

Small and High Accuracy Temperature Sensor IC Series

Analog Output Temperature Sensor IC


BD1020HFV

No.10047EBT02

●Description

Low quiescent current (4μA) and high accuracy temperature sensor
Detecting temperature by itself, output voltage appears linearly along the temperature.

●Features

- 1) Detection Temperature Range -30~+100°C
- 2) Operating Voltage Range +2.4V~+5.5V
- 3) High Accuracy (typically $\pm 1.0^{\circ}\text{C}@T_a=30^{\circ}\text{C}$, typically $\pm 2.0^{\circ}\text{C}@T_a=-30\sim+100^{\circ}\text{C}$)
- 4) Temperature Sensitivity (typically $-8.2\text{mV}/^{\circ}\text{C}$)
- 5) Low Quiescent Current (typically 4μA)
- 6) Ultra Small Package (typically $1.60\text{mm}\times 1.60\text{mm}\times 0.60\text{mm}$)
- 7) Low Thermal Resistance (typically $187^{\circ}\text{C}/\text{W}$)
- 8) ESD Rating 8kV (HBM)
- 9) Excellent Ripple Rejection Characteristic

●Applications

Cell Phone (RF Module, Battery Thermal Management), Audio Systems, Digital Still Camera
LCD, PDP, Optical pick up module for DVD, BlueRay

●Absolute Maximum Ratings ($T_a=25^{\circ}\text{C}$)

| PARAMETERS | SYMBOL | LIMIT | UNIT |
|---------------------------|-----------|-----------------------|--------------------|
| Power Supply Voltage | V_{DD} | $-0.3\sim 7.0^{*1}$ | V |
| Output Voltage | V_{OUT} | $-0.3\sim V_{DD}+0.3$ | V |
| Output Current | I_{OUT} | ± 1 | mA |
| Power Dissipation | P_d | 536^{*2} | mW |
| Storage Temperature Range | T_{stg} | $-55\sim 150$ | $^{\circ}\text{C}$ |

*1. Not to exceed P_d

*2. Reduced by 5.36mW for each increase in T_a of 1°C over 25°C (mounted on $70\text{mm}\times 70\text{mm}\times 1.6\text{mm}$ Glass-epoxy PCB)

●Recommended Operating Condition

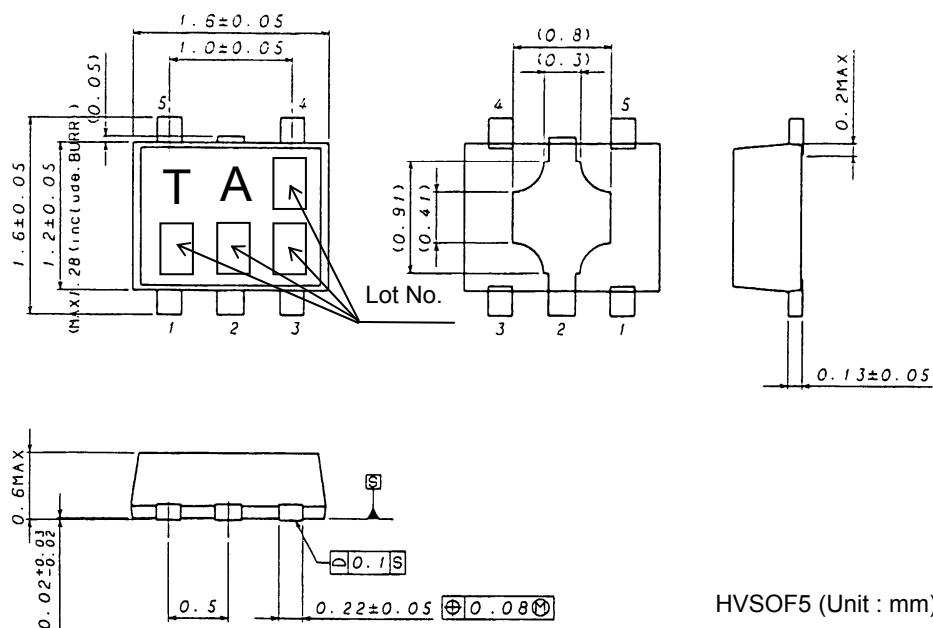
| PARAMETERS | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-----------------------|-----------|------|------|------|--------------------|
| Power Supply Voltage | V_{DD} | 2.40 | 3.00 | 5.50 | V |
| Operation Temperature | T_{opr} | -30 | - | 100 | $^{\circ}\text{C}$ |

●Electrical Characteristics and Accuracy (Unless otherwise specified, $V_{DD}=3.0\text{V}$, $T_a=25^{\circ}\text{C}$)

| PARAMETERS | SYMBOL | LIMIT | | | UNIT | CONDITIONS |
|-------------------------------|-------------------------|-------|-----------|-----------|------------------------|--|
| | | MIN. | TYP. | MAX. | | |
| Accuracy | T_{acc} | - | ± 1.0 | ± 1.5 | $^{\circ}\text{C}$ | $T_a = 30^{\circ}\text{C}$ |
| | | - | ± 2.0 | ± 2.5 | | $T_a = 100^{\circ}\text{C}$ |
| | | - | ± 2.0 | ± 2.5 | | $T_a = -30^{\circ}\text{C}$ |
| Temperature Sensitivity | V_{SE} | -8.4 | -8.2 | -8.0 | mV/ $^{\circ}\text{C}$ | |
| Supply Current | I_S | - | 4.0 | 7.0 | μA | |
| Output Voltage | V_{OUT} | 1.288 | 1.300 | 1.312 | V | $T_a = 30^{\circ}\text{C}$ |
| Output VoltageLine Regulation | $\Delta V_{OUT}/V_{DD}$ | - | - | 4 | mV | $V_{DD} = 2.4\sim 5.5\text{V}$ |
| Output VoltageLoad Regulation | $\Delta V_{OUT}/R_L$ | - | - | 1 | mV | $I_{OUT} : 0\mu\text{A} / 0.7\mu\text{A}, \text{Difference}$ |

Radiation hardness is not designed.

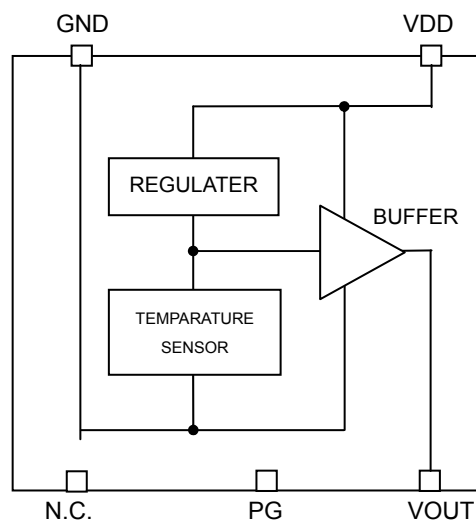
●Package Outlines



●Pin Descriptions

| Pin No. | Pin Name | Function | Comment |
|---------|----------|--|---|
| 1 | N.C. | - | Please set to OPEN . |
| 2 | PG | Heat Condition | Please connect to temperature measurement part. |
| 3 | VOUT | Output Voltage for proportional t emperature reversely | - |
| 4 | VDD | Power Supply | - |
| 5 | GND | Ground | - |

●Block Diagram



●Reference Data

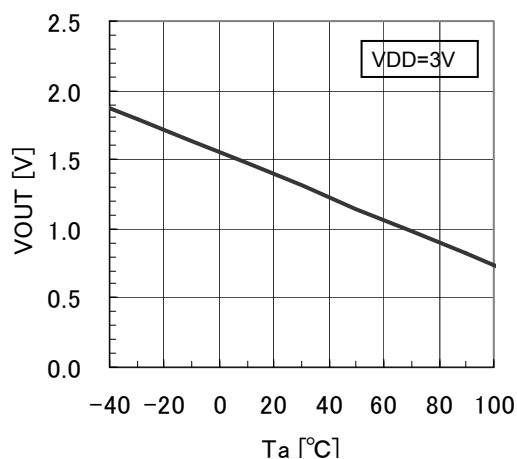


Fig.1 Output Voltage vs. Temperature

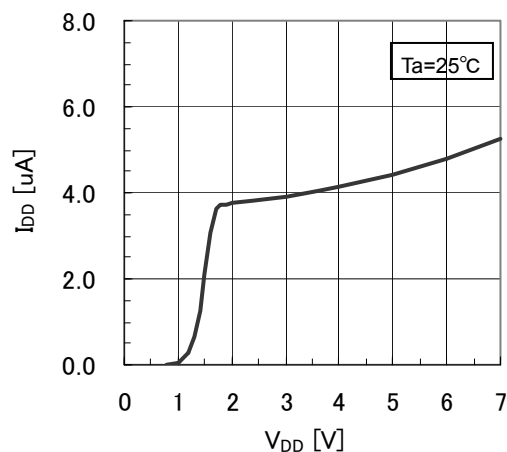


Fig.2 Supply Current vs. Supply Voltage

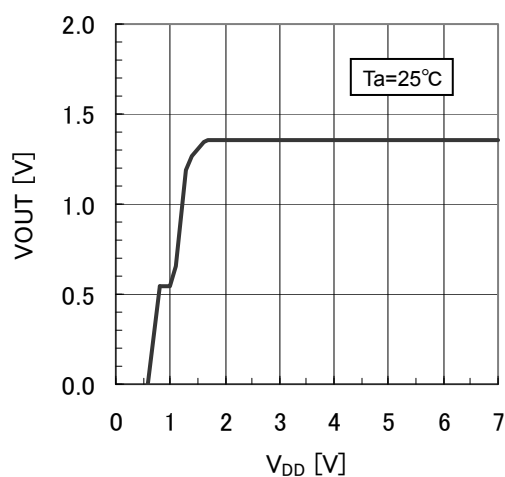


Fig.3 Output Voltage vs. Supply Voltage

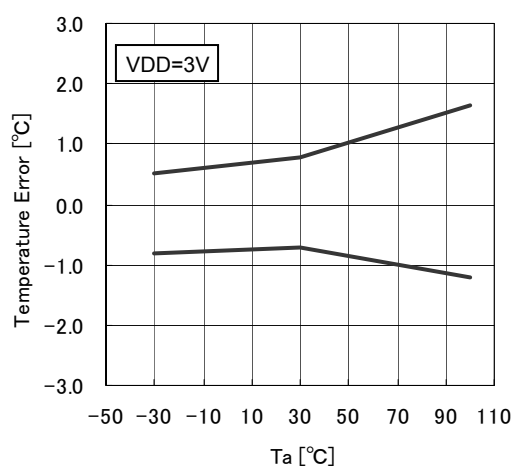


Fig.4 Error vs. Temperature

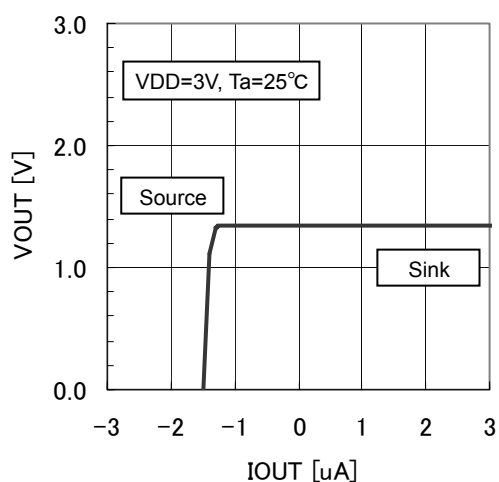
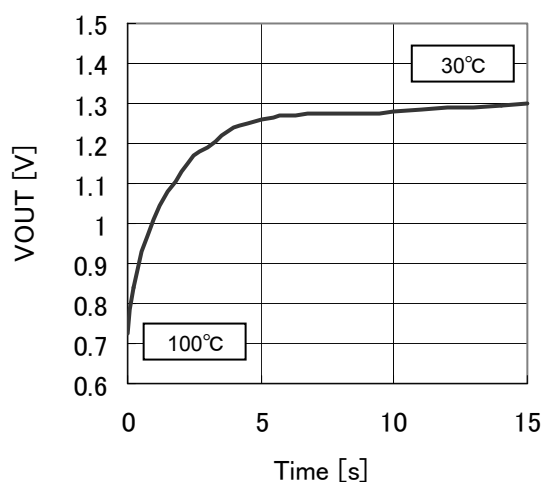


Fig.5 Output Voltage vs. Output Current

Fig.6 Start Up Response
(VOUT response 100°C→30°C in atmosphere)

●Notes for use

1) Absolute Maximum Ratings

An excess in the absolute maximum ratings, such as supply voltage, temperature range of operating conditions, etc., can break down devices, thus making impossible to identify breaking mode such as a short circuit or an open circuit. If any special mode exceeding the absolute maximum ratings is assumed, consideration should be given to take physical safety measures including the use of fuses, etc.

2) GND voltage

Make setting of the potential of the GND terminal so that it will be maintained at the minimum in any operating state.

3) 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.

4) Operation in strong electric field

Be noted that using ICs in the strong electric field can malfunction them.

5) 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.

6) Please connect it with the temperature measurement part (GND line usually) to make thermal conductivity with the mount board side the best though the PG pin (Pin NO.2) is hindered and doesn't exist about OPEN even if it connects it with GND.

●Ordering part number

| | |
|---|---|
| B | D |
|---|---|

Part No.

| | | | |
|---|---|---|---|
| 1 | 0 | 2 | 0 |
|---|---|---|---|

Part No.
1020

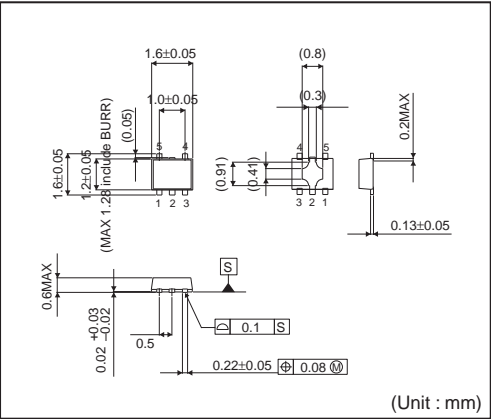
| | | |
|---|---|---|
| H | F | V |
|---|---|---|

Package
HFV: HVSOF5

| | |
|---|---|
| T | R |
|---|---|

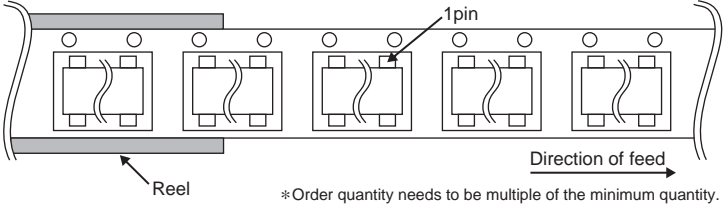
Packaging and forming specification
TR: Embossed tape and reel
(HVSOF5)

HVSOF5



<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 reel on the left hand and you pull out the tape on the right hand) |



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- Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment ^(Note 1), transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

| JAPAN | USA | EU | CHINA |
|-----------|-----------|------------|-----------|
| CLASS III | CLASS III | CLASS II b | CLASS III |
| CLASS IV | | CLASS III | |

- ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
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 - Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, and NO₂
 - Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
 - Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
 - Sealing or coating our Products with resin or other coating materials
 - 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
 - Use of the Products in places subject to dew condensation
- The Products are not subject to radiation-proof design.
- Please verify and confirm characteristics of the final or mounted products in using the Products.
- In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- De-rate Power Dissipation (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient temperature.
- Confirm that operation temperature is within the specified range described in the product specification.
- ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

- When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.
- In principle, the reflow soldering method must be used; if flow soldering method is preferred, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.
2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of ionizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
 - [a] the Products are exposed to sea winds or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, and NO₂
 - [b] the temperature or humidity exceeds those recommended by ROHM
 - [c] the Products are exposed to direct sunshine or condensation
 - [d] the Products are exposed to high Electrostatic
2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.
3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

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QR code printed on ROHM Products label is for ROHM's internal use only.

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When disposing Products please dispose them properly using an authorized industry waste company.

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