

**STRUCTURE**                      Silicon Monolithic Integrated Circuit  
**PRODUCT NAME**                1ch DC/DC Converter IC built in synchronous rectifier  
**TYPE**                                **BD9130NV**

**FEATURES**                        • Output Voltage : Adjustable(1.0~2.5 V), Output Current : 2.0A  
    • High Efficiency and Fast Transient Response

○ABSOLUTE MAXIMUM RATING (Ta=25°C)

| Parameter                    | Symbol    | Limit                  | Unit |
|------------------------------|-----------|------------------------|------|
| Power Supply Voltage         | VCC       | -0.3~+7 * <sup>1</sup> | V    |
|                              | PVCC      | -0.3~+7 * <sup>1</sup> | V    |
| EN Voltage                   | VEN       | -0.3~+7                | V    |
| SW · ITH Voltage             | VSW, VITH | -0.3~+7                | V    |
| SW Output Current            | ISW       | 2.6 * <sup>1</sup>     | A    |
| Power Dissipation 1          | Pd1       | 0.9 * <sup>2</sup>     | W    |
| Power Dissipation 2          | Pd2       | 3.9 * <sup>3</sup>     | W    |
| Operating Temperature Range  | Topr      | -25~+105               | °C   |
| Storage Temperature Range    | Tstg      | -55~+150               | °C   |
| Maximum Junction Temperature | Tjmax     | +150                   | °C   |

\*<sup>1</sup> Pd, ASO, and Tjmax=150°C should not be exceeded.

\*<sup>2</sup> Reduced by 7.2mW for increase in Ta of 1°C above 25°C.

(when mounted on a board 70.0mm × 70.0mm × 1.6mm Glass-epoxy PCB)

\*<sup>3</sup> Reduced by 31.2mW for increase in Ta of 1°C above 25°C.

(when mounted on a board according to JESD51-7)

○OPERATING CONDITIONS (Ta=-25~+105°C)

| Parameter                 | Symbol | Min. | Typ. | Max.              | Unit |
|---------------------------|--------|------|------|-------------------|------|
| Power Supply Voltage      | VCC    | 2.7  | 3.3  | 5.5               | V    |
|                           | PVCC   | 2.7  | 3.3  | 5.5               | V    |
| EN Voltage                | VEN    | 0    | -    | Vcc               | V    |
| Output Voltage range      | VOUT   | 1.0  | -    | 2.5* <sup>4</sup> | V    |
| SW Average Output Current | ISW    | -    | -    | 2.0* <sup>5</sup> | A    |

\*<sup>4</sup>In case set output voltage 1.6V or more, VccMin. = Vout + 1.3V.

\*<sup>5</sup> Pd and ASO should not be exceeded.

★This product is not designed for protection against radioactive rays.

Status of this document

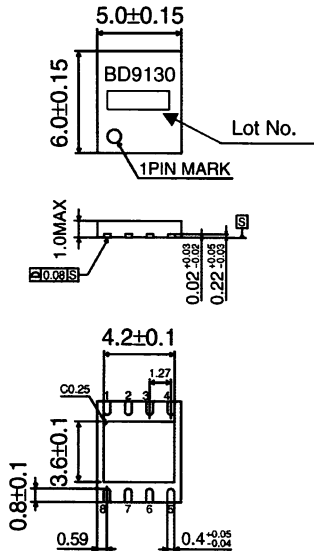
The Japanese version of this document is the formal specification. A customer may use this translation version only for a reference to help reading the formal version. If there are any differences in translation version of this document, formal version takes priority.

○ ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta=25°C VCC=PVCC=3.3V, EN=VCC, R1=10kΩ, R2=5kΩ)

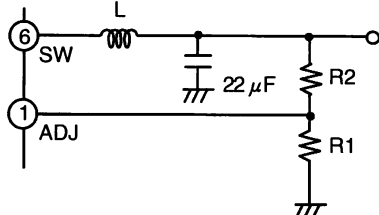
| Parameter                              | Symbol | Limit |            |            | Unit | Condition     |
|--|--------|-------|------------|------------|------|---------------|
|  |        | Min.  | Typ.       | Max.       |      |               |
| Standby Current                        | ISTB   | -     | 0          | 10         | μA   | EN=GND        |
| Bias Current                           | ICC    | -     | 250        | 450        | μA   |               |
| EN Low Voltage                         | VENL   | -     | GND        | 0.8        | V    | Stand-by Mode |
| EN High Voltage                        | VENH   | 2.0   | VCC        | -          | V    | Active Mode   |
| EN Input Current                       | IEN    | -     | 1          | 10         | μA   | VEN=3.3V      |
| Oscillation Frequency                  | FOSC   | 0.8   | 1          | 1.2        | MHz  |               |
| Pch FET ON Resistance*1                | RONP   | -     | 200        | 400        | mΩ   | PVCC=3.3V     |
| Nch FET ON Resistance*1                | RONN   | -     | 160        | 350        | mΩ   | PVCC=3.3V     |
| ADJ Reference Voltage                  | VADJ   | 0.788 | 0.800      | 0.812      | V    |               |
| ITH SINK Current                       | ITHSI  | 10    | 20         | -          | μA   | VADJ=1.0V     |
| ITH Source Current                     | ITHSO  | 10    | 20         | -          | μA   | VADJ=0.6V     |
| UVLO Threshold Voltage                 | VUVLO1 | 2.400 | 2.500      | 2.600      | V    | Vcc=3.3V→0V   |
| UVLO Hysteresis Voltage                | VUVLO2 | 2.425 | 2.550      | 2.700      | V    | Vcc=0V→3.3V   |
| Soft Start Time                        | TSS    | 0.5   | 1          | 2          | ms   |               |
| Timer Latch Time                       | TLATCH | 1     | 2          | 3          | ms   |               |
| Output Short circuit Threshold Voltage | VSCP   | -     | VOUT × 0.5 | VOUT × 0.7 | V    | VOUT=1.2V→0V  |

○ PHYSICAL DIMENSION



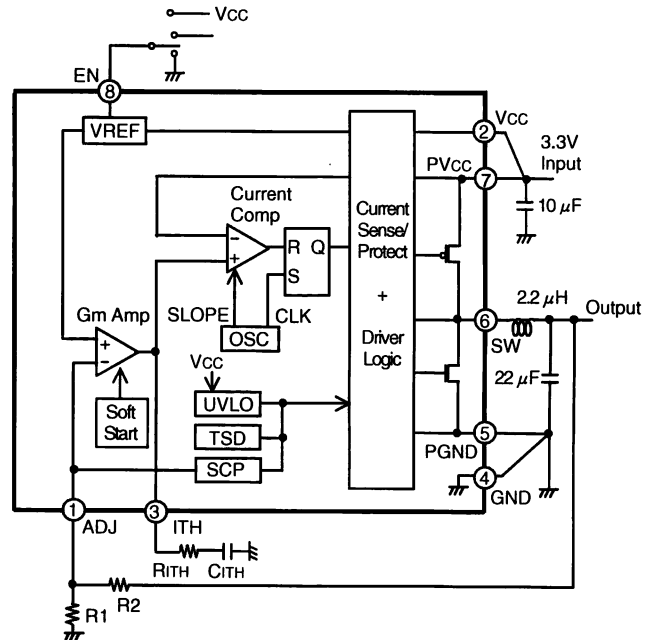
SON008V5060 (unit:mm)

○ SETTING THE OUTPUT VOLTAGE



The Output Voltage is set by the external resistor divider and is calculated as :  
 $V_{out} = (R2/R1 + 1) \times V_{ADJ}$  . . . ①  $V_{ADJ}$  : ADJ pin reference Voltage (0.8V typ)  
 It's possible to adjust the output voltage by R1 and R2. (The  $V_{out}$  must be set from 1.0V to 2.5V.)  
 Resistance  $R1 \approx 10k\Omega$  is recommended. Please confirm the ripple voltage, if you can use the resistance more than 100kΩ.

○ BLOCK DIAGRAM · APPLICATION CIRCUIT



○ PIN No., PIN NAME

| PIN No. | PIN Name |
|---------|----------|
| 1       | ADJ      |
| 2       | VCC      |
| 3       | ITH      |
| 4       | GND      |
| 5       | PGND     |
| 6       | SW       |
| 7       | PVCC     |
| 8       | EN       |

## ○NOTES FOR USE

## (1) Absolute Maximum Ratings

We are careful enough for quality control about this IC. So, there is no problem under normal operation, excluding that it exceeds the absolute maximum ratings. However, this IC might be destroyed when the absolute maximum ratings, such as impressed voltages or the operating temperature range, is exceeded, and whether the destruction is short circuit mode or open circuit mode cannot be specified. Please take into consideration the physical countermeasures for safety, such as fusing, if a particular mode that exceeds the absolute maximum rating is assumed.

## (2) GND Potential

Make setting of the potential of the GND terminal so that it will be maintained at the minimum in any operating state. Furthermore, check to be sure no terminals are at a potential lower than the GND voltage except for SW, PGND, GND terminals including an actual electric transient.

## (3) Thermal design

Do not exceed the power dissipation (Pd) of the package specification rating under actual operation, and please design enough temperature margins.

## (4) Short circuit mode between terminals and wrong mounting

In order to mount the IC on a set PCB, pay thorough attention to the direction and offset of the ICs. Erroneous mounting can destroy the IC. Furthermore, if a short circuit occurs due to foreign matters entering between terminals or between the terminal and the power supply or the GND terminal, the IC can destroy

## (5) Operation in Strong electromagnetic field

Be noted that using the IC in the strong electromagnetic radiation can cause operation failures.

## (6) ASO(Area of Safety Operation.)

Do not exceed the maximum ASO and the absolute maximum ratings of the output driver.

## (7) TSD(Thermal Shut-Down) circuit

The thermal shutdown circuit (TSD circuit) is built in this product. When IC chip temperature becomes higher, the thermal shutdown circuit operates and turns output off. The guarantee and protection of IC are not purpose. Therefore, please do not use this IC after TSD circuit operates, nor use it for assumption that operates the TSD circuit.

## (8) GND wiring pattern

Use separate ground lines for control signals and high current power driver outputs. Because these high current outputs that flows to the wire impedance changes the GND voltage for control signal. Therefore, each ground terminal of IC must be connected at the one point on the set circuit board. As for GND of external parts, it is similar to the above-mentioned.

## (9) Operation in supply voltage range

Functional Circuit operation is guaranteed within operation ambient temperature, as long as it is within operation supply voltage range. The electrical characteristics standard value cannot be guaranteed. However, there is no drastic variation in these values, as long as it is within operation supply voltage range.

## (10) We are confident in recommending the above application circuit example, but we ask that you carefully check the characteristics of this circuit before using it. If using this circuit after modifying other external circuit constants, be careful to ensure adequate margins for variation between external devices and this IC, including not only static characteristics but also transient characteristics. If switching noise is high, please insert the Low pass filter between Vcc pin and PVcc pin, insert the schottky barrier diodes between SW pin and PGND pin.

## (11) Overcurrent protection circuit

The overcurrent protection circuit is built in the output. If the protection circuit operates more than for specific hours (when the load is short.), the output will be latched in OFF. The output returns when EN is turned on or UVLO is released again. These protection circuits are effective in the destruction prevention by broken accident. Please do not use in continuous circuit operation.

(12) Selection of inductor

It is recommended to use an inductor with a series resistance element (DCR)  $0.1\ \Omega$  or less. Especially, in case output voltage is set 1.6V or more, note that use of a high DCR inductor will cause an inductor loss, resulting in decreased output voltage. Should this condition continue for a specified period (soft start time + timer latch time), output short circuit protection will be activated and output will be latched OFF. When using an inductor over  $0.1\ \Omega$ , be careful to ensure adequate margins for variation between external devices and this IC, including transient as well as static characteristics. Furthermore, in any case, it is recommended to start up the output with EN after supply voltage is within operation range.

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