# AN48820A

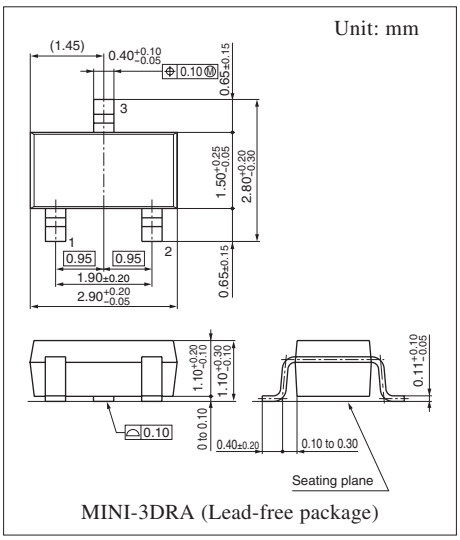
## Low current consumption, high sensitivity CMOS Hall IC
## Operate by the value of magnetic flux density, regardless of polarity

### ■ Overview

The AN48820A is a Hall IC (a magnetic sensor) which has 2 times or more sensitivity and a low current consumption of about one three-hundredth compared with our conventional one.

In this Hall IC, a Hall element, a offset cancel circuit, an amplifier circuit, a sample and hold circuit, a Schmidt circuit, and output stage FET are integrated on a single chip housed in a small package by IC technique.

www.DataSheet4U.com




MINI-3DRA (Lead-free package)

### ■ Features

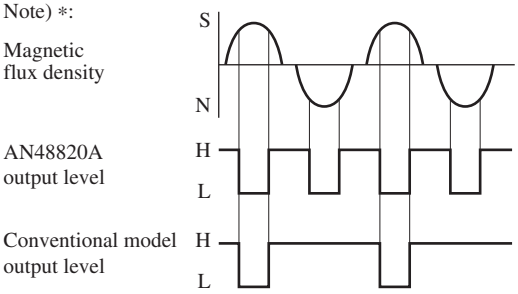
- Either North nor South magnetic pole can be selected *
- High sensitivity (6 mT max.) due to offset cancel circuit and a new sample and hold circuit
- Small current by using intermittent action (Average supply current: 3.5 μA typ.)
- Small package (SMD)
- Open drain output

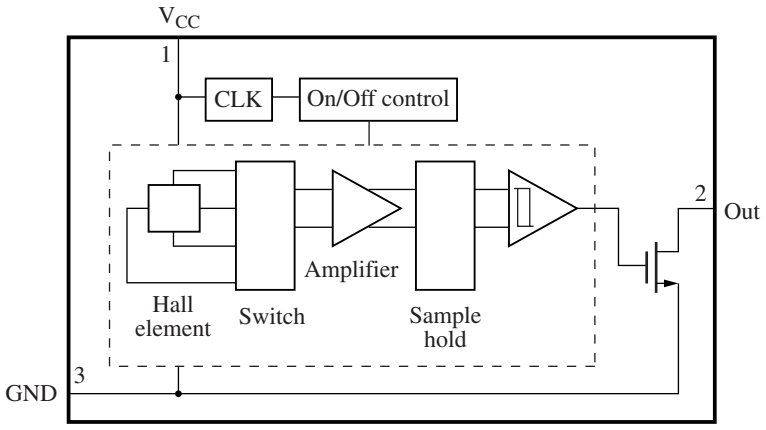
### ■ Applications

- Flip type cellular phone, digital video camera

### ■ Block Diagram

Note) *:




### ■ Pin Descriptions

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | $V_{CC}$ | Power supply |
| 2 | Out | Output |
| 3 | GND | Ground |


www.DataSheet4U.com

## ■ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 5 | V |
| Output voltage | $V_{OUT}$ | 5 | V |
| Supply current | $I_{CC}$ | 5 | mA |
| Output current | $I_{OUT}$ | 15 | mA |
| Power dissipation *1, 2 | $P_D$ | 60 | mW |
| Operating ambient temperature *1 | $T_{opr}$ | −25 to +75 | °C |
| Storage temperature *1 | $T_{stg}$ | −55 to +125 | °C |

Note) ∗1: Except for the power dissipation, operating ambient temperature and storage temperature, all ratings are for $T_a$ = 25°C.
∗2: $T_a$ = 85°C. For the independent IC without a heat sink. Please use within the range of power dissipation, refering to $P_D$ — $T_a$ curve.

www.DataSheet4U.com

## ■ Recommended Operating Range

| Parameter | Symbol | Range | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 2.5 to 3.5 | V |

## ■ Electrical Characteristics at $T_a$ = 25°C

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Operating magnetic flux density 1 | $B_{H-LS}$ | $V_{CC}$ = 3 V | — | — | 6 | mT |
| Operating magnetic flux density 2 *1 | $B_{H-LN}$ | $V_{CC}$ = 3 V | −6 | — | — | mT |
| Operating magnetic flux density 3 *2 | $B_{L-HS}$ | $V_{CC}$ = 3 V | 0.5 | — | — | mT |
| Operating magnetic flux density 4 *2 | $B_{L-HN}$ | $V_{CC}$ = 3 V | — | — | − 0.5 | mT |
| Output voltage 1 | $V_{OLS}$ | $V_{CC}$ = 3 V, $I_O$ = 2 mA, B = 6.0 mT | — | 0.1 | 0.3 | V |
| Output voltage 2 | $V_{OLN}$ | $V_{CC}$ = 3 V, $I_O$ = 2 mA, B = −6.0 mT | — | 0.1 | 0.3 | V |
| Output current 1 | $I_{OHS}$ | $V_{CC}$ = 3 V, $V_O$ = 3 V, B = 0.5 mT | — | — | 10 | µA |
| Output current 1 | $I_{OHN}$ | $V_{CC}$ = 3 V, $V_O$ = 3 V, B = − 0.5 mT | — | — | 10 | µA |
| Supply current 1 *3 | $I_{CCAVE}$ | $V_{CC}$ = 3 V, B = 0.5 mT | — | 3.5 | — | µA |

Note) ∗1: Symbol $B_{H-LS}$ , $B_{H-LN}$ stands for the operating magnetic flux density where its output level varies from high to low.
∗2: Symbol $B_{L-HS}$ , $B_{L-HN}$ stands for the operating magnetic flux density where its output level varies from low to high.
∗3: $I_{CCAVE} = \{I_{CCON} \times t_{ON} + I_{CCOFF} \times t_{OFF}\}/\{t_{ON} + t_{OFF}\}$

• Design reference data

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Hysteresis width 1 | BWS | $V_{CC}$ = 3 V | — | 1.2 | — | mT |
| Hysteresis width 2 | BWN | $V_{CC}$ = 3 V | — | 1.2 | — | mT |
| Supply current 2 | $I_{CCON}$ | $V_{CC}$ = 3 V, B = 0.5 mT | — | 1.4 | — | mA |
| Supply current 3 | $I_{CCOFF}$ | $V_{CC}$ = 3 V, B = 0.5 mT | — | 2 | — | µA |
| Operating time | $t_{ON}$ | $V_{CC}$ = 3 V | — | 40 | — | µs |
| Stop time | $t_{OFF}$ | $V_{CC}$ = 3 V | — | 41 | — | ms |

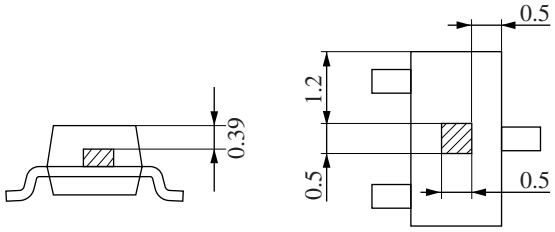
Note) It will operate normally in approximately 41 ms after power on.


www.DataSheet4U.com

## ■ Technical Data

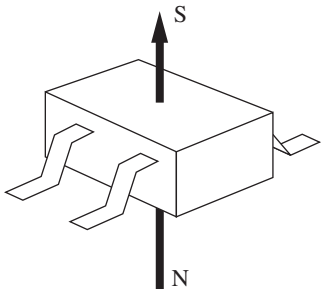
• Position of a Hall element (unit in mm)

Distance from a package surface to sensor part: 0.39 mm (reference value)
A Hall element is placed on the shaded part in the figure.

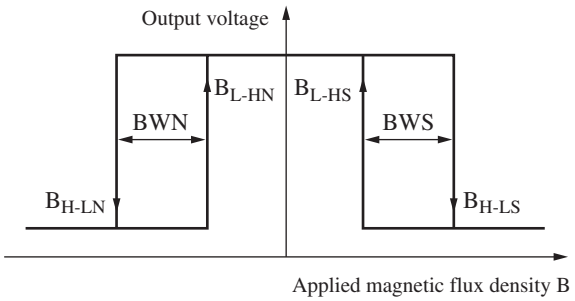



• Magneto-electro conversion characteristics

www.DataSheet4U.com

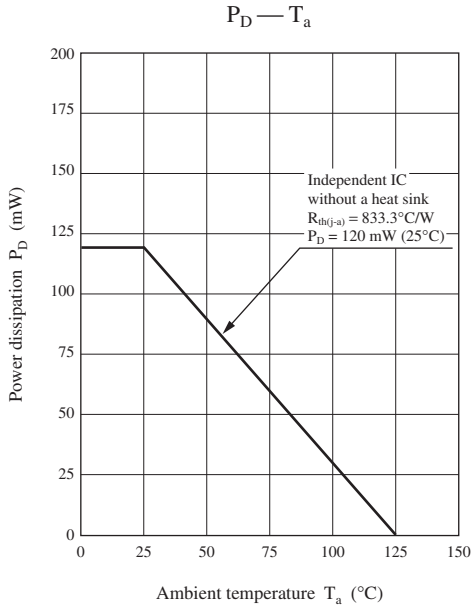



Direction of applied magnetic field




Operating magnetic flux density

## ■ Power dissipation of package MINI-3DRA






www.DataSheet4U.com

## ■ Caution on Use of Hall ICs

The Hall ICs are often used to detect movement. In such cases, the position of the Hall IC may be changed by exposition to shock or vibration over a long period of time, and it causes the detection level change. To prevent this, fix the package with adhesives or fix it on a dedicated case.

1. A case using an adhesive

Some kinds of adhesive generate corrosive gas (such as chloric gas) during curing. This corrosive gas corrodes the aluminum on the surface of the Hall IC, and may cause a functional defect of disconnection.

If Hall IC is to be sealed after installation, attention should be given to the adhesive or resin used for peripherals and substrate cleaner, as well as to the adhesive used for Hall IC installation. Please confirm the above matter to those manufacturers before using.

We could not select the specified adhesive, for we find it difficult to guarantee the ingredient of each adhesive.

2. Power supply line/Power transmission line

If a power supply line/power transmission line becomes longer, noise and/or oscillation may be found on the line. In this case, set the capacitor of 0.1 µF to 10 µF near the Hall IC to prevent it.

www.DataSheet4U.com

If a voltage of 18 V or more is thought to be applied to the power supply line (flyback voltage from coil or the ignition pulse, etc.), avoid it with external components (capacitor, resistor, Zener diode, diode, surge absorbing elements, etc.).

3. On mounting of the surface mount type package (MINI-3DR)

When mounted on the printed circuit board, the Hall IC may be highly stressed by the warp that may occur from the soldering. This may also cause a change in the operating magnetic flux density and a deterioration of its resistance to moisture.

Wrong Correct

4. $V_{CC}$ and GND

Do not reverse $V_{CC}$ and GND. If the $V_{CC}$ and GND pins are reversely connected, this IC will be destroyed. If the IC GND-pin voltage is set higher than other pin voltage, the IC configuration will become the same as a forward biased diode. Therefore, it will turn on at the diode forward voltage (approximately 0.7 V), and a large current will flow through the IC, ending up in its destruction. (This is common to monolithic IC.)

5. Cautions on power-on of Hall IC

When a Hall IC is turned on, the position of the magnet or looseness may change the output of a Hall IC, and a pulse may be generated. Therefore, care should be given whenever the output state of a Hall IC is critical when the supply power is on.

6. On using flux in soldering

Choose a flux which does not include ingredients from halogen group, such as chlorine, fluorine, etc. The ingredients of halogen group may enter where the lead frame and package resin joint, causing corrosion and the disconnection of the aluminum wiring on the surface of an IC chip.

7. On surface treatment of mini-mold package

Surface treatment is available in either smooth or dull finish.

8. On soldering of the surface mount type package

Surface mounting type Hall ICs are apt to change its electrical characteristics due to the stress from soldering at mounting. Therefore, avoid the mounting by flow (dipping) and a soldering iron. Please mount it by reflow soldering abiding by its recommended conditions.



www.DataSheet4U.com

## Request for your special attention and precautions in using the technical information and semiconductors described in this book

(1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.

(2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products, and no license is granted under any intellectual property right or other right owned by our company or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.

(3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

www.DataSheet4U.com

(4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
 Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.

(7) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of Matsushita Electric Industrial Co., Ltd.

www.DataSheet4U.com