Free Delay Time Setting
CMOS Voltage Detector IC
BD4142HFV

● General Description
BD4142HFV is 1ch voltage detector IC for monitoring an input voltage line. The default detected voltage is 0.5V and is adjustable via external resistors. When monitoring an input voltage supply, the IC outputs a HIGH signal via a PGOOD pin when the supply rises above the threshold and is LOW when below.

● Features
  ● Open Drain Output
  ● Built in Under Voltage LockOut (UVLO) Circuit
  ● Delay Time Controlled by External Capacitor
  ● Very small and low height package
  ● PGOOD HIGH Output

● Applications
  Laptop PC, Desktop PC, LCD-TV, Printer, STB, Digital Appliances, and more.

● Key Specifications
  ● Input voltage range: 3.0V to 5.5V
  ● Detected voltage: 500mV(Typ)
  ● PGOOD output ON resistance: 100Ω(Typ)
  ● Bias current: 7.5μA (Typ)
  ● Operating temperature range (Ta): -10°C to +100°C

● Package
  HVSOF5 1.60mm x 1.60mm x 0.60mm

● Typical Application Circuit

![Typical Application Circuit Diagram](image-url)

Figure 1. Typical Application Circuit
Pin Configuration

(TOP VIEW)

![Pin Configuration Diagram]

Figure 2. Pin configuration

Pin Description

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PGOOD</td>
<td>Reset Output Pin (Power Good Signal)</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>3</td>
<td>Vcc</td>
<td>Power Supply Input Pin</td>
</tr>
<tr>
<td>4</td>
<td>IN</td>
<td>Monitoring Voltage Input Pin</td>
</tr>
<tr>
<td>5</td>
<td>DLY</td>
<td>Capacitor Connected Pin for Setting Delay Time</td>
</tr>
<tr>
<td>Bottom</td>
<td>E-Pad</td>
<td>Substrate. Connect the substrate to GND.</td>
</tr>
</tbody>
</table>

Block Diagram

![Block Diagram]

Figure 3. Block Diagram
### Absolute Maximum Ratings (Ta=25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal voltage</td>
<td>VCC, VIN, VDLY, VPGOOD</td>
<td>6°1</td>
<td>V</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>Pd</td>
<td>0.67°2</td>
<td>W</td>
</tr>
<tr>
<td>PGOOD Capacity Current</td>
<td>IPGOOD</td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>Topr</td>
<td>-10 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>Tstg</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>Tjmax</td>
<td>+150</td>
<td>°C</td>
</tr>
</tbody>
</table>

°1 No need to exceed Pd.<br>°2 Reduced by $\theta_{ja}=186.6°C/W$ when used over 25°C.<br>(when mounted on a board 70.0mm × 70mm × 1.6mm Glass-epoxy PCB which has 1 layer. (copper foil density :2%))

### Recommended Operating Ratings (Ta=25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal voltage</td>
<td>VCC</td>
<td>3.0 5.5</td>
<td>V</td>
</tr>
<tr>
<td>VIN</td>
<td>-0.3</td>
<td>VCC - 2</td>
<td>V</td>
</tr>
<tr>
<td>VPGOOD</td>
<td>-0.3</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>VDLY</td>
<td>-0.3</td>
<td>VCC</td>
<td>V</td>
</tr>
</tbody>
</table>

### Electrical Characteristics (Unless otherwise noted, Ta=25°C, Vcc=5V)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bias Current</td>
<td>ICC</td>
<td>- 7.5 20</td>
<td>μA</td>
</tr>
<tr>
<td>Detected Voltage</td>
<td>VDET</td>
<td>491 500 509</td>
<td>mV</td>
</tr>
<tr>
<td>Hysteresis Voltage</td>
<td>VHYS</td>
<td>- 10 -</td>
<td>mV</td>
</tr>
<tr>
<td>Delay Current</td>
<td>IDLY</td>
<td>150 250 350</td>
<td>nA</td>
</tr>
<tr>
<td>PGOOD Output ON Resistance</td>
<td>ROUT</td>
<td>- 100 200</td>
<td>Ω</td>
</tr>
<tr>
<td>PGOOD Output Leak Current</td>
<td>IOUT</td>
<td>- 0 5</td>
<td>μA</td>
</tr>
</tbody>
</table>
• Typical Performance Curves (Unless otherwise noted, Ta=25°C, Vcc=5V)

Figure 4. Supply Voltage - Bias Current

Figure 5. Temperature - Bias Current

Figure 6. Supply Voltage - Detected Voltage

Figure 7. Temperature - Detected Voltage
Typical Performance Curves (Unless otherwise noted, Ta=25°C, Vcc=5V) - continued

Figure 8. Supply Voltage - Delay Current

Figure 9. Temperature - Delay Current

Figure 10. External Capacitance - Delay Time
**Basic Operation**

BD4142HFV is a 1ch voltage detector IC with an independent supply voltage (Vcc). Vcc voltage must be supplied before inputting the monitoring voltage (IN).

![Input-Output Voltage Characteristic](Vcc=5V)

Figure 11. Input-Output Voltage Characteristic

**Timing Chart**

![Timing Chart](IN [V]

![Timing Chart](DLY [V]

![Timing Chart](PGOOD [V]

Figure 12. Timing Chart

**Detected Delay Time (TDELAY) Setting**

TDELAY is calculated as below.

\[
T_{\text{delay}} [s] = \frac{C_{\text{ext}} [F] \times 500 [mV]}{250 [nA]}
\]

\[
= C_{\text{ext}} [F] \times 2 \times 10^6
\]

\[
C_{\text{ext}} [F] = T_{\text{delay}} [s] / (2 \times 10^6)
\]

(Example) When using a 4700pF capacitor,

\[
T_{\text{delay}} = 4700 [\text{pF}] \times 2 \times 10^6
\]

\[
= 9400 \times 10^{-6} = 9.4 [\text{ms}]
\]

(Example) When setting a 2ms delay,

\[
C_{\text{ext}} = 2 [\text{ms}] / (2 \times 10^6)
\]

\[
= \frac{2 \times 10^{-3}}{2 \times 10^6}
\]

\[
= 1 \times 10^{-9}
\]

\[
= 1000 [\text{pF}]
\]
● Limit of Detected Delay Time Operation (Ta=25°C, Vcc =5V, Cext=4700pF)
When the input pulse width (IN) is shorter than 50µs (Typ) (20µs (Min)), PGOOD goes LOW and come back to HIGH without any delay time setup by capacitor of DLY terminal. The behavior depends on the Vcc voltage and the Cext capacitance.

![Diagram of IN and PGOOD pulses](image)

Figure 13. Input low pulse is shorter than 50µs (Typ) (Ta=25°C, Vcc =5V, Cext=4700pF)

● Limit of Reaction Time
If the input pulse (IN) is shorter than 1µs (Typ), PGOOD does not react (PGOOD keeps HIGH).

![Diagram of IN and PGOOD pulses](image)

Figure 14. Input low pulse is shorter than 1µs
**VCC Operation**

1. When VCC is below the minimum operation voltage, PGOOD pin will become HIGH.
   (The meaning of the minimum operation voltage is: When the starting of Vcc, PGOOD output voltage become within 10% of Vcc voltage, and the value will be around 0.8V (Typ). Note that this value is reference.)

2. When VCC value exceeds the minimum operation voltage, PGOOD output become LOW until the Vcc reached UVLO released voltage (2.5V (Typ)).

3. When Vcc exceeds UVLO released voltage, PGOOD pin will become HIGH if the input voltage of IN pin is over the detected voltage (0.5V (Typ)), and PGOOD pin will become LOW if the input voltage of IN pin is below the detected voltage.

![Diagram](https://via.placeholder.com/150)

---

**Figure 15. IN > Detected Voltage**

- Vcc [V]
- PGOOD [V]
- t

**Figure 16. VCC Operation**

- Vcc [V]
- PGOOD [V]
- IN [V]

**Figure 17. IN < Detected Voltage**

- Vcc [V]
- PGOOD [V]
- IN [V]
Application Example

Figure 18. Application Circuit

Table 1. Recommended Component Values

<table>
<thead>
<tr>
<th>Ref Des</th>
<th>Value</th>
<th>Description</th>
<th>Type</th>
<th>Manufacturer</th>
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<tr>
<td>U1</td>
<td>-</td>
<td>BD4142HFV</td>
<td>-</td>
<td>ROHM</td>
</tr>
<tr>
<td>C1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C2</td>
<td>4700pF</td>
<td>GRM18 series, 50V, 1608 Ceramic Capacitor</td>
<td>MURATA</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C4</td>
<td>0.01µF</td>
<td>GRM18 series, 50V, 1608 Ceramic Capacitor</td>
<td>MURATA</td>
<td></td>
</tr>
<tr>
<td>R1</td>
<td>100kΩ</td>
<td>MCR03 series, 1608 Chip Resistor</td>
<td>ROHM</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>Short</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R4</td>
<td>Short</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

- **R1 (Pull-up Resistor)**
  R1 should be set not to be affected by output leak current (5µA (Max)) and capacity current (5mA).

- **R2, R3**
  The detected voltage is adjustable via external resistors (R2, R3).
  The recommended total resistance value for R2 and R3 is within total 300kΩ.

- **C2 (Capacitor for Detected Delay Time Setting)**
  Please set C2 value with double of minimum delay time for application.
  Please refer to Page. 6 regarding Detected Delay Time Setting. The maximum value of C2 is 4.7µF.
● Power Dissipation

![Power Dissipation Graph](image)

PCB size: 70mm × 70mm × 1.6mm
① board: 1 layer board (copper foil density: 2%)

● I/O Equivalence Circuit

<table>
<thead>
<tr>
<th>1. PGOOD</th>
<th>4. IN</th>
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<tr>
<td><img src="image" alt="PGOOD Diagram" /></td>
<td><img src="image" alt="IN Diagram" /></td>
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</table>

<table>
<thead>
<tr>
<th>5. DLY</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="DLY Diagram" /></td>
</tr>
</tbody>
</table>
Operational Notes

1. Reverse Connection of Power Supply
   Connecting the power supply in reverse polarity can damage the IC. Take precautions against reverse polarity when connecting the power supply, such as mounting an external diode between the power supply and the IC’s power supply pins.

2. Power Supply Lines
   Design the PCB layout pattern to provide low impedance supply lines. Furthermore, connect a capacitor to ground at all power supply pins. Consider the effect of temperature and aging on the capacitance value when using electrolytic capacitors.

3. Ground Voltage
   Ensure that no pins are at a voltage below that of the ground pin at any time, even during transient condition.

4. Ground Wiring Pattern
   When using both small-signal and large-current ground traces, the two ground traces should be routed separately but connected to a single ground at the reference point of the application board to avoid fluctuations in the small-signal ground caused by large currents. Also ensure that the ground traces of external components do not cause variations on the ground voltage. The ground lines must be as short and thick as possible to reduce line impedance.

5. Thermal Consideration
   Should by any chance the power dissipation rating be exceeded the rise in temperature of the chip may result in deterioration of the properties of the chip. In case of exceeding this absolute maximum rating, increase the board size and copper area to prevent exceeding the Pd rating.

6. Recommended Operating Conditions
   These conditions represent a range within which the expected characteristics of the IC can be approximately obtained. The electrical characteristics are guaranteed under the conditions of each parameter.

7. Inrush Current
   When power is first supplied to the IC, it is possible that the internal logic may be unstable and inrush current may flow instantaneously due to the internal powering sequence and delays, especially if the IC has more than one power supply. Therefore, give special consideration to power coupling capacitance, power wiring, width of ground wiring, and routing of connections.

8. Operation Under Strong Electromagnetic Field
   Operating the IC in the presence of a strong electromagnetic field may cause the IC to malfunction.

9. Testing on Application Boards
   When testing the IC on an application board, connecting a capacitor directly to a low-impedance output pin may subject the IC to stress. Always discharge capacitors completely after each process or step. The IC’s power supply should always be turned off completely before connecting or removing it from the test setup during the inspection process. To prevent damage from static discharge, ground the IC during assembly and use similar precautions during transport and storage.

10. Inter-pin Short and Mounting Errors
    Ensure that the direction and position are correct when mounting the IC on the PCB. Incorrect mounting may result in damaging the IC. Avoid nearby pins being shorted to each other especially to ground, power supply and output pin. Inter-pin shorts could be due to many reasons such as metal particles, water droplets (in very humid environment) and unintentional solder bridge deposited in between pins during assembly to name a few.

11. Unused Input Pins
    Input pins of an IC are often connected to the gate of a MOS transistor. The gate has extremely high impedance and extremely low capacitance. If left unconnected, the electric field from the outside can easily charge it. The small charge acquired in this way is enough to produce a significant effect on the conduction through the transistor and cause unexpected operation of the IC. So unless otherwise specified, unused input pins should be connected to the power supply or ground line.
Operational Notes – continued

12. Regarding the Input Pin of the IC

This monolithic IC contains P+ isolation and P substrate layers between adjacent elements in order to keep them isolated. P-N junctions are formed at the intersection of the P layers with the N layers of other elements, creating a parasitic diode or transistor. For example (refer to figure below):

When GND > Pin A and GND > Pin B, the P-N junction operates as a parasitic diode.
When GND > Pin B, the P-N junction operates as a parasitic transistor.

Parasitic diodes inevitably occur in the structure of the IC. The operation of parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Therefore, conditions that cause these diodes to operate, such as applying a voltage lower than the GND voltage to an input pin (and thus to the P substrate) should be avoided.

![Figure 19. Example of monolithic IC structure](image)

13. Ceramic Capacitor

When using a ceramic capacitor, determine the dielectric constant considering the change of capacitance with temperature and the decrease in nominal capacitance due to DC bias and others.

Ordering Information

<table>
<thead>
<tr>
<th>B</th>
<th>D</th>
<th>4</th>
<th>1</th>
<th>4</th>
<th>2</th>
<th>H</th>
<th>F</th>
<th>V</th>
<th>TR</th>
</tr>
</thead>
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<tr>
<td>Part Number</td>
<td>Package</td>
<td>Packaging and forming specification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HFV: HVSOF5</td>
<td></td>
<td>TR: Embossed tape and reel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Marking Diagram

![HVSOF5 (TOP VIEW)](image)
## Physical Dimension, Tape and Reel Information

### Package Name

<table>
<thead>
<tr>
<th>Package Name</th>
<th>HVSOF5</th>
</tr>
</thead>
</table>

### Physical Dimensions

![Physical Dimension Diagram](image)

### Tape and Reel Information

- **Tape**: Embossed carrier tape
- **Quantity**: 3000pcs
- **Direction of feed**: TR
  - The direction is the 1pin of product is at the upper right when you hold the reel on the left hand and you pull out the tape on the right hand.

### Order Information

- Order quantity needs to be multiple of the minimum quantity.

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TSZ02201-0333AAZ00350-1-2

## Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Changes</th>
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<tr>
<td>21. Aug. 2015</td>
<td>002</td>
<td>Add Application Example</td>
</tr>
</tbody>
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   (Note1) Medical Equipment Classification of the Specific Applications

<table>
<thead>
<tr>
<th>JAPAN</th>
<th>USA</th>
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<td>CLASS IV</td>
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   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

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8. Confirm that operation temperature is within the specified range described in the product specification.

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2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification
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   c. the Products are exposed to direct sunshine or condensation
   d. the Products are exposed to high Electrostatic

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<td><strong>Package</strong></td>
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<td><strong>Minimum Package Quantity</strong></td>
<td>3000</td>
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<tr>
<td><strong>Packing Type</strong></td>
<td>Taping</td>
</tr>
<tr>
<td><strong>Constitution Materials List</strong></td>
<td>inquiry</td>
</tr>
<tr>
<td><strong>RoHS</strong></td>
<td>Yes</td>
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