## ●Design Support Tools

Online tools to support device selection and purchasing

### Power Device Simulator

The Power Device Simulator (free) is a web-based simulation tool for our DC-DC regulator ICs* and switching MOSFETs. This tool allows you to verify the product specifications, to analyze the characteristics, to make a BOM list, and to purchase desired products, thus reducing your time for product selection.

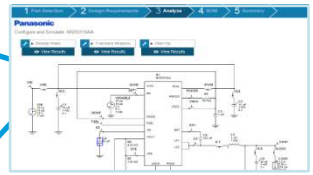
*Currently, DC-DC regulator IC with built-in power MOS only is available.

- IC Designer --- Power circuit simulation for DC-DC regulator IC
- Active Datasheet --- Performance simulation for switching MOSFET
- Buck Analyzer --- Power circuit simulation for switching MOSFET

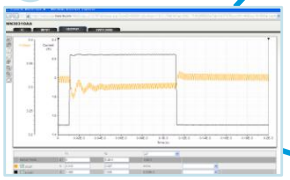
Operation procedure

1 Requirement

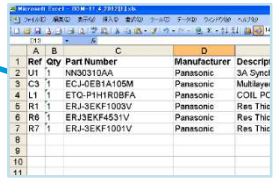
2 Circuit / Analyze



3 Result



4 BOM list



| | A | B | C | D |
|---|---|---|---|---|
| 1 | Ref | Qty | Part Number | Manufacturer |
| 2 | U1 | 1 | NN30310AA | Panasonic |
| 3 | C3 | 1 | ECJ-0EB1A105M | Panasonic |
| 4 | L1 | 1 | ETQ-P1H1R0BFA | Panasonic |
| 5 | R1 | 1 | ERJ-3EKF1003V | Panasonic |
| 6 | R6 | 1 | ERJ3EKF4531V | Panasonic |
| 7 | R7 | 1 | ERJ-3EKF1001V | Panasonic |

### DC-DC Circuit Calculator

The DC-DC Circuit Calculator (free) is a web-based tool that calculates the recommended peripheral circuit constants for our DC-DC regulator IC* to meet your power system design specifications. Use this calculator together with the "Power Device Simulator" to make the simulation more effective.

*Currently, DC-DC regulator IC with built-in power MOS only is available.

Panasonic offers a variety of devices as "Total Power simulations." Please visit the URL below to learn more about coil, capacitor, components for suppressing noise or surge, etc.
http://industrial.panasonic.com/ww/index_e.html

## ●Evaluation Board

・We have prepared the DC-DC evaluation boards

NN30195A evaluation board
NN30195A-EVB-R2

NN30196A evaluation board
NN30196A-EVB-R2

NN30295A evaluation board
NN30295A-EVB-0

NN30310AA evaluation board
NN30310AA-EVB-R2

NN30312A evaluation board
NN30312A-EVB-R2

NN30320A evaluation board
NN30320A-EVB-R2

NN30321A evaluation board
NN30321A-EVB-R2



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Issued in June, 2014

2.3_06. 2014_Pub. No. A02024BE-3

010413
Printed in Japan

Panasonic

June, 2014

# Step down DC-DC Regulator (with built-in power MOS)


www.semicon.panasonic.co.jp/en

### Power device solution, ENELEAD

ENELEAD

Panasonic provides ENELEAD, the "Total solution of power devices," which supports from power system design to purchasing of components, allowing you to select a suitable small, high-efficiency power device, to easily perform a design and evaluation of power systems by using web-based tools, and to purchase peripheral components.

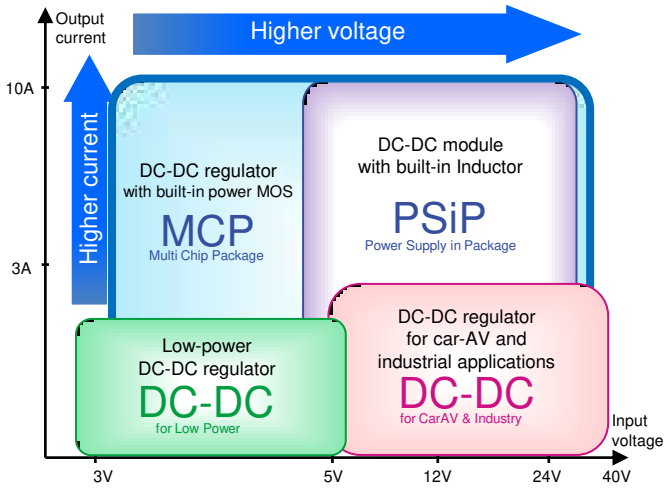

Panasonic will continue to offer the power solutions that satisfy our customers along with the "ENELEAD."

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

or Panasonic power device simulator global Click

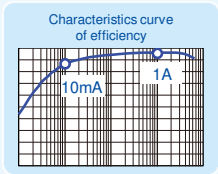
Thank you for your interest in Panasonic Step down DC-DC Regulator. We provide a variety of regulators with wide ranges of input voltage and output current, based on the low power technologies that have been cultivated through the development of customized power supplies for mobile phones. In the next generation, we are going to expand its application for industrial and infrastructure such as server, network and so on with a view to high current not just low power of several hundred mA degree.

## Wide product lineup for various applications




Provides DC-DC solutions with high efficiency, fast response, and small size.

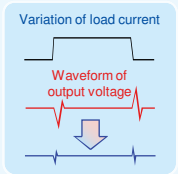
### High efficiency




Achieves high efficiency for a wide load range (from light to heavy).

Achieves low power consumption and low heat generation.

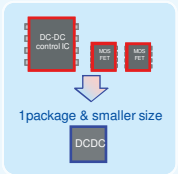
### Fast response




Suppresses the transient variation of load.

Supplies a stable voltage to equipments.

### Small size




Reduces the footprint of parts for power supply.

Achieves miniaturization of equipments.

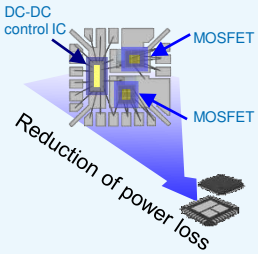
# ●DC-DC Regulator with Built-in Power MOS

DC-DC regulators including both Fast-response control IC with hysteretic control and MOSFET with low ON-resistance in a single package (MCP).

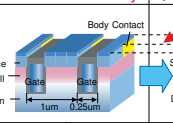
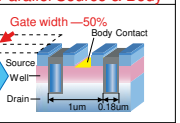
## ●Feature 1 ~High efficiency~

Core Technology

### (1) Built-in MOSFET with low ON-resistance



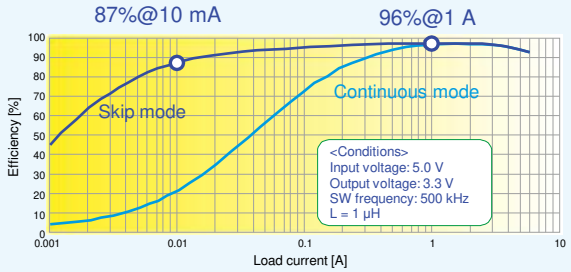

[Trench-MOSFET] The optimization of the structure reduces the capacity, and improves the Qg/ON-resistance significantly.

| | Conventional design Square Source & Body | New design Parallel Source & Body |
|---|---|---|
| |  |  |
| Process rule | 250nm | 110nm |
| RDS (on) | 1 | 0.6 |
| Qg | 1 | 0.4 |
| Ron×Qg | 1 | 0.24 |



Core Technology

### (2) Skip mode (Set at light load)



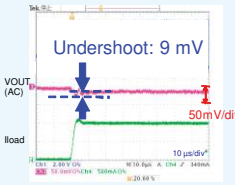
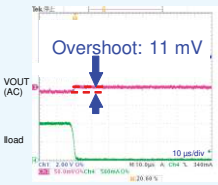

Improves the efficiency at light load.

Achieves low power consumption and low heat generation.

## ●Feature 2 ~Fast response~

Core Technology

### Hysteretic control method

| Load current | 10 µA⇒1 A | 1 A⇒10 µA |
|---|---|---|
| Load transient<br>Vin = 5.0 V, Vout = 1.2 V<br>Cout: 44 µF<br>L: 1.0 µH |  |  |



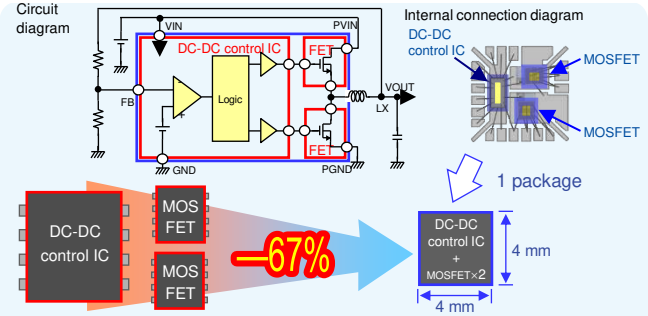
Reduces the overshoot/undershoot due to load current transient to ±10 mVpp.

Ensures stable operation of equipments.

## ●Feature 3 ~Small size~

Core Technology

### MCP (Multi-Chip Package)




Both DC-DC control IC and MOSFET are included in a single package.

Small footprint, achieving miniaturization of equipments

Line-up

| | | NN30195A | NN30295A | NN30297A | NN30196A | NN30310AA | NN30320A | NN30321A | NN30421A | NN30331A | NN30332A | NN30312A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Input voltage 1 | | 4.5 to 5.6V | 4.5 to 5.6V | 4.0 to 5.6V | 4.5 to 5.6V | 6.0 to 30V | 4.5 to 28V | 4.5 to 28V | 4.75 to 24V | 4.5 to 24V | | 4.5 to 30V |
| Input voltage 2 (∗1) | | — | — | — | — | — | — | — | 4.5 to 5.5V | 4.5 to 5.5V | | — |
| Absolute maximum rating | | 6V | | | | 33V | 30V | | | | | 33V |
| Output voltage | | 0.6 to 3.5V | 0.6 to 3.5V | | 0.6 to 3.5V | 0.75 to 5.5V | | | 0.75 to 3.6V | 0.75 to 3.6V | | 0.75 to 5.5V |
| Output current (max) | | 6A | | | 9A | 3A | | 6A | 8A | | 10A | |
| Control method | | Hysteretic | | | | Hysteretic | | | | | | |
| Ron (Ω) | Hi/Lo | 25m/25m | 25m/25m | 28m/25m | 9m/9m | 25m/25m | 20m/20m | 20m/10m | 20m/10m | 20m/6m | 20m/6m | 9m/9m |
| I2C control (∗2) | | — | Yes | Yes | — | — | — | — | — | — | — | — |
| Synchronous rectification | | Yes | | | | Yes | | | | | | |
| Skip mode (∗3) | | ○ | | | | ○ | | | | | | |
| Package | Type | HQFN24 | HQFN24 | HQFN24 | HQFN40 | HQFN24 | HQFN24 | HQFN24 | HQFN24 | HQFN24 | HQFN24 | HQFN40 |
| | Size | 4.0x4.0mm | 4.0x4.0mm | 4.0x4.0mm | 6.0x6.0mm | 4.0x4.0mm | 4.0x4.0mm | 4.0x4.0mm | 4.0x 4.0mm | 4.0x4.0mm | 4.0x4.0mm | 6.0x6.0mm |
| | Pin-pitch | 0.5mm | | | | 0.5mm | | | | | | |
| Selectable frequency | | 0.5/1.0 /2.0 MHz | 0.5 to 2.0 MHz (∗2) | 0.5 to 2.0 MHz (∗2) | 0.5/1.0 /2.0 MHz | 0.25/0.75 /1.25 MHz | 0.21/0.43 /0.65 MHz | 0.21/0.43 /0.65 MHz | 0.22/0.41 /0.58 MHz | 0.43/0.63 MHz | 0.43/0.63 MHz | 0.25/0.75 /1.25 MHz |
| Function | | OCP, OVD, SCP, UVLO, TSD | | | | OCP, OVD, SCP, UVLO, TSD | | | | | | |
| Product life cycle stage | | MP | | | | | | | | | | |

(∗1) Ultra-high efficiency at light load achieved by a 5-V input voltage
(∗2) For NN30295 & NN30297, the I2C interface can be used to select from among seven frequency values and change the output voltage.
(∗3) Skip mode: High efficiency mode at light load