Online Design Tool of ROHM

ROHM DC/DC Designer User's Guide

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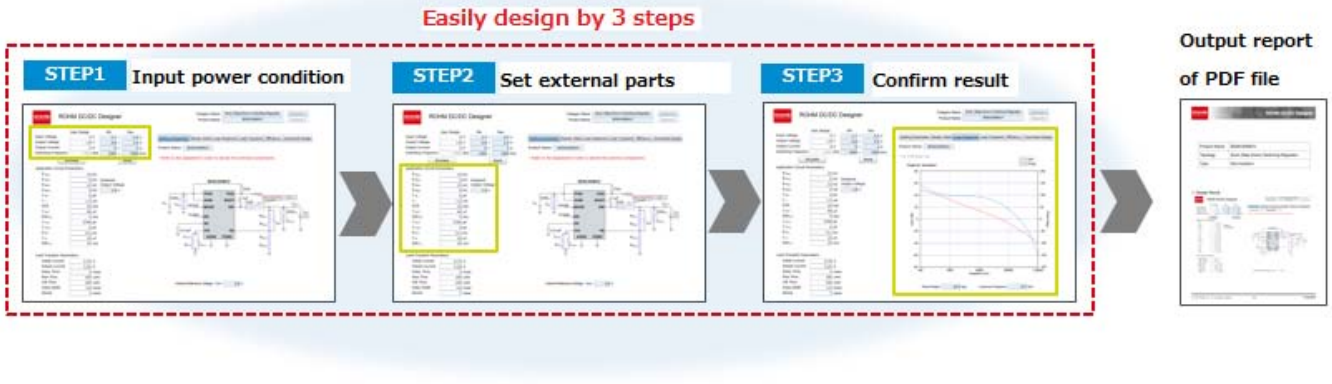
1. What is ROHM DC/DC Designer?

1.1 General Description

Use the online design tool "ROHM DC/DC Designer" to easily simulate the application circuit on the Web before actual parts evaluation. You can confirm the basic characteristics such as efficiency, loop stability and transient response by only 3 steps

You can freely change the constant and the input signal of external parts; it can significantly reduce the time of IC and parts selection.



1.2 Applicable Products

- Switching regulator with built-in FET
- Switching regulator controller for external high current FET

1.3 System Requirements

The following environment is necessary to operate ROHM DC/DC Designer.

- Adobe Reader®
- Microsoft® Silverlight®

  This tool can't be run on Microsoft Silverlight unsupported browser.
  Confirm in the following "System Requirements" URL for browser compatibility of this tool.
  (https://www.microsoft.com/getsilverlight/get-started/install/default.aspx?reason=unsupportedbrowser&_helpmsg=ChromeVersionDoesNotSupportPlugins&v=4.0.50826.0#")

  Please note that you cannot use the latest version of "Google Chrome™".
  "Internet Explorer®" is the recommended browser to use this tool.

Trademarks:

- Adobe Reader® is a registered trademark of Adobe Systems Incorporated in the United States and other countries.
- Microsoft® Silverlight® and Internet Explorer® are registered trademarks of Microsoft Corporation in the United States and other countries.
- Google Chrome™ is a trademark of Google Inc.

1.4 Notes

- Before using ROHM DC/DC Designer, please confirm that you have read the disclaimer.
- The results provided by ROHM DC/DC Designer are based on experimental results using ROHM evaluation boards and cannot be guaranteed. In addition, ROHM DC/DC Designer offers reference results, not guaranteed results.
- Please note the characteristics of external parts.
- ROHM DC/DC Designer specifications are subject to change without notice.

1.5 Questions/Comments

For inquiries and/or comments, please contact us at: https://www.rohm.com/web/global/contactus

2. Access method

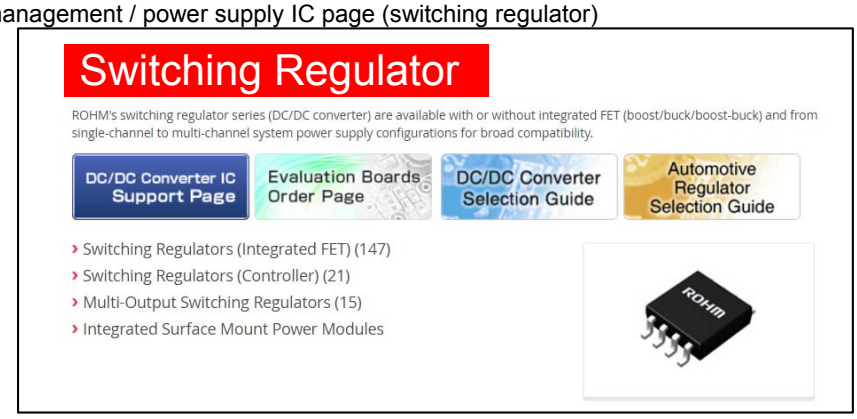
The following are three methods to access ROHM DC/DC Designer.

- Via ROHM's homepage (http://www.rohm.com)
- Via the individual product page
- Via parametric search page of switching regulator products (http://www.rohm.com/web/global/search/parametric/-/search/Switching%20Regulators)

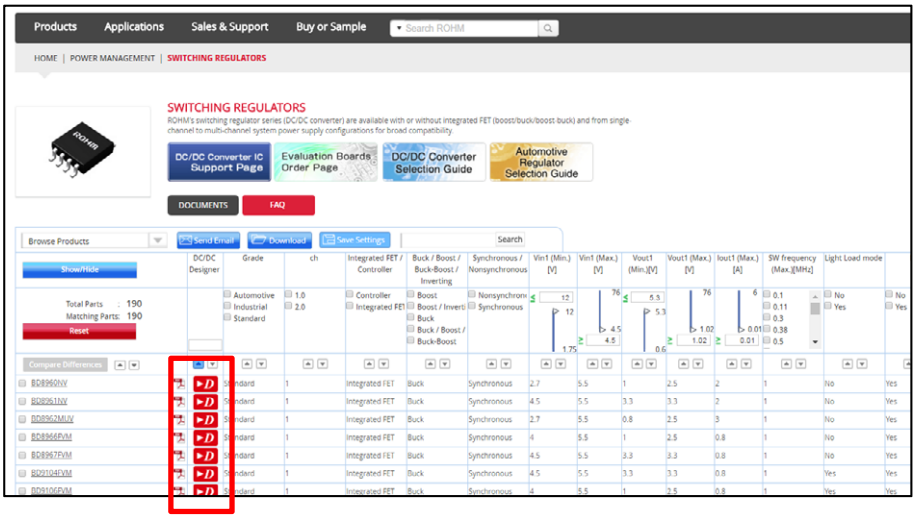
2.1 Via ROHM's homepage

■ TOP of the homepage

■ Power management / power supply IC page (switching regulator)



■Parametric Search of Switching Regulator
(http://www.rohm.com/web/global/search/parametric/-/search/Switching%20Regulators)
ROHM DC/DC Designer corresponding to the individual product activates by clicking the "D button".



3. Usage Instructions

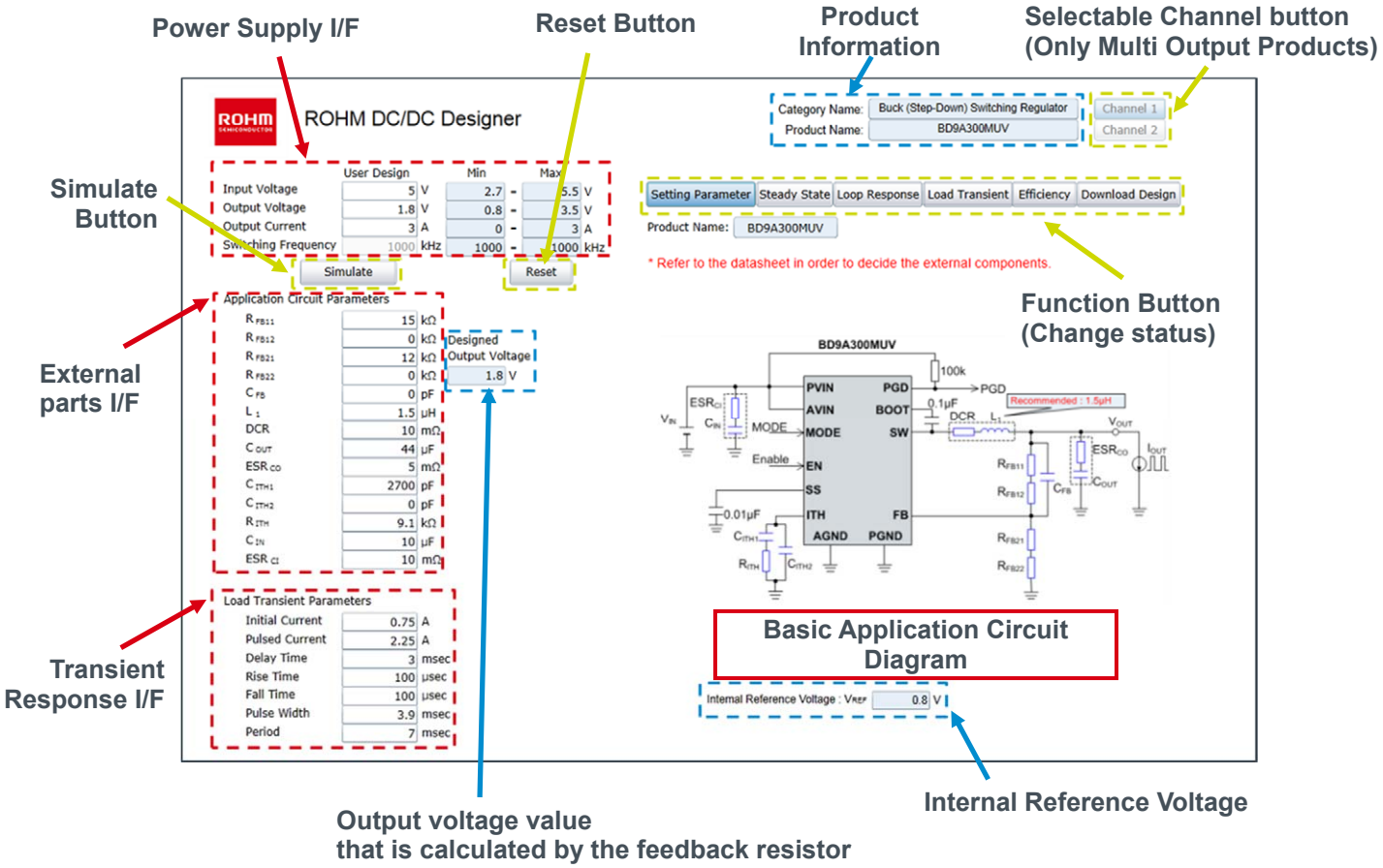
3.1 Activating the ROHM DC/DC Designer

A new window opens when you activate the ROHM DC/DC Designer, and the simulation result on the basic application condition is displayed. A recommended circuit is displayed in the initial display. This display can be changed to show each characteristic data by using the Function button.

3.2 User interface description

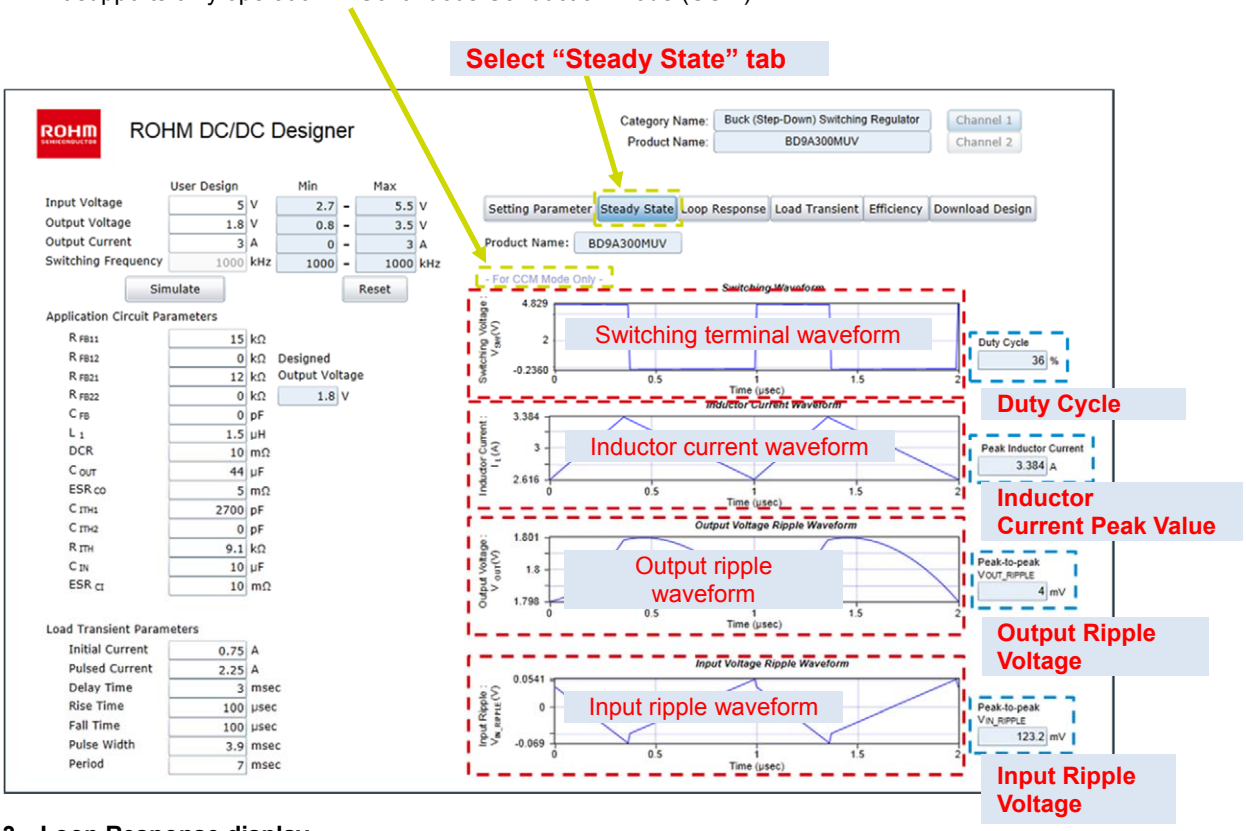
3.2.1 Setting parameters

Please choose "Setting Parameter" tab on Function button. (This is the initial image displayed at startup)
In "Setting Parameter", input the power supply specifications, external component values and transient response parameters in this screen. It also displays the basic application circuit diagram.
In the basic application circuit diagram, the external components with settable values are colored blue.



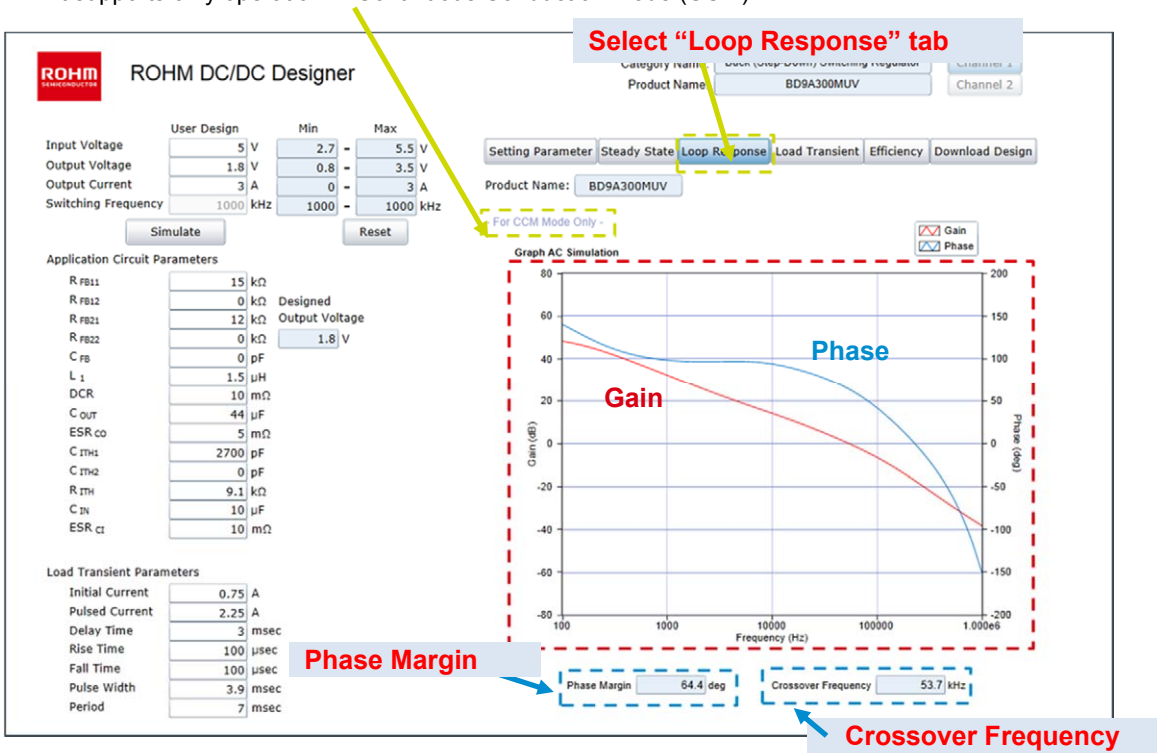
3.2.2 Steady State display

Please choose "Steady State" tab on Function button.
In the Steady State screen, "input power supply specifications", "switching terminal waveform", "inductor current waveform", "output voltage ripple waveform" and "input voltage ripple waveform" are displayed.
In addition, you can confirm "Duty Cycle", "inductor current peak value", "output ripple voltage" and "input ripple voltage".
*It supports only operation in Continuous Conduction Mode (CCM).



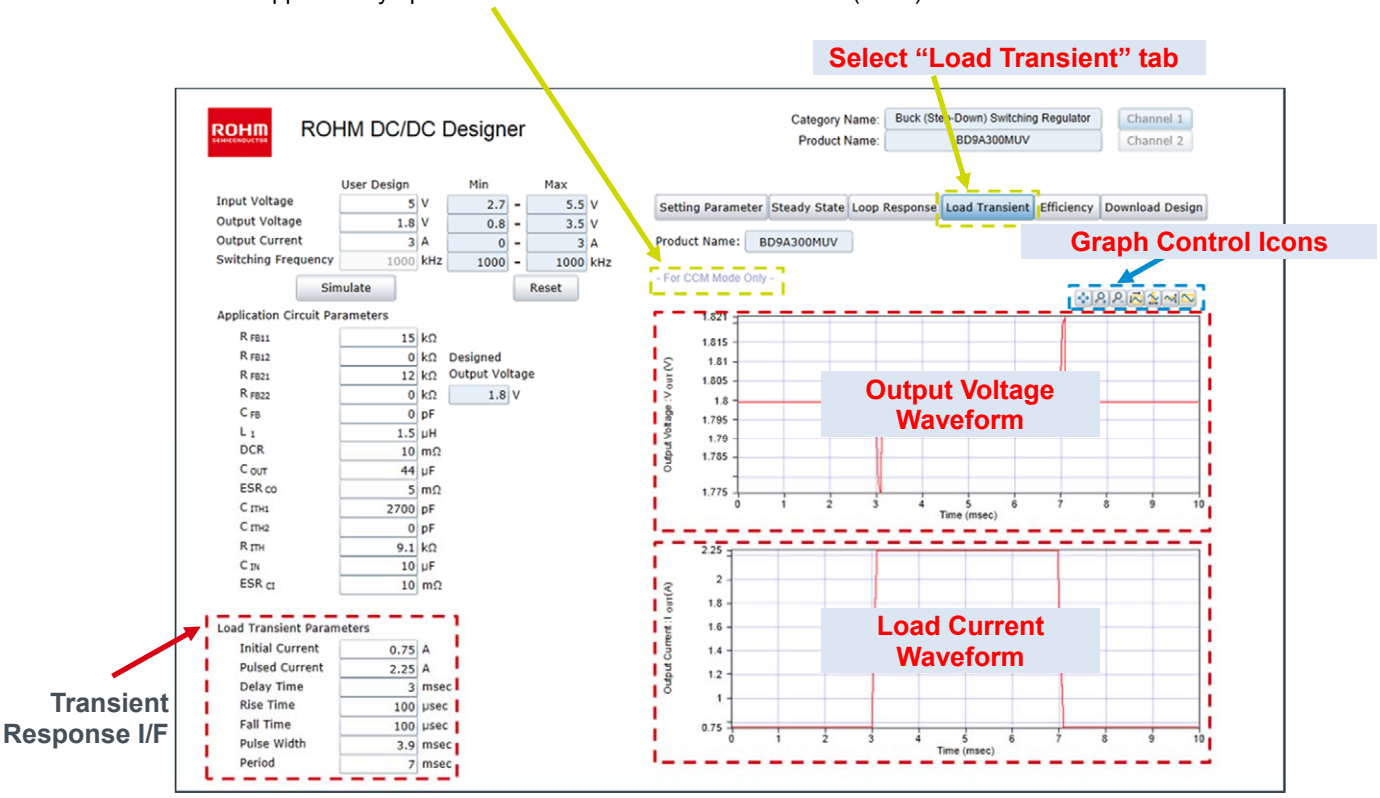
3.2.3 Loop Response display

Please choose "Loop Response" tab on Function button.
Loop Response screen displays Loop Characteristics from the conditions that have been entered by the user.
Because "Phase Margin", "Crossover Frequency" are displayed, you can confirm the stability of the feedback loop.
*It supports only operation in Continuous Conduction Mode (CCM).



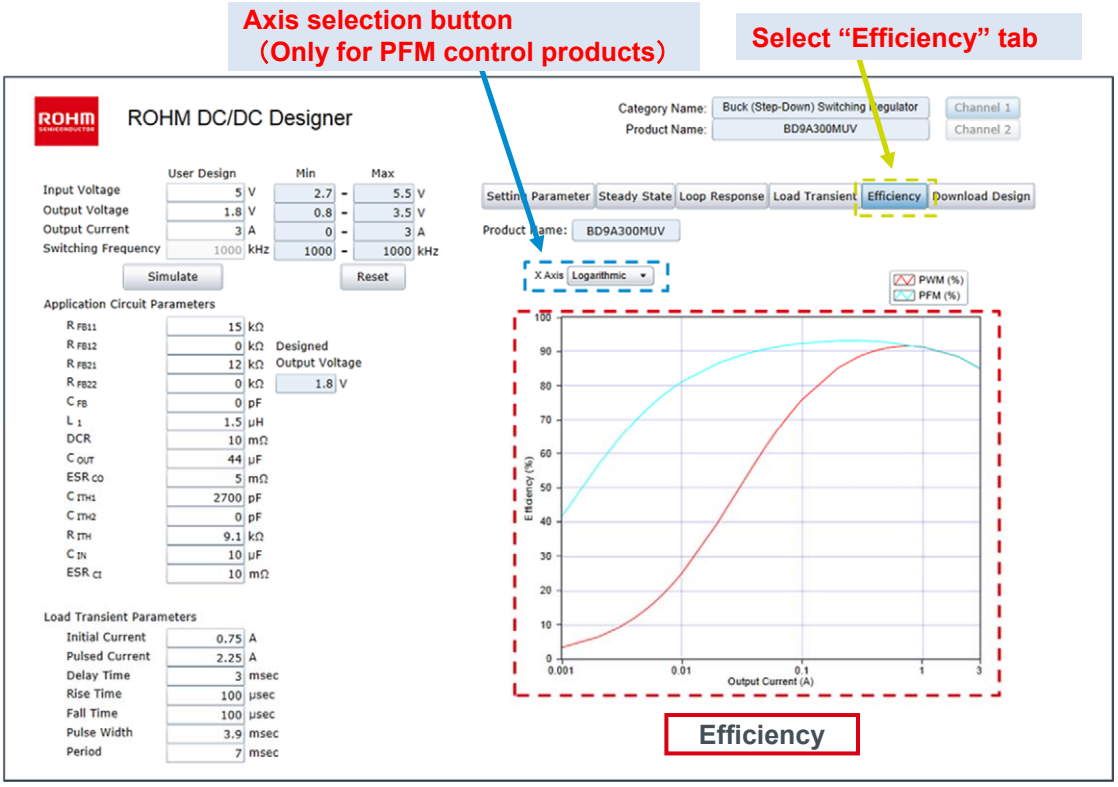
3.2.4 Load Transient display

Please choose "Load Transient" tab on Function button.
The Load Transient screen displays "Transient Response" by the inputted power supply specifications and external component value.
Load condition of the transient response can be set by the transient response characteristic setting I / F
*It supports only operation in Continuous Conduction Mode (CCM).



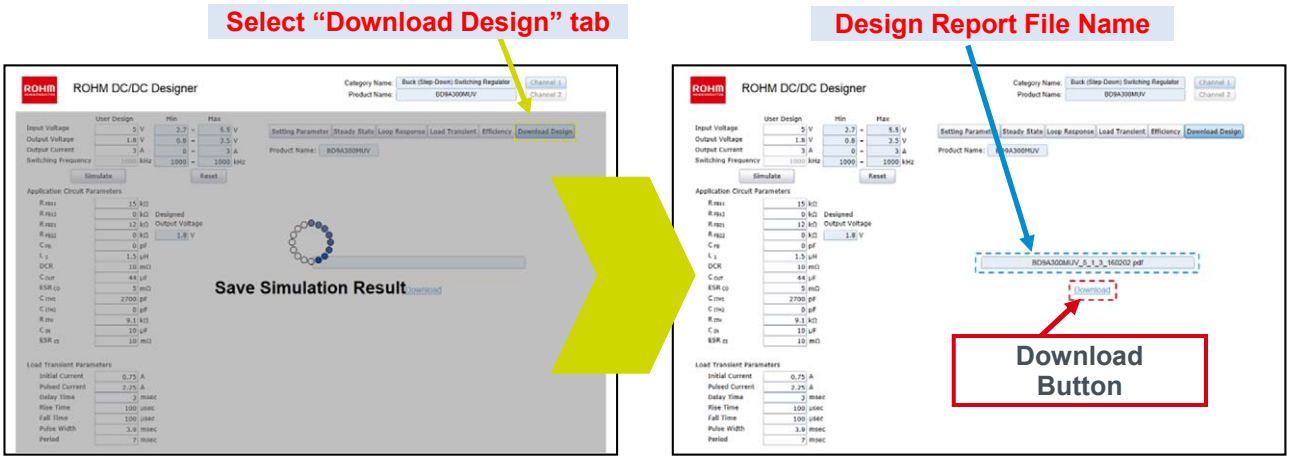
3.2.5 Efficiency display

Please choose "Efficiency" tab on Function button.
The Efficiency screen displays efficiency properties from the input power supply specifications and external component conditions.
For products that have the PFM control mode, it will display both PWM mode and PFM mode.

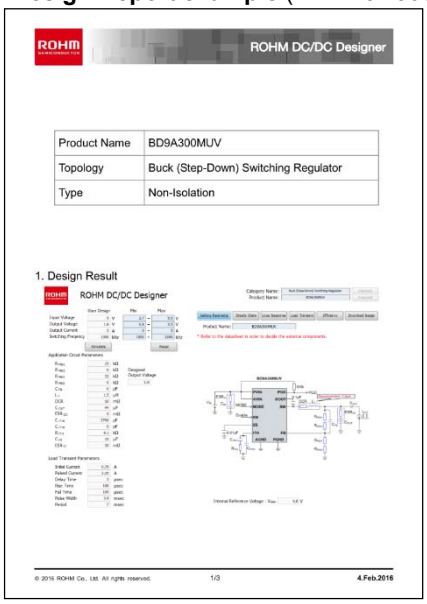


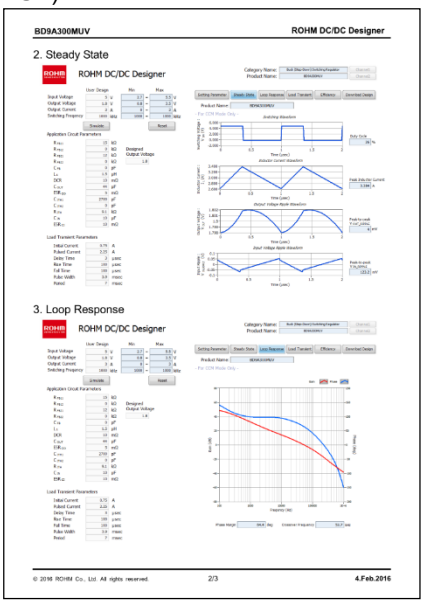
3.2.6 Download Design display

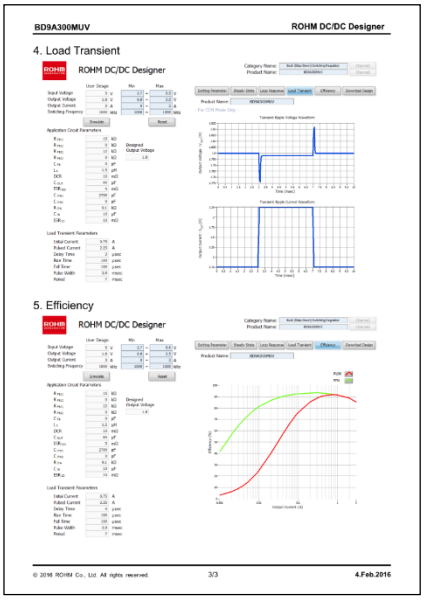
Please choose "Download Design" tab on Function button. Please wait while each output display result is saved. The Design Report (PDF file) is ready for download after a filename is displayed. Please click the "Download" button to download it.

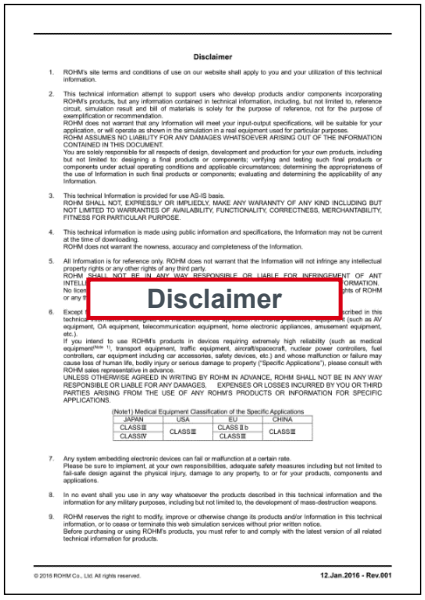


■Design Report example (Ex.BD9A300MUV)



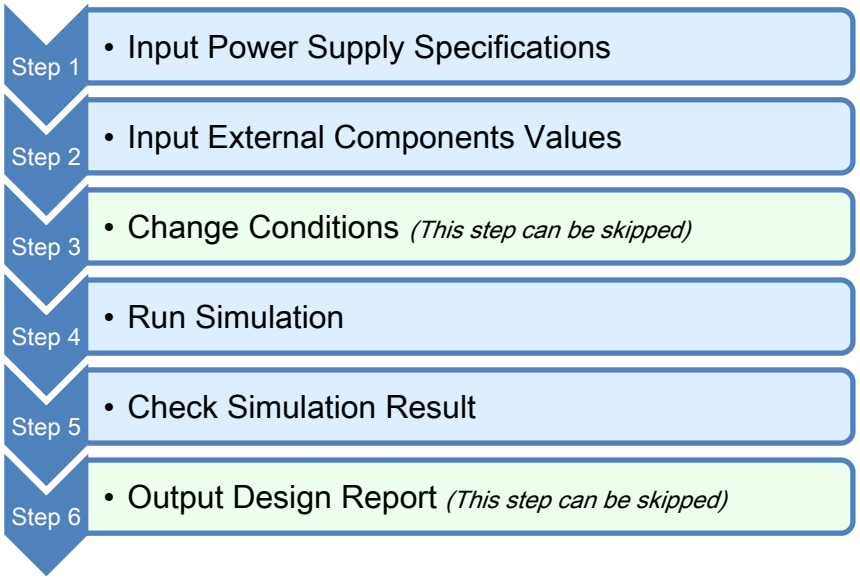






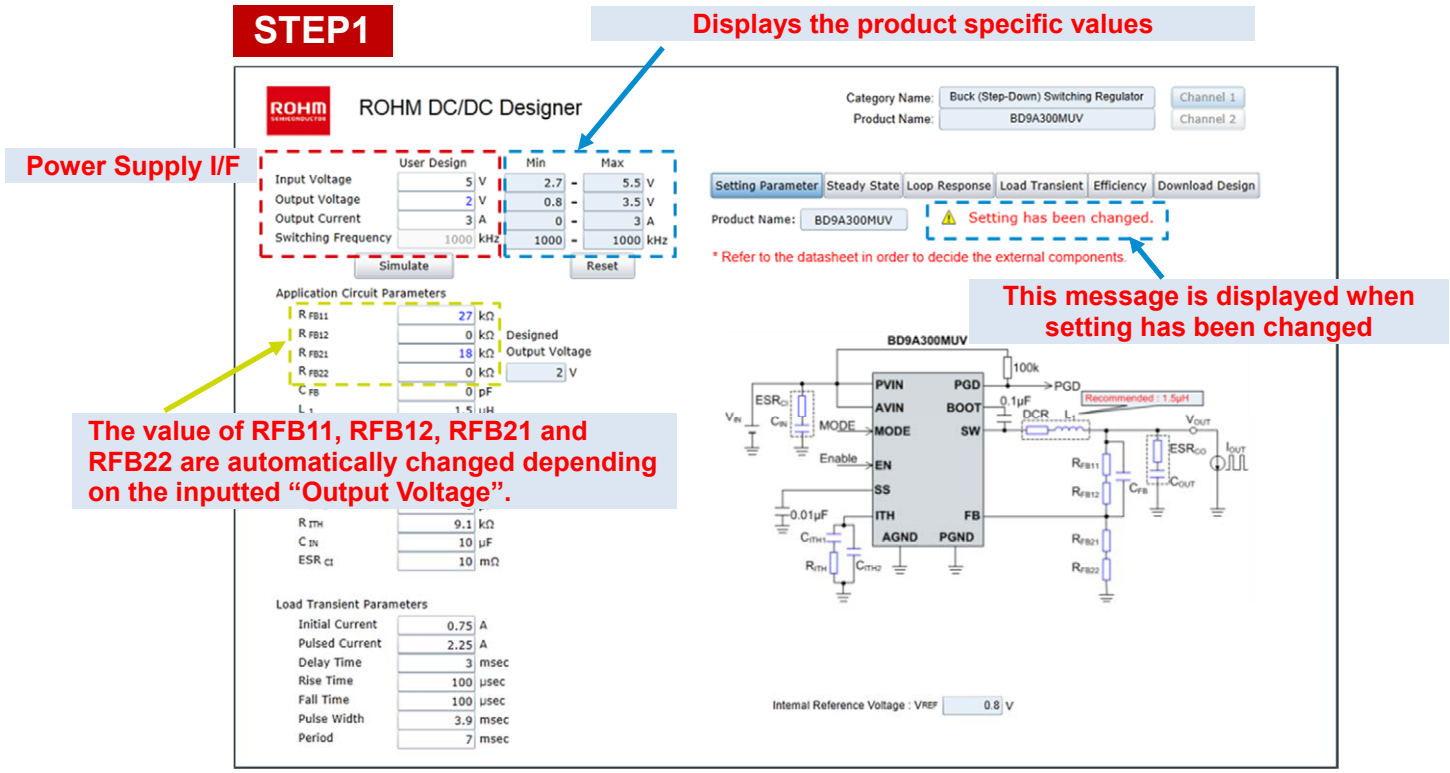
3.3 Design Flow

The basic design flow are as follows:



3.3.1 STEP1: Input power supply specifications

Please input power supply conditions (input voltage, output voltage and output current).
For products that can change the switching frequency, input the switching frequency.



3.3.2 STEP2: Input external components values

Set the values of external components (resistance, capacitor, and inductor).
The settable external parts are colored blue on the basic application circuit diagram.
Please be careful on the characteristics of the parts shown below

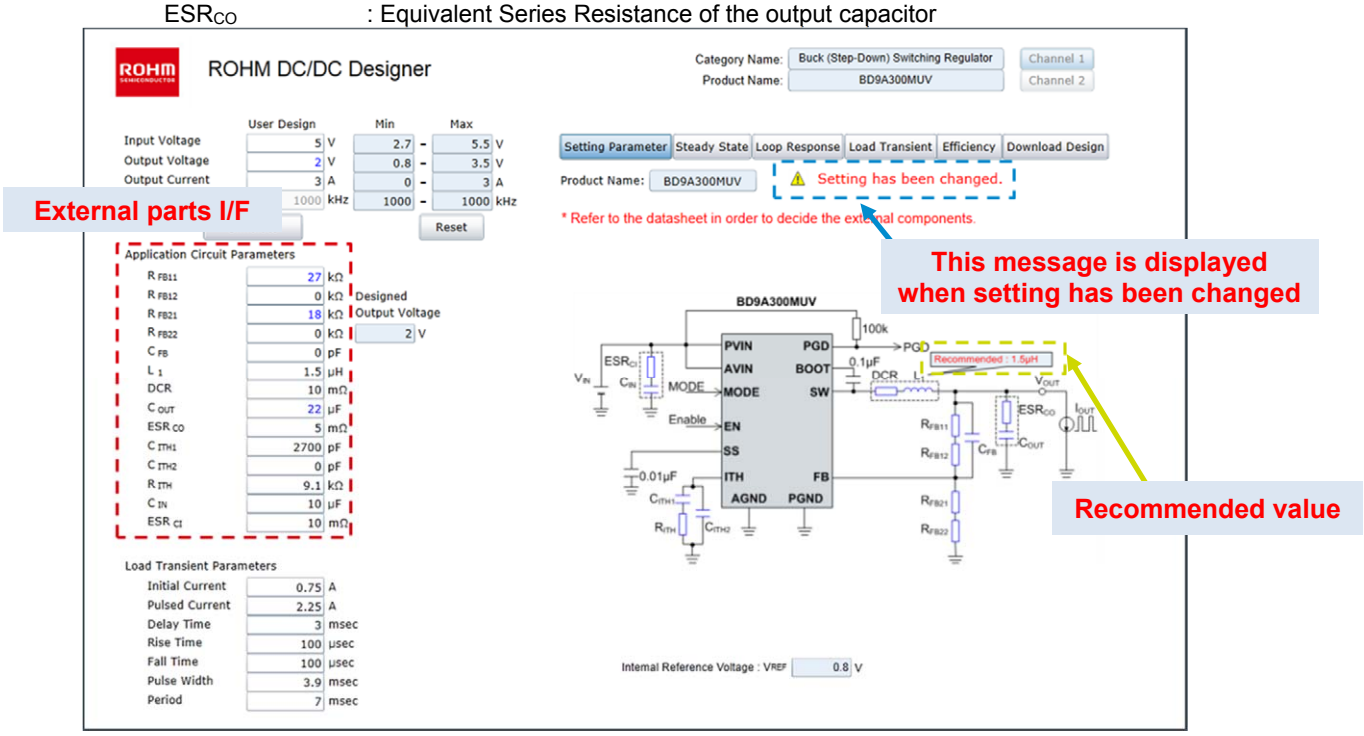
- Ceramic Capacitor : DC-bias, Frequency and Temperature Characteristics
- Electrolytic Capacitor : Frequency and Temperature Characteristics
- Inductor : DC Superimposition Characteristics
  (This tool does not need the AC Resistance calculation.)

STEP2

*** When determining the parts values, be sure to confirm Datasheet.**

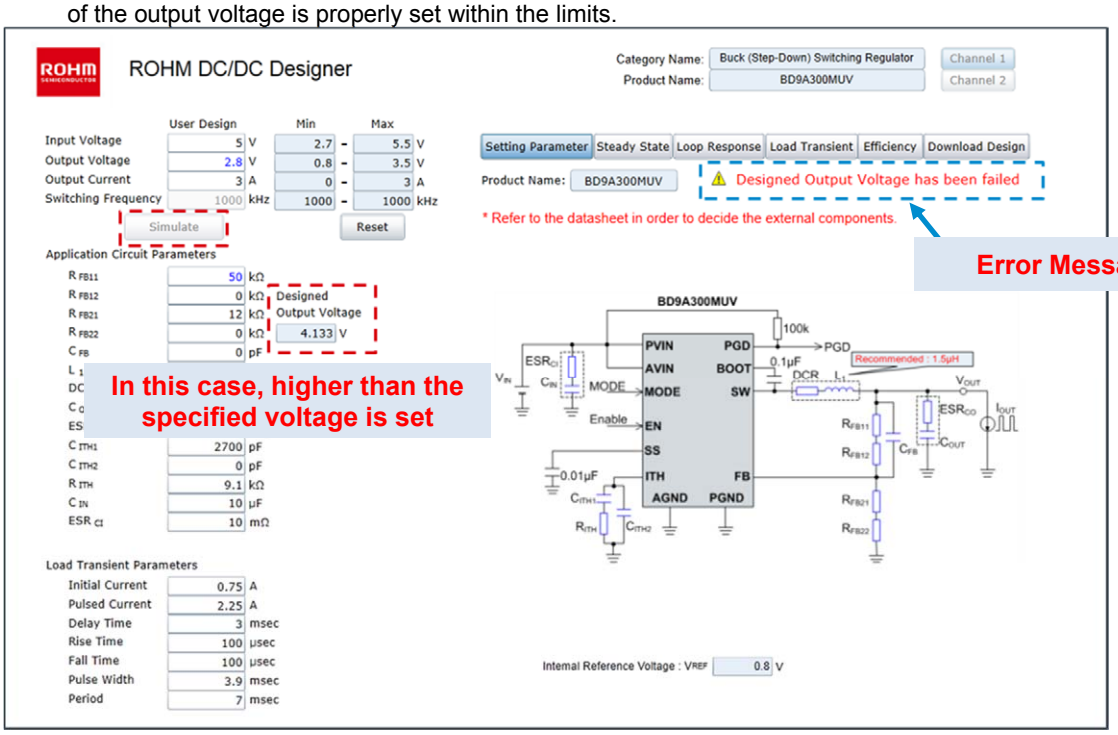
■ **Settable parasitic parameters**

DCR : Direct Current Resistance of the inductor
ESR_{CI} : Equivalent Series Resistance of the input capacitor
ESR_{CO} : Equivalent Series Resistance of the output capacitor



■ **Caution when changing the feedback resistor**

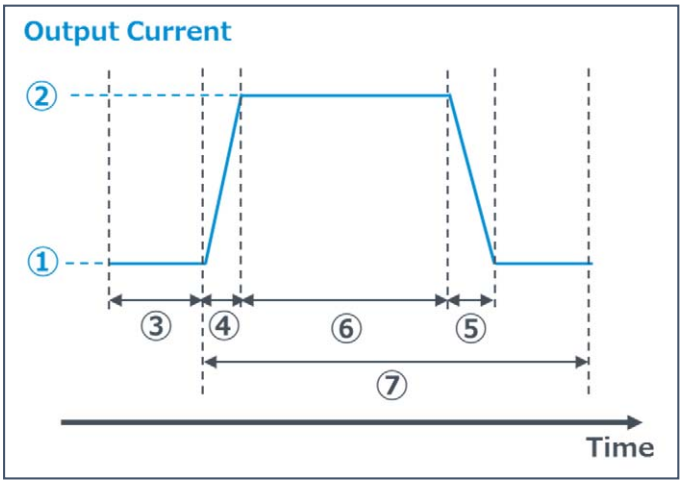
When feedback resistors are changed, and if the designed output voltage value is outside the set range, you will no longer be able to run the simulation. Please re-set the feedback resistor value so that the value of the output voltage is properly set within the limits.

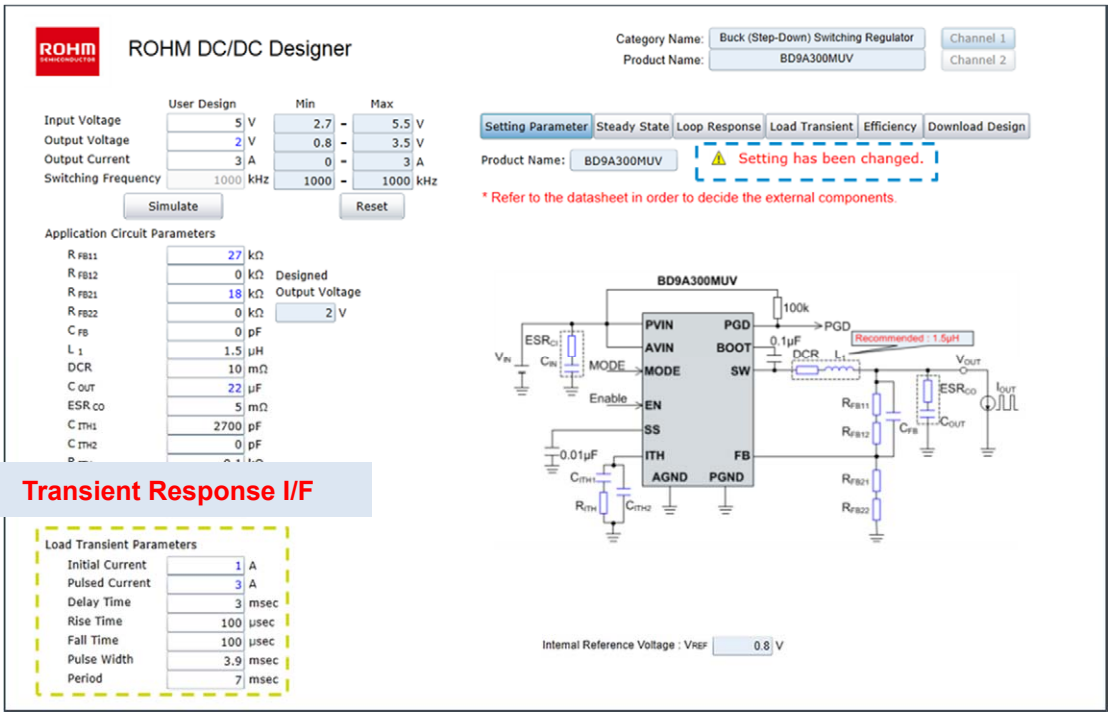


3.3.3 STEP3: Setting transient parameters

■Transient response setting parameter

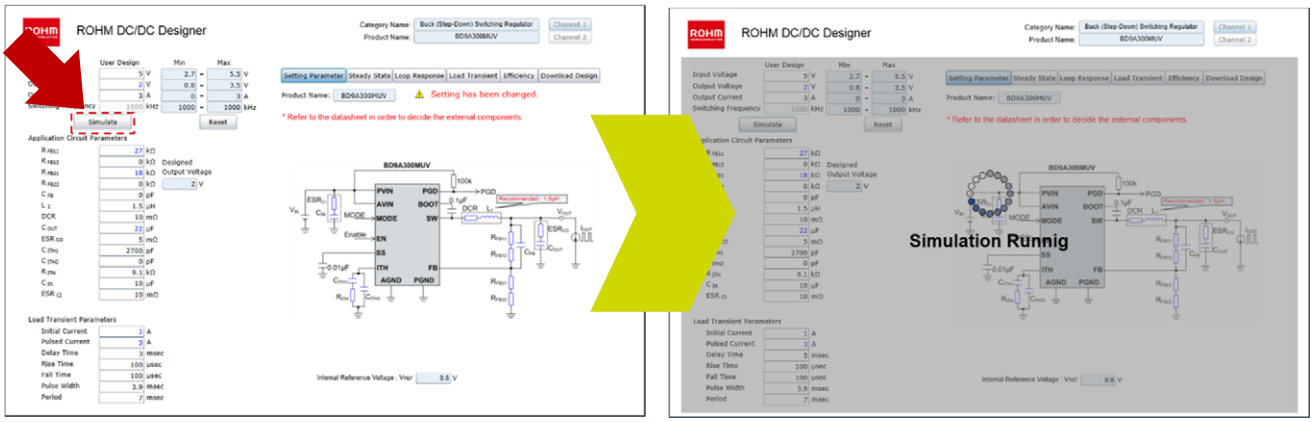
-①Initial Current : Load current value before the change
-②Pulsed Current : Load current value after the change
-③Delay Time : Delay time to load change
-④Rise Time : Load current rise time
-⑤Fall Time : Load current fall time
-⑥Pulse Width : Load current pulse width
-⑦Period : Period





3.3.4 STEP4: Run simulation

Start by clicking "Simulate" button.

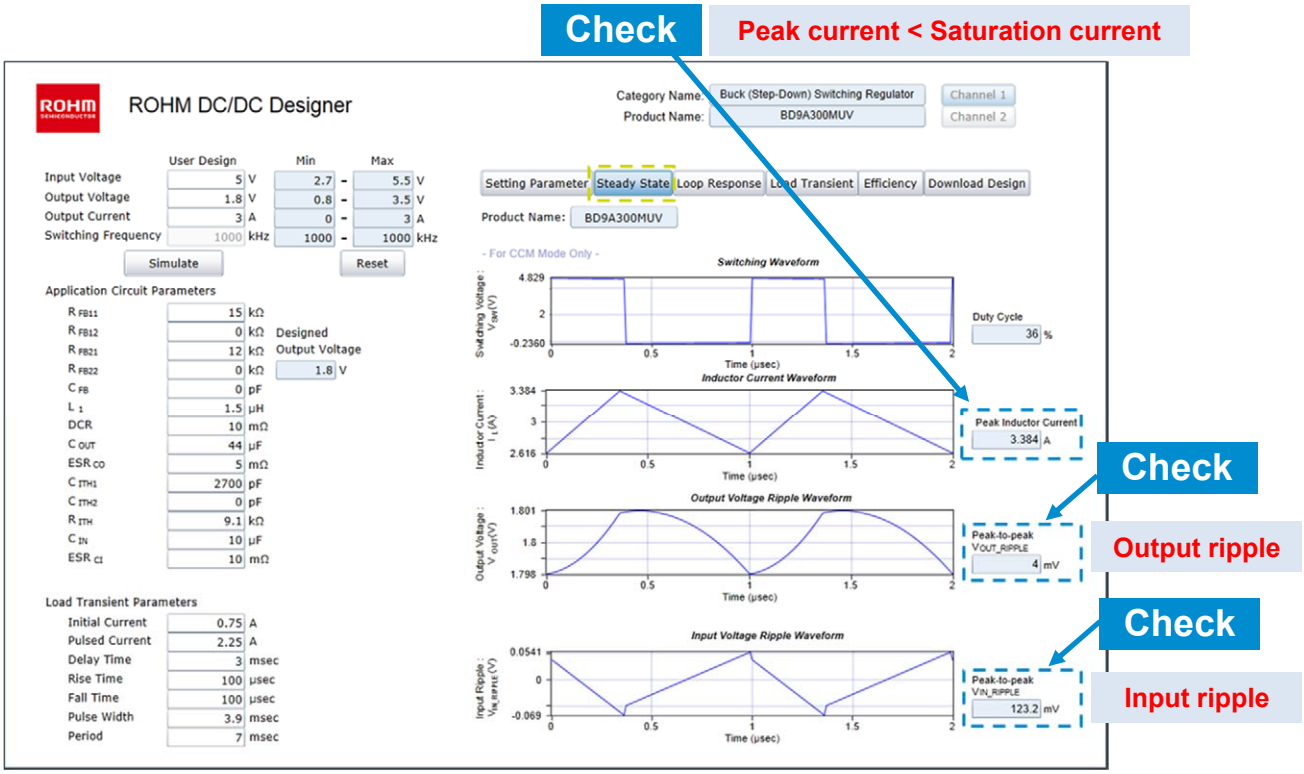


3.3.5 STEP5: Confirm "Steady State" result

In "Steady State" screen, it is possible to confirm the "switching waveform", "inductor current waveform", "output ripple waveform" and "input ripple waveform".

■ **Check Point**

Make sure that the inductor saturation current is greater than or equal to the peak current.
The confirmation of output ripple voltage and input ripple voltage is possible, too.



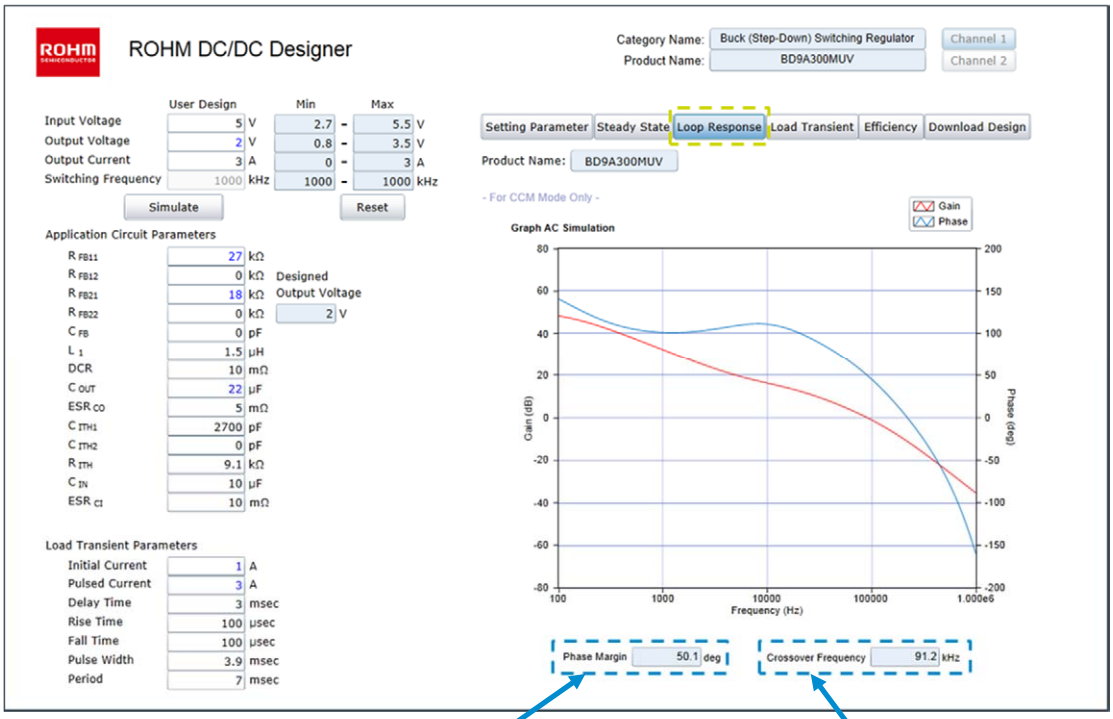
3.3.6 STEP5: Confirm "Loop Response" result

In "Loop Response" screen, confirm the stability of the feedback loop and decide setting values of external parts.

*** The resulting output from this tool will not be exact because there is a difference between the parameters of this tool and the actual parts parameters such as parasitic characteristics that depend on PCB and implementation condition.**
In order to confirm the stability and response of the system, creating an actual prototype is needed

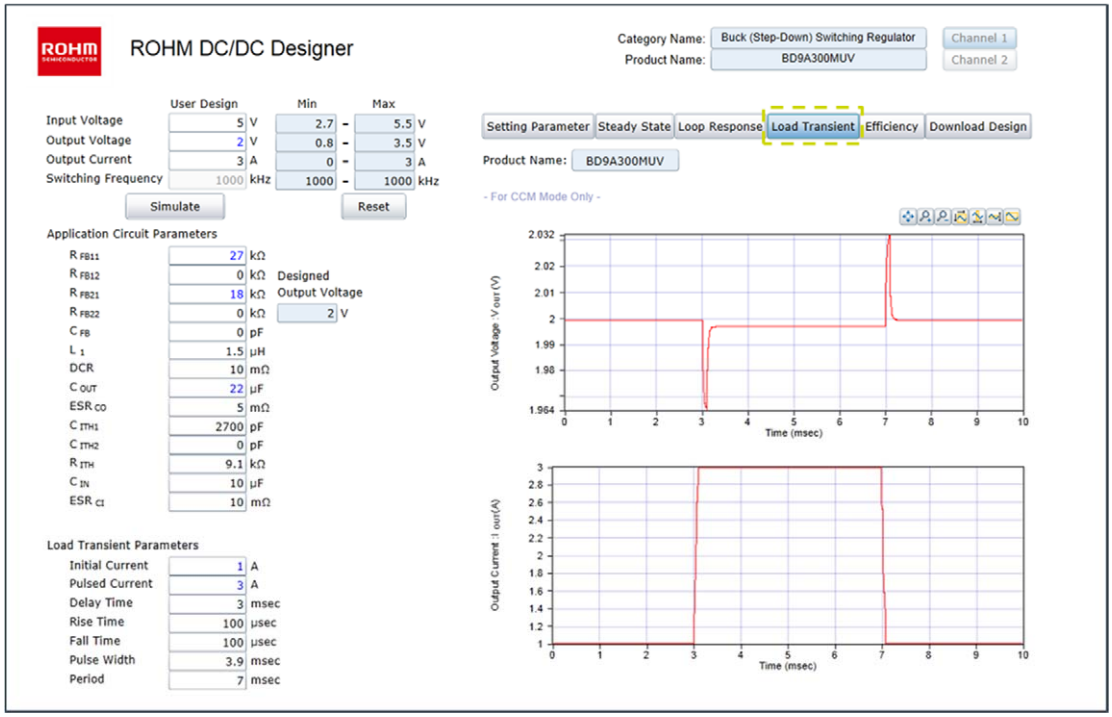
■Check Point

The system is required to have a phase margin of more than 45deg. (it is the phase at 0dB). It is an indicator of the feedback loop stability. Next, the crossover frequency is set to less than 1/10 of the switching frequency.
When the phase margin is small, there is a possibility that the output voltage has abnormal oscillation. In that case, adjust the phase compensation constant (R_{ITH}, C_{ITH}) to establish both stability and good transient response of the feedback loop.
(Click "Load Transient" button to confirm the transient response characteristics.)



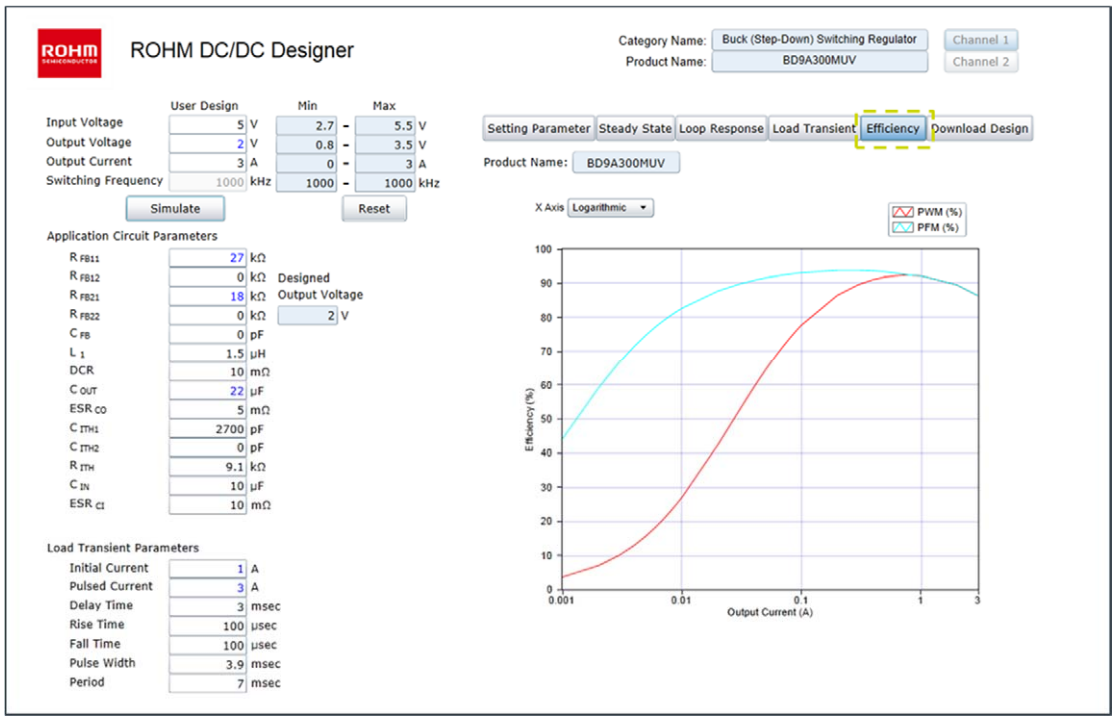
3.3.7 STEP5: Confirm "Load Transient" result

In "Load Transient" screen, confirm transient response. The output voltage response will change depending on the steepness of the load change (rise time, fall time).
There is a need to check the actual load slew rate.



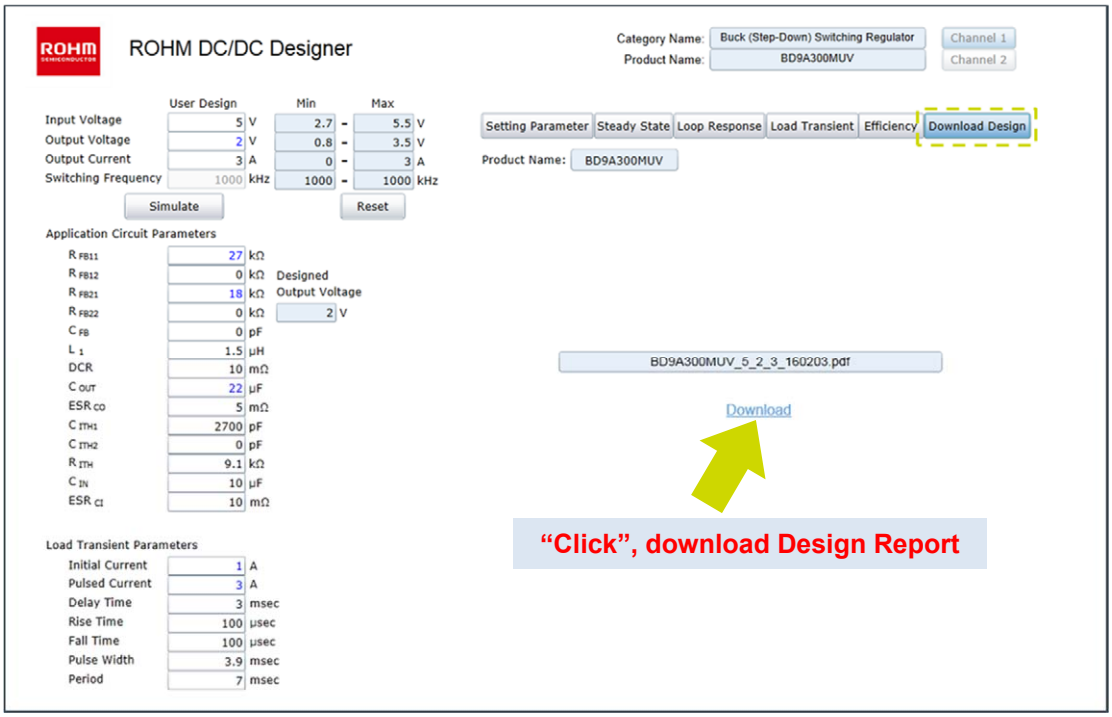
3.3.8 STEP5: Confirm "Efficiency" result

In the "Efficiency" screen, confirm the efficiency characteristics.
Using a small DCR inductor, a small ESR capacitor and a small forward voltage diode, you can improve the efficiency.
Because DCR and ESR parameters are related to the stability of the feedback, a confirmation of the loop characteristics is also necessary.



3.3.9 STEP6: Output Design Report

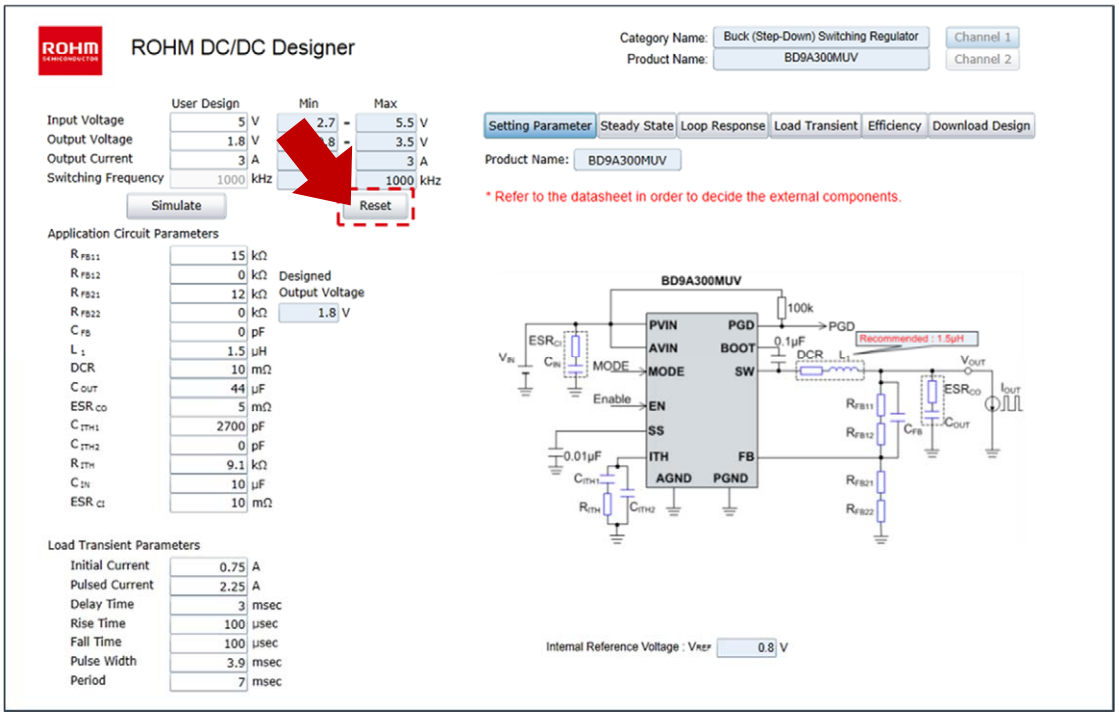
At "Download Design" screen, download the resulting output of the design as Design Report (PDF file).



3.4 Other functions

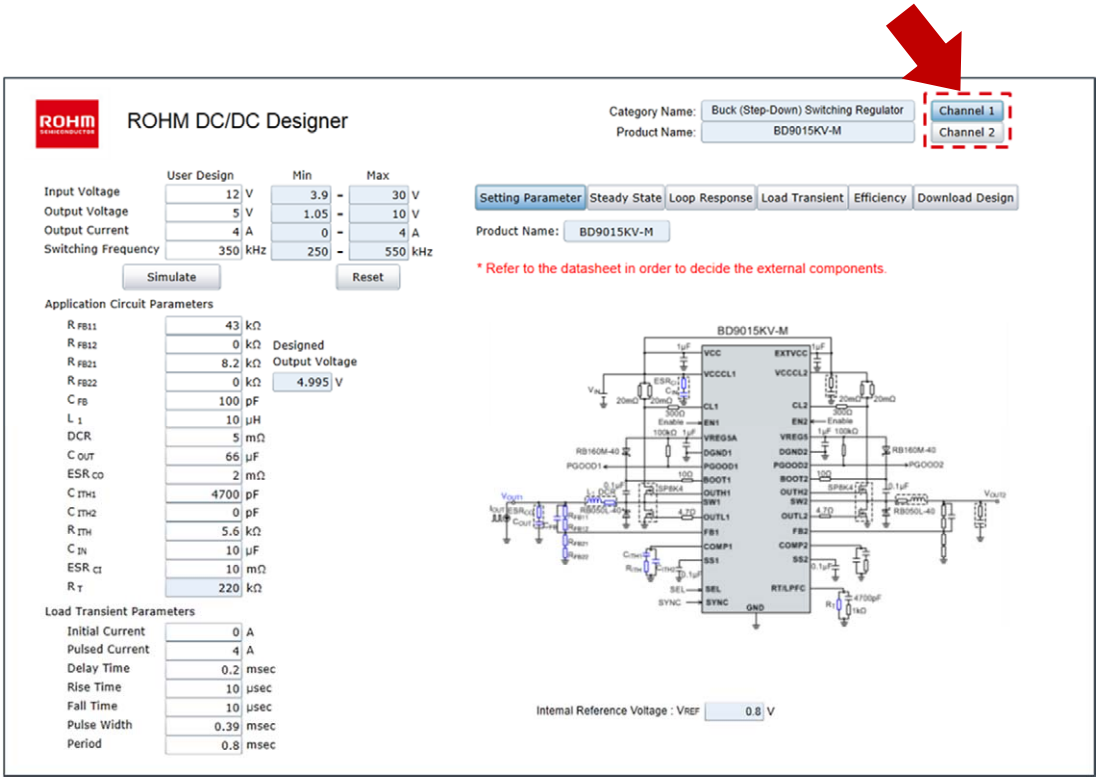
3.4.1 Reset function

When you click the "Reset" button, you can revert to the start-up state. The simulation will run using the initial parameters.



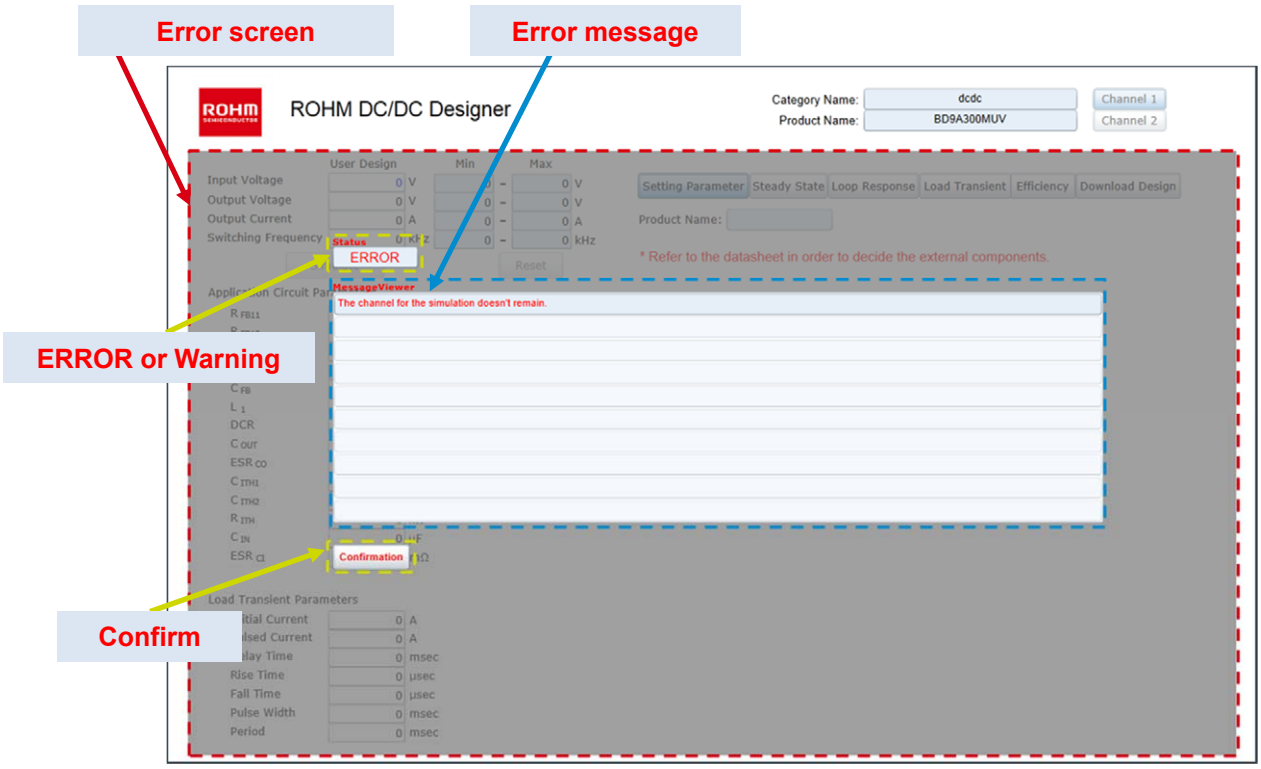
3.4.2 Multi-output model

You can switch the output channel in multi-output models by clicking the "Channel" button. However, please note that at every output channel change, application circuit resets to the initial state. Changes to power supply specifications and external constants are not saved and reset to the initial state.



4. Troubleshooting

If an error occurs, you will see an error screen. Close the error screen by clicking the "Confirmation" button.



Error List

Classification	Message	Error contents / solution
ERROR	The channel for the simulation doesn't remain.	Access to the ROHM DC/DC Designer exceeds an upper bound. Please access it again after some time.
ERROR	Session close. (Timeout happened between server PC.)	Displaying result fails for a certain period of time. Please reload the browser or access it again.
ERROR	"Load Transient"/"Loop Response" simulation wasn't carried out.	Error is given by transient or AC characteristics analysis. Please review a value you set.
Warning	Setting has been changed. Please run the simulation.	After changing the settings, it will be displayed when you run the "Download Design" without running the "Simulate". Please carry out simulation.

5. Disclaimer

Please confirm that you have read the disclaimers before using the ROHM DC/DC Designer.
The disclaimer can be seen by clicking the following URL.

"http://rohmfs.rohm.com/jp/products/databook/disclimer/ic/tech_info/disclaimer_for_lsiwebtool-j.pdf"

6. Additional Notes

■ **When using the Internet proxy search engine**

Please enable the HTTP1.1 setting of the Web browser.
When using Windows Internet Explorer, please enable all HTTP1.1 settings from Menu bar>Tools>Internet Options>Advanced tab.

7. Revision History

Date	Revision	Changes
12.Apl.2016	001	New release