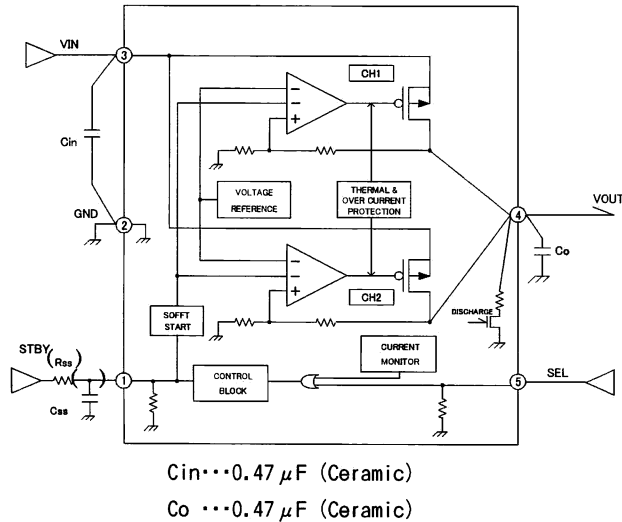


STRUCTURE Silicon Monolithic Integrated Circuit  
 PRODUCT Auto Power Save CMOS Type series regulator

TYPE **BH□□PB1WHFV Series**

○ BLOCK DIAGRAM and APPLICATION CIRCUIT



○ PIN DESCRIPTION

| PIN No. | PIN NAME | DESCRIPTION                                                                 |
|---------|----------|-----------------------------------------------------------------------------|
| 1       | STBY     | OUTPUT CONTROL (High:ON, Low:OFF) & SOFT START CONTROL                      |
| 2       | GND      | GROUND Pin                                                                  |
| 3       | VIN      | INPUT Pin                                                                   |
| 4       | VOUT     | OUTPUT Pin                                                                  |
| 5       | SEL      | Mode selector<br>(High:Fixed, High Speed Mode<br>Low:Automatic Switch Mode) |

Fig.1 BLOCK DIAGRAM and APPLICATION CIRCUIT

○ ABSOLUTE MAXIMUM RATINGS ( $T_a=25^\circ C$ )

| PARAMETER                   | Symbol | Limit        | Unit       |
|-----------------------------|--------|--------------|------------|
| Power Supply Voltage        | VMAX   | -0.3 ~ +6.5  | V          |
| Power Dissipation           | Pd     | 410 (Note.1) | mW         |
| Operating Temperature Range | Topr   | -40 ~ +85    | $^\circ C$ |
| Storage Temperature Range   | Tstg   | -55 ~ +125   | $^\circ C$ |

Note.1 Pd derated at 4.1mW/ $^\circ C$  for temperature above  $T_a=25^\circ C$ ,  
 mounted on 70mm×70mm×1.6mm glass-epoxy PCB.

Application example

The application circuit is recommended for use. Make sure to confirm the adequacy of the characteristics.

When using the circuit with changes to the external circuit constants, make sure to leave an adequate margin for external components including static and transitional characteristics as well as dispersion of the IC.

Note that ROHM cannot provide adequate confirmation of patents.

The product described in this specification is designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys).

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○RECOMMENDED OPERATING RANGE

| PARAMETER            | Symbol | Limit     | Unit |
|----------------------|--------|-----------|------|
| Power Supply Voltage | VIN    | 1.7 ~ 5.5 | V    |
| Output Max Current   | IMAX   | 150       | mA   |

○ELECTRICAL CHARACTERISTICS

(Ta=25°C, VIN=VOUT+1V, STBY=1.5V, SEL=0V, Cin=0.47 μF, Co=0.47 μF, unless otherwise noted.)

| PARAMETER                                 | Symbol   | Limit            |      |                  | Unit   | Conditions                                          |                       |
|-------------------------------------------|----------|------------------|------|------------------|--------|-----------------------------------------------------|-----------------------|
|                                           |          | MIN.             | TYP. | MAX.             |        |                                                     |                       |
| <b>【Regulator】</b>                        |          |                  |      |                  |        |                                                     |                       |
| Output Voltage                            | VOUT     | -1.0%<br>(-25mV) | -    | +1.0%<br>(+25mV) | V      | IOUT=1mA, SEL=1.5V<br>At 2.5≤VOUT accuracy is ±25mV |                       |
| Circuit Current 1                         | ICC1     | -                | 2    | 4                | μA     | IOUT=0mA, Monitor VIN PIN, SEL=0V                   |                       |
| Circuit Current 2                         | ICC2     | -                | 20   | 40               | μA     | IOUT=0mA, Monitor VIN PIN, SEL=1.5V                 |                       |
| Circuit Current (STBY)                    | ISTBY    | -                | -    | 1.0              | μA     | STBY=0V                                             |                       |
| Ripple Rejection Ratio                    | RR       | -                | 60   | -                | dB     | VRR=-20dBv, fRR=1kHz, IOUT=10mA, SEL=1.5V           |                       |
| Input output Voltage difference 1 Note.1  | VSAT1    | -                | 100  | 200              | mV     | VIN=VOUT×0.98, IOUT=50mA                            |                       |
| Input output Voltage difference 2 Note.1  | VSAT2    | -                | 210  | 400              | mV     | VIN=VOUT×0.98, IOUT=100mA                           |                       |
| Input output Voltage difference 3 Note.1  | VSAT3    | -                | 315  | 600              | mV     | VIN=VOUT×0.98, IOUT=150mA                           |                       |
| Line Regulation 1                         | VDL1     | -                | 2    | 20               | mV     | VIN=VOUT+1V to 5.5V, IOUT=100 μA                    |                       |
| Line Regulation 2                         | VDL2     | -                | 2    | 20               | mV     | VIN=VOUT+1V to 5.5V, IOUT=10mA                      |                       |
| Load Regulation                           | VDLO     | -                | 10   | 40               | mV     | IOUT=10mA to 100mA                                  |                       |
| Output Voltage temperature Characteristic | ΔVOUT/ΔT | -                | ±100 | -                | ppm/°C | IOUT=10mA, Ta=-40~+85°C                             |                       |
| <b>【Low Output Current Mode】</b>          |          |                  |      |                  |        |                                                     |                       |
| Current Threshold (Low Icc Mode)          | ITH1     | -                | 0.3  | -                | mA     | SEL=0V IOUT=3mA⇒0mA sweep                           |                       |
| Current Threshold (Normal Mode)           | ITH2     | -                | 1.2  | -                | mA     | SEL=0V IOUT=0mA⇒3mA sweep                           |                       |
| <b>【Over Current Protection 1】</b>        |          |                  |      |                  |        |                                                     |                       |
| Limit Current                             | ILMAX    | -                | 300  | -                | mA     | Vo=VOUT×0.90                                        |                       |
| Short Current                             | ISHORT   | -                | 50   | -                | mA     | Vo=0V                                               |                       |
| <b>【Stand-by block】</b>                   |          |                  |      |                  |        |                                                     |                       |
| STBY Pin Current                          | ISTB     | -                | 2    | 4                | μA     | STBY=1.5V                                           |                       |
| STBY Control Voltage                      | ON       | VSTBH            | 1.5  | -                | VCC    | V                                                   |                       |
|                                           | OFF      | VSTBL            | -0.3 | -                | 0.3    | V                                                   |                       |
| Discharge resistance at standby           | RDCG     | -                | 2.4  | -                | kΩ     |                                                     |                       |
| <b>【SEL Pin】</b>                          |          |                  |      |                  |        |                                                     |                       |
| Pull Down Resistor of SEL Pin             | RSEL     | 0.5              | 1.0  | 2.0              | MΩ     |                                                     |                       |
| SEL Control Voltage                       | ON       | VSELH            | 1.5  | -                | VCC    | V                                                   | Fixed High speed mode |
|                                           | OFF      | VSELL            | -0.3 | -                | 0.3    | V                                                   | Automatic swith mode  |

●This product is not designed for protection against radio active rays. Note.1 except at VOUT≤1.5V

○ ELECTRICAL CHARACTERISTICS of

EACH OUTPUT VOLTAGE

| Output Voltage | PARAMETER          | MIN. | TYP. | MAX. | Unit | CONDITION     |
|----------------|--------------------|------|------|------|------|---------------|
| 1.2V           | Output Max Current | 70   | 120  | -    | mA   | VCC=1.7V      |
|                |                    | 150  | -    | -    |      | VCC=2.0V      |
| 1.5V           |                    | 50   | 100  | -    |      | VCC=1.8V      |
|                |                    | 150  | -    | -    |      | VCC=2.2V      |
| 1.8V≤VOUT      |                    | 75   | 143  | -    |      | VCC=VOUT+0.3V |
|                |                    | 150  | -    | -    |      | VCC=VOUT+0.6V |

○ TEST CIRCUIT

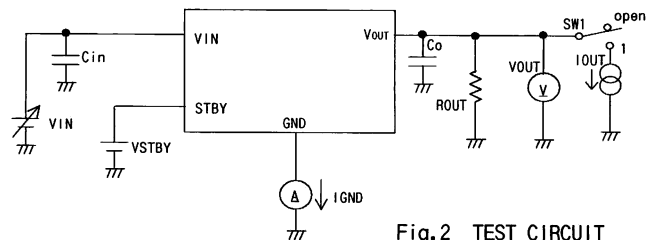


Fig.2 TEST CIRCUIT

○RECOMMENDED OPERATING CONDITION

| PARAMETER        | Symbol | MIN        | TYP. | MAX. | Unit | CONDITION                     |
|------------------|--------|------------|------|------|------|-------------------------------|
| Input Capacitor  | Cin    | 0.33Note.2 | 0.47 | -    | μF   | Ceramic capacitor recommended |
| Output Capacitor | Co     | 0.33Note.2 | 0.47 | -    | μF   | Ceramic capacitor recommended |

Note.2 Includes temperature coefficient and DC bias of the capacitor. Recommended capacitor type is X5R or X7R

○Power Dissipation Reduction

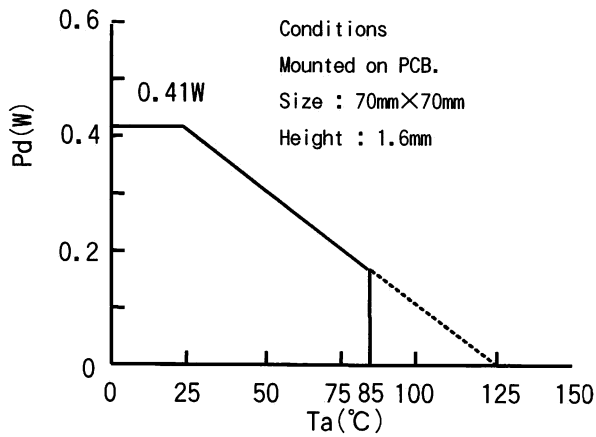


Fig.3 Pd reduction (example)

○Device Name and Marking

Device Name : BH       PB1WHFV

↑  
a

| Symbol | Description                                                                                                                   |                | Device Mark |
|--------|-------------------------------------------------------------------------------------------------------------------------------|----------------|-------------|
|        | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | Output Voltage |             |
| a      | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | 12V typ.       | PA          |
|        | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | 15V typ.       | PB          |
|        | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | 18V typ.       | PC          |
|        | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | 25V typ.       | PD          |
|        | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | 28V typ.       | PE          |
|        | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | 29V typ.       | PF          |
|        | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | 3.0V typ.      | PG          |
|        | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | 3.1V typ.      | PH          |
|        | <span style="border: 1px solid black; padding: 2px;">  </span> <span style="border: 1px solid black; padding: 2px;">  </span> | 3.3V typ.      | PJ          |

○Package dimensions (HVS0F5)

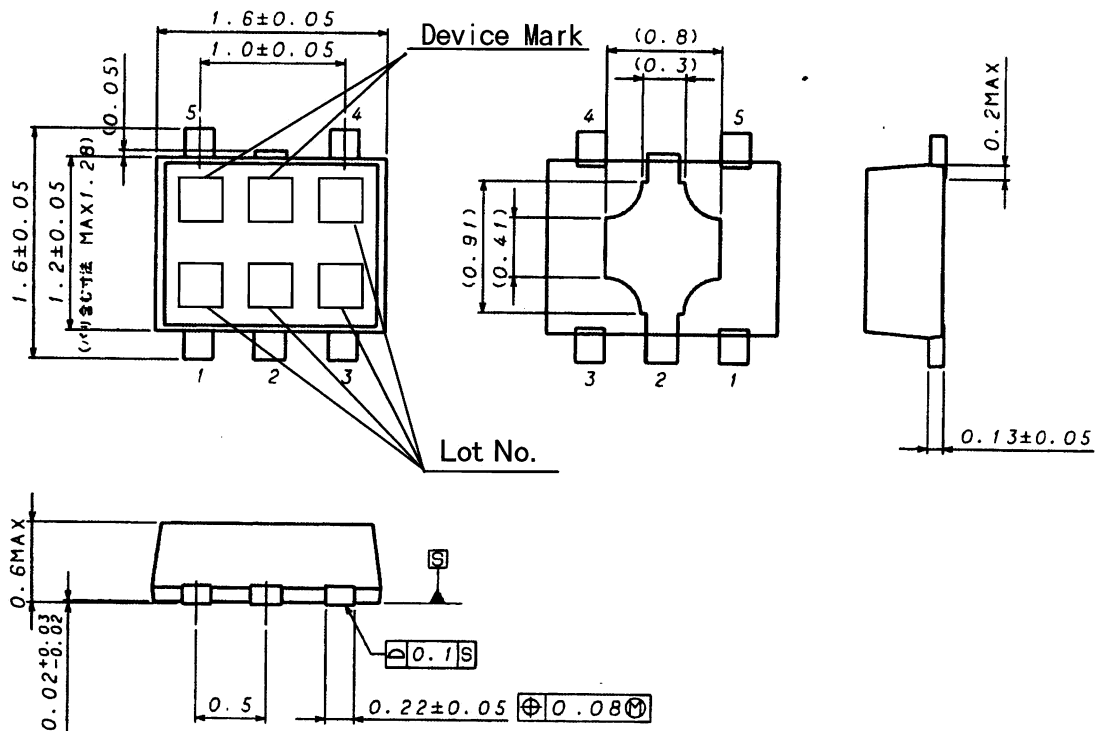


Fig.4 Package dimensions (UNIT:mm)

## ○Operation Note

## 1.) Absolute maximum ratings

May be destroyed if it is operated beyond its absolute maximum ratings. If the device is destroyed in exceeding the recommended maximum ratings, the failure mode will be difficult to determine. (E.g. short mode, open mode) Therefore, physical protection counter-measures (like fuse) should be implemented when operating conditions are beyond the absolute maximum ratings specified.

## 2.) GND potential

GND potential must be the lowest potential no matter what may happen. Actually, including transitional states, all pins except GND must not be below the GND potential.

## 3.) Setting of heat

Consider Pd at actual application, carry out the heat design that have adequate margin.

## 4.) Pin short and mistake fitting

When mounting the IC on the PCB, pay attention to the orientation of the IC. If there is a placement mistake, the IC may be burned up.

## 5.) Actions in strong magnetic field

Using the IC within a strong magnetic field may cause a malfunction.

## 6.) Mutual impedance

Use short and wide wiring tracks for the power supply and ground to keep the mutual impedance as small as possible. Use a capacitor to keep ripple to a minimum.

## 7.) Regarding STBY Pin

For standby mode, set STBY voltage below 0.3V. For normal operation, set the pin voltage beyond 1.5V. When voltage is set over 1.5V at normal mode, if in-rush current occurs at startup please put R-C filter at STBY pin.

## 8.) Over current protection circuit

Over current and short circuit protection is built-in at the output, and IC destruction is prevented at the time of load short circuit. These protection circuits is effective in the destructive prevention by the sudden accident, please avoid use to which a protection circuit operates continuously.

## 9.) Thermal shutdown

In cases of operation at high temperature, thermal shut-down will be activated and output will be turned off. Once IC is returned on normal operating temperature, the output will be turned back on.

## 10.) Input output Voltage difference

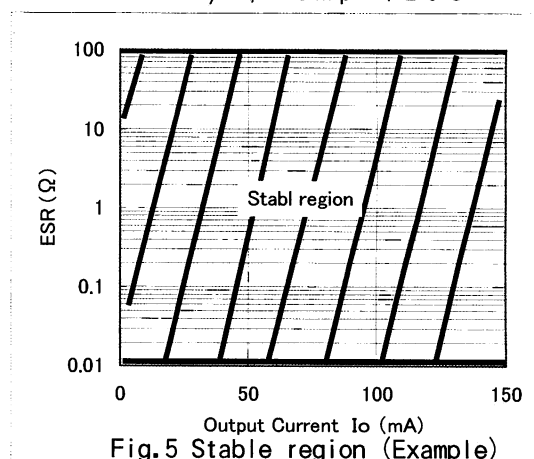
When operating at saturation state ( $V_{IN}-V_{OUT}<100mV$ ) at automatic switch mode, Output Noise may increase. To avoid such phenomenon please use with SEL Pin at high state.

## 11.) Output capacitor

To prevent oscillation at output, it is recommended that the IC be operated at the stable region as shown on Fig.5. It is recommended that the IC operates with capacitor of more than  $0.47\mu F$ , and ESR below  $10\Omega$ .

At larger capacitance value, output becomes more stable and output load fluctuation is improved.

$C_o = 0.47\mu F$ , Temp = +25°C



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