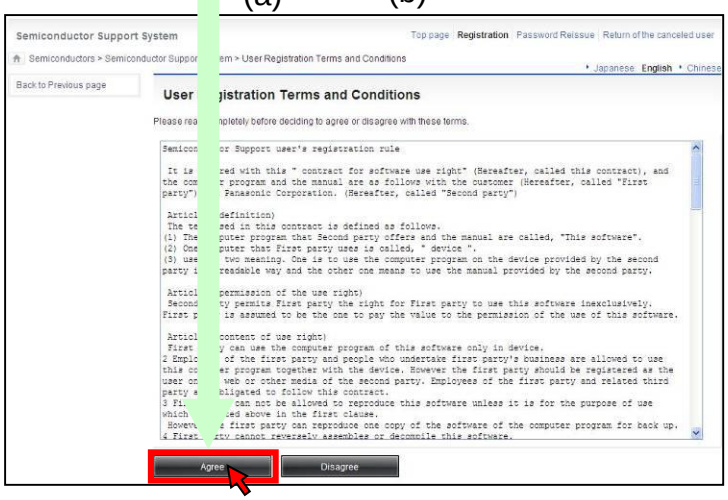
8.2 Unregistered Products





If you need samples of unregistered products (Status: *1), request from **Request Samples** displayed below.

* Please note that samples are for evaluation and are not guaranteed for operation on your equipments.

To use **Request Samples**, user registration for **Semiconductor Support System** is required.

(a) For new users, click **Register New User** button to go to **User Registration Terms and Conditions**, and read "user's registration rule" completely.

(b) For registered users, click **Registered User** button to go to **Login** window.

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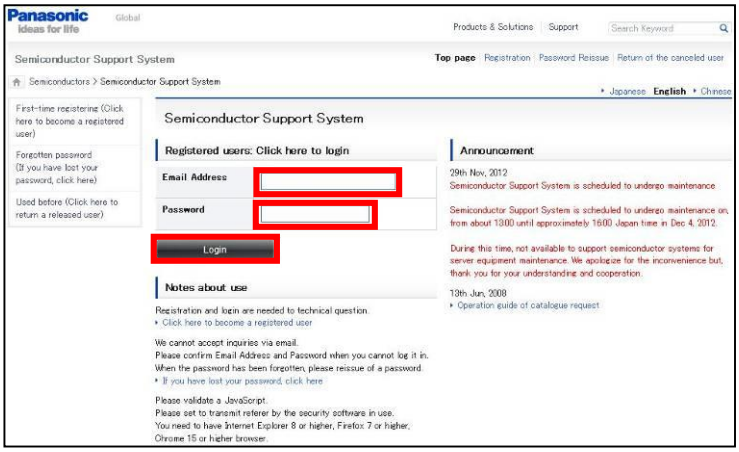
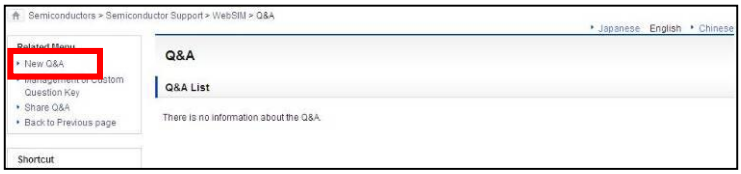
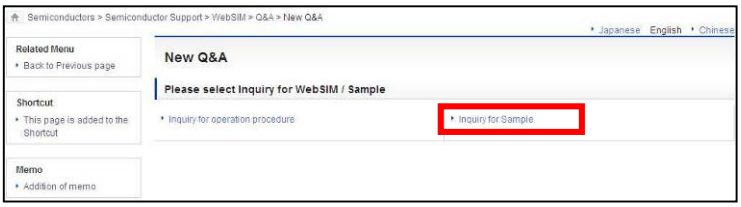


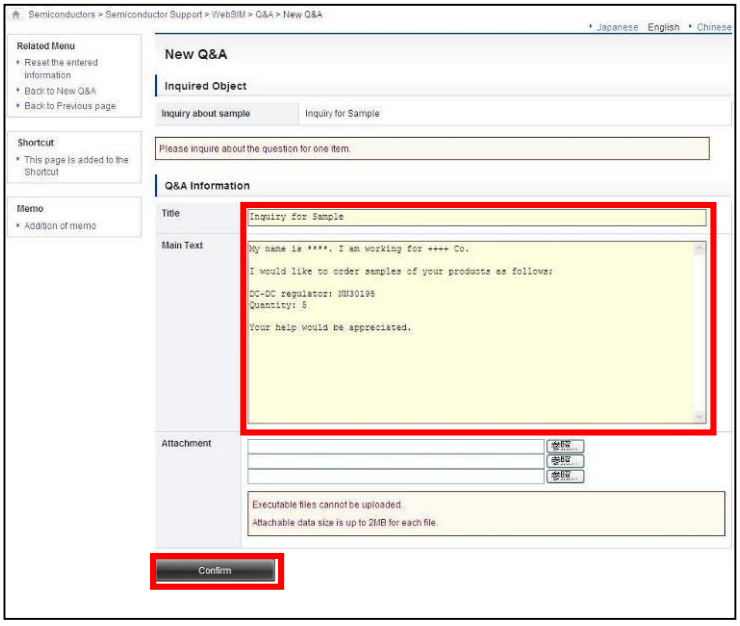
Click **Login** button after entering your email address and password.



Click **New Q&A**.



Click **Inquiry for Sample**.



Enter the title and the main text like the example.
(Do not forget to write Part No. and quantity.)

Click **Confirm** button.

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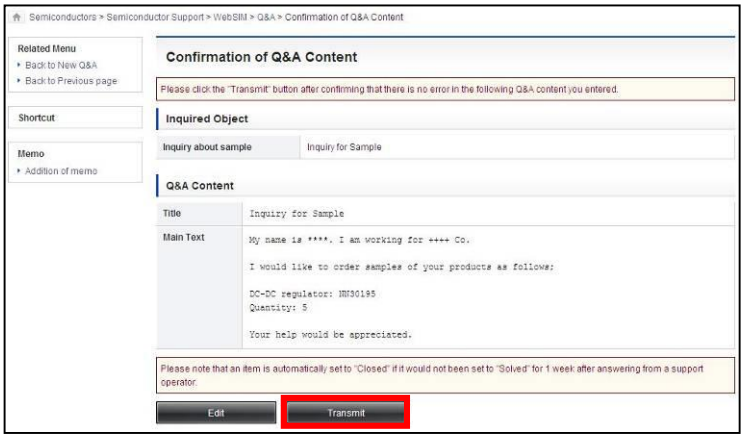

Click **Transmit** button after confirming contents you enter.

If you want to edit, click **Edit** button to return to previous window.

Our sales representatives will respond to your request.

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Record of changes

The following shows the changes in the publication of Power Device Simulator User's Manual.

Revised on January 25, 2013

Definition	Previous Edition (1st Edition)			New Edition (2nd Edition)		
	Page	Section	Details of Changes	Page	Section	Details of Changes
Change	8	5	② Enter Operational Parameters (Vin, Vout, Iout, SW Frequency, Mode).	8	5	② Enter Operational Parameters (Vin, Vout, Iout(*), SW Frequency, Mode). * Input the maximum value to Iout. In the operating analysis simulation, the load current is assumed as 50% to 75% (RMS) of Iout. (For more information, see Section 5.3.1, "Constant Value Change.")
Addition	8	Capture	—	8	Capture	Comments of [LOAD] in circuit diagram, and Constant Value Change window. (⑤, ⑤´)
Change	8	18	④ Constant values of components can be changed with pop-up window (⑤´) displayed by clicking each component figure.	8	23	④ Constant values of components can be changed with pop-up window (④´) displayed by clicking each component figure.
Addition	8	—	—	8	26	⑤ The Start Current and Final Current of [LOAD] refer to the load current (ILOAD) in each operating analysis. 【Initial setting values of ILOAD】 Start Current: Iout x 50% Final Current: Iout x 75% To change parameters, click [LOAD] on the circuit diagram. (⑤´)

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Inquiries

If you have questions regarding operating methods for **Power Device Simulator** described in this manual, please visit the following URL.

URL: https://www.semicon.panasonic.co.jp/semi-spt/general/?lang=en

To new customers:

Please register your account prior to login. After login, click "WebSIM" in **Semiconductor Support System** site, click "Inquiry", click "New Q&A" of "Related Menu", and click "Inquiry for operation procedure".

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