

IC for Human Body Detector

# Amplifier for Pyroelectric Infrared Sensor



BD9251FV

No.11096EAT01

## ●Description

BD9251FV is used for the human body detection application.

Make to single-chip, easy to use then before. Power-saving in the best design.

Reduce the standby power requirement of the device used always. Don't choose the mounting place by a space-saving.

## ●Features

- 1) Amplifier for sensor output
- 2) Comparator for sensor output
- 3) Built-in voltage regulator
- 4) Built-in moving detector

## ●Applications

Lighting, Sensor Light, Security system, WEB camera, TV, PC display, Air Conditioner, Ventilation fan

## ●Absolute Maximum Ratings (Ta=25°C)

| Parameter             | Symbol           | Ratings           | Units |
|-----------------------|------------------|-------------------|-------|
| Supply Voltage        | V <sub>DD</sub>  | -0.3~7.0          | V     |
| Power Dissipation     | P <sub>d</sub>   | 440* <sup>1</sup> | mW    |
| Operating Temperature | T <sub>opr</sub> | -30~75            | °C    |
| Storage Temperature   | T <sub>stg</sub> | -55~125           | °C    |

\*1. It reduces 3.5mW/°C then Ta≥25°C. (On glass epoxy board of 70mm×70mm×1.6mm)

## ●Operating Conditions

| Parameter             | Symbol                     | Ratings |      |      | Units | Conditions               |
|-----------------------|----------------------------|---------|------|------|-------|--------------------------|
|                       |                            | Min.    | Typ. | Max. |       |                          |
| Supply Voltage        | V <sub>DD</sub>            | 2.97    | 5.0  | 6.0  | V     |                          |
| A1P_IN Offset Voltage | V <sub>A1P_IN_OFFSET</sub> | -       | 1.5  | -    | V     | V <sub>DRAIN</sub> =2.3V |

This product doesn't design for protection radioactive rays.

## ●Electric Characteristics (VDD=5.0V, Ta=25°C)

| Parameter                        | Symbol              | Limits               |      |                      | Units | Conditions   |
|----------------------------------|---------------------|----------------------|------|----------------------|-------|--|
|                                  |                     | Min.                 | Typ. | Max.                 |       |  |
| Supply Current                   | I <sub>DD</sub>     | -                    | 300  | 400                  | uA    | Output no load   |
| DRAIN Output Voltage             | V <sub>DRAIN</sub>  | 2.0                  | 2.3  | -                    | V     | V <sub>DD</sub> ≥ 2.97V,<br>I <sub>DRAIN</sub> ≤ 100μA |
| AMP1/AMP2 Input Voltage          | V <sub>IN</sub>     | 0.1                  | -    | V <sub>DD</sub> -0.8 | V     |  |
| AMP1/AMP2 Gain                   | A <sub>G</sub>      | -                    | -    | 46                   | dB    |  |
| AMP1/AMP2 Unity Gain             | A <sub>UG</sub>     | -                    | 1    | -                    | MHz   |  |
| AMP1 Input Offset Voltage        | V <sub>A1OFF</sub>  | -                    | -    | 10                   | mV    |  |
| AMP2 Output Offset Voltage       | V <sub>A2OUT</sub>  | -                    | 1.5  | -                    | V     |  |
| A2_OUT Output Current (source)   | I <sub>A2OUT1</sub> | 20                   | 30   | -                    | μA    |  |
| A2_OUT Output Current (sink)     | I <sub>A2OUT2</sub> | 20                   | 200  | -                    | μA    |  |
| D_OUT / T_OUT Output "H" Voltage | V <sub>OH</sub>     | V <sub>DD</sub> -0.6 | -    | V <sub>DD</sub>      | V     | I <sub>OH</sub> =-1mA                                  |
| D_OUT / T_OUT Output "L" Voltage | V <sub>OL</sub>     | 0                    | -    | 0.6                  | V     | I <sub>OL</sub> =+1mA                                  |

●Electrical characteristic curves (Reference data)

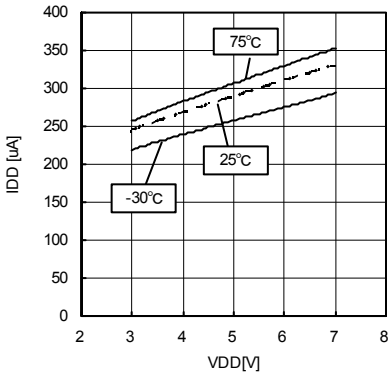


Fig.1 IDD

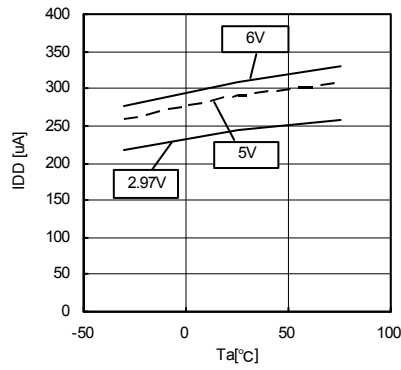


Fig.2 IDD

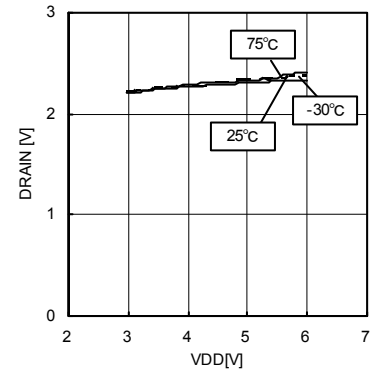


Fig.3 Drain Voltage (source 100μA)

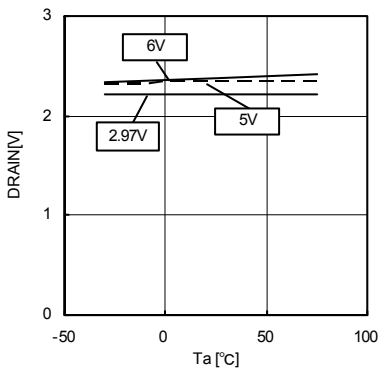


Fig.4 Drain Voltage (source 100μA)

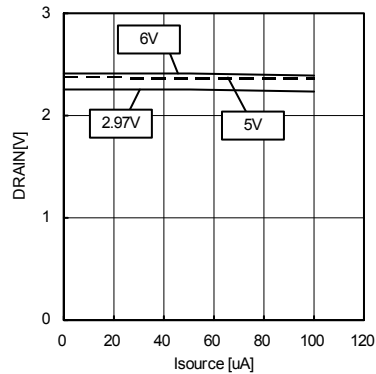


Fig.5 Drain Voltage (Ta=25°C)

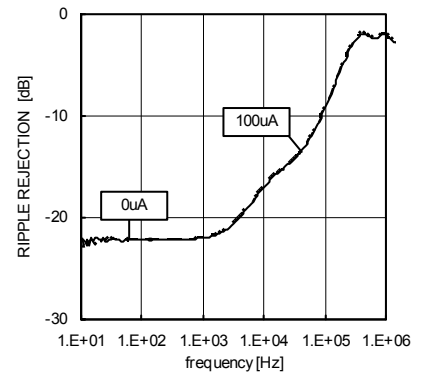


Fig.6 Drain Voltage PSRR (Ta=25°C) VDD=2.97V

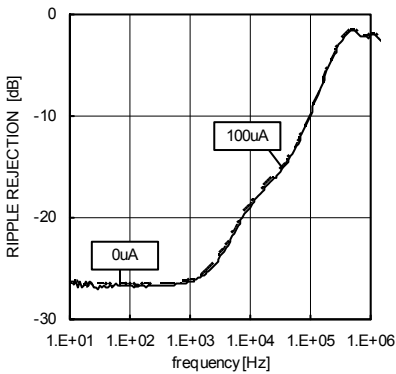


Fig.7 Drain Voltage PSRR (Ta=25°C) VDD=5.0V

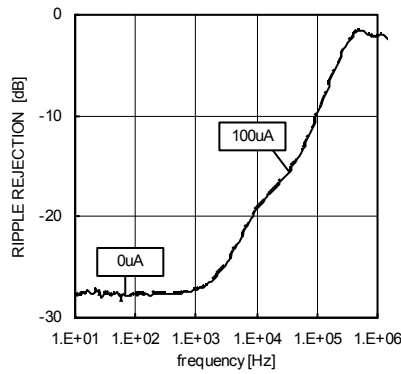


Fig.8 Drain Voltage PSRR (Ta=25°C) VDD=6.0V

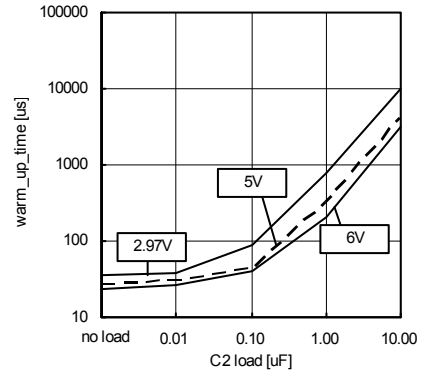


Fig.9 DRAIN VOLTAGE warm\_up\_time (Ta=25°C)

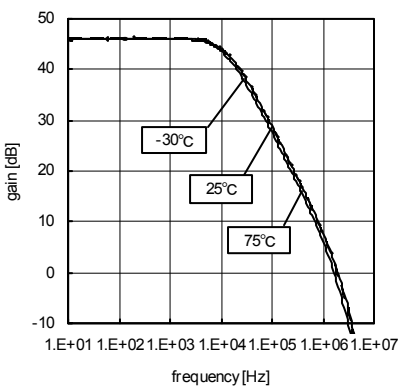


Fig.10 amp1/amp2 closed-loop-gain VDD=2.97V

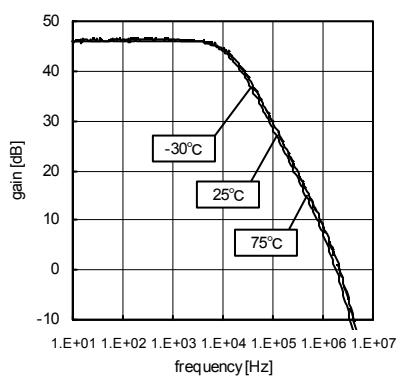


Fig.11 amp1/amp2 closed-loop-gain VDD=5V

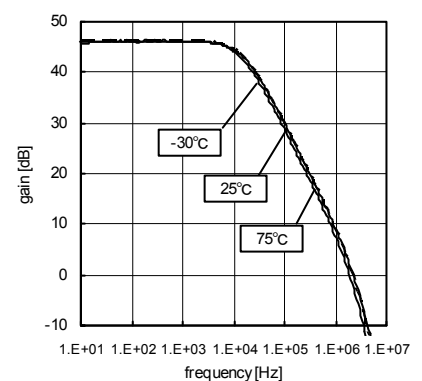


Fig.12 amp1/amp2 closed-loop-gain VDD=6V

●Electrical characteristic curves (Reference data) – Continued

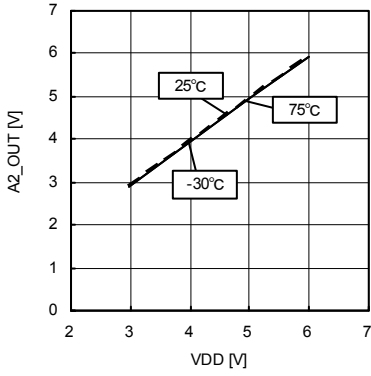


Fig.13 AMP2 Output High Voltage (source 20uA)

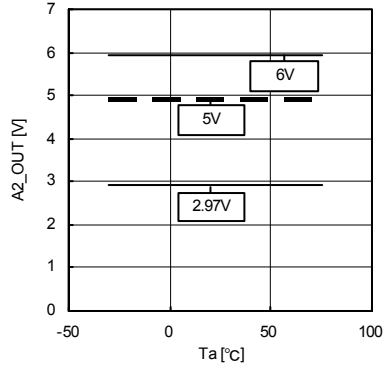


Fig.14 AMP2 Output High Voltage (source 20uA)

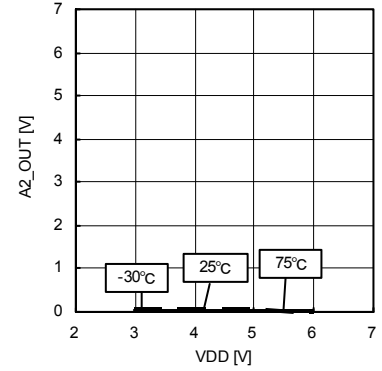


Fig.15 AMP2 Output Low Voltage (sink 20uA)

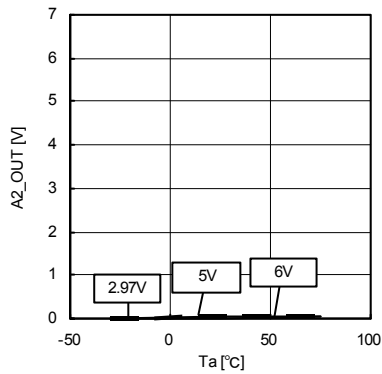


Fig.16 AMP2 Output Low Voltage (source 20uA)

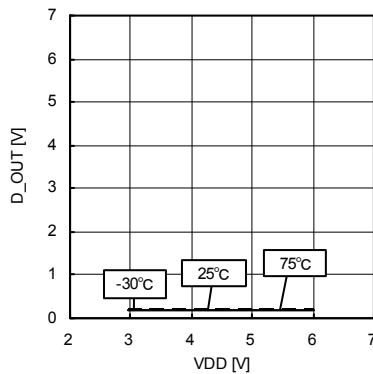


Fig.17 D\_OUT Output Low Voltage (sink 1mA)

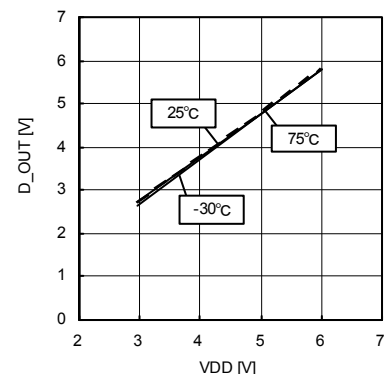


Fig.18 D\_OUT Output High Voltage (source 1mA)

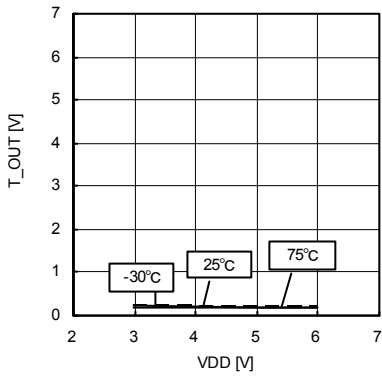


Fig.19 T\_OUT Output Low Voltage (sink 1mA)

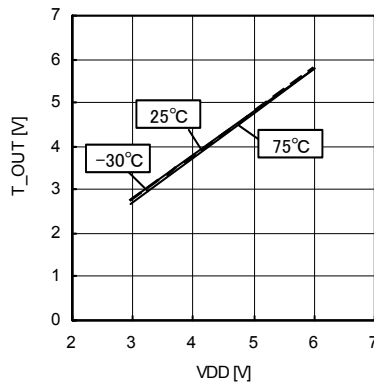
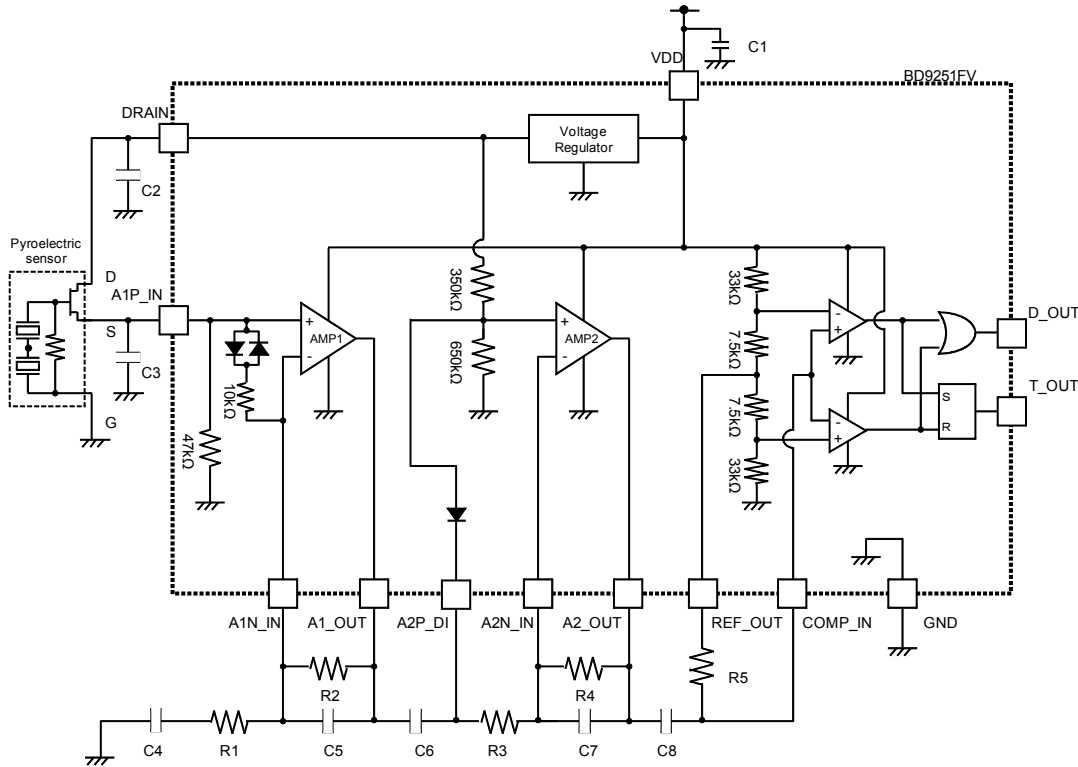


Fig.20 T\_OUT Output High Voltage (source 1mA)

●Block Diagram/Application



※ Please decide the constant after it confirms it enough examining the characteristic and the condition of the pyroelectric sensor.

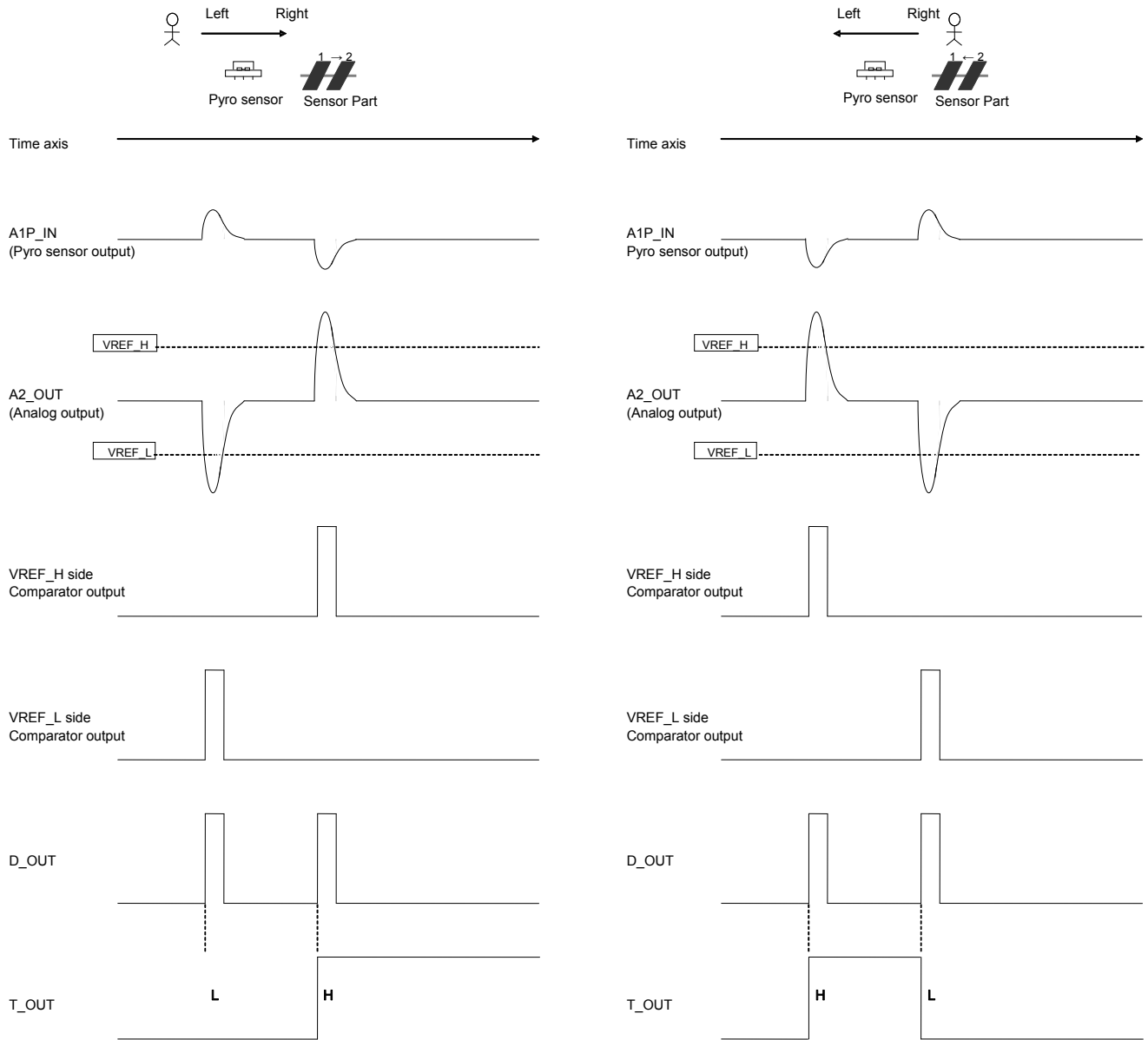
Example of circuit constant :

- |          |         |       |         |
|----------|---------|-------|---------|
| C1=C2=C3 | : 1uF   | R1=R3 | : 47kΩ  |
| C4=C6    | : 6.9uF | R2=R4 | : 4.7MΩ |
| C5=C7    | : 15nF  | R5    | : 220kΩ |
| C8       | : 10uF  |       |         |

●PIN Description

| PIN No. | PIN Name | Function                                      | Remarks |
|---------|----------|---|---------|
| 1       | GND      | Ground  |         |
| 2       | NC       | NC  |         |
| 3       | DRAIN    | Power supply for pyroelectric infrared sensor |         |
| 4       | A1P_IN   | Sensor input                                  |         |
| 5       | A1N_IN   | Amp1 n-input                                  |         |
| 6       | A1_OUT   | Amp1 output                                   |         |
| 7       | A2P_DI   | Amp2 diode output                             |         |
| 8       | A2N_IN   | Amp2 n-input                                  |         |
| 9       | A2_OUT   | Amp2 output, Analog output                    |         |
| 10      | REF_OUT  | Reference voltage (1/2VDD) output             |         |
| 11      | COMP_IN  | Comparator input                              |         |
| 12      | D_OUT    | Comparator output                             |         |
| 13      | T_OUT    | Moving detection output                       |         |
| 14      | VDD      | Power supply                                  |         |

●Timing chart ( When using dual type pyro sensor )



※When using dual type pyro sensor , it's possible to detect the direction of movement by checking the switch of T\_out signal at D\_out=H.

**●Notes for use**

- (1) Absolute maximum ratings  
Use of the IC in excess of absolute maximum ratings such as the applied voltage or operating temperature range may result in IC damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. A physical safety measure such as a fuse should be implemented when use of the IC in a special mode where the absolute maximum ratings may be exceeded is anticipated.
- (2) GND potential  
Ensure a minimum GND pin potential in all operating conditions.
- (3) 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.
- (4) Actions in strong magnetic field  
Use caution when using the IC in the presence of a strong magnetic field as doing so may cause the IC to malfunction.
- (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) About warm-up time  
Operation depends on a power-supply voltage and an external constant for time until stabilizing. Please confirm warm-up time enough when you use it.
- (7) PCB design considerations  
To reduce the noise from OUTPUT to INPUT, COMP\_IN(11pin) and D\_OUT(12pin) and T\_OUT(13pin) lines away from Pyro Sensor and A1P\_IN(4pin).

●Ordering part number

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

Part No.

|   |   |   |   |
|---|---|---|---|
| 9 | 2 | 5 | 1 |
|---|---|---|---|

Part No.

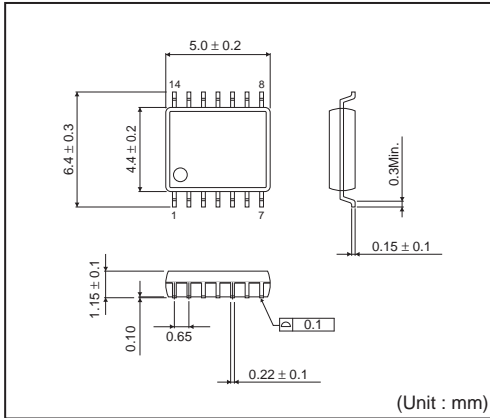
|   |   |
|---|---|
| F | V |
|---|---|

Package  
FV: SSOP-B14

|   |   |
|---|---|
| E | 2 |
|---|---|

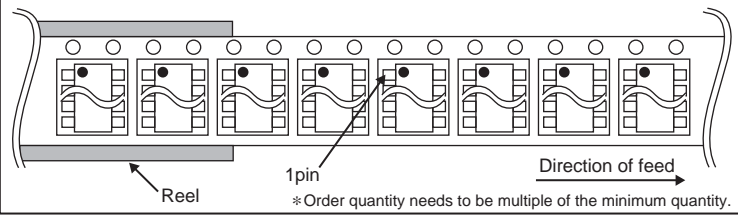
Packaging and forming specification  
E2: Embossed tape and reel

SSOP-B14



<Tape and Reel information>

|                   |   |
|-------------------|---|
| Tape              | Embossed carrier tape   |
| Quantity          | 2500pcs   |
| Direction of feed | E2<br>( The direction is the 1pin of product is at the upper left when you hold reel on the left hand and you pull out the tape on the right hand ) |





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

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  - Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>
  - 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

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### 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 Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>
  - [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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